Meta-regression Analysis of Agricultural Productivity Studies

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Objectives

we use meta-regression analysis to examine the results of previous empirical studies measuring productivity in the agricultural sector

We survey a total of 124 papers published in 45 different scientific journals during the period 1963 to 2009. Based on this sample we have a total of 1,307 observations as some authors report results from more than one methods or for more than one countries/regions

We attempt to account for this in the econometric estimation and we also examine the statistical significance of author's effect

Meta-analysis

Meta-analysis serves as a quantitative literature review that integrates and explains the various results found in a given domain of empirical research. It is a statistical based method that has been found useful in reviewing and evaluating empirical research results

meta-analysis is the analysis of empirical analyses

Meta-regression Analysis

Meta-regression analysis (MRA) is a form of meta-analysis

The MRA involves a simple regression equation between a particular variable of interest, which can be an estimated model parameter, elasticity, or another model variable, and a set of meta-independent variables that account for relevant characteristics of an empirical study and explain the systematic variation from other results in the literature

The empirical estimates from each individual study become an observation in the sample of all possible empirical results for a particular phenomenon.

MRA in Agricultural Economics

1. Phillips (1994): the effect of farmer education in efficiency

2. Alston et al. (2000): returns to agricultural R&D

3. Bravo-Ureta et al. (2001, 2007) technical efficiency in farming

Methodological Sketch of MRA

1. include all (if possible) relevant studies

1. choose the relevant metric for dependent variable

2. choose moderator (meta-independent) explanatory variables

3. conduct a careful econometric estimation

1. subject the MRA results to specification testing

Figure 1. Distribution of Agricultural Productivity Papers by year of publication

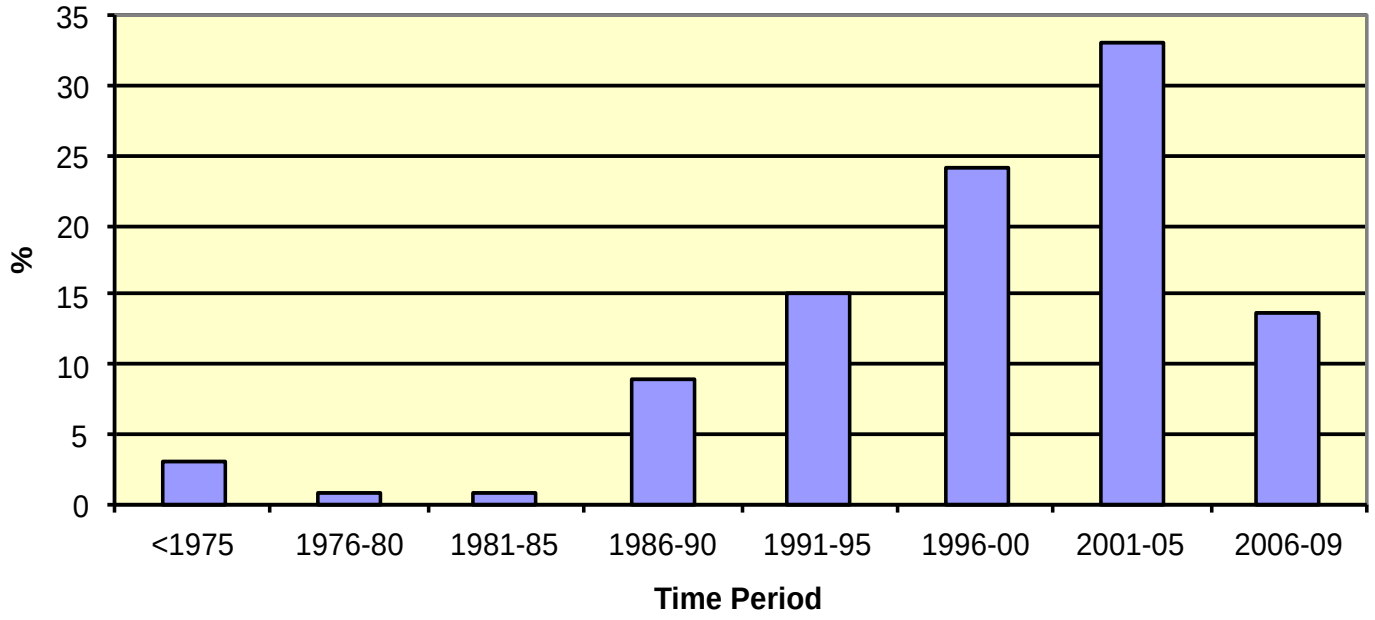
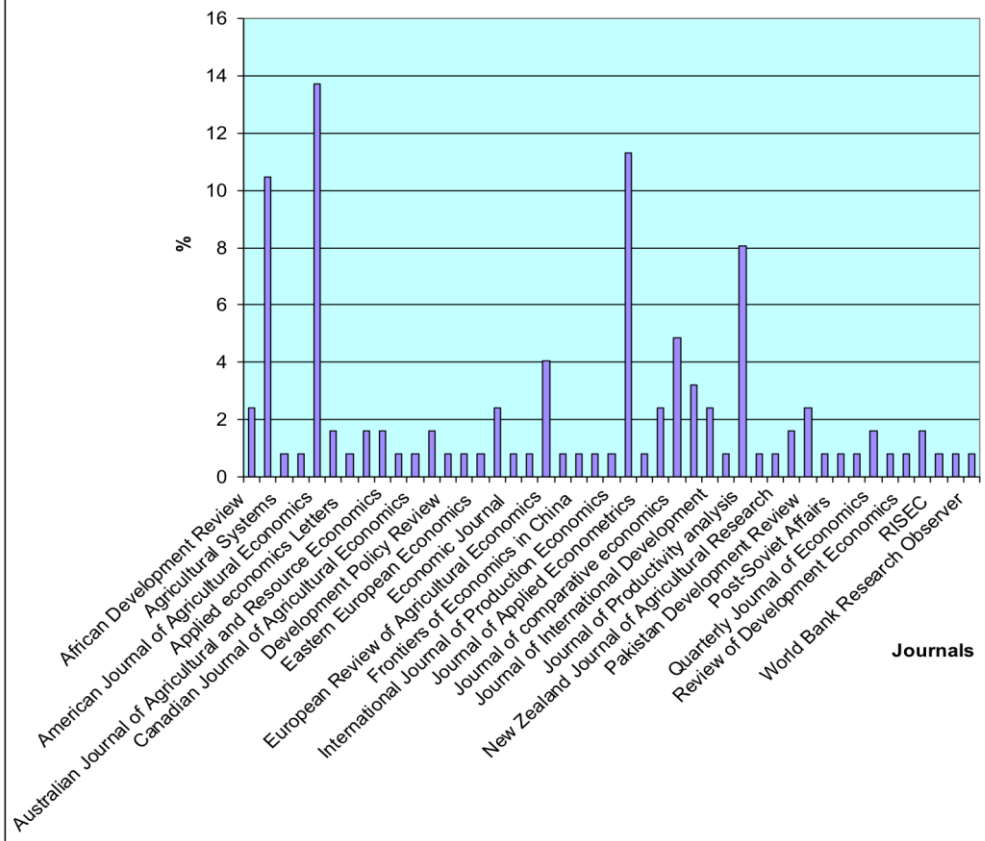


Figure 2. Frequency Distribution of Agricultural Productivity papers by source of publication



Methodological Sketch of MRA

Choice of the relevant metric for dependent variable

1. regression coefficients
2. elasticities
3. other calculated or estimated variables (e.g., wage gaps, economic returns, efficiency or productivity levels)
4. t-statistics and/or the results of other statistical tests (e.g., likelihood ratio, Wald, or Langrange multiplier)

Methodological Sketch of MRA

Choice of moderator (meta-independent) explanatory variables

1. type and characteristics of the data set
2. choice of estimation modeling
3. model specification choices
4. measures of the estimate's precision or accuracy
5. quality measures (specification tests passed, degrees of freedom)
6. geographical orientation of the study
7. period covered
8. researchers' characteristics (gender, institutional affiliations)
9. type and quality of publication

Our Choice of meta-independent variables

1. different types of productivity measures (i.e., partial versus TFP)
2. different TFP indices (i.e.., Tornqvist, Fisher, etc)
3. different levels of aggregation (i.e., regional, country, or international studies)
4. different coverage (i.e., commodity, industry, sector)
5. different methods of estimation (i.e., growth accounting, parametric-econometric, nonparametric-DEA)
6. different functional specifications (i.e., primal versus dual; flexible versus inflexible)
7. different types of data (time series vs panel data)
8. Quality adjusted input measures
9. differences in the level of economic development

Methodological Sketch of MRA

Econometric Estimation

1. the relevant weight of different observations
    a. equal weight to each observation
    b. equal weight to each study
        I. average estimate per study
        II. equal weight to study observation
2. publication bias issues

Methodological Sketch of MRA

Specification Testing

1. heteroscedasticity
2. dependent observations (random effects estimation)
3. novelty or genuine effect
4. fashion effects (year and year squared variables included in the meta-independent variables)
5. authors' effects (control with dummy variables)

	%	*Average TFP Growth*
Level of Aggregation		
Regions	31.14	2.26
Countries	13.80	1.83
International	55.08	8.13
Coverage of the Economy		
Commodity	6.50	3.82
Sector	9.40	1.95
Industry	84.10	5.93

	%	*Average TFP Growth*
Method of Estimation		
Accounting	21.35	2.14
DEA	52.00	0.92
Parametric	26.65	2.98
Functional Form		
Primal	24.00	4.92
Dual	2.40	2.02
Flexible	12.00	2.45
Inflexible	14.00	1.14
Type of Index		
Partial	18.35	5.93
TFP:	81.55	3.53
Laspayers	0.25	1.28
Paasche	0.00	0.00
Tornqvist	29.29	8.29
Malmquist	50.00	2.58
Fisher	1.31	1.65
Geometric	0.70	0.84
Type of Data		
TS	19.13	4.28
Panel	80.87	1.14
Quality Adjustment		
Yes	10.25	1.76
No	89.75	4.22

	%	*Average TFP Growth*
Level of Development		
World Bank Classification		
High Income	30.6	10.47
Middle Income	69.0	1.14
Low Income	0.40	-3.98
OECD Classification		
OECD	27.4	5.90
Non OECD	72.6	3.25

Econometric Results

There is no statistically significant differences between

a. primal and dual specifications

b. flexible and inflexible functional forms

c. panel and time series data

d. positive and significant year effect

Further work….

1. update the sample up to 2012 and include books and chapter in books

2. change the equal weight for all observation with an equal weight within each study