An approach of measuring TFP within European agriculture: The agricultural productivity Between slowdown and catch up

Jean-Pierre Butault (UMR LEF, INRA-SAE2, Nancy),
Why this intervention?

It is not a methodological study. It is not either an academic intervention.

The starting point of this intervention is a request of the ministry for agriculture on the current competitiveness of French agriculture.

In retirement, it is also by personal interest as I made this study: I observed a stagnation of the productivity gains in France (much stronger than in the United States) and I wanted to know the situation of the other European countries.

It is an important matter for the agricultural policy, the world food policy, the environmental policy and I believe that the professional economists are late on this question.
A stagnation of the productivity gains?

The question is not specific to agriculture: see the theses of Gordons (2012) which suggest that the 250 years after the first industrial revolution are a single episode of the history of humanity and that one witnesses of a reversal in the formation of the productivity gains.

The studies on agriculture are recent:
- Alston and al. (2015) detect significant slowdowns in the rate of productivity growth of the American agriculture (1,2% between 1990-2007 against 2% between 1990-2007).
- Ball and al. (2013) claims that the rate of productivity remains high in the United States, with only one light dropping
- From the data of Ball and Al (2010), Wang Al (2012) estimate that there is no significant fall of the productivity in the agriculture of Western Europe but the data stop in 2002.
A stagnation of the productivity gains in France?

In France, my results over long period (Butault and al 2015), suggest a complete stop of the increase in the production and a fall of the rate of productivity.

These results return to those of the agronomists (Brisson and al. 2010) who study the stagnation of the cereal yields in France as from “1995”, stagnation explained not by a reduction of the inputs use but by an effect of the climate change, unfavourable with wheat.

The question thus relates to the evolution of the agricultural productivity of the European countries (by taking into account also the phenomena of catch up).
How to measure the productivity of European agricultures with the Eurostat data available?

Like the OCDE preliminary paper notes it, the approaches to measure the conventional cross-country agricultural TFP are numerous:
- In using ideal indexes (Fisher or Törnqvist chain index in temporal analysis, EKS or CCD for PPP), Ball and al. (2001, 2010) applied a method close to the USDA approach. This method is demanding because it requires the reconstitution of the stock of capital to appreciate the services flows of this one.
- A large number of studies are based on the FAO data which are very limited.

With the Eurostat data (agricultural accounts), intermediate solutions are possible to calculate TFP indexes in aggregating, by ideal indexes (Törnqvist), output and input (IC, capital, land, hired labour, unpaid labour).

But, the data are poor in particular, for the capital for which only the volume of depreciation is given.
The European accounts of agriculture

In the new methodology, the accounts are available for 14 countries from 1991 and 25 counties for 1998:

<table>
<thead>
<tr>
<th>Country</th>
<th>From 1991</th>
<th>From 1998</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belgium</td>
<td></td>
<td>Bulgaria</td>
</tr>
<tr>
<td>Denmark</td>
<td></td>
<td>Czech Republic</td>
</tr>
<tr>
<td>Germany</td>
<td></td>
<td>Estonia</td>
</tr>
<tr>
<td>Ireland</td>
<td></td>
<td>Greece</td>
</tr>
<tr>
<td>Spain</td>
<td></td>
<td>Latvia</td>
</tr>
<tr>
<td>France</td>
<td></td>
<td>Lithuania</td>
</tr>
<tr>
<td>Italy</td>
<td></td>
<td>Hungary</td>
</tr>
<tr>
<td>Luxembourg</td>
<td></td>
<td>Poland</td>
</tr>
<tr>
<td>Netherlands</td>
<td></td>
<td>Romania</td>
</tr>
<tr>
<td>Austria</td>
<td></td>
<td>Slovenia</td>
</tr>
<tr>
<td>Portugal</td>
<td></td>
<td>Slovakia</td>
</tr>
<tr>
<td>Finland</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sweden</td>
<td></td>
<td></td>
</tr>
<tr>
<td>United Kingdom</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The account are given in Laspeyres chain indexes but it is possible de calculate Törnqvist indexes. The results on the volume of production depend strongly on the indexes: for example, annual growth of the volume of production in Spain between 1991 and 2014:

<table>
<thead>
<tr>
<th></th>
<th>Laspeyres</th>
<th>Paasche</th>
<th>Fisher</th>
<th>Törnqvist</th>
</tr>
</thead>
<tbody>
<tr>
<td>1991-2014</td>
<td>2,1%</td>
<td>1,1%</td>
<td>1,6%</td>
<td>1,6%</td>
</tr>
</tbody>
</table>

1991-2014 is a short period to study the trend of evolution of the productivity but the data of the old methodology are available starting from 1973.
How to measure the productivity of European agricultures?

Törnqvist indexes are calculated on production (21 items) and IC (10 items).

The volume for the other factors is given:
- For land, the area of the farm
- For capital, the volume of depreciation
- For labour (hired and not paid), the annual work units

Quality is not taken into account.

It is necessary to associate prices to these factors to calculate the shares.

With macro-economic data, it is necessary to adopt the hypothesis of constant returns, with equality between output and input. The decoupled subsidies however are added to the fixed factor income.

For this study, we take:
- The rental rate as the price of land (consistent with the FADN data)
- The value of depreciation and paid interest as the share of capital
- The income of labour corresponds to the balance.

It is possible to take as balance, the income of capital but the implicit rate of wages in not consistent (with the FADN data) in some countries.
The volume of production between 1991 and 2014 in E14

The stagnation of the production relates to all the countries, except for Spain. The rupture is important in comparison with the past years.
At the European level, the growth of the production is very moderate, after 1998. On average, the new members do not have a stronger growth. Growth rates remain variable according to the countries.
The productivity between 1991 and 2014 in E14

Between “1992 ” and “2013”, the rate of productivity is lower or equal to 1% in eleven countries. Between 1973 and 1994, this rate varied between 1.5 and 2%. Only, Spain maintenance a high rate (catch up)
The productivity between 1998 and 2013 in E25

The new members have a relatively high growth of the productivity, thanks to the improvement of the labour productivity.

We are between slowdown and catch up.

OECD Paris 2015 J.P. Butault
Conclusion

It is only one first approach. I do not have time to give the reasons for this evolutions which are numerous. Much work remains to be made….not by me.
Thank you.