

# Smart Specialization: Searching for New Theoretical Foundations

Christophe Feder

University of Aosta Valley

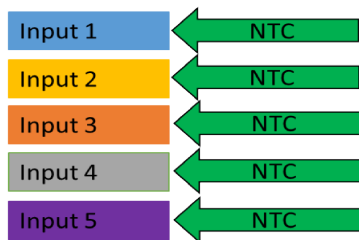
*c.feder1@univda.it*

30/09/2016

# LITERATURE

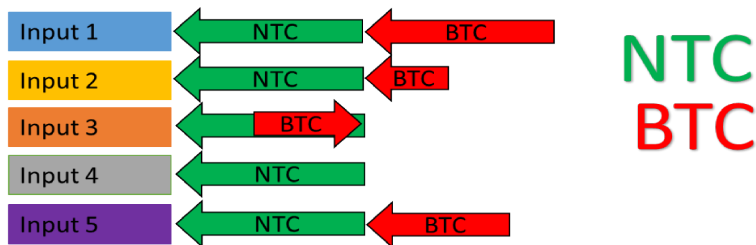
- ▶ **There is an extensive use of smart specialization strategy at government level in Europe and beyond** (European Commission, 2010c, 2011, 2012b, 2014; OECD, 2012);
- ▶ **There is a qualitative literature** (Aghion et al. 2011; McCann and Ortega Argils 2014; Georghiou et al. 2014; Komninos et al. 2014; Valdaliso et al., 2014; Boden et al., 2015; Foray and Rainoldi, 2013; da Rosa Pires et al., 2014);
- ▶ **There are some empirical papers** (Neffke et al., 2011; Gianelle et al., 2014; Navarro et al., 2014; Rodríguez-Pose et al., 2014; Montresor and Quatraro, 2015);
- ▶ **There are two theoretical papers** (Martinez and Palazuelos-Martinez, 2014; Boschma and Gianelle, 2014).

# THE NEUTRAL TECHNOLOGICAL CHANGE - SOLOW (1957)



NTC

# THE BIASED TECHNOLOGICAL CHANGE - ACEMOGLU (1998)



## THE KEY POINTS

- ▶ Is it possible to easily formalize the S3 concept using the BTC approach?

## THE KEY POINTS

- ▶ Is it possible to easily formalize the S3 concept using the BTC approach?
- ▶ It is possible to use a solid **theoretical background** amply accepted by scholars.

## THE KEY POINTS

- ▶ Is it possible to easily formalize the S3 concept using the BTC approach?
- ▶ It is possible to use a solid **theoretical background** amply accepted by scholars.
- ▶ It is possible to use a well-know and amply developed **econometric tools** and accepted by scholars.

## THE KEY POINTS

- ▶ Is it possible to easily formalize the S3 concept using the BTC approach?
- ▶ It is possible to use a solid **theoretical background** amply accepted by scholars.
- ▶ It is possible to use a well-know and amply developed **econometric tools** and accepted by scholars.
- ▶ It is possible to evaluate the S3 with **standard databases**.



## THE KEY POINTS

- ▶ Is it possible to easily formalize the S3 concept using the BTC approach?
- ▶ It is possible to use a solid **theoretical background** amply accepted by scholars.
- ▶ It is possible to use a well-know and amply developed **econometric tools** and accepted by scholars.
- ▶ It is possible to evaluate the S3 with **standard databases**.
- ▶ It is possible **to analyze, strengthen and generalize** the implementation of the smart specialization concept.

## THE KEY POINTS

- ▶ Is it possible to easily formalize the S3 concept using the BTC approach?
- ▶ It is possible to use a solid **theoretical background** amply accepted by scholars.
- ▶ It is possible to use a well-know and amply developed **econometric tools** and accepted by scholars.
- ▶ It is possible to evaluate the S3 with **standard databases**.
- ▶ It is possible **to analyze, strengthen and generalize** the implementation of the smart specialization concept.
- ▶ It is possible **to complement** the previous theoretical approaches.

# ASSUMPTIONS

- ▶ There is a region in a union with a public sector and a private sector.
- ▶ Timing:
  1. The policy-maker chooses the RIS3 policy,  $S$ , to maximize the GDP,  $Y$ .
  2. The firms choose the entrepreneurial discovery strategy,  $E$ , to maximize its profit,  $\Pi$ .
  3. The firms choose capital,  $K$ , and labour,  $L$ , to maximize its profit,  $\Pi$ .
- ▶ The production function is:

$$Y = AK^aL^{1-a},$$

where  $Y$  is the regional GDP;  $A$  captures the *NTC*; and

# ASSUMPTIONS

- ▶ The output elasticities of inputs captures the *BTC* and it is:

$$a = \alpha + \beta E + \gamma S,$$

where  $\alpha$  measures the constant component of  $a$ ; and  $\beta, \gamma > 0$  measure the marginal effect of  $E$  and  $S$  on  $a$ , respectively.

- ▶ Both  $S > 0$  and  $E > 0$  increases the output elasticity of  $K$ .
- ▶ Both  $S < 0$  and  $E < 0$  increases the output elasticity of  $L$ .

## OPTIMAL LEVEL OF CAPITAL AND LABOUR

- ▶ Let  $K^*$  and  $L^*$  be the optimal level of capital and labour, respectively. Then:

$$K^* = \frac{a(C - T)}{r},$$

$$L^* = \frac{(1 - a)(C - T)}{w}.$$

where  $r$  and  $w$  are the unitary cost of capital and labor, respectively;  $C$  is the standard total cost, and  $T$  is the lump-sum tax.

# ENTREPRENEURIAL DISCOVERY PROCESS

- ▶ The optimal level of  $E$  is found solving:

$$\frac{d\Pi}{dE} = Y^* \ln \left( \frac{K^*}{L^*} \right) \beta,$$

where  $Y^* = AK^{*a}L^{*1-a}$ .

- ▶ The efficient entrepreneurial discovery process is aimed at:
  - ▶ boosting the productivity of capital when the most abundant regional input is capital;
  - ▶ boosting the productivity of labour when the most abundant regional input is labour;
  - ▶ each possible discovery process when a most abundant regional input does not exist.

# RIS3 POLICY

- ▶ The policy-maker chooses the efficient  $S$ :

$$\frac{dY^*}{dS} = Y^* \ln \left( \frac{K^*}{L^*} \right) \gamma.$$

- ▶ The efficient RIS3 policy is aimed at:
  - ▶ boosting the productivity of capital when the most abundant regional input is capital;
  - ▶ boosting the productivity of labour when the most abundant regional input is labour;
  - ▶ each possible policy when a most abundant regional input does not exist.

# PROPERTIES - FORAY AND GOENAGA (2013)

- ▶ The policy is mid-granular.
- ▶ The entrepreneurial discovery process is pivotal.
- ▶ The political support of firms is limited over time.
- ▶ The easily and transparency of the pre and post evaluation.
- ▶ The policy is inclusive.



# EUROPE 2020 STRATEGY

- ▶ Each RIS3 policy is also inclusive.
- ▶ Each RIS3 policy is not necessarily also sustainable.
- ▶ The Europe 2020 strategy correctly divides the EU budget into two funds: smart and inclusive growth (47.88%) and sustainable growth (37.40%).
- ▶ But this strategy may be politically distorted.

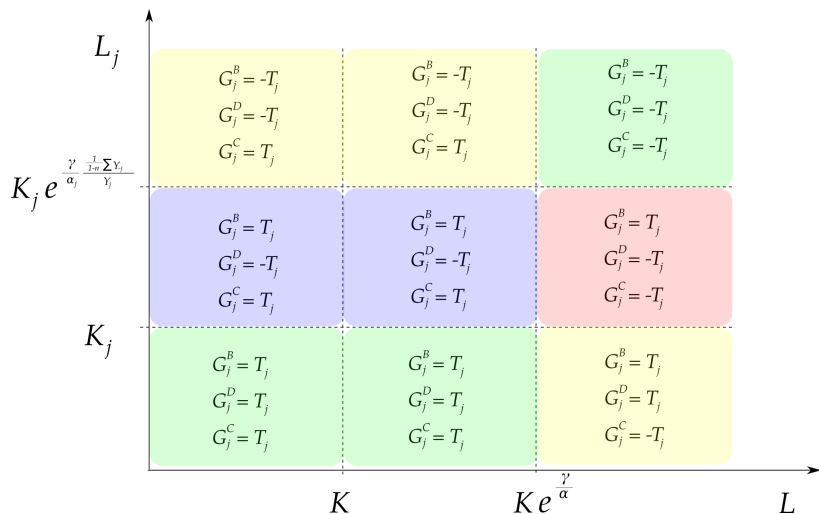
# HORIZON 2020

Table 1: The direction of the European Program Horizon 2020

Budget Item	Billion of €	Political Direction
<b>Excellent Science</b>		
European Research Council	13.095	Labour
Future and Emerging Technologies	2.696	Capital
Marie Skłodowska-Curie Actions	6.162	Labour
Research Infrastructures, Including E-Infrastructures	2.488	Capital
<b>Industrial Leadership</b>		
Leadership in Enabling and Industrial Technologies	13.557	Capital
Access to Risk Finance	2.842	Capital
Innovation in SMEs	3.000	Capital
<b>Societal Challenges</b>		
Health, Demographic Change and Wellbeing	7.472	Labour
Food Security, Sustainable Agriculture and Forestry, Marine, Maritime and Inland Water Research and the Bioeconomy	3.851	Capital
Secure, Clean and Efficient Energy	5.931	Capital
Smart, Green and Integrated Transport	6.339	Capital
Climate Action, Environment, Resource Efficiency and Raw Materials	3.081	Capital
Europe in a Changing World Inclusive, Innovative and Reflective Societies	1.309	Labour
Secure Societies Protecting Freedom and Security of Europe and its Citizens	1.695	Labour

Source: Author's elaboration

## SPILLOVERS



# AN EMPIRICAL IMPLEMENTATION (1)

- ▶ We use the following standard variables:

$$Y_t; w_t; L_t; K_t.$$

- ▶ By Euler's theorem, under constant returns to scale, in each time  $t$  are:

$$a_t = \frac{w_t L_t}{Y_t}.$$

- ▶ We calculate  $1 - a_t$  and  $A_t$ .

## AN EMPIRICAL IMPLEMENTATION (2)

- ▶ The BTC effect on GDP is:

$$BTC_t = \frac{K_t^{a_t} L_t^{1-a_t}}{\hat{K}_t^{a_0} \hat{L}_t^{1-a_0}}.$$

- ▶ Using Euler's theorem, we find:

$$r_t = \frac{(1 - a_t) Y_t}{K_t}.$$

- ▶ Then,  $\hat{K}$  and  $\hat{L}$  in each time  $t$  are:

$$\begin{aligned}\hat{K}_t &= \frac{a_0 Y_0}{r_t}, \\ \hat{L}_t &= \frac{(1 - a_0) Y_0}{w_t}.\end{aligned}$$