SEVENTH FRAMEWORK PROGRAMME

The Impact of Research on EU Agriculture

impresa

Toward a multiple outcome impact assessment of research in agriculture

Bartolini Fabio[1], Brunori Gianluca[1], Coli Alessandra[2],

Magrini Alessandro[1] Pacini Barbara[3]

1. Department of Agricultural, Food and Environmental Sciences

2. Department of Economics and Management

3. Department of Political Sciences

Ancona, 12 June 2015

outline

- Impresa – Research question
- Background
- Paper objectives
- Proposed methodology
- Preliminary results
- Discussion

Research questions - Task 4.2

- General objective of T4.2 (Unipi Task leader)
  - What is the adjusted impact of agricultural research expenditure taking into account both research objectives and sustainability of agricultural systems
- Specific objecitves
  - How to estimate multiple impacts of agricultural research expenditure?
  - How to evaluate research priorities /objectives over time?
  - How to measure and incorporate environmental and social dimensions on the estimation of research expenditure impacts?

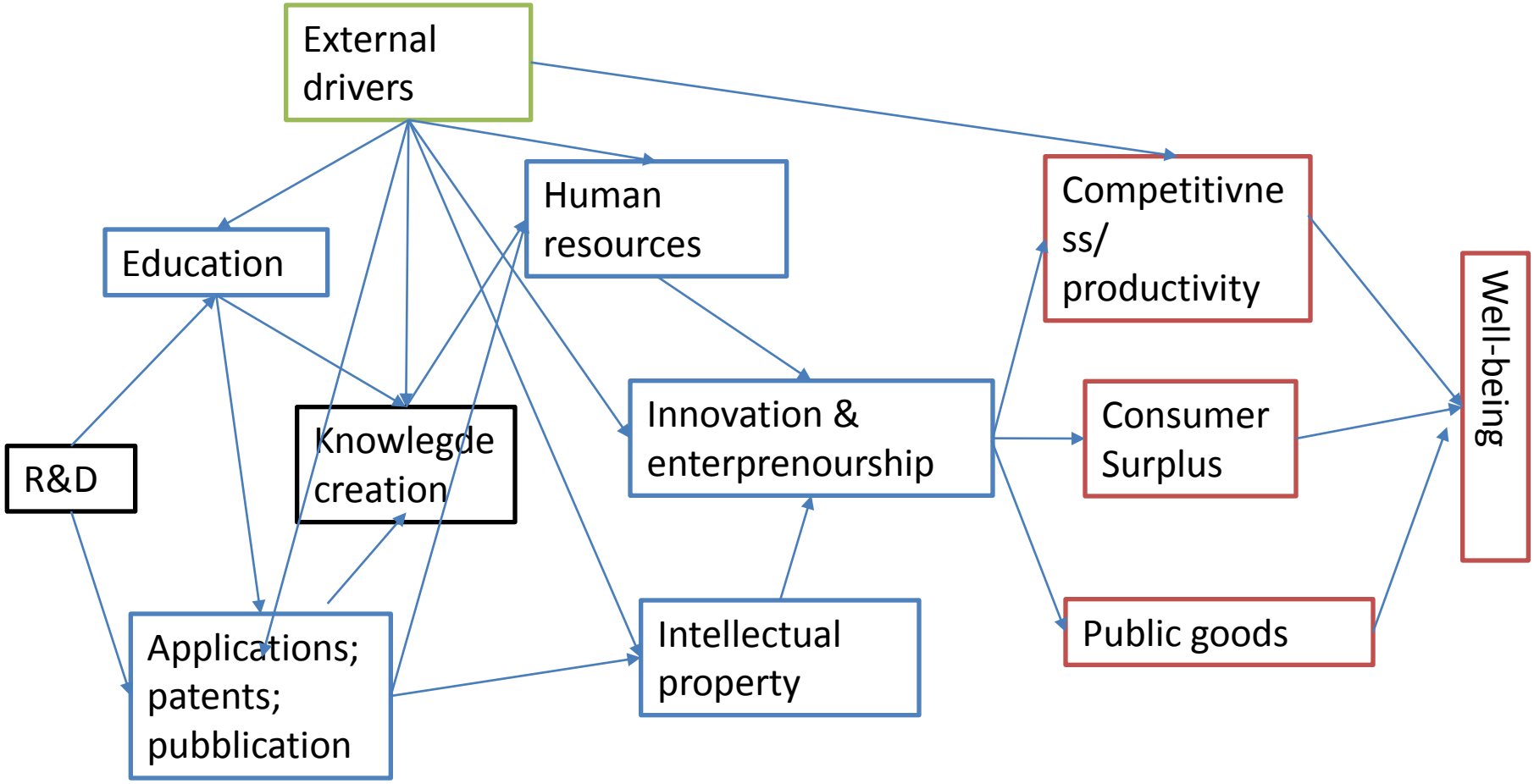
Background (1)

- Large literature deals with estimation of research impact on productivity measure (see Alston et al. 2000; Alston et al., 2011; Pardey et al., 2012)
- Several papers investigate limits of productivity in measuring sustainability of agricultural systems (Byerlee and Murgai and 2001)
  - TFP does not take into account non-market outputs and inputs (positive and negative externalities) Repetto et al., 1996; 1997;
  - Research on Agriculture does not pursue only productivities objectives (Richards 2004).
- Several papers develop an adjusted productivity measures
  - Measurement of TSFP (total social factor productivities) Eg. Ehui and Spencer 1993 computes TFP for productions in Nigeria with a quantification of nutrients applied and extracted
  - Nanere et al., 2007 adjusted TFP incorporating environmental impact of soil erosion for the Australian Agriculture

Background (2)

- Ideally assessment of research investments should be evaluated vis à vis the research objectives/priorities
- but
  - Research priorities/objectives change over time and across countries
  - Research may just shift declinations
    - i.e. increase productivity vs sustainable intensification
  - New research objectives may arise
    - i.e. Bio-economy
- Changing research objectives implies enlarging/prioritizing outcome/impact indicators
- More complex pathways form research to impact

Background (3)



Adapted from Campbell et al., 2013

Paper Objective

- General objective
  - Develop a methodology to assess impact of agricultural research expenditure taking into account both research objectives and multiple impacts of agricultural research
- Specific objectives
  - How to evaluate research priorities /objectives over time?
  - How to measure and identify multiple impacts of agricultural research?
  - How to characterise linkages between impacts and research priorities

Proposed methodology

- Three steps
  - A) Identification of research priorities across EU countries
  - B) Identification of impacts indicators
  - C) Relating priorities with impacts

A) Identification of Research priorites

- Approach
  - Textual cluster analysis using word similarities to identify groups project with similar objectives
  - Attribution at category of research priorities by word frequency
- Data used
  - No data available about research priorities across EU countries
  - Comparable data from EU projects FP4 –FP7 from cordis database
  - Data about financial contribution, abstract, duration, partner countries involved, subject, funding schemes

B) Selection of outcome measurements

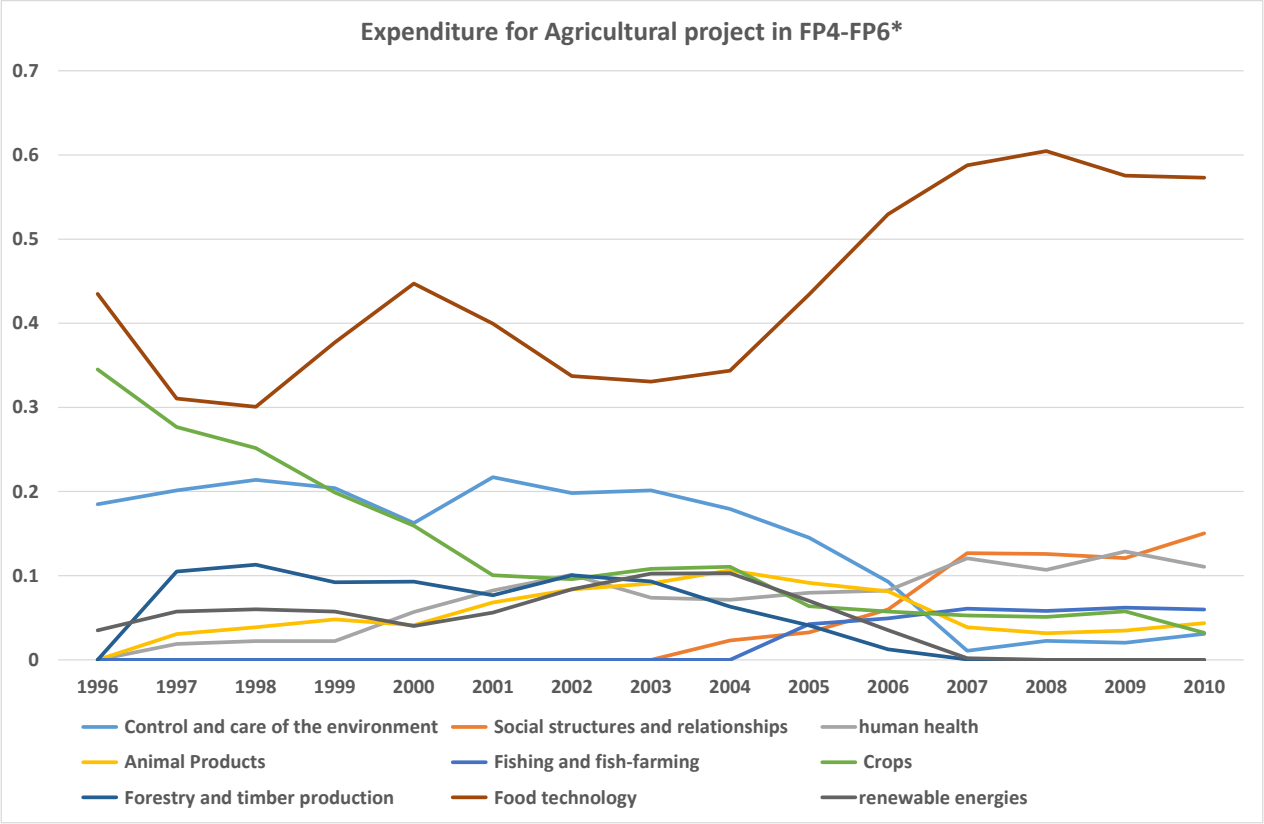
- Dynamic factor analysis
  - Decompose multivariate time series into the sum of a reduced number of common trends and random noise
  - DFA quite new in statistical analysis and allows one to work with few observations taking into account changes across space and time
- Data used
  - Data from EUROSTAT concerning variables associated to economic, social and environmental dimensions
  - Assuming the existence of three factors

C) Relating research priorities to impacts

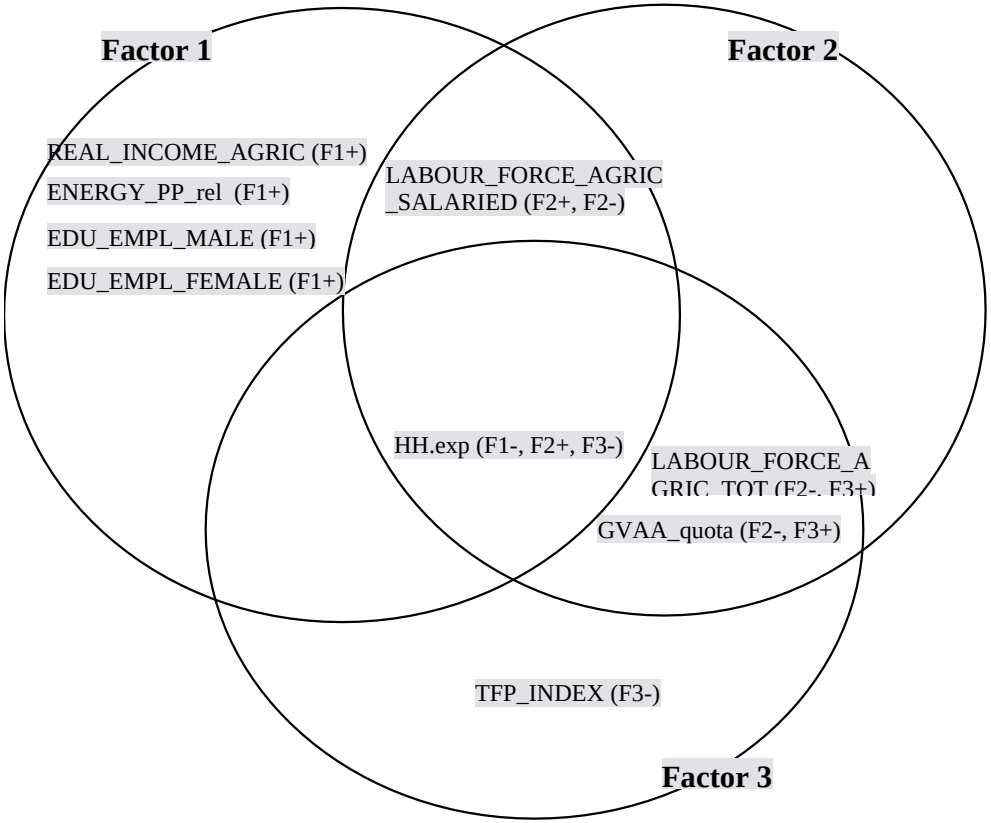
- Cograduation analysis
  - first insight of the direction of the association between research priorities and results of factor analysis can be obtained (Spearman's rho)
  - Non parametric test based on ranking of two variables

Preliminar results

EU research objectives –NABS2 code



DFA – factor loadings

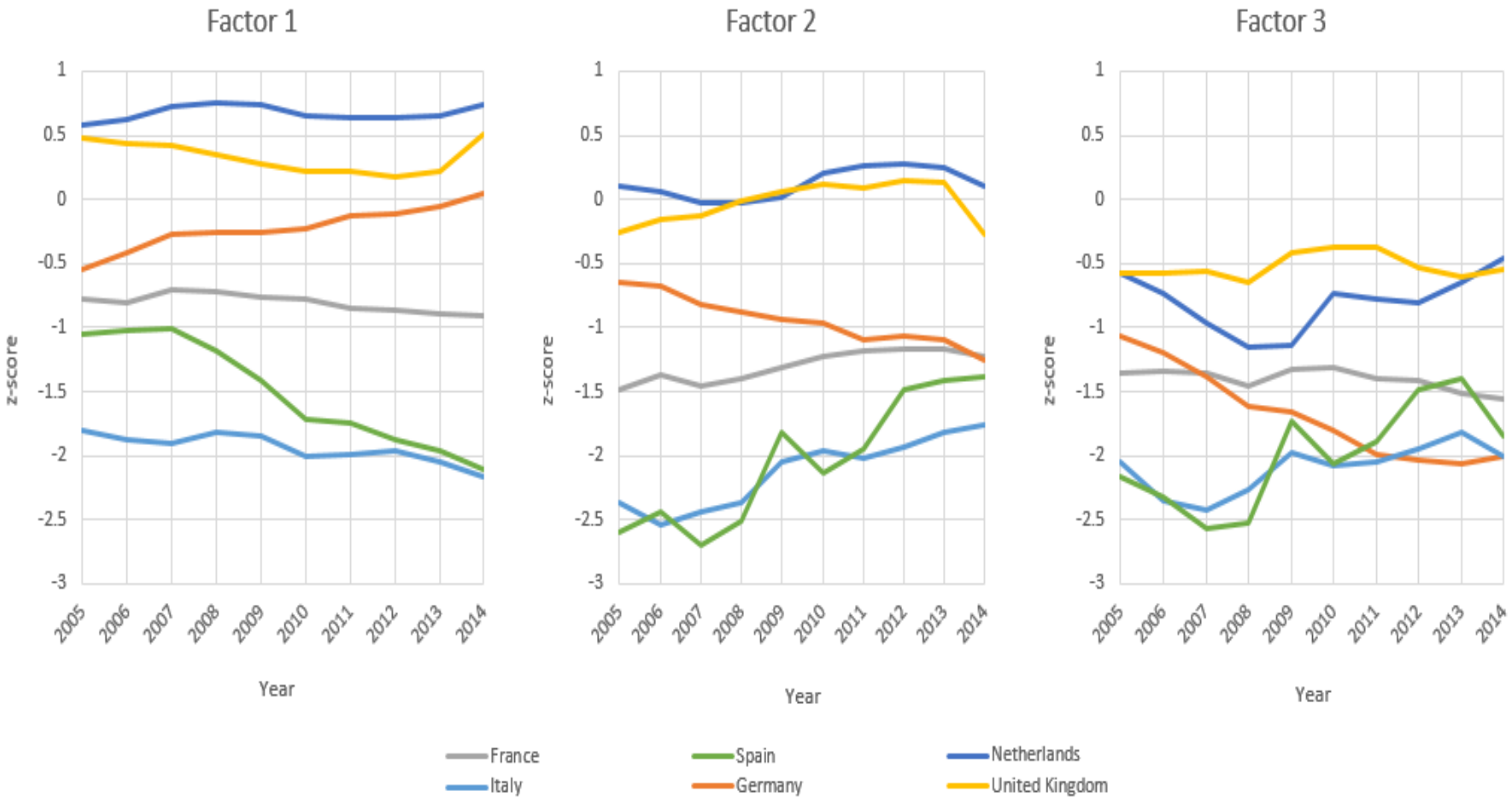


Factor 1: Income and employment

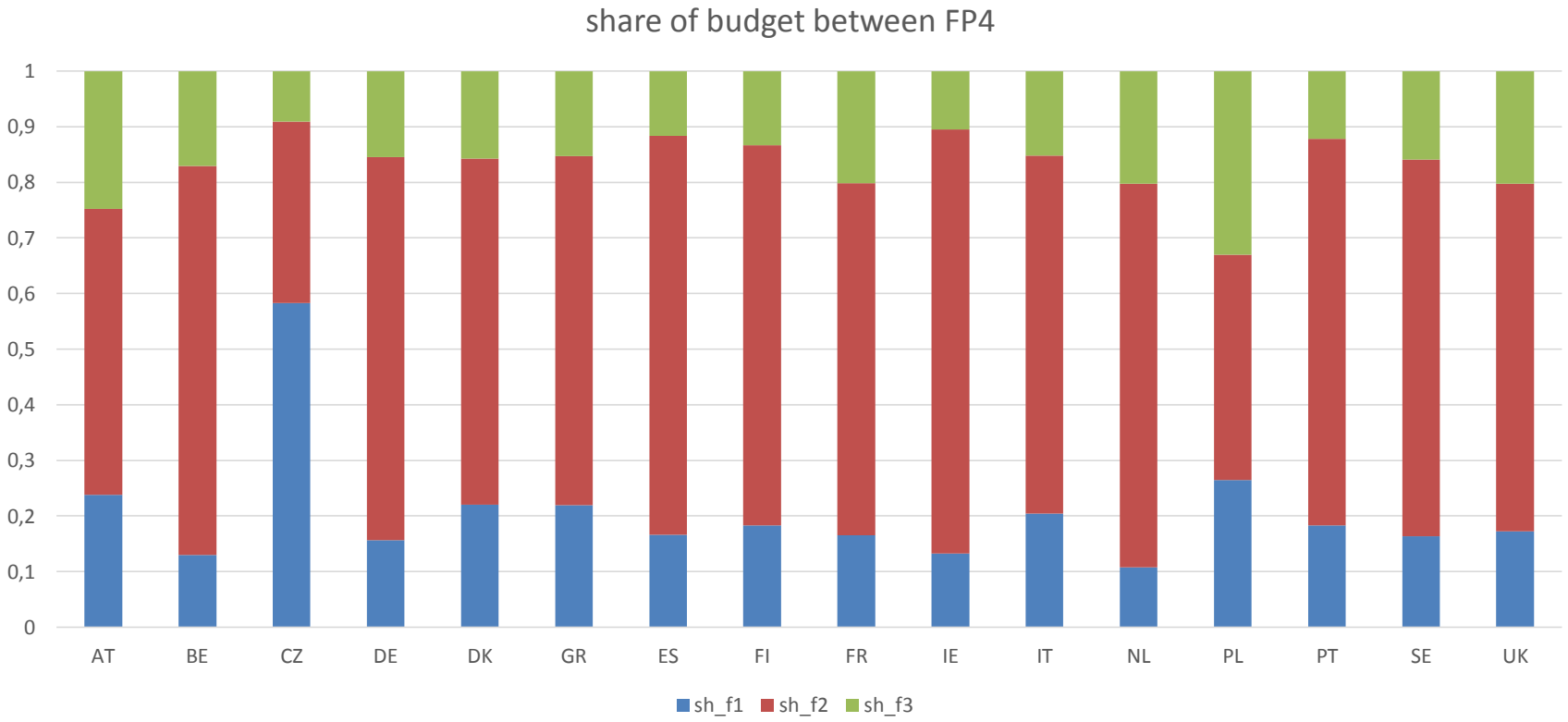
Factor 2: Food industry and added value

Factor 3: Productivity and consumptions

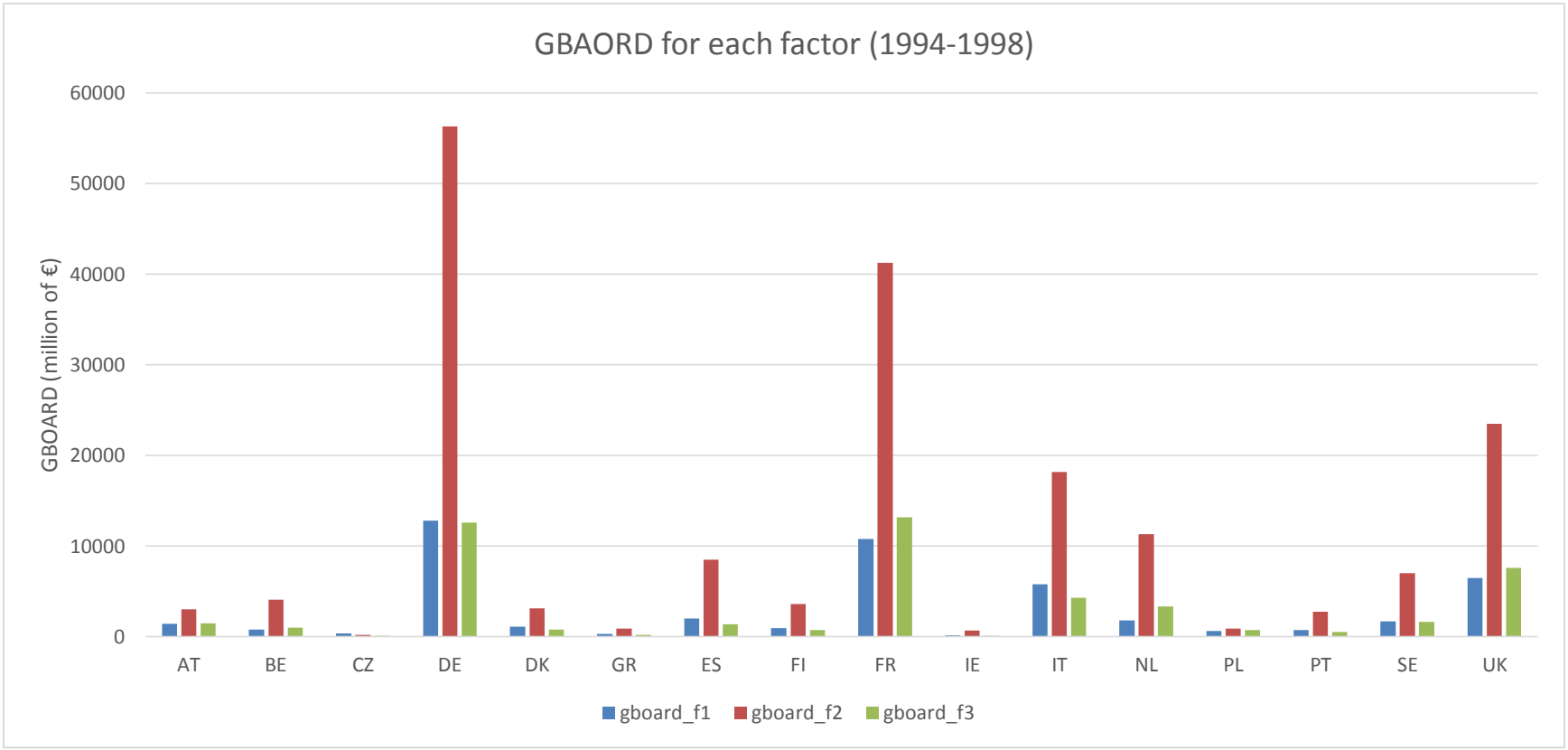
DFA trends


Factor 1
Factor 2
Factor 3
z-score
Year
1
0.5
0
-0.5
-1
-1.5
-2
-2.5
-3
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
France
Italy
Spain
Germany
Netherlands
United Kingdom

Research priorities by country



Research priorities by country



Cograduation tests

factor	year	w_f1	w_f2	w_f3	w1_gbaord	w2_gbaord	w3_gbaord
f1	2005-2014	0.1206	-0.3176	0.3794	-0.1441	-0.2029	-0.1118
f2	2005-2014	-0.1059	0.1824	-0.1	-0.6765***	-0.5765*	-0.5882*
f3	2005-2014	0.2059	-0.0882	0.0353	-0.8618***	-0.7676***	-0.7294***
f1	2005-2009	-0.0059	-0.0971	0.1735	-0.2765	-0.3029	-0.2529
f2	2005-2009	-0.1176	0.1412	-0.0382	-0.5794	-0.5059*	-0.4824
f3	2005-2009	0.2029	-0.1118	0.1059	-0.8265**	-0.7382***	-0.6735*
f1	2010-2014	0.1441	-0.3765	0.4706**	-0.0559	-0.1265	-0.0176
f2	2010-2014	-0.0882	0.1824	-0.1118	-0.7059**	-0.6059**	-0.6147**
f3	2010-2014	0.2471	-0.0647	-0.0941	-0.9294***	-0.8471***	-0.8176***

Discussion

- Preliminary and rough analysis
- Methodology seems feasible but needs improvements
- Relevant option to find proxy of research priorities expenditure
- Use of latent variables seems suitable when addressing multiple impacts
- Control for other effects (option to use meta-model for relevant confounding variables – i.e. policy; crisis etc.)
- Try to relational model taking into account expected path (SEM model)
- Sisyphean task(?)
  - proxy of research priorities/proxy of research impacts/»proxy» of research expenditure….

impresa The Impact of Research on EU Agriculture

Thank you

fabio.bartolini@unipi.it

SEVENTH FRAMEWORK PROGRAMME

IN SUPREMÆ DIGNITATIS 1343