GROWTH AND PRODUCTIVITY IN ARGENTINE AGRICULTURE

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OUTLINE

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Motivation

• In the last fifty years the availability of new technologies has allowed an important growth in argentine agricultural production.

• Grain production, cultivated area, and average yields increased sharply in the last twenty years.
Motivation

• A relevant question is if land productivity growth was associated with positive shifts in the production function.

• During the last 20 years Argentina has increased the use of fertilizers, improved seeds, machinery and human capital.
Growth of Argentine Agriculture

• From 1860 to 1930 the economic growth of Argentina was mainly based on the exploitation of land of the Pampas.

• Agricultural production and GDP grew at very high rates.

• After the 1929 Crash, Argentina gradually transformed itself from a very open economy into one of the most closed economies in the world.
Growth of Argentine Agriculture

- World trade started to be gradually liberalized after 1945 but Argentina decided to maintain trade barriers.
- Economic performance began to deteriorate, particularly in agriculture, and economic growth slowed down.
- In this context Argentine agriculture started a period of stagnation.
Growth of Argentine Agriculture

- The cultivated area and grain production fall along the 1940s.
- In 1952 the wheat production was lower than the domestic consumption.
- Starting from then the policies changed slowly and began to reconsider the role of the agriculture in the Argentine economy.
Growth of Argentine Agriculture

• A recovery began in the 1970s, mainly due on account of the promotion of mechanization and adoption of improved seeds.

• The more market oriented policies after 1990 led the agricultural sector to a new growth process doubling the grain production between 1990 and 2005.
Crop Production and Input Use

- The growth rate of grain production in Argentina between 1995 and 2008 was 6.6%.
- As a comparison, during the period of the great expansion of the Argentinean agriculture, between 1900 and 1914 the growth rate of grain production was 4.6%.
From 1961 to 1994 cultivated area grew from 9.5 to 16 million of hectares (78%).

The area expanded other 13 million of hectares (81%) between 1994 and 2008.

This increase recognizes three main sources:
- Around 50% has replaced pasture land
- 25% is due to a more intensive use of the soil (double cropping wheat-soybeans)
- 25% is due to the expansion of the soybeans outside of the Pampean region
Grain production grew along the last half century at an annual rate of 4%. This rate was higher than the world rate (2.3%).
The Argentine share in world grain production in the last 50 years multiplied by four: it reaches 4.25% in 2008.
The area grew 3 times (10 to 30 millions of hectares), the production multiplied by 8 (12 to 95 million tons) and the average yield per hectare grew from 1.3 to 3.2 tons.
In the 1960s corn and wheat yields in Argentina were, on average, 50% of those reached in the US.
Since 1970 the gap began to decrease
Fertilizers have been one important input in the growth of the grain production between 1990 and 2008.
Between 1991 and 2008 the use of fertilizers in Argentina grew 8 times. Similar to what happened in the main grain producers after World War II.
The rapid adoption of RR soybean varieties become the most important genetic breakthrough in the agriculture over the last years.
The land prices captured the combined effect of the rise in grain prices and the growing agricultural productivity.
Land prices in Argentina were 40% below to those of Iowa in the 1970s, 20% in the 1980s and 15% in the last years.
PRODUCTIVITY ESTIMATES 1968-2008

• TOTAL FACTOR PRODUCTIVITY

• TFP = Y/X

• GROWTH APPROACH

• Growth rate of TFP: growth rate of the product (Y) minus the growth rate of inputs (X)

• THEORETICAL ASSUMPTIONS
  * Hicks neutral technological change.
  * Linear homogeneity of the production function
  * Profit Maximization
Output Index

• Value of Grain Production (Wheat, Corn, Sunflower and Soybeans)

Input Index: Quantities

• Land (hectares)
• Labor (economically active persons)
• Capital (tractors and harvesters)
• Fertilizers (tons)

Constant Input Shares (from previous estimates)
• Land 0.33
• Labor 0.33
• Capital 0.31
• Fertilizers 0.03
Table 1. Output, Inputs and TFP - Annual growth rates (%)

<table>
<thead>
<tr>
<th>Years</th>
<th>Output</th>
<th>Land</th>
<th>Labor</th>
<th>Capital</th>
<th>Fertilizers</th>
<th>TFP</th>
</tr>
</thead>
<tbody>
<tr>
<td>1968-08</td>
<td>5.24</td>
<td>3.18</td>
<td>0.03</td>
<td>1.09</td>
<td>8.34</td>
<td>2.43</td>
</tr>
</tbody>
</table>
Figure 12. Production and Land Indexes 1968-2008
1968=100
1990-2008 TFP growth rate: 4.38%.
Figure 15. Argentina - Sources of Agricultural Growth
1968-2008

- TFP: 68.6%
- Land: 20%
- Fertilizers: 4.8%
- Capital: 6.4%
- Labor: 0.2%

Land contributed 20% to the agricultural growth in Argentina from 1968 to 2008, followed by Fertilizers at 4.8%, Capital at 6.4%, and Labor at 0.2%. TFP accounted for the remaining 68.6%.
Final Comments

- TFP growth rate summarizes a group of improvements that are not captured by the input index.

- There have been important improvements in the quality of factors: better machineries and chemicals, new agricultural techniques and improvements in the quality of the human capital applied to agriculture.

- At the same time, these factors were combined with new organizational and managerial technologies that have allowed a great improvement in technical and economic efficiency.
Final Comments

• The main result is the important role of technological change
• TFP explains more than two thirds of the output growth.
• This result suggests that the main contribution to output growth comes from the availability of innovations and the adoption of new technologies when the economic incentives are present.
Final Comments

Topics for future research

- Output and input use in Cattle raising
- More data
- More data
• Thank you very much!