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Accounting for Greenhouse Gas Emissions in OCDE Agricultural Productivity

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1. Background

- Farming accounted for about
- a quarter of total OECD acidifying emissions,
- 8% of the use of potential ozone depleting substances,
- 8% of greenhouse gases (GHGs) (2002-04).
- 70% of nitrous oxide N2Oand over 40% of methane CH4
- Consequences of GHGs Emissions :
  - ozone depletion
  - climate change,
  - … etc

2. Objective

- To analyze the environmental performance of the OECD agriculture with respect to Greenhouse Gases Emissions

3. Approaches and Data

- Data Envelopment Analysis : Malmquist-Luenberger (ML)Productivity Index

- $\vec{D}_o^t\left(x^t, y^t, b^t; g_y, -g_b\right) = Sup[\beta: (y + \beta g_y, b - \beta g_b) \in P^t(x^t)]$

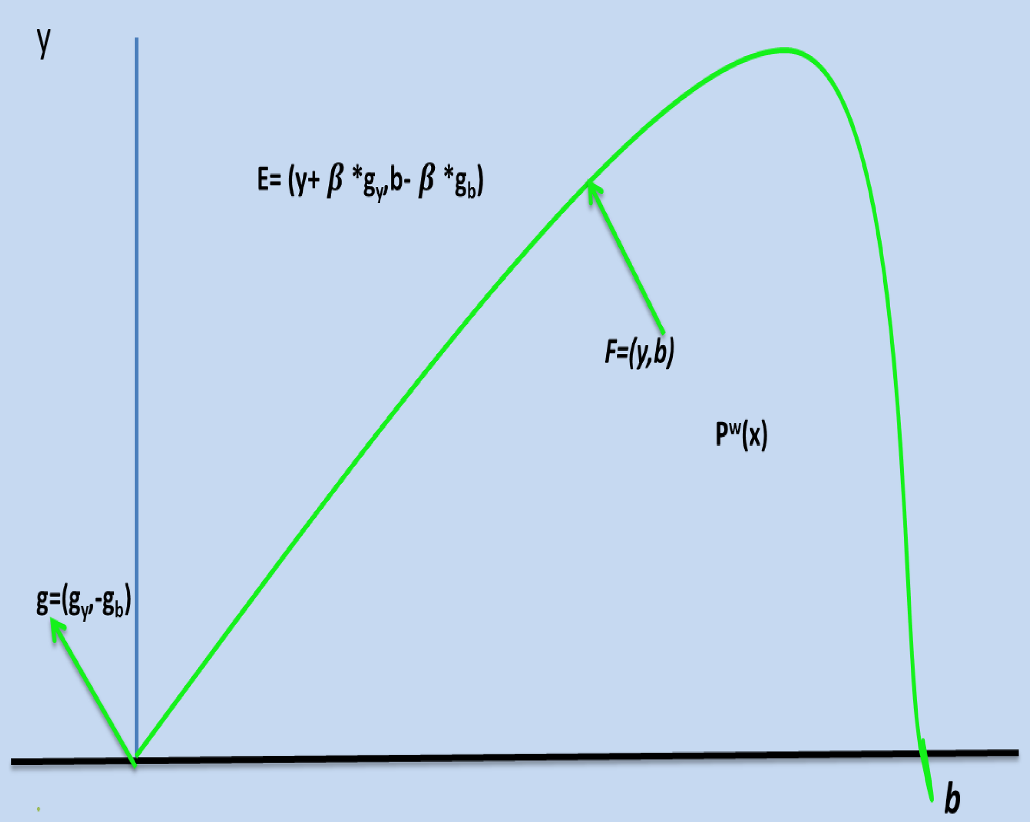


Fig 1. Directional Output Distance Function and Undesirable Outputs Färe(2005)

- Malmquist Luenberger . Chung , Färe and Grosskopf 1997
- $ML^t = [\frac{(1+\overrightarrow{D^t}(x^t, y^t, b^t; y^t, -b^t))}{(1+\overrightarrow{D^t}(x^{t+1}, y^{t+1}, b^{t+1}; y^{t+1}, -b^{t+1}))}]$
- $ML^{t+1} = [\frac{(1+\overrightarrow{D^{t+1}}(x^t, y^t, b^t; y^t, -b^t))}{(1+\overrightarrow{D^{t+1}}(x^{t+1}, y^{t+1}, b^{t+1}; y^{t+1}, -b^{t+1}))}]$
- $ML^{t,t+1} = [ML^t * ML^{t+1}]^{1/2}$
- $ML^{t,t+1} = MLTEFCH^{t,t+1} * MLTECH^{t,t+1}$

Data : 27 Countries data 1990-2006

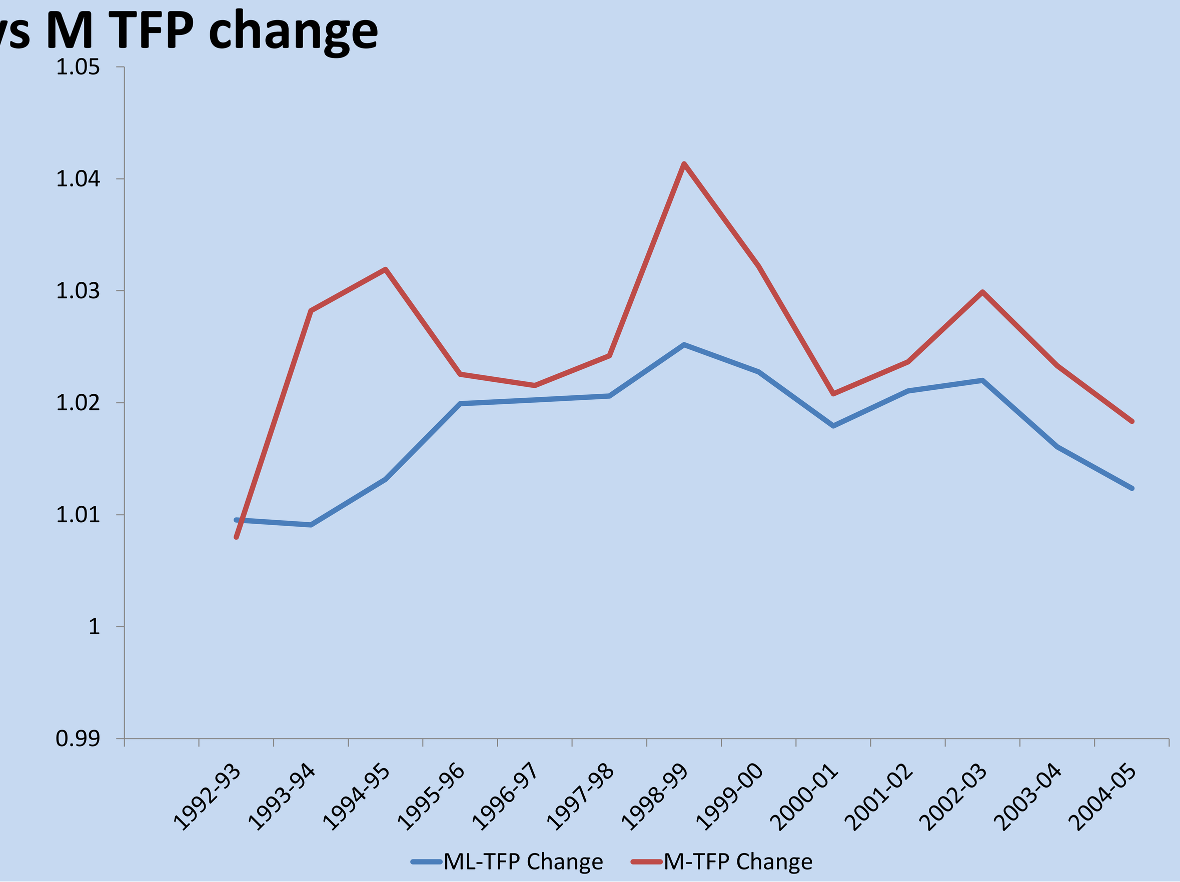
- Desirable output : Production/Ind (2000=100)
- Undesirable Output : Agricultural total GHGs (Tonnes CO2 equivalent)
- Inputs : Land; Labor, Machinery, Energy, Fertilizer

Source : OECD

4. Results

- Efficiency Change accounting for GHGs averaged 0.3% vs 0.7% while ignored
- Technical Change accounting for GHGs averaged 0.1% vs 1.8% while ignored
- The ML productivity is driven by technical change
- and higher than the one ignoring the GHGs

ML vs M TFP change



- ML TFP growth is 2.5% vs 0.5% for the traditional Malmquist

5. Conclusion

- Accounting for GHGs results in lower TFP
- TFP is driven by technical change in both cases
- This performance is explained by technical change
- Technical change is biased toward expansion of desirable outputs rather than contraction of the bads

Acknowledgement

The author is grateful to Professors Lilyan Fulginiti and ichard Perrin for their comments and guidance.

His gratitude is extended to Dr Carl Pasurka for his comments and suggestions and for sharing his GAMS code and to Mr Tom Wirth for providing data on agriculture greenhouse emissions

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