The effectiveness of R&D tax incentives

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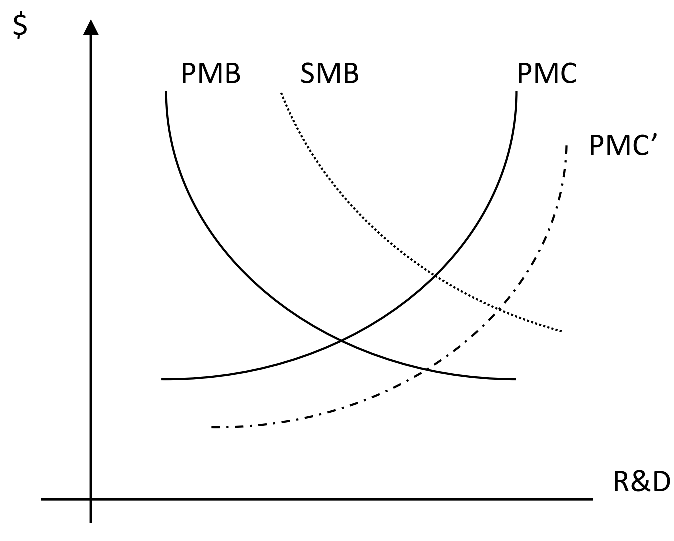
Why should government intervene?

- market failure: spillovers
- market failure: access to finance for R&D
- coordination failure: timely provision of human capital
- High uncertainty
- Excessively high costs for single firm

Market failure: spillovers

- Optimal social amount of R&D



Ways to intervene

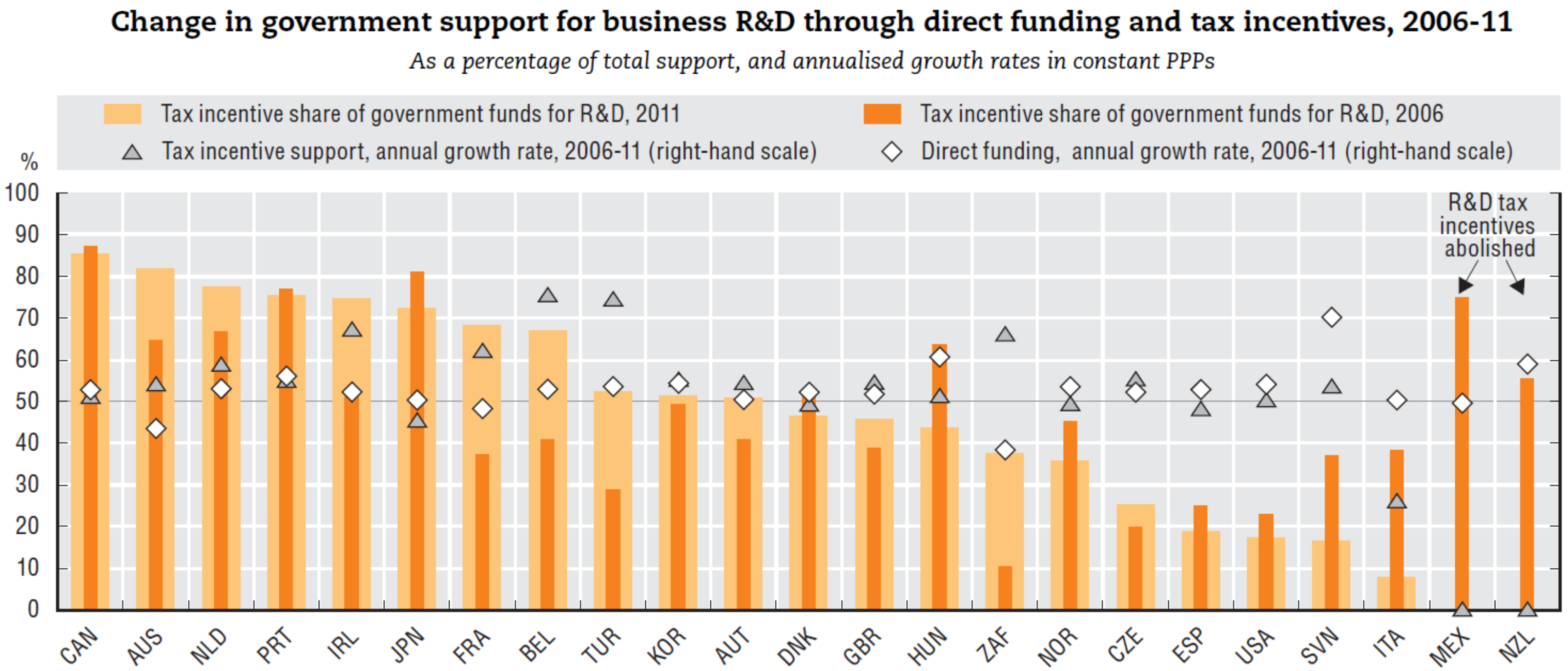
- Tax incentives
  - Level-based or increment-based
- Direct support for R&D
  - Grants, subsidies, public procurement, research contracts
- Soft loans, loan guarantees
- Venture capital
- Regulatory measures
  - IPR, R&D cooperation, standard settings
- Public R&D (labs, universities)
- Infrastructure
  - education, technology centers

Kinds of R&D tax incentive**s**

- In proportion to the level of the expenses
  - immediate write-off or expensing
  - tax credits proportional to the level of R&D
- In proportion to the increment of R&D
  - Definition of the base (fixed or variable, e.g. last two years)
- Measures intended to remove ceilings in the effective use of tax incentives
  - refundability of unused tax credits
  - Carry-back and carry forward of unused tax credits
  - Flow through mechanisms, i.e. transfer of unused tax credits to an eligible third party
- Focus on specific types of R&D
  - environment, health, defense, agriculture, information
  - university, small and medium enterprises (SME), regional support, R&D cooperation
- Indirect tax incentives
  - reduced corporate income taxes, exemption of capital gains taxes
  - Reduced taxes on dividends from venture capital funding
  - Reduced taxes for high-skilled immigrants

Expenditure-based R&D tax incentives				
Corporate income tax				Social security/pay withholding tax
R&D tax credit		R&D tax allowance	Accelerated depreciation of capital	
Volume	Incremental/hybrid			
Australia, Austria, Belgium (incompatible with allowance), Canada, Chile, Denmark (deficit only), France, Norway, Hungary	Ireland, Italy, Japan, Korea, Portugal, Spain, United States (credit on fixed, indexed base and incremental for simplified credit)	Belgium, Brazil, China, Czech Republic, Finland, Hungary, Iceland, Netherlands, Russian Federation, Slovenia, Slovak Republic (subsidy recipients only), South Africa, Turkey (hybrid), United Kingdom	Belgium, Brazil, Canada, Chile, Denmark, France, Israel (non R&D specific), Poland, Russian Federation, Turkey, United Kingdom	Belgium, France Netherlands, Hunga Russian Federatio Turkey
Treatment of excess claims				
Refund				
Australia (SMEs), Austria, Belgium, Canada (SMEs), Denmark, France (SMEs), Norway	Ireland	United Kingdom	...	*Automatic refund through wage syste*
Carry-forward				
Australia, Belgium, Canada, Chile, France	Ireland, Japan, Korea, Portugal, Spain, United States	Belgium, China, Czech Republic, Finland, Netherlands, Russian Federation, Slovenia, Slovak republic, South Africa, Turkey, United Kingdom	*Country-specific loss carry-forward provisions apply*	*Not applicable*
Enhanced tax credit/allowance rates or more favourable terms				
SMEs				

Importance of tax incentives



Note: This is an experimental indicator. International comparability may be limited. For more information, see *www.oecd.org/sti/rd-tax-stats.htm*.
Source: OECD, based on OECD R&D tax incentives questionnaires, January 2010, June 2011 and June 2013, publicly available sources, and OECD, Main Science and Technology Indicators Database, *www.oecd.org/sti/msti.htm*, June 2013. See chapter notes.

Recent literature surveys

- European Commission (2014), "A study on R&D tax incentives", CPB Netherlands, consortium leader.
- Ientile, Damien and Jacques Mairesse (2009), "A policy to boost the R&D: Does the tax credit work?", European Investment Bank paper 14(1).

Additionality

- Additionality: How much additional R&D/ Euro of tax expenditure?

- Tax expenditures:
  - Include all taxes (level, incremental, …)
  - Allow for changes in tax position

  - Calculate it (statutory rates)
  - Observe it (administrative data)

How to measure additional R&D?

- Ask firms
  - Do they really know?
  - Self-interest to respond positively

- Estimate econometrically
  - Structural models
  - Treatment evaluation methods

Structural models

- Demand for R&D equation
  - With R&D tax credit dummies or with user cost including B-index
  - Endogeneity of dummy or user cost
  - Time effects (adjust. costs, lags between spending and receiving credits, credit rate dependent on past R&D levels)
- Examples: Bloom-Griffith-van Reenen (2002), Hall (2003), Dagenais-Mohnen-Therrien (2004), Mulkay and Mairesse (2008)

Model: R&D as an investment

- First-order condition: marginal return on R&D has to be sufficiently high to cover the user cost of R&D (plus possibly marginal adjustment costs, option value,…)

$$\mathrm{MPK} = \rho = \frac{1 - A^{\mathrm{d}} - A^{\mathrm{c}}}{1 - \tau}(r + \delta - \Delta p_{\mathrm{R}}/p_{\mathrm{R}} + \mathrm{MAC})$$

B-index

- Introduced by McFetridge and Warda, 1983
- Defined as the ratio of the net cost of a dollar spent on R&D, after all quantifiable tax incentives have been accounted for, to the net income from one dollar of revenue.
- Example: suppose complete expensing of all R&D expenditures, R&D tax credit of 20%, corporate income tax rate of 50%. Then B-index is:(1-0.5)(1-0.2)/(1-0.5)=0.8.

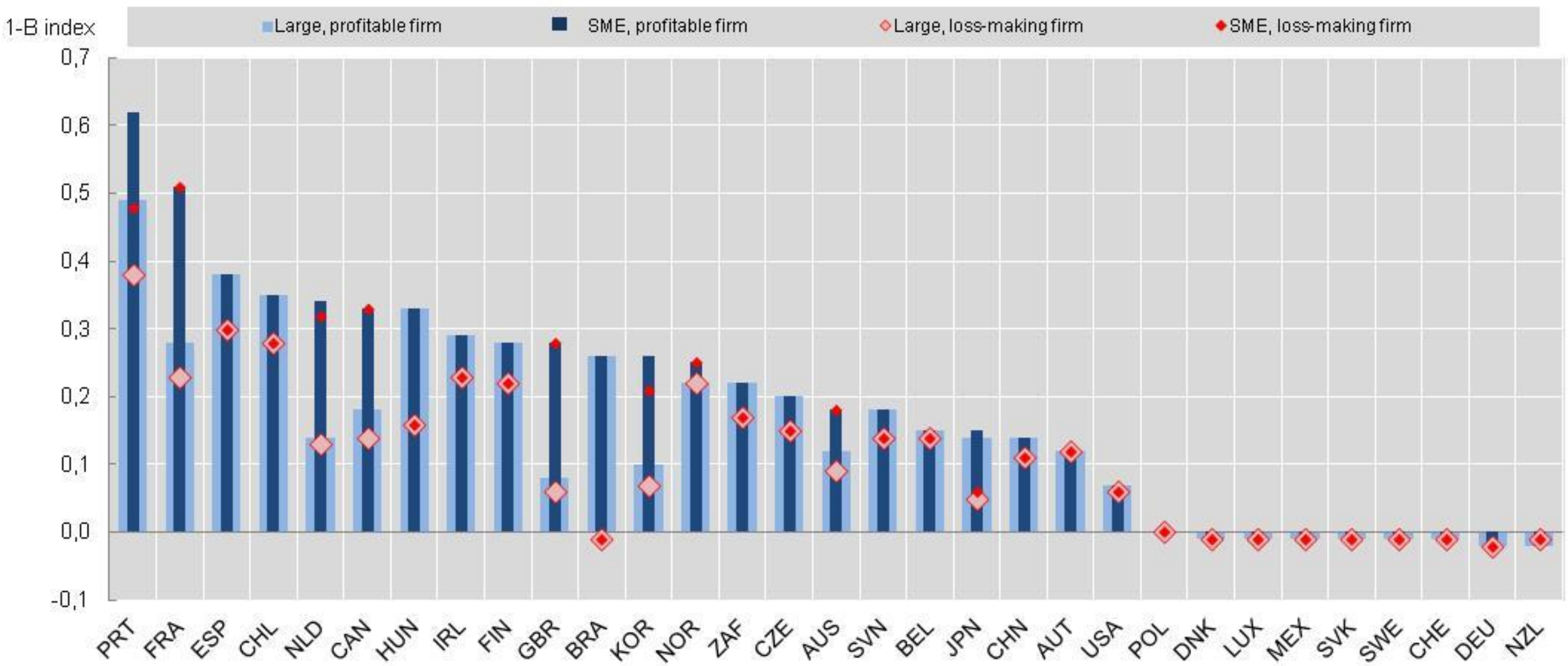
Construction of the user cost of R&D

- Example of the Netherlands

$$u_{Ri} = P_R(r+\delta).B_i$$

$$B_i = \frac{1}{1-\tau}\left\{\begin{array}{l} 1-(1-\tau)w_i^{\ L} \\ D_{1i}\left[\begin{array}{l} [\omega_1^1(1-D_{2i})+\omega_2^1 D_{2i}]\min\left(\dfrac{R_L^1}{w_i^{\ L}R_i},1\right)+1_{R_L^1<w_i^{\ L}R_i}[\omega_1^2(1-D_{2i})+\omega_2^2 D_{2i}] \\ \min\left(1-\dfrac{R_L^1}{w_i^{\ L}R_i},\dfrac{(R_L^2-[\omega_1^1(1-D_{2i})+\omega_2^1 D_{2i}]R_L^1)/[\omega_1^2(1-D_{2i})+\omega_2^2 D_{2i}]}{w_i^{\ L}R_i}\right) \end{array}\right] \\ -\tau w_i^B z^B-\tau w_i^E z^E-\tau w_i^{\ O}-\tau w_i^{\ L} \end{array}\right\}$$

Generosity: international comparison



SOURCE	OECD R&D Tax Incentives Indicators; based on the 2013 OECD-NESTI data collection on tax incentives support for R&D expenditures.

Price elasticity of R&D

- Netherlands: short-run -0.3, long-run -0.7
- Quebec:
  - Small firms: -0.14 in SR, -0.19 in LR
  - Large firms: -0.06 in SR, -0.10 in LR
- Comparison with other studies:
  - Bloom, Griffith, van Reenen (2002), -0.1 in SR, -1.0 in LR
  - Wilson (2005), in LR -1.0 within states, but because of market stealing total effect -0.1
  - Harris, Li, Trainor (2009), -1.36 in LR

Quasi-natural experiments

- Identification of treatment and control groups
  - Matching estimators
  - Difference in difference
  - Regression discontinuity design
- Examples: Haegeland and Møen (2007), Duguet (2007), Cornet and Vroomen (2005), Czarnitzki, Hanel, Rosa (2004), Corchuelo and Martínez-Ros (2008)

Does R&D respond to tax incentives?

YES

- User cost elasticities:
  - Bloom, Griffith, van Reenen (2002), various countries:-0.1 in SR, -1.0 in LR
  - Harris, Li, Trainor (2009), Northern Ireland: -0.53 in SR, -1.36 in LR
  - Mairesse-Mulkay (2013), France: -0.6 after 2008, at least -2.0 before 2008 (incremental R&D tax credit)
  - Lokshin-Mohnen (2012), Netherlands: -0.3 in SR, -0.7 in LR
  - Labeaga, Martinez-Ros, Mohnen (2015), Spain: -0.19 in SR, -0.70 in LR
- Quasi-experiments:
  - Hægeland and Møen (2007) for Norway: R&D tax credits increase R&D by 1.35%
  - Duguet (2007) for France: firms that use R&D tax credits increase their R&D growth by 0.01% to 0.1%
  - Czarnitzki, Hanel, Rosa (2004), Canada: almost 30% of firms that use tax credits would not have done R&D without it

Is there additionality?

- Also called multiplier effect or bang for the buck
- Per euro spent on tax incentives, do we get at least one euro of additional R&D?
- A lot of variability across studies
- The additionality is not unrelated to level-based vs increment-based R&D tax credit schemes
  - Mairesse-Mulkay (2004) find a BFTB between 1 and 2.6 for the period where there was still incremental CIR
  - Mairesse-Mulkay (2013) report a BFTB of 0.7 under the regime of level-based CIR

Study	country	method	Incrementality ratio
Mansfield and Switzer (1985)	Canada	survey	0.40
Finance Canada and Revenue Canada (1997)	Canada	survey	1.38
Bernstein	Canada	Structural model	0.80 (exogenous output) 1.05-1.70 (induced output)
Dagenais, Mohnen, Therrien (2004)	Canada	Stuctural model	0.98-1.04
Russo (2004)	Canada	CGE model[$]	Higher for incremental than for level-based R&D tax credits
Parsons and Phillips (2007)*	Canada	Cost/benefit analysis	10.9% net welfare effect
Mairesse and Mulkay (2013)	France	Structural model	0.7
Lokshin and Mohnen (2007)	Netherlands	Structural model	0.80-1.40 in short run 0.31-0.75 in long run
Czarnitzki, Hanel and Rosa (2004)	Canada	Evaluation treatment	R&D tax credit receivers have higher innovative, but not higher economic performance
Duguet (2007)	France	Evaluation treatment	1.00-3.30
Haegeland and Møen (2007b)	Norway	Evaluation treatment	2.00
Cornet and Vroomen (2005)	Netherlands	Evaluation treatment	0.50-0.80

Bang for the buck (BFTB)

$$BFTB = \frac{\sum_{i}\sum_{t=1}^{\infty}(\tilde{R}_{it} - R_{it})/(1+r)^{t-1}}{\sum_{t=1}^{\infty}(\tilde{W}_{t} - W_{t})/(1+r)^{t-1}}.$$

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Denominator in the BFTB

- Cost to government

$$\sum_i \sum_t^{\infty} \left[\tilde{\gamma}_1 \left(\tilde{R}_{it} - R_{it}\right) + (\tilde{\gamma}_1 - \gamma_1) R_{it} + \tilde{\gamma}_2 (\Delta \tilde{R}_{it} - \Delta R_{it}) + (\tilde{\gamma}_2 - \gamma_2) \Delta R_{it}\right] / (1 + r)^{t-1}. \quad (13)$$

- Deadweight loss: terms 2 and 4

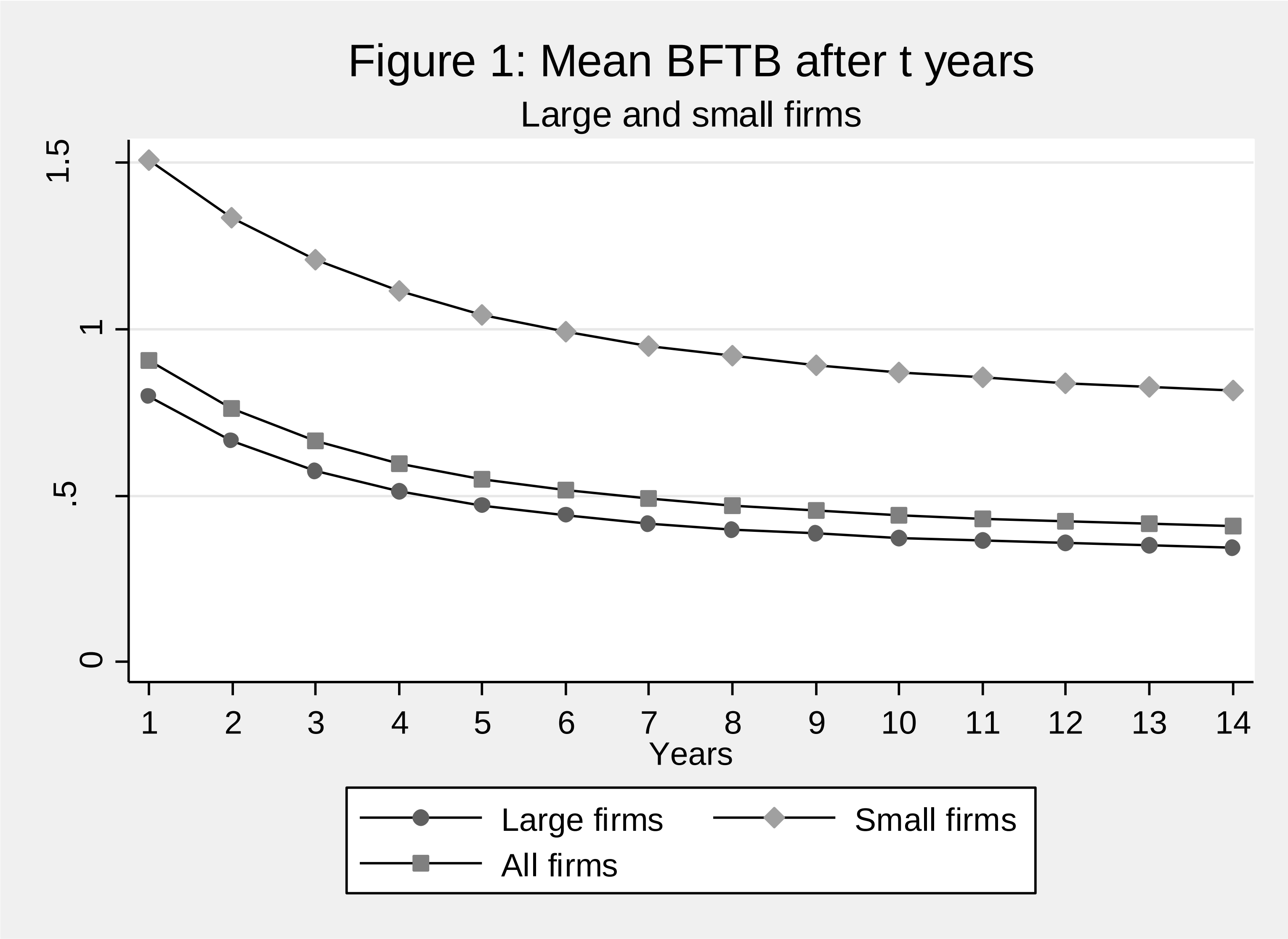


Figure 1: Mean BFTB after t years
Large and small firms
1.5
1
.5
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
Years
Large firms
Small firms
All firms

BFTB in Quebec

- If level-based R&D tax credit increases by 10%, for small firms, the BFTB stays above 1 after 20 years, for large firms it falls below 1
- Deadweight loss: 68% for small firms, 82% for large firms
- If increment-based R&D tax credit increases by 10%, the BFTB= 2.98 for small firms, 2.79 for large firms

Ways to assess effectiveness of R&D

Additionality

Cost-effectiveness ratio
Incrementality ratio
Tax sensitivity ratio

Full
Cost benefit analysis

Spillovers
Administration costs
Compliance costs
Opportunity costs

General equilibrium analysis

Wage effects
Balanced budget
Open trade

Second-order effects
Third-order effects

Full cost-benefit analysis (1)

Study by Parsons and Phillips (2007)

- Inclusion of
  - Spillovers (0.56)
  - Administration costs (0.02)
  - Compliance costs (0.08)
  - Opportunity costs (0.27)

- Net welfare effect: 10.9%

Full cost-benefit analysis (2)

- Behavioral additionality (2nd order effects)
  - Innovation incidence
  - Innovation intensity
  - patenting
- Returns to marginal R&D (3rd order effects)
  - Productivity or profitability

Full cost-benefit analysis (3)

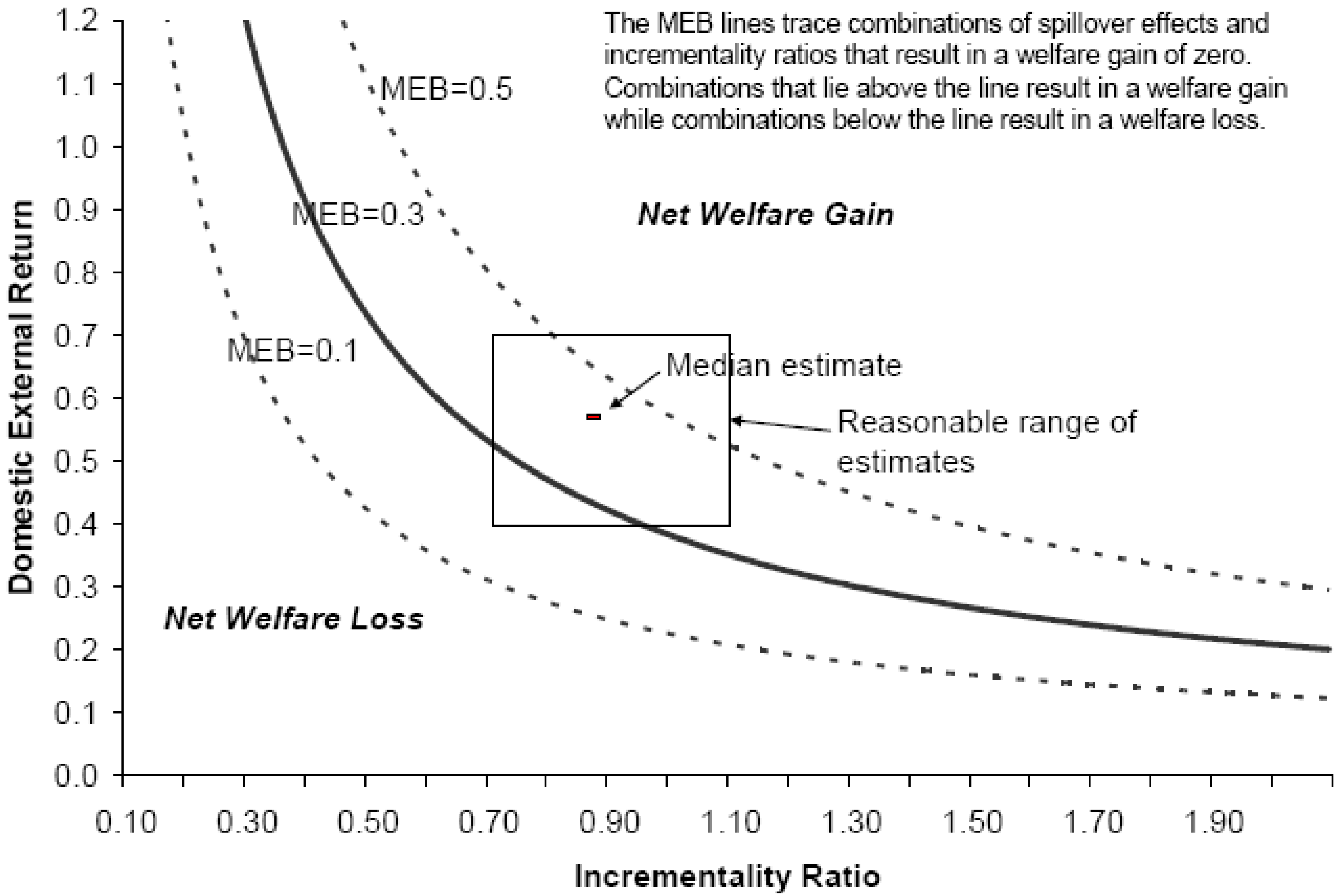
- General equilibrium effects
  - Wage effects
  - Balanced budget
  - Credit constraints
  - Open economy

  - Study by Russo (2004)

Sensitivity analysis

- Parsons and Phillips (2007)
  - Range of values
  - Example: net welfare = 0 if
    - Spillover = 0.45
    - Incrementality = 0.71
  - Imprecise estimates

Sensitivity analysis (from Parsons and Phillips, 2007)



Example: Lokshin and Mohnen (2009)

- CES production function

$$Q_{it} = F_t(K_{it}, X_{it}) = \gamma[\beta K_{it}^{-\rho} + (1-\beta) X_{it}^{-\rho}]^{-\nu/\rho}$$

- Constant price elasticity

$$Q_{it} = Q_{It}\left(\frac{P_{it}^{Q}}{P_{It}}\right)^{-\varepsilon}$$

- Optimal level of R&D stock

$$k_{it}^{*} = a + \phi v_{it} - \sigma(u_{R,it} - p_{I,it}) + \gamma q_{I,it}$$

Three ways to introduce dynamics

- Partial adjustment model in R&D flow

$$k_{it} = (1-\lambda)k_{i,t-1} + a + \phi v_{it} - \sigma(u_{it}^{R} - p_{It}) + \gamma q_{It}$$

- Partial adjustment model in R&D stock

$$\frac{R_{it}}{K_{i,t-1}} = \frac{R_{it}^{r} + R_{it}^{n}}{K_{i,t-1}} = \delta + (\frac{K_{it}}{K_{i,t-1}} - 1) \cong \delta + d\log K_{t}$$

$$k_{t} - k_{t-1} = \lambda(k_{t}^{*} - k_{t-1}^{*}) + (1-\lambda)\lambda(k_{t-1}^{*} - k_{t-2}^{*}) + (1-\lambda)^{2}\lambda(k_{t-2}^{*} - k_{t-3}^{*}) + \ldots$$

$$\frac{R_{it}}{K_{i,t-1}} = \lambda\delta + (1-\lambda)\frac{R_{i,t-1}}{K_{i,t-2}} + \varphi\lambda\, dv_{it} - \sigma\lambda\,(du_{Rit} - dp_{I,it}) + \gamma\lambda dq_{I,it} + (\varepsilon_{it} - (1-\lambda)\varepsilon_{i,t-1})$$

Three ways to introduce dynamics

- Error correction model

$$k_{it} = \xi_1 k_{i,t-1} + \phi_0 v_{it} + \phi_1 v_{i,t-1} - \sigma_0 (u_{it}^R - p_{It}) - \sigma_1 (u_{i,t-1}^R - p_{I,t-1}) + \gamma_0 q_{It} + \gamma_1 q_{I,t-1} + \alpha_i + \eta_{it}$$

$$\frac{R_{it}}{K_{i,t-1}} = \delta \; + (\xi_1 - 1)[k_{i,t-1} - \frac{(\varphi_0 + \varphi_1)}{(1-\xi_1)} v_{i,t-1} + (\frac{\sigma_0 + \sigma_1)}{(1-\xi_1)} (u_{i,t-1}^R - p_{i,t-1}^I) - \frac{\gamma_0 + \gamma_1}{(1-\xi_1)} q_{i,t-1}^I]$$

$$+ \varphi_0 \Delta v_{it} - \sigma_0 \Delta (u_{i,t}^R - p_{i,t}^I) + \gamma_0 \Delta q_{it}^I + \alpha_i + \varepsilon_{i,t}.$$

Example for the Netherlands - Lokshin-Mohnen (2012): data sources

- CBS production statistics (PS)
- CIS (& R&D) surveys
- Data in PS, CIS collected at *bedrijfseenheid* (business unit) level
- In the official report we also used data from Senter Novem on WBSO disbursements. Those data are collected at fiscal unit level.
- A backbone file was used to connect PS, CIS and SN

WBSO parameters

Table 1 Overview of WBSO program parameters

Year	WBSO budget (in mln. Euro)	Length of the first bracket (in Euro)	% First bracket	% Second bracket	Ceiling (in mln. Euro)
1996	253	68067	40	12.05	4.5
1997	274	68067	40	12.5	6.8
1998	372	68067	40	17.5	6.8
1999	353	68067	40	13	6.8
2000	365	68067	40	13	6.8
2001	435	90756	40 or 60 (s)	13	7.9
2002	464	90756	40 or 70 (s)	13	7.9
2003	425	90756	40 or 60 (s)	13	7.9
2004	466	110000	40 or 60 (s)	14	7.9

Source: de Jong and Verhoeven (2007); (s) stands for 'starters'

Construction of the user cost of R&D

$$u_{Ri} = P_R(r+\delta).B_i$$

$$B_i = \frac{1}{1-\tau}\left\{\begin{array}{l} 1-(1-\tau)w_i{}^L \\ D_{1i}\left[\begin{array}{l} [\omega_1^1(1-D_{2i})+\omega_2^1 D_{2i}]\min\left(\dfrac{R_L^1}{w_i{}^L R_i},1\right)+1_{R_L^1<w_i{}^L R_i}[\omega_1^2(1-D_{2i})+\omega_2^2 D_{2i}] \\ \min\left(1-\dfrac{R_L^1}{w_i{}^L R_i},\dfrac{(R_L^2-[\omega_1^1(1-D_{2i})+\omega_2^1 D_{2i}]R_L^1)/[\omega_1^2(1-D_{2i})+\omega_2^2 D_{2i}]}{w_i{}^L R_i}\right) \end{array}\right] \\ -\tau w_i^B z^B-\tau w_i^E z^E-\tau w_i{}^O-\tau w_i{}^L \end{array}\right\}$$

Descriptive statistics

Table 3 Annual average user cost of R&D and its components

Year	$P_R(r+\delta)$	WBSO Tax credit	B-index	User cost of R&D	User cost of R&D w/o WBSO tax credit
	(1)	(2)	(3)	(4)	(5)
1997	0.308	0.173	0.833	0.258	0.310
1998	0.298	0.191	0.815	0.243	0.300
1999	0.306	0.200	0.806	0.246	0.308
2000	0.311	0.207	0.797	0.248	0.312
2001	0.309	0.216	0.791	0.245	0.312
2002	0.334	0.200	0.803	0.268	0.334
2003	0.364	0.187	0.815	0.298	0.366
2004	0.388	0.194	0.808	0.314	0.389

Notes: The corporate income tax rate used in the construction of the user cost has decreased on average for the sampled firms from 36% to 29% between 1997 and 2004. B-index (column 3) is calculated using expression (A4) in Appendix A; WBSO tax credit (column 2) is calculated using the expression in square brackets (times wage share) of A4. Column (4) is a product of column (1) and column (3). Column (5) is the product of column (1) and the sum of column (3) and column (2).

Table 4. Estimation of R&D equation (14) by instrumental variables

Dependent variable	$k_{i,t}$	$\frac{R_{it}}{K_{i,t-1}}$	$\frac{R_{it}}{K_{i,t-1}}$
	Simple dynamic model (eq. 8)	ECM (1,1) model (eq. 15)	Partial adjustment model (eq. 13)
$\frac{R_{it-1}}{K_{i,t-2}}$ R&D flow/stock	--	--	0.47*** (0.13)
$k_{i,t-1}$ ln(R&D stock)	0.62*** (0.04)	0.11*** (0.06)	--
$d(u^R_{i,t} - p^I_{i,t})$ d(ln user cost)	--	-0.50*** (0.18)	-0.42*** (0.14)
$u^R_{i,t} - p^I_{i,t}$ ln(user cost)	-0.21*** (0.05)	--	--
$u^R_{i,t-1} - p^I_{i,t-1}$ ln(lagged user cost)	--	-0.48*** (0.18)	--
dv_{it} dln(output)	--	0.05 (0.04)	0.06* (0.03)
$v_{i,t}$ ln(output)	0.14** (0.06)	--	--
$v_{i,t-1}$ ln(lagged output)		0.08* (0.04)	--
dq_{Iit} dln(industry output)		0.09* (0.04)	0.05 (0.03)
$q^I_{i,t-1}$ ln(lagged industry output)	0.01 (0.01)	0.13* (0.05)	
δ		--	0.10*** (0.03)
Long-run user cost elasticity	-0.56*** (0.15)	-0.54*** (0.20)	-0.79*** (0.35)
Time dummies	Included	Included	Included
Individual effects	Fixed	Fixed	--
Sargan test (p-value)	5.18 (0.16)	0.21 (0.97)	0.61 (0.89)
Number of observations	1185	1185	1185

Notes: Estimation period is 1996-2004. *** indicates significance at 1%, ** at 5%, * at 10%.
Standard errors of the long-run elasticities are computed using the delta method.

Data

- Generated random sample of 1000 observations
- Reproducing composition of Dutch population of firms
- 75% small firms (R&D< €110,000)
- 25% large firms (€110,000<R&D<€ 50ML)

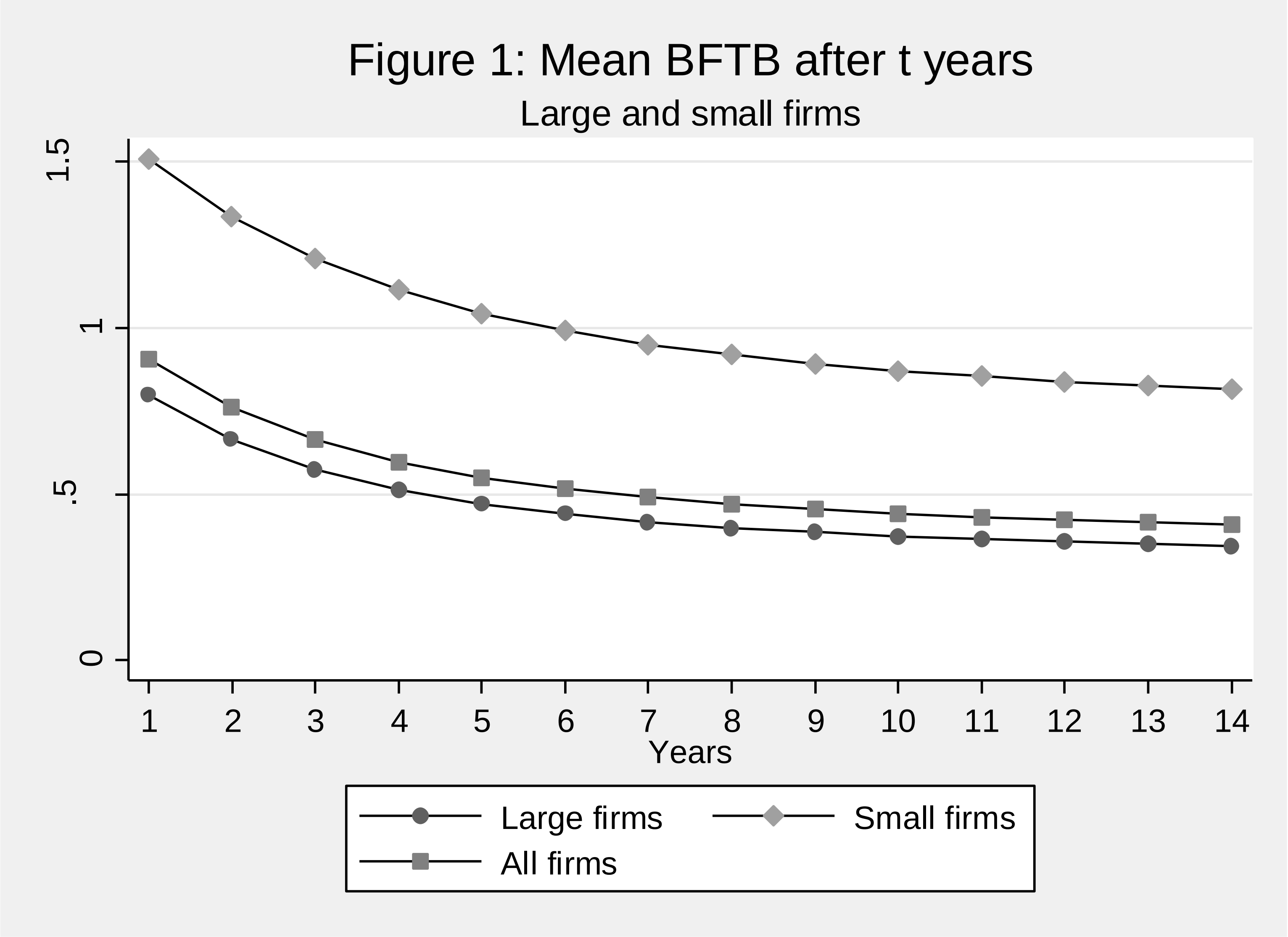
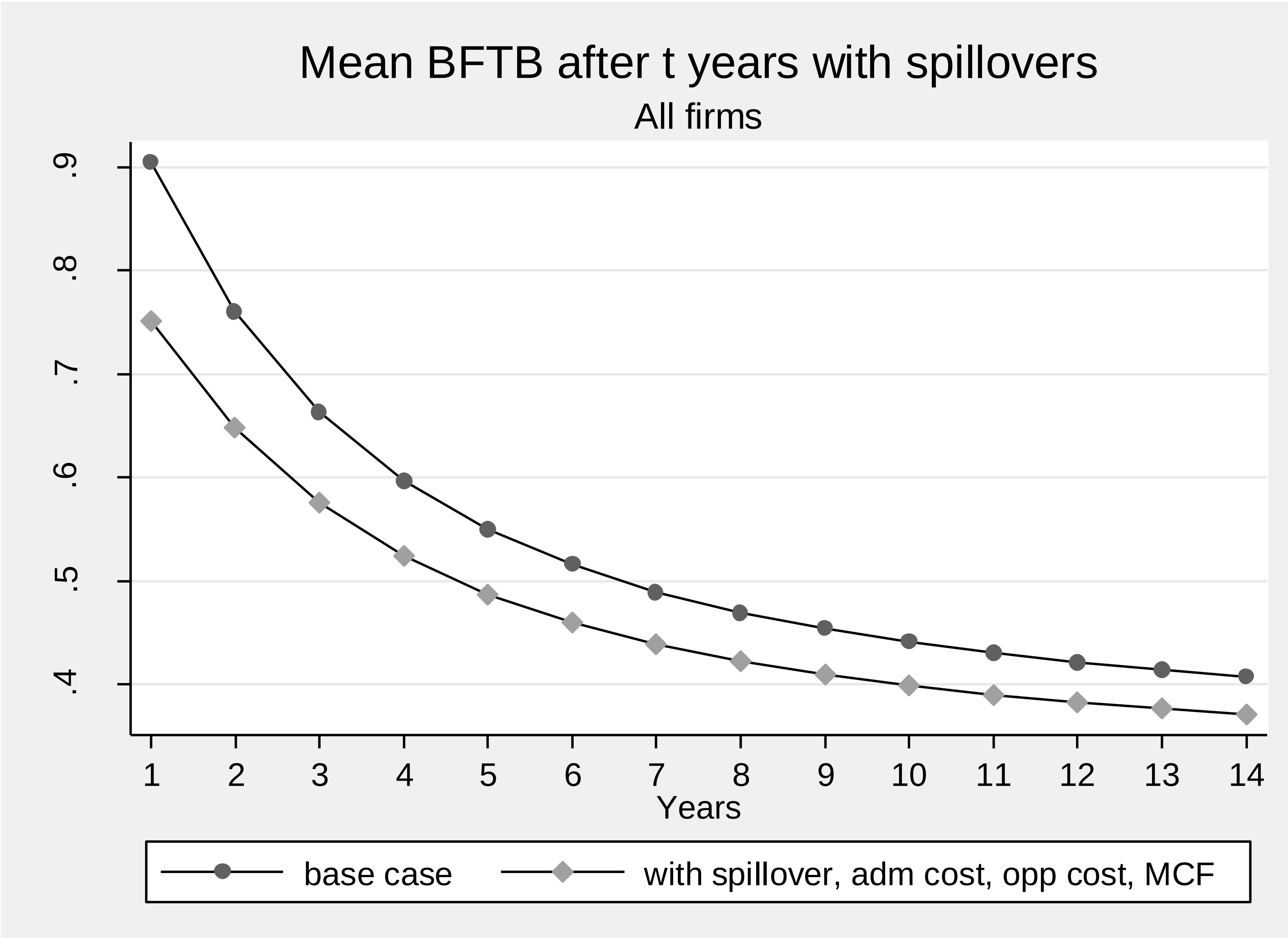


Figure 1: Mean BFTB after t years
Large and small firms
0
.5
1
1.5
1 2 3 4 5 6 7 8 9 10 11 12 13 14
Years
Large firms
Small firms
All firms


Mean BFTB after t years with spillovers
All firms
.9
.8
.7
.6
.5
.4
1
2
3
4
5
6
7
8
9
10
11
12
13
14
Years
base case
with spillover, adm cost, opp cost, MCF

Wage effects

Why?

- Supply constraint of R&D personnel
- Search costs for R&D personnel
- Negotiating power of R&D personnel
- To stimulate researchers to apply for R&D tax credits

Effects:

- Goolsbee (1998)-US: 10% rise in R&D leads to 1% rise in R&D wages →overestimation of additionality 30%-50%
- Hægeland and Møen(2007)-Norway: increase in wage 30% of R&D increase
- Lokshin-Mohnen (2013)-Netherlands : elasticity of the R&D wage w/t the fraction of the wage supported by the fiscal incentives: 0.10 (SR)-0.13 (LR)
- Dumont (2013)-Belgium: one Euro of tax subsidy yields 0.15 to 0.45 Euro of wage increase

Tax competition

- Evidence by Hines (1994) that firms may relocate to benefit from differences in tax incentive
- Wilson (2005), United States:
  - price-elasticity of R&D in LR -1.0 within states
  - If in-state and out-of-state user costs are included, the respective user cost elasticities are negative and positive and cancel each other out.
- Similar results are found by Bloom, Griffith and van Reenen (1998) and by Corrado, Haskel, Jona-Lasinio and Nasim (2015) for 10 European countries

Extensive margin

- Caiumi (2011)-Italy: especially small firms, startups and credit constrained firms are inclined to start doing R&D
- Corchuelo (2006)-Spain:
  - 1% decrease in user cost leads to 2.6 percentage point increase in probability to engage in R&D
- Labeaga, Martínez-Ros-Mohnen(2015)-Spain:
  - a 1% decrease in user cost of R&D increases probability to become an R&D performer by 4.6 percentage points for large firms and by 19.5 percentage points for SMEs
  - No significant effect of user cost of R&D on probability of stopping R&D
- Arque-Castells and Mohnen (2015)-Spain:
  - 25% of manufacturing firms in Spain need subsidies to enter but not to continue R&D (existence of sunk costs)
  - High return of attracting newcomers

Second- and third-order effects

- R&D tax incentives increase R&D, but do they also increase innovation and productivity?
- Czarnitzki, Hanel and Rosa (2005) –Canada-matching estimator:
  - positive effect of receiving tax credits on various measures of innovation (introduction of new products, of new-to-the-market products, new product sales intensity)
  - mixed results regarding firm performance (insignificant for profitability and domestic market share, positive for international market shares and keeping up with competitors)
- Most studies based on the CDM model find that R&D, especially continuous R&D, has a positive significant effect on innovation (patents, innovation occurrence, share of innovative sales)

Incentive-based policy

- Weakness of level-based tax incentive
  - Deadweight loss
- Weakness of increment-based tax incentive
  - Little effect on the user cost of R&D
  - Encourages seesaw behavior
  - More effective with fixed base than with rolling base, although fixed base not very realistic.
  - Limit to R&D acceleration
- Explore new avenues: e.g. Jeunes Entreprises Innovantes
  - Support not just small but young firms that do R&D
  - Support is limited in time

Increment-based R&D tax incentives

- Pros
  - Less deadweight loss
  - Larger bang for the buck
- Cons
  - Little effect of the user cost of R&D
  - More effective with fixed base than with rolling base, although fixed base not very realistic.
  - Limit to R&D acceleration

Pros and Cons of R&D tax incentives

Pros

- Let the private sector decide on the allocation of funds and let it foot part of the bill
- Neutral, not biased towards particular projects
- Predictable, reliable
- Lower administration costs than direct subsidies

Cons

- R&D tax incentives are not terribly effective in stimulating more R&D than the amount of tax revenues foregone in the long run, except perhaps for small firms
- Deadweight loss for level-based R&D tax credits
- Tax incentives support more the big firms than the small firms even if rates are more favorable for small firms
- Tax incentives might lead to research projects with a low rate of return, unprofitable without the tax support
- Benefits partly washed out by a wage effect

Actually

Deadweight loss and effectiveness should be compared for tax credits versus direct government aid for R&D support.

Policy discussion

- Deadweight loss and effectiveness should be compared for tax credits versus direct government aid for R&D support.
- Combine R&D tax incentives with other incentives and complementary measures (e.g. creating human capital)
- Coordination of tax incentives to avoid tax competition
- Devise tax incentives or other means of support for innovation appropriate to the particular market failures (e.g. spillover, financing problems, or human capital insufficiencies)
- Keep tax laws stable

Further work?

- What does it take to turn firms into R&D performers?
- R&D tax competition – R&D location
- Less emphasis on the BFTB, more on net welfare gain (how big spillovers?)
- What is more effective: direct-indirect?
- Complementarity direct-indirect R&D support

Further work? (2)

- Willingness to apply for R&D tax incentives?
- Level based or incremental R&D tax credits?
- Productivity of additional R&D emanating from government support (2nd and 3rd order effects)?