

Ex-Ante Assessments for EUROPEAN 7th FP for RTD

TIP GROUP Workshop

Socio Economic Impacts of Public RTD

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Ex-Ante Assessments for EUROPEAN 7th FP OECD RTD TIP GROUP

I. Methodological and Theoretical Aspects

II. General conditions for exercises

III. Results

IV. Conclusions

I. Methodological and Theoretical Aspects

I.1 What can we learn from new growth theories ?

I.2 The Technical Progress in NEMESIS

I.1 What can we learn from the new growth theories?

1/2

-
- We can act on long term growth
 - R&D Policies are important
 - Complete description of endogenous technical progress grounded on microeconomics

I.1 What can we learn from the new growth theories?

2/2

- Possibilities of non decreasing returns

- Knowledge externalities
 - Social returns of research are greater than private returns

 - Spontaneous research level is insufficient: needs for R&D subsidies.

I.1 What can we learn from the new growth theories?

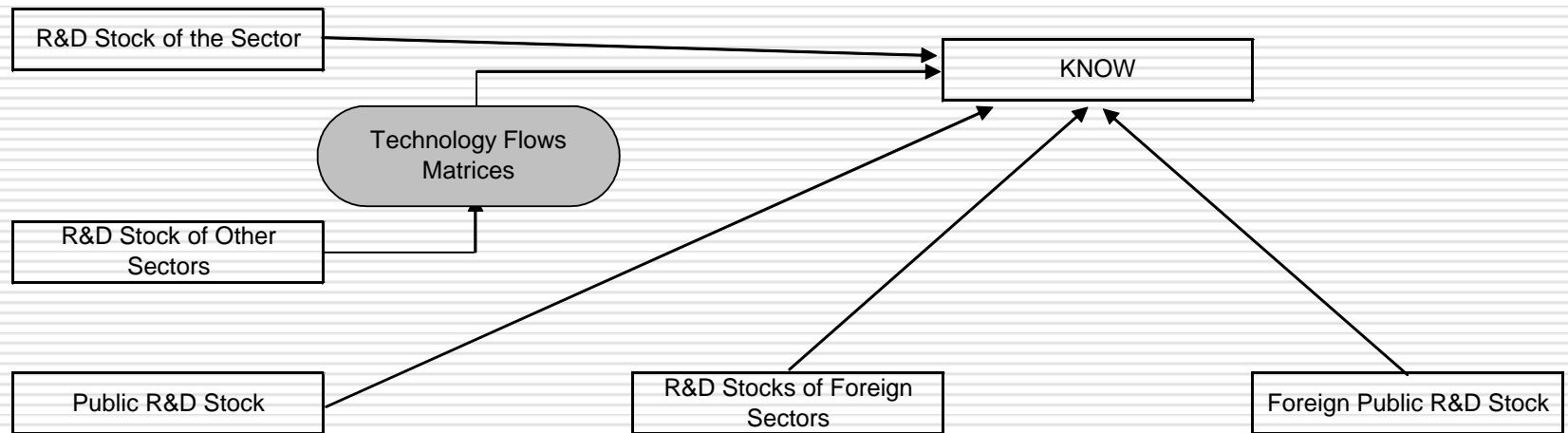
- Two types of innovations
 - Process
 - Product (quality)
- Endogenous technical progress
 - Learning
 - R&D
- Knowledge externalities (Knowledge Spillovers)
 - Inter-sectoral
 - Inter-national

I.2 The technical progress in NEMESIS

- From R&D to knowledge stock
- From knowledge to innovations
- From innovation to economic performances

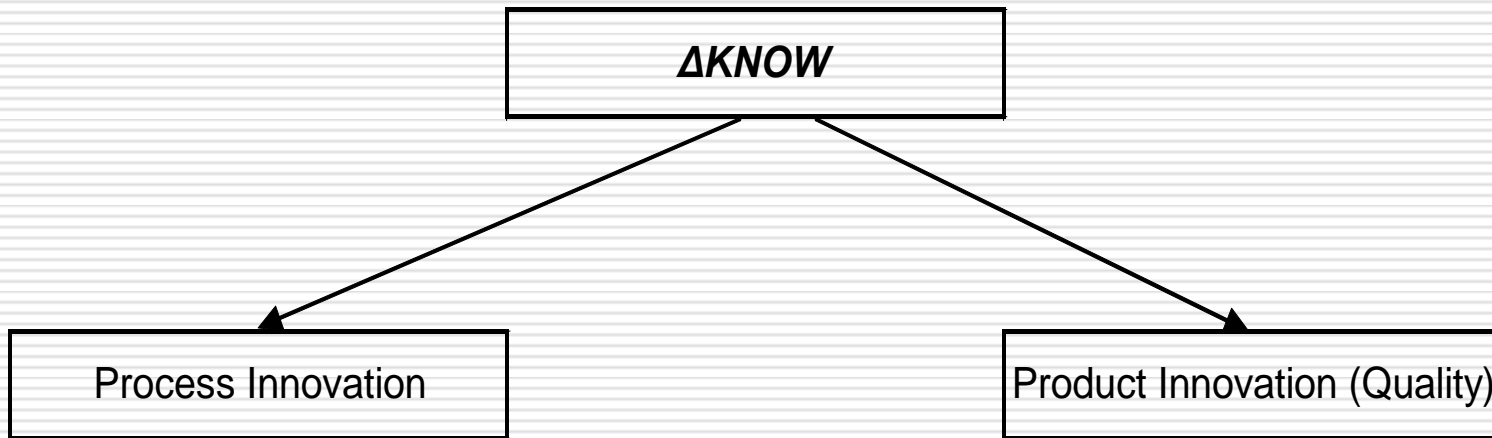
I.2 The technical progress in NEMESIS

From R&D to knowledge stock



I.2 The technical progress in NEMESIS

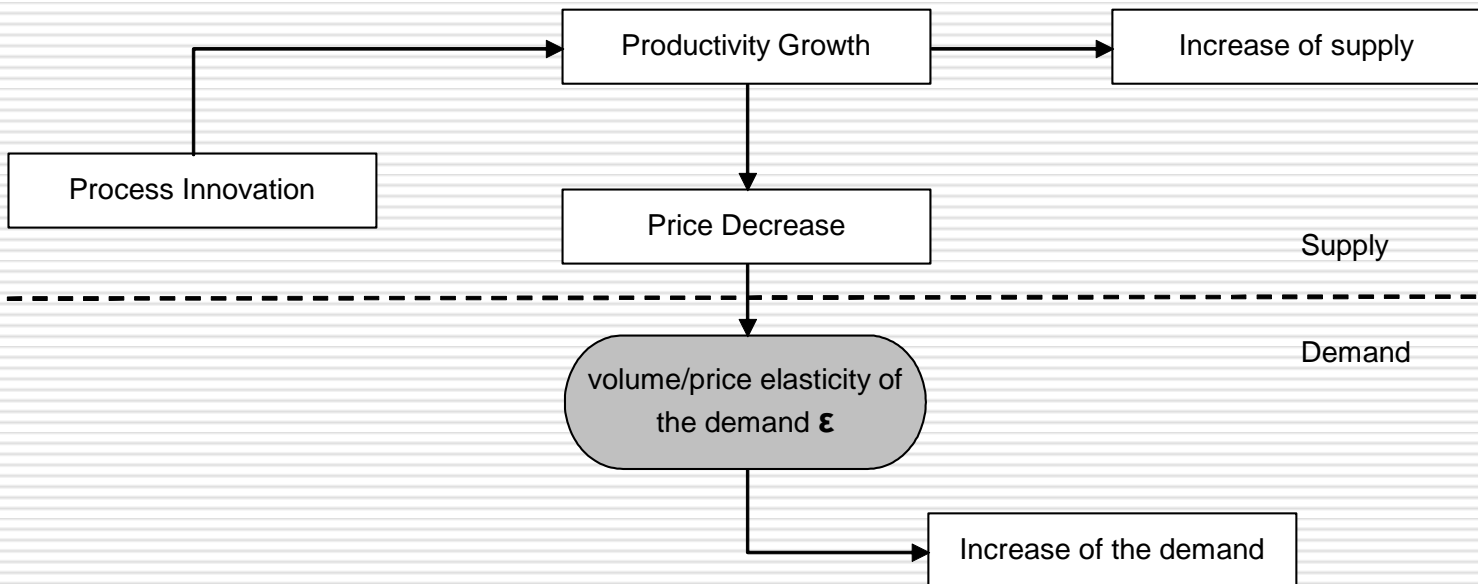
From knowledge to Innovation...



I.2 The technical progress in NEMESIS

From innovations to economic performances...

□ Process innovation:



I.2 The technical progress in NEMESIS

From innovations to economic performances...

□ Process innovation :

- Increase of the demand greater than the supply increase if $\varepsilon > 1$

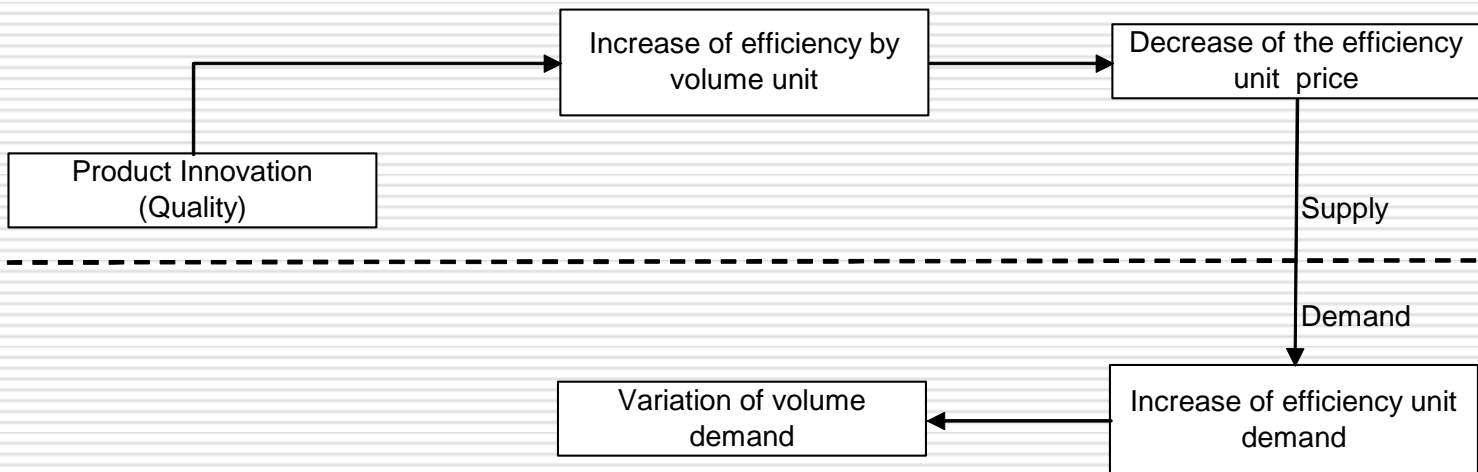
- But in time series $\varepsilon < 1$

→ Thus, absorption following a productivity shock is not sufficient for maintaining factors use

I.2 The technical progress in NEMESIS

From innovations to economic performances...

□ Product Innovation:



I.2 The technical progress in NEMESIS

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From innovations to economic performances

□ Product innovations:

- For a production increase, the increase of the demand for the new efficiency must be greater than the increase of efficiency due to the innovation, that is generally the case.
- Moreover, product innovations makes more than compensate the decrease of factor employment due to process innovations

I.2 The technical progress in NEMESIS

Technical progress equations

□ Process innovations

$$\frac{\Delta TFP}{TFP} = a \frac{\Delta KNOW}{KNOW}$$

□ Quality (product) innovations

$$\frac{\Delta QUAL}{QUAL} = a' \frac{\Delta KNOW}{KNOW}$$

I.2 The technical progress in NEMESIS

Technical progress equations

□ Economic performance

$$\frac{\Delta Y}{Y} = \underbrace{\varepsilon}_{\text{Production increase}} \underbrace{\frac{\Delta TFP}{TFP}}_{\text{Demand increase due to process innovations}} + \underbrace{\varepsilon'}_{\text{Demand increase due to quality innovations}} \underbrace{\frac{\Delta QUAL}{QUAL}}_{\text{Demand increase due to quality innovations}}$$

Production increase

Demand increase due to process innovations

Demand increase due to quality innovations

$$\frac{\Delta Y}{Y} = (\varepsilon a + \varepsilon' a') \frac{\Delta KNOW}{KNOW} \rightarrow \boxed{\frac{\Delta Y}{Y} = \beta \frac{\Delta KNOW}{KNOW}}$$

I.2 The technical progress in NEMESIS

Technical progress equations

□ Econometric studies

$$Y = A \cdot (SRD)^\alpha F(K, L)$$

$$\frac{\Delta Y}{Y} = \alpha \frac{\Delta SRD}{SRD}$$

- α similar role than β

I.2 The technical progress in NEMESIS

- Value of a in the literature (Mohnen [90], Griliches [92], Nadiri [93], Cameron [98], Guellec et alii [92] van Pottelsberghe de La Potterie [2001], Bagnoli [2001])
 - Between 0.05 et 0.20
 - Knowledge elasticity variables with technological achievement of the sector: more important in R&D intensive sectors (equi-returns).

II. General conditions for exercise

- ❑ II.1-Main mechanisms involved
- ❑ II.2-Crowding in effects
- ❑ II.3-Economic performance
- ❑ II.4-Allocation of funding
- ❑ II.5-Evolution of F.P.
- ❑ II.6-All the scenarios.

II-General conditions for exercise

- II.1-Main mechanisms involved
 - Subsidies from M.S and European F.P. increases RTD expenses (crowding effects)
 - RTD increases Knowledge variable and then :
 - Productivity
 - Quality
 - Increases competitiveness, external, internal demand and then economic performances : GDP, employment, exports.

II-General conditions for exercise

□ II.2 Crowding-in effects 1/3

- David, Hall, Toole (2000)
- Duguet (2002)
- Guellec and van Pottelsberg (2003)
 - Crowding-in depends on the rate of subsidies
 - $1 \rightarrow 1.7 - 2$

II-General conditions for exercise

- II.2-Crowding-in effects 2/3
- Positive leverage
 - Private RTD
 - 1 for Member States Funding 1 → 2
 - 1.1 for F.P.: 1 → 2.1
 - 1.4 for performance allocation and networks effects (best practice) : 1 > 2.4

II-General conditions for exercise

- II.2-Crowding-in effects 3/3
- Negative leverage: Diminution of 1€ FP
 - Reversibility
 - -2.1 € without national compensation,
 - $-2.1 + 0.5 * 2 = -1.1€$ with a 50% compensation
 - Irreversibility
 - -1€

II-General conditions for exercise

II.3-Economic performance β

$$Y=A(\text{KNOW})^\beta F(K,L\dots)$$

- β increases with RTD efforts
 - Ref. Scen. 1: β identical for F.P and M.S funding
(β from 0.075 to 0.124)
 - Ref Scen.2: β higher for F.P funding (from 0.0075 to 0.13) than for MS funding (from 0.075 to 0.10)

II-General conditions for exercise

- II.4-Allocation of European funding 1/2
 - Member states
 - FP6 structure
 - Grand-fathering: Proportional to RTD expenses
 - Performance:
 - Public research: Publications
 - Private research: Patents

II-General conditions for exercise

- II.4-Allocation of European funding 2/2
 - Inside Nations
 - 60% private research except for performance
 - 40% public research
 - Sectors in Nations
 - Grand fathering

II-General conditions for exercise

□ II.5-Evolution of F.P. Funding (annual rate of growth)

	FP7 2007-2010	After
BAU	3.87%	3.87%
Generally	doubling	3.87%
Voluntarist	doubling	7.74%
Renationalisation	3.87%	3.87%
Discontinuation	0%	0%

III-Results

- III.1- Grand fathering
- III.2- Performance
- III.3- Voluntary
- III.4- Renationalisation
- III.5- Discontinuation
- III.6- Costs of non F.P

III-Results

- III.1-Grand fathering results 1/2
 - Crowding in: 1.1
 - β : identical
 - Allocation: proportional to RTD efforts
 - Evolution of FP: doubling for FP7 and 3.7% after

III-Results

□ III.1-Grand-fathering Results 2/2

<i>Europe</i>	2010	2015	2020	2025	2030
GDP	0.08	0.16	0.25	0.35	0.45
Quality Adjusted GDP	0.15	0.32	0.41	0.58	0.69
Extra-European Exports	0.00	0.15	0.31	0.47	0.64
Extra-European Imports	0.08	-0.02	-0.11	-0.21	-0.27
Total Investment	0.10	0.13	0.17	0.22	0.29
Households Final Consumption	0.11	0.20	0.30	0.41	0.52
Factors Productivity	0.05	0.05	0.10	0.10	0.15
R&D Intensity*	0.036	0.04	0.046	0.052	0.059
Products Quality	0.10	0.20	0.20	0.30	0.30
Employment in Research**	31	37	44	50	59
Total Employment**	115	155	220	305	428

In % deviation from baseline scenario, except* (in % of GDP) and** (in thousands)

III-Results

- III.2-Performance results 1/2
 - Crowding-in 1,4
 - β identical
 - Allocation proportional to:
 - Publications (public)
 - Patents (private)
 - Evolution of FP doubling for FP7 and 3,7% after

III-Results

□ III.2-Performance results 2/2

<i>Europe</i>	2010	2015	2020	2025	2030
GDP	0.08	0.18	0.29	0.43	0.58
Quality Adjusted GDP	0.16	0.33	0.52	0.74	0.96
Extra-European Exports	0.03	0.23	0.46	0.76	1.07
Extra-European Imports	0.07	-0.05	-0.18	-0.34	-0.50
Total Investment	0.10	0.13	0.19	0.26	0.35
Households Final Consumption	0.11	0.20	0.31	0.45	0.58
Factors Productivity	0.16	0.31	0.45	0.60	0.75
R&D Intensity*	0.044	0.054	0.065	0.08	0.097
Products Quality	0.10	0.20	0.30	0.40	0.50
Employment in Research**	44	58	73	91	113
Total Employment**	113	138	199	303	418

In % deviation from baseline scenario, except* (in % of GDP) and** (in thousands)

III-Results

- III.3-Voluntarist results 1/2
 - Crowding-in 1,1
 - β identical
 - Allocation proportional
 - Evolution of FP: Doubling R&D intensity of FP from 0.06% to 0.23% in 2030

III-Results

□ III.3- Voluntarist results 2/2

<i>Europe</i>	2010	2015	2020	2025	2030
GDP	0.08	0.19	0.34	0.58	0.92
Quality Adjusted GDP	0.16	0.34	0.65	1.04	1.62
Extra-European Exports	0.00	0.16	0.42	0.87	1.56
Extra-European Imports	0.08	-0.01	-0.15	-0.44	-0.84
Total Investment	0.10	0.17	0.26	0.40	0.60
Households Final Consumption	0.11	0.22	0.38	0.61	0.92
Factors Productivity	0.05	0.05	0.15	0.20	0.35
R&D Intensity*	0.04	0.067	0.104	0.157	0.228
Products Quality	0.10	0.20	0.40	0.60	0.89
Employment in Research**	34	60	95	145	214
Total Employment**	120	203	336	550	905

In % deviation from baseline scenario, except* (in % of GDP) and** (in thousands)

III-Results

- III.4-Renationalisation results 1/2
 - Crowding-in 1,1 for FP and 1 for MSF
 - $\beta_{FP} = 0.13$ (end)
 - $\beta_{MSF} = 0.10$ (end)
 - Allocation: FP6
 - FP efforts: 3.87% for FP7 and after
 - MS efforts : Enough for giving the same global subsidies as in doubling FP7

III-Results

□ III.4-Renationalisation results 2/2

<i>Europe</i>	2010	2015	2020	2025	2030
GDP	0.06	0.10	0.15	0.21	0.27
Quality Adjusted GDP	0.06	0.18	0.15	0.29	0.35
Extra-European Exports	-0.04	-0.03	0.00	0.04	0.07
Extra-European Imports	0.10	0.14	0.15	0.18	0.21
Total Investment	0.10	0.15	0.20	0.25	0.32
Households Final Consumption	0.08	0.14	0.22	0.30	0.39
R&D Intensity*	0.037	0.04	0.046	0.051	0.058
Products Quality	0	0.1	0.0	0.1	0.1
Employment in Research**	18	21	25	29	34
Total Employment**	121	173	238	320	428

In % deviation from baseline scenario, except* (in % of GDP) and** (in thousands)

III-Results

- III.5-Discontinuation results 1/2
 - Crowding-in $-1,1 \rightarrow -2,1$
 - β identical
 - Allocation grand-fathering
 - FP efforts null during FP7 and after
 - MS efforts as in the Baseline scenario, no compensation

III-Results

□ III.5- Discontinuation results 2/2

<i>Europe</i>	2010	2015	2020	2025	2030
GDP	-0.17	-0.34	-0.51	-0.68	-0.84
Quality Adjusted GDP	-0.32	-0.57	-0.82	-1.07	-1.31
Extra-European Exports	-0.31	-0.76	-1.18	-1.58	-1.92
Extra-European Imports	0.17	0.52	0.87	1.18	1.43
Total Investment	-0.12	-0.16	-0.22	-0.30	-0.40
Households Final Consumption	-0.13	-0.26	-0.39	-0.53	-0.66
Factors Productivity	-0.05	-0.15	-0.20	-0.25	-0.30
R&D Intensity*	-0.062	-0.066	-0.073	-0.08	-0.089
Products Quality	-0.20	-0.30	-0.40	-0.50	-0.60
Employment in Research**	-52	-59	-67	-77	-87
Total Employment**	-143	-292	-446	-627	-839

In % deviation from baseline scenario, except* (in % of GDP) and** (in thousands)

III-Results

□ III.6-Costs of non FP results 1/2

→ Voluntarist –Discontinuation

III-Results

□ III.6-Costs of non FP results 2/2

<i>Europe</i>	2010	2015	2020	2025	2030
GDP	0.25	0.52	0.85	1.26	1.76
Quality Adjusted GDP	0.48	0.91	1.47	2.11	2.93
Extra-European Exports	0.31	0.92	1.60	2.45	3.49
Extra-European Imports	-0.09	-0.53	-1.02	-1.62	-2.26
Total Investment	0.22	0.33	0.48	0.69	1.01
Households Final Consumption	0.24	0.48	0.78	1.14	1.59
Factors Productivity	0.10	0.20	0.35	0.45	0.65
R&D Intensity*	0.102	0.133	0.177	0.237	0.317
Products Quality	0.30	0.50	0.80	1.09	1.49
Employment in Research**	86	119	163	222	301
Total Employment**	263	495	782	1 177	1 743

In % deviation from baseline scenario, except* (in % of GDP) and** (in thousands)

IV-Conclusion 1/5

- Spontaneous level of RTD efforts is far from the optimum in European countries. Public subsidies can be a way of increasing RTD
- The success of such policies depends on « crowding effects »
 - The crowding-in is more important for European Fundings: 1.1 versus 1
 - Networks effects
 - Best practice transfers
 - Allocation of funding performance-based increases the crowding-in

IV-Conclusion 2/5

- In some cases the β elasticity of economic performances is more important for European funding (best practice transfers and Networks effects)

IV-Conclusion 3/5

- In the short term FP increases RTD and plays the same role as a « multiplier effect »: Increase of expenses, of employment, of prices and of GDP
- In the medium and long term, after « maturation delays for RTD », productivity and quality boost competitiveness, consumption, growth and employment

IV-Conclusion 4/5

- There is no perfect substitution between FP funding and MS funding
- Necessity to think to an application of the « subsidiarity principle »
- Great performance in terms of multiplier effects of FP expenses
 - Crowding-in
 - Innovation and supply effects in 2030 of an FP voluntary Program :
 - 1.76% GDP
 - 1,7 M employment

IV-Conclusion 5/5

□ Deepening :

■ DEMETER

■ WIOD