R&D and environmental objectives of the "Europe 2020" strategy: assessment by the NEMESIS model

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Outline

1. Origin of the model
2. Main characteristics
3. R&D in NEMESIS
4. Main uses

1. Origin of the model

- The HERMES modelling experience
  - Project launched in 1981 by the Commission of European Communities
  - Construction of a new macrosectoral (9 branches) and dynamic model designed to study the interactions energy-economy
  - Same models built simultaneously in 12 European countries, linked together by a bilateral flows model
  - Main uses: consequences of oil price shock; harmonization of VAT rates at the Community level; alternative financing of the social security…

1. Origin of the model

- The E3ME experience
  - During the nineties: need to develop more detailed econometric models, including all regions of Europe and giving a better description of long term properties of the economy.
  - The E3ME econometric model: 19 EU regions and 30 sectors, with a complete treatment of energy and environment, developed by a consortium of teams including Erasme and FPB and cofinanced by the European Union (Joule programs of the European commission)

1. Origin of the model

- BUT:
  - difficulties in simulating the whole system, due to the use of four different softwares;
  - no complete and fully coherent databank;
  - model not completely balanced for supply-demand;
  - coherent supply block not really integrated,…

  - --→ new project: NEMESIS

1. Origin of the model

- New Econometric Model for Environmental and Strategies Implementation for Sustainable development

- NEMESIS is an European macro sectoral econometric model initially developed by a consortium coordinated by Erasme and including the CCIP (chambre de commerce et d'industrie de Paris), NTUA (University of Athens) and the FPB.

- The project is cofinanced by the European commission

2. Main characteristics

- Detailed sectoral model representing 26 European countries (EU27 less Bulgaria and Cyprus+ Norway), 30 industries and 27 consumption categories

- Each country is modelled individually

- Owing to its important level of detail, this model contains about 200,000 equations and 250,000 variables

- In spite of its size, NEMESIS can be run on every recent computer by using the IODE software developed by the FPB.

2. Main characteristics

- NEMESIS is a macro econometric model wherein the new neoclassical theories of growth have been largely taken into account, notably by integrating a supply side deeply developed.

- In this medium-long term structural model, the supply determines the long term equilibrium.

- The model includes an endogenous technical change module and a very detailed energy-environment module.

2. Main characteristics

- 30 sectors:

1 Agriculture
2 Coal and Coke
3 Oil & Gas Extraction
4 Gas Distribution
5 Refined Oil
6 Electricity
7 Water Supply
8 Ferr & non Ferrous Metals
9 Non Metallic Min Products
10 Chemicals
11 Metal Products
12 Agr & Indus Machines
13 Office machines
14 Electrical Goods
15 transport Equipment
16 Food, Drink & Tobacco
17 Tex., Cloth & Footw.
18 Paper & Printing Products
19 Rubber & Plastic
20 Other Manufactures
21 Construction
22 Inland Transports
23 Sea & Air Transports
24 Other Transports
25 Distribution
26 Lodging & Catering
27 Communication
28 Bank, Finance & Insurance
29 Other Market Services
30 Non Market Services

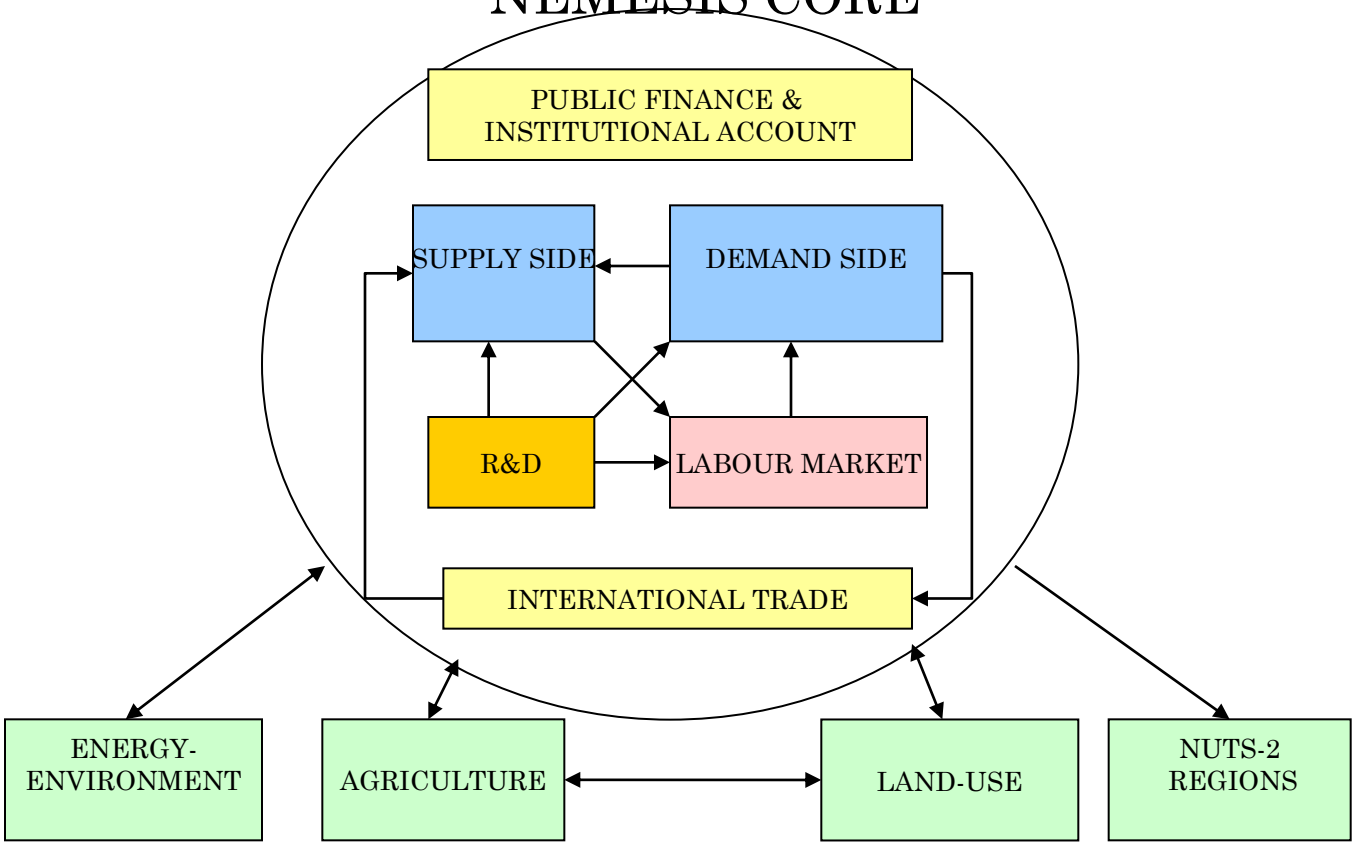
2. Main characteristics

- 27 consumption categories

1 Food
2 Drink
3 Tobacco
4 Clothing and Footwear
5 Gross Rent & Water
6 Electricity
7 Gas
8 Liquid Fuels
9 Other Fuels (solids)
10 Furniture, etc.
11 Household Text., etc.
12 Major Appliances
13 Hardware
14 Household Operation
15 Domestic Services
16 Medical Care, etc.
17 Cars, etc.
18 Petrol, etc.
19 Rail Transport
20 Buses & Coaches
21 Air Transport
22 Other Transport
23 Communication
24 Equipment, etc.
25 Entertainment, etc.
26 Exp Rest and Hotel
27 Misc. Good & Services

2. Main characteristics

- NEMESIS blocks and optional modules:
- NEMESIS CORE



- NEMESIS OPTIONAL MODULES

2. Main characteristics

- Exogenous variables:
  - National and European Level :
    - demography, labour supply
    - fiscal policy and government expenditures (defence, health, education, other)
    - interest rates and exchange rates
  - Rest of the world :
    - activity proxies in the rest of the world
    - wholesale and commodity prices, energy prices

- Endogenous variables:
  - The model outputs provide all relevant economic variables at both European and National, macroeconomic and detailed sectoral levels for the next 30 years

3. R&D IN NEMESIS

- Introduction
- What can we learn from the new growth theories?
- Technical progress in NEMESIS

3. R&D IN NEMESIS
INTRODUCTION

- In the 90's, development of endogenous/semi endogenous growth theories literature
- Late development of these theories in applied modeling
  - Lack of data
  - Lack of empirical evidences
- Increasing questioning from policy makers

3. R&D IN NEMESIS

WHAT CAN WE LEARN FROM THE NEW GROWTH THEORIES? 1/2

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

3. R&D IN NEMESIS

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

3. R&D IN NEMESIS

TECHNICAL PROGRESS IN NEMESIS 1/5

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

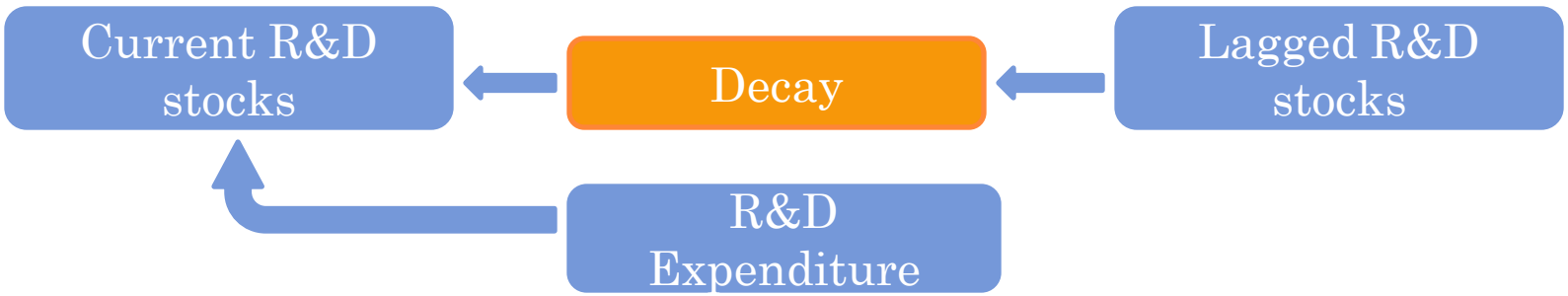
3. R&D in NEMESIS

Technical progress in NEMESIS 2/5

- From R&D Expenditures to R&D stocks
- From R&D stocks to Knowledge
- From Knowledge to economic performances

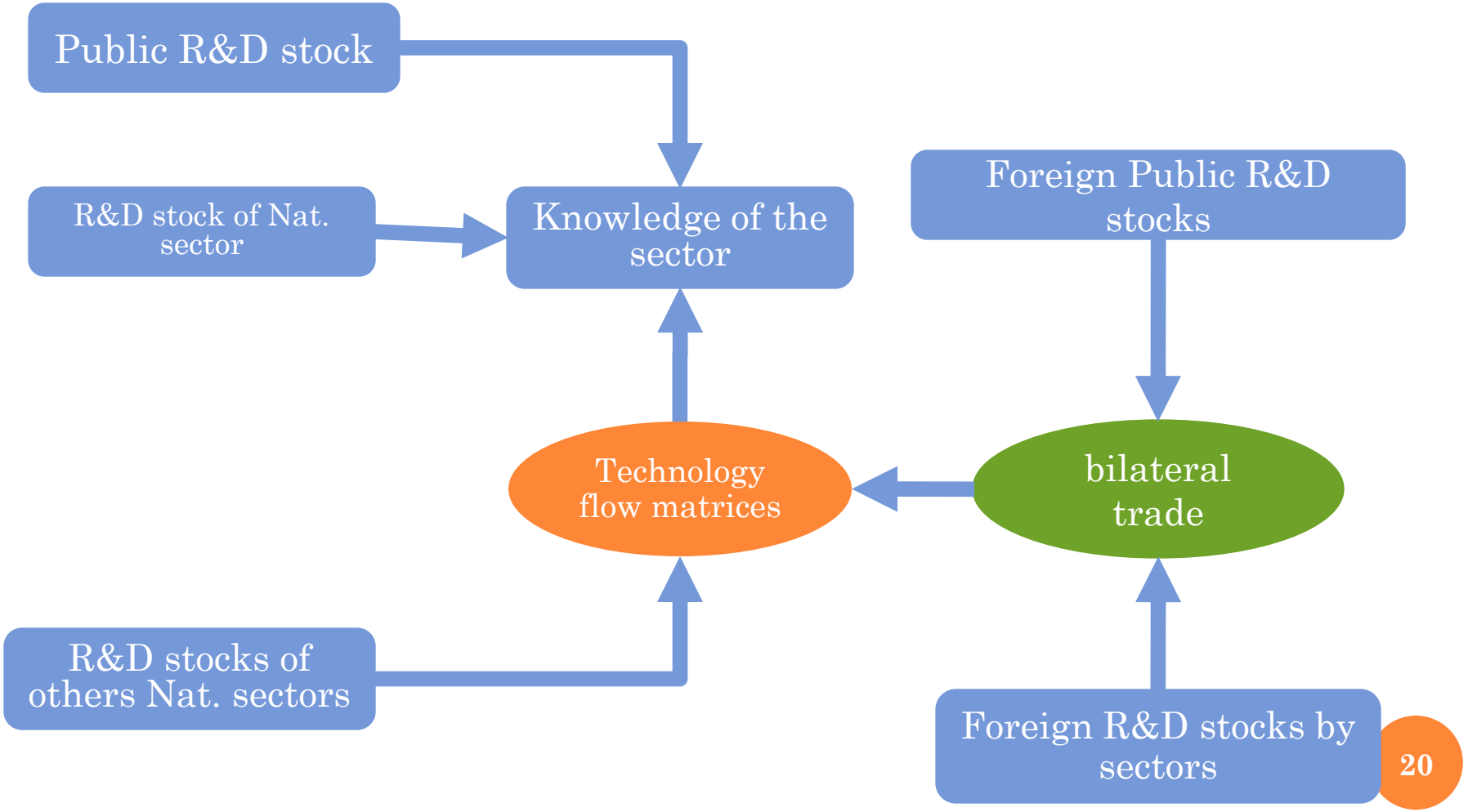
3. R&D IN NEMESIS

TECHNICAL PROGRESS IN NEMESIS 3/5



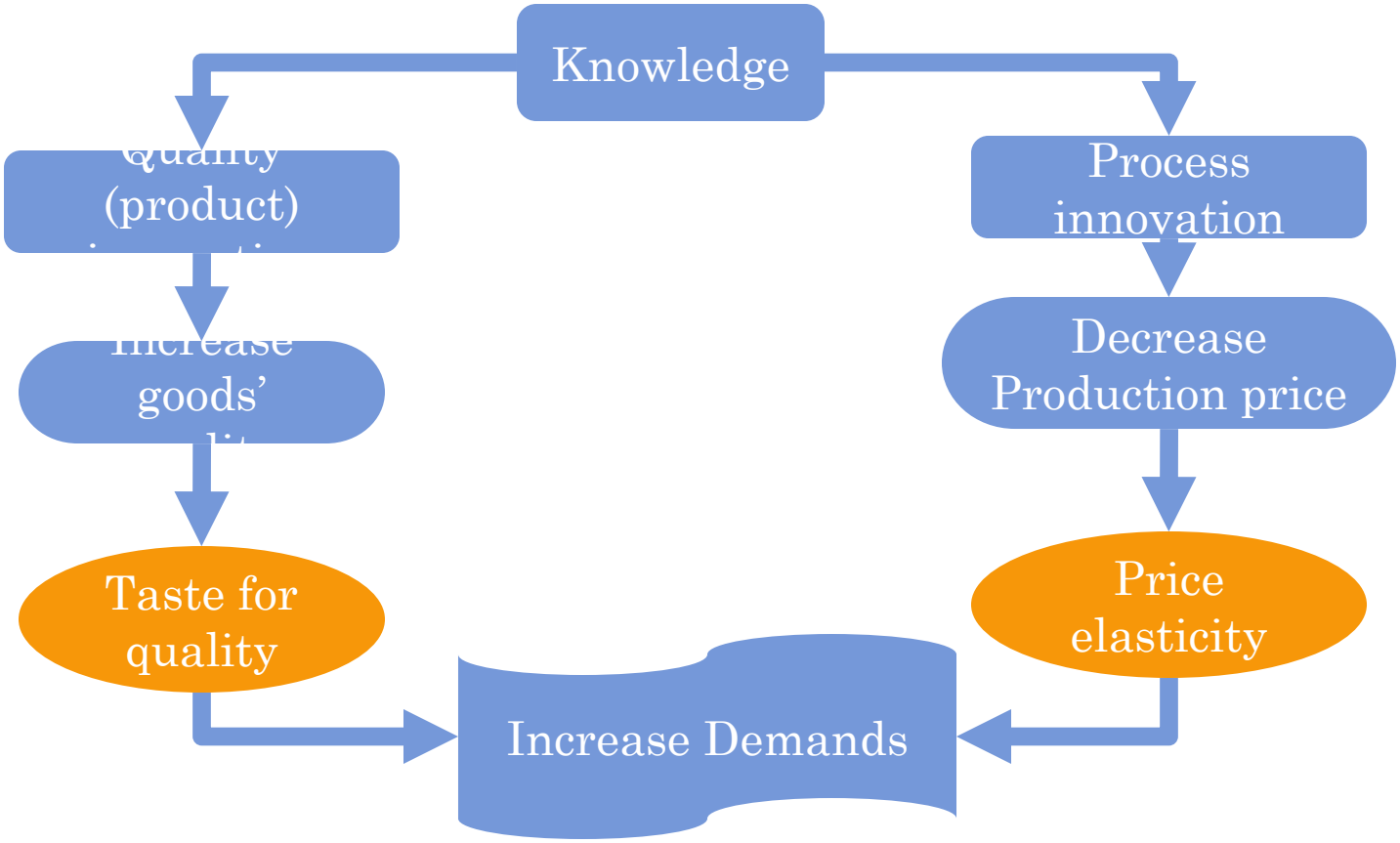
3. R&D IN NEMESIS

TECHNICAL PROGRESS IN NEMESIS 4/5



3. R&D IN NEMESIS

TECHNICAL PROGRESS IN NEMESIS 5/5



4. Main uses

- The baseline: provides European economic tendencies from 2010 to 2030 in absence of additional policies.

- The baseline outputs:
  - Allow highlighting the main challenges that the EU will have to face in the next 20 years in terms of growth, labour development , R&D and environment.
  - enable to assess the impacts of a policy implementation

4. Main uses

- Economic policies
  - Fiscal policies
    - Social VAT
    - Green fiscality
    - …
  - Growth and employment policies
  - Economic recovery

4. Main uses

- R&D and knowledge policies
  - Ex-ante assessment of national action plans for R&D
  - Ex-ante assessment of the 7th and 8th European framework program
  - Assessment of the R&D target of “Europe 2020” Strategy

4. Main uses

- Energy/Environment policies
  - Oil Price shock
  - Assessment of the impacts of national energy policies (french “Grenelle de l’environnement”,…)
  - Assessment for EU ‘Climate Action and Renewable Energy Package’