Selected Studies on the Impact of Ag Expenditure and Composition on Ag Sector Performance

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Introduction

❖ Agricultural public expenditure is a crucial policy tool to influence agrifood system transformation.

❖However, expenditures are not equal in their impacts

- How governments spend matters more than how much they spend.
- Evidence consistently shows that spending composition significantly affects agricultural outcomes, with public goods investments like research, infrastructure, and extension services generally showing higher returns than private subsidies, especially that are coupled to production of specific outputs.

❖ Market failures tend to deliver suboptimal investment in agriculture, particularly in research and development, infrastructure, and other public goods. This creates a clear rationale for government intervention through targeted public spending.

❖This presentation makes for you available the empirical evidence on agricultural spending effectiveness across regions and over time, analyzing which types of expenditures generate the highest returns for agricultural growth, productivity improvement, and poverty reduction. The findings provide guidance for policymakers seeking to optimize their agricultural spending portfolios.

❖The compilation of studies cut across Latin America, Africa, Asia, and Europe, and demonstrates that strategic repurposing of agricultural support can substantially improve sector performance without requiring increased total budgets.

List of Studies by Region

Region	Studies [14]
LAC (3)	Lopez and Galinato (2006); Anriquez et al (2016); Fan (2003)
Africa (3)	World Bank (2016); Jambo (2017); FAO (2021)
Asia (3)	Armas et al (2012); Fan et al (2008); Fan and Pardey (1997)
EU (4)	World Bank (2018a); Rikov et al (2013); Gerrone et al (2019); World Bank (2018b)
Global	World Bank (2023)

Outline of summaries

- ❑ Link to download
- ❑ Objective
- ❑ Data and methods
- ❑ Key findings
- ❑ Conclusions
- ❑ Overall conclusions for all studies

LAC Region

ELSEVIER

Journal of Public Economics 91 (2007) 1071 – 1094

JOURNAL OF PUBLIC ECONOMICS

www.elsevier.com/locate/econbase

LAC: Lopez and Galinato (2006)

Should governments stop subsidies to private goods? Evidence from rural Latin America ☆

Ramón López *, Gregmar I. Galinato

2200 Symons Hall, University of Maryland College Park, MD 20742, USA

Received 8 December 2005; received in revised form 21 September 2006; accepted 24 October 2006
Available online 13 December 2006

Click here to download a copy of the paper

LAC: Lopez and Galinato (2006)

Scope of the study

❑ **Research Objective:** Examine how government spending allocation between private subsidies and public goods affects: *Rural per capita income; Agricultural land expansion; and Poverty levels*

Data and Methods

❑ Data

- 15 Latin American countries
- 1985-2001 timeframe
- 27 expenditure items
- FAO, World Bank & IDB datasets

❑ Methods

- Panel data regression
- Fixed/random effects models
- GMM estimation
- Instrumental variables

Expenditure Analyzed

❑ **Public Goods**

- Technology generation/transfers (research included)
- Soil conservation
- Rural public infrastructure
- Plant/animal sanitary protection
- Communications and information services
- Social services

❑ **Private Subsidies**

- Commodity-specific subsidies
- Marketing promotion
- Production promotion
- Irrigation subsidies

LAC: Lopez and Galinato (2006)

Key Findings

❑ Public vs Private Impact Estimates (Elasticities)

	Total Rural Public Expenditure	Share of Subsidies
Agricultural GDP per capita	+0.064 to +0.202	-0.252 to -0.524
Agricultural Land Area	No significant effect	+0.211 to +0.247
Rural Poverty	No significant effect	-0.693 to -0.951

- ❖ A 10% reallocation from subsidies to public goods could:
  - Increase per capita agricultural GDP by 5%
  - Reduce agricultural land expansion by 2%
  - Improve rural poverty indicators

❑ Other Impact Estimates

- ❖ High-subsidy countries (>65%) have 40% lower per capita agricultural GDP than low-subsidy countries (<30%).

- ❖ Spending composition > total amount
  - If a country in the bottom half of spenders increased spending to match the average of the top half, GDP could increase by 19%

  - However, if a high-subsidy country reduced its subsidy share from 65% to 30% (matching low-subsidy countries), GDP could increase by 40%

LAC: Lopez and Galinato (2006)

Key Findings

Public Goods Impact on Agricultural GDP

Public Good Component	Elasticity
Environmental expenditure	+0.323
Social capital	+0.472
Social infrastructure	+0.253
Basic infrastructure	+0.408
Research	+0.132 (not significant)
Law enforcement	+0.021 (not significant)

Private Subsidies Impact on Agricultural GDP

Subsidy Component	Elasticity
Marketing	-0.272
Irrigation infrastructure	-0.496
Agricultural output promotion	-0.119 (not significant)
Rural production promotion	-0.226

- Public goods investments show consistently positive returns on Ag GDP
- Private subsidies show consistently negative impacts on Ag GDP

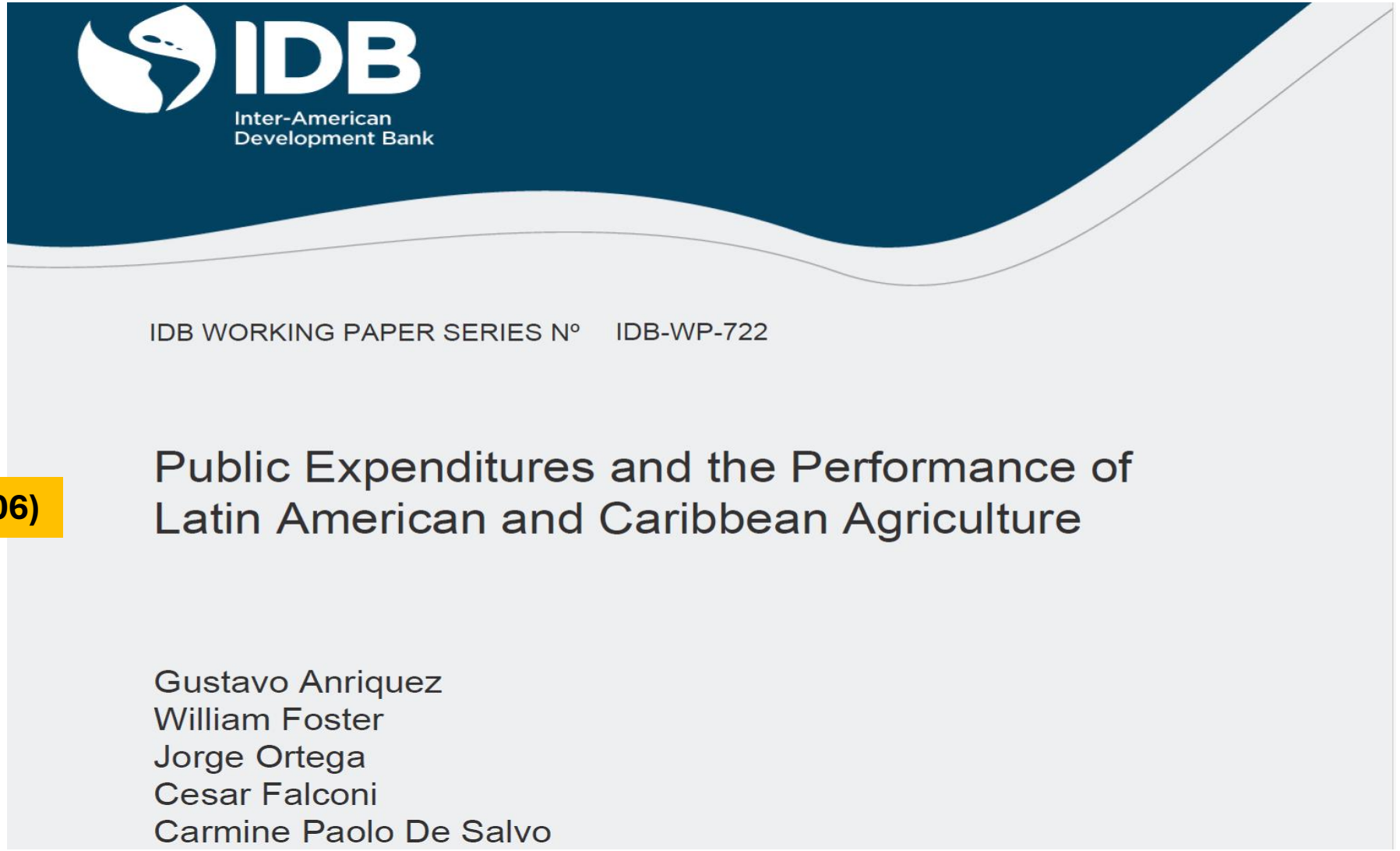
LAC: Lopez and Galinato (2006)

Conclusions

- ❑ Public goods spending more effective than private subsidies for development
  - All significant public goods components show positive impacts on GDP
  - All significant private subsidy components show negative impacts on GDP
  - Subsidies tend to benefit wealthy farmers more than poor ones

- ❑ Spending composition matters more than total amount
  - The elasticity estimates showed that reducing the share of subsidies had a larger impact than increasing total expenditures

LAC: Anriquez et al (2006)



IDB Inter-American Development Bank

IDB WORKING PAPER SERIES Nº IDB-WP-722

Public Expenditures and the Performance of Latin American and Caribbean Agriculture

Gustavo Anriquez
William Foster
Jorge Ortega
Cesar Falconi
Carmine Paolo De Salvo

Click here to download a copy of the paper

LAC: Anriquez et al (2006)

Scope of the Study

Research Objective: Examine how government expenditure mix affects agricultural sector performance in Latin American and Caribbean countries; Key focus: Impact of shifting spending between public goods and private subsidies

Data and Methods

❑ Data

- 19 LAC countries
- Timeframe: 1985-2012
- FAO; IDB Agrimonitor data

❑ Methods

- Panel regression analysis
- Fixed effects and random effects models
- Instrumental variables approach
- Controls for country-specific factors

Summary of Expenditure Analyzed (click here for full list)

❑ Agricultural spending

- Public goods
  - Research
  - Infrastructure
  - Inspection systems
- Private goods
  - Subsidies
  - Market price supports
- Mixed goods
  - Irrigation development
  - Farm restructuring

❑ Non-agricultural rural spending

- Infrastructure
- Education
- Health

LAC: Anriquez et al (2006)

Key Findings

Impact on Agricultural Value Added per Capita

Variable	Fixed Effects	Random Effects
Total rural spending (log)	0.104*	0.152**
Share of private spending	-0.455***	-0.606***
Trade openness	0.092	-0.145
Non-ag GDP per capita (log)	0.694***	0.642***
Land area per capita (log)	0.000	-0.039

Impact on Ag Value Added per Capita

Variable	Fixed Effects	Random Effects
Total agricultural spending (log)	0.096	0.137*
Share of private spending	-0.516***	-0.737***
Trade openness	0.215	-0.045
Non-ag GDP per capita (log)	0.731***	0.619***
Land area per capita (log)	-0.247	-0.063

Impact of Ag vs Non-Ag Private Spending on Ag GDP per Capita

Variable	Fixed Effects	Random Effects
Total rural spending (log)	0.136**	0.170***
Agricultural private share	-0.668**	-0.787***
Non-agricultural private share	-0.684	-0.393
Non-ag GDP per capita (log)	0.765**	0.708***

- Rural spending positively impact ag performance
- The share of the private spending negatively impact ag performance
- The negative impact of private good spending is due primarily to private spending on agriculture, not rural non-agricultural spending
- A Shift of 10 percentage points of the ag budget from private to public goods, leads to an approximately 5 percent increase in value added per capita.
- To achieve the same increase would require an increase of approximately 25 percent or more in total spending

LAC: Anriquez et al (2006)

Conclusions

❑ Composition Matters Most

- Spending allocation more important than total amount
  - How governments divide their agricultural budget between public and private goods matters more than the total size of the budget

- Shift from private to public goods brings greater benefits
  - Moving money from subsidies to things like research or infrastructure leads to better agricultural performance

- More effective than increasing total budget
  - Simply getting a bigger budget while keeping the same spending mix doesn't improve outcomes as much

❑ Agriculture spending > Rural Spending

- Effects driven by agricultural spending decisions
  - The benefits come specifically from how farm-related money is spent

- Not broader rural development spending
  - General rural spending (like on schools or healthcare) doesn't show the same effect
- Specific to farm sector allocations
  - The composition effect only appears in spending directly related to agriculture

- Important policy targeting implication
  - This tells policymakers they should focus on reforming agricultural budgets specifically

LAC: Fan (2003)

PUBLIC INVESTMENT AND POVERTY REDUCTION CASE STUDIES FROM ASIA AND IMPLICATIONS FOR LATIN AMERICA

By

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LAC: Fan (2003)

Scope of the Study

Research Objective: Assess how different types of public investment affect: Agricultural growth and poverty reduction in India and China

Data and Methods

❑ Data:

- State/provincial panel data
  - India: 1970-1993
  - China: 1970-1997

❑ Methods:

- Simultaneous equation systems
- Channels analyzed:
  - Agricultural production
  - Wages
  - Non-farm employment
  - Regional variations

❑ **Types of Public Investment Analyzed**

- Agricultural R&D
- Irrigation
- Roads
- Education
- Electricity/Power
- Telecommunications
- Health
- Soil and water conservation
- Anti-poverty programs

LAC: Fan (2003)

Key Findings

Impacts in India

Investment Type	Returns (Rupees per Rupee Spent)	Poverty Reduction (Poor Reduced per Million Rupee)
R&D	13.45	84.5
Roads	5.31	123.8
Education	1.39	41.0
Irrigation	1.36	9.7
Anti-poverty Programs	1.09	17.8
Soil and Water Conservation	0.96	22.6
Health	0.84	25.5
Power	0.26	3.8

Impacts in China

Investment Type	Returns (Yuan per Yuan Spent)	Poverty Reduction (Poor Reduced per 10,000 Yuan)
R&D	9.59	6.79
Education	3.71	8.80
Roads	2.12	3.22
Telephone	1.91	2.21
Irrigation	1.88	1.33
Electricity	0.54	2.27
Poverty Loan	-	1.13

- In both countries, R&D showed consistently high returns for both economic growth and poverty reduction
- Roads and education were also among the top performers in both countries
- Anti-poverty/poverty loan programs showed relatively low returns in both countries
- Infrastructure investments (roads, electricity, telephone) showed moderate returns
- Irrigation showed relatively low returns in both countries compared to other investments

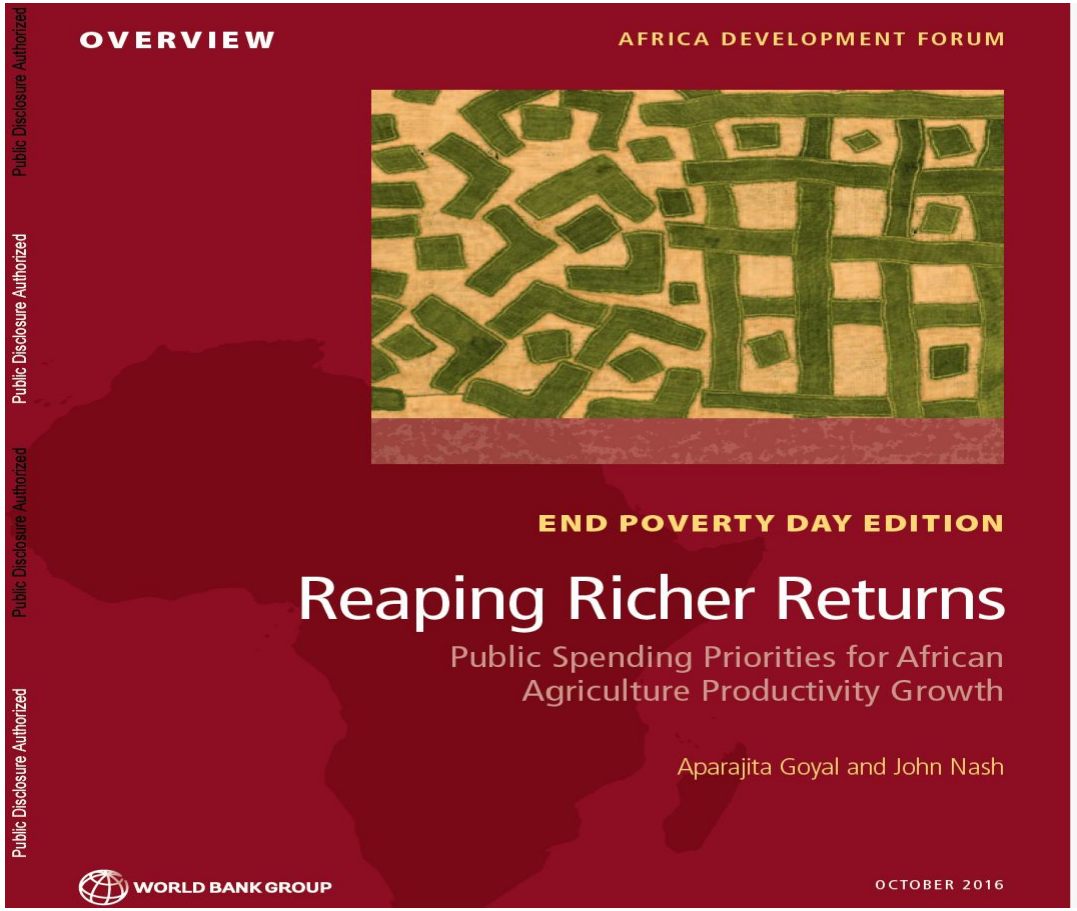
LAC: Fan (2003)

Conclusions

1. Most Effective Investments
    1. Agricultural R&D
    2. Education
    3. Rural infrastructure (especially roads) → These consistently show highest returns for both growth and poverty reduction
2. Regional Variations
    1. Highest poverty reduction returns often in less-developed areas
    2. Different optimal investment mixes by region
3. Declining Returns
    1. Irrigation showing diminishing returns vs historical impact
    2. Anti-poverty programs showing relatively low impact
4. Policy Implications
    1. Focus on R&D, education, and infrastructure
    2. Target investments to regional needs
    3. Reassess traditional irrigation investments
    4. Reform anti-poverty program delivery

Africa Region

Africa: World Bank (2016)



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Africa: World Bank (2016)

Scope of the Study

Research Objective: To examine how to rebalance agricultural public spending to improve its efficiency and effectiveness in Sub-Saharan Africa for boosting agricultural productivity growth and reducing poverty

Data and Methods

❑ **Data Sources**

- IFPRI Statistics on Public Expenditures Database
- Regional Strategic Analysis and Knowledge Support System
- Farm-level surveys
- Regional agricultural spending data

❑ **Method:**

- **Synthesis Approach:** Compilation and comparison of descriptive statistics on agricultural spending across regions
- Review of previous studies:
  - Benefit-cost analyses
  - Returns to investment calculations
  - Impact evaluations of input subsidies
  - Farm-level survey analyses
- Analysis of institutional knowledge:
  - 20 World Bank-Gates Foundation agricultural expenditure reviews
  - Country case studies
  - Historical policy analyses

❑Types of Spending Analyzed

Public

- Agricultural research and development (R&D)
- Extension services
- Irrigation infrastructure
- Rural roads and market access infrastructure
- Land governance/administration
- Post-harvest processing facilities
- Recurrent administrative spending

Private

- Input subsidies (primarily fertilizer)

Africa: World Bank (2016)

Key Findings

❑ R&D Returns (High)

- National R&D: $3 benefit per $1 spent
- CGIAR research: $6 benefit per $1 spent
- Large countries: 4.4 benefit-cost ratio
- Mid-size countries: 2.6 benefit-cost ratio
- Small countries: 1.6 benefit-cost ratio

❑ Irrigation Returns (High)

- Large-scale: 17% return
- Small-scale: 43% return

❑ Input Subsidy Returns (low)

- Malawi: 0.62 financial, 0.80 economic benefit-cost ratio
- Zambia: 0.56 financial, 0.92 economic benefit-cost ratio
- Kenya: 0.79 financial, 1.09 economic benefit-cost ratio

Africa: World Bank (2016)

Conclusions

- African agricultural spending lags behind other regions
- High returns for R&D, extension, and infrastructure spending
- Input subsidies show low returns and poor targeting
- Need to shift from private goods to public goods spending
- Budget processes need improvement
- Political economy factors must be managed

Africa: Jambo (2017)

The Impact of Government Spending on Agricultural Growth: A Case of Zambia, Malawi, South Africa and Tanzania

By

Newettie Jambo

Thesis presented in partial fulfilment of the requirements for the degree of Master of Science in Agriculture (Agricultural Economics) in the Faculty of AgricSciences at Stellenbosch University

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Africa: Jambo (2017)

Scope of the Study

Objective: Determine which components of public agricultural expenditure most enhance agricultural sector growth in Zambia, Malawi, South Africa, Tanzania

Data and Methods

❑Data

- Timeframe: 2000-2014

❑Method

- Vector Error Correction Model (VECM)

Types of Agricultural Spending

- Input subsidy programs (ISPs)
- Price support programs (PSPs)
- Agricultural research and extension
- Infrastructure development
- CASP (South Africa only)

Africa: Jambo (2017)

Key Findings

Spending Component	Zambia	Malawi	South Africa	Tanzania
Agricultural Research/Extension	-0.04	+13.53	+1.03	+0.006
Infrastructure Development	+0.04	+4.17	-0.26	-0.12
Input Subsidies	-0.06	-5.96	N/A	-0.08
Price Support Programs	-0.11	+4.33	N/A	N/A
CASP*	N/A	N/A	+0.29	N/A
Agricultural Extension**	N/A	N/A	+0.10	N/A

- CASP (Comprehensive Agricultural Support Program) exists only in South Africa
- Agricultural Extension is reported separately only for South Africa; for other countries it's combined with Research
- Values represent percentage change in agricultural GDP for a 1% increase in spending component

Africa: Jambo (2017)

Conclusions

❑ Key Conclusions

- The impact of agricultural spending on growth varies substantially across different countries, ranging from -5.96% to +13.53%.
- Agricultural research spending generally demonstrates a positive impact on growth, particularly in Malawi where it shows the highest returns.
- Infrastructure development spending shows inconsistent effects across countries, with positive impacts in some nations and negative in others.
- Input subsidy programs consistently demonstrate negative impacts on agricultural growth across all countries where they were studied.
- Current evidence indicates that many countries are allocating funds to less effective spending categories rather than to areas that generate higher growth.
- The significant variation in results across countries indicates that standardized spending approaches are less effective than country-specific strategies.
- More precise targeting of agricultural spending is needed to achieve optimal growth outcomes in each country's unique context.

❑ Recommendations

- Governments should redirect agricultural spending away from ineffective programs and toward areas that demonstrate higher impacts on growth.
- Each country needs to develop its own unique agricultural spending strategy based on evidence of what works in their specific context.
- Agricultural spending programs require improved targeting mechanisms to ensure funds reach the most productive uses and beneficiaries.
- Regular assessments of spending impacts should be conducted to monitor program effectiveness and guide future allocation decisions.
- All agricultural spending decisions should be based on empirical evidence rather than political considerations or historical precedent.

Africa: FAO (2021)

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Africa: FAO (2021)

Scope of the Study

Research Objective: Analyze trends, composition and effectiveness of public expenditure on food and agriculture across 13 sub-Saharan African countries (2004-2018)

- **Data & Methods and Definitions**

❑ Data

- Public expenditure data: 13 countries, 2004-2018
- Methods
- Data Envelopment Analysis (DEA)

❑ **Technical Efficiency Definition**

- Measured using Data Envelopment Analysis (DEA)
- Scores range from 0 to 1
- Score of 1 = Full efficiency in converting inputs to outputs
- Score < 1 = Indicates potential input reduction while maintaining output
- Average score for studied countries: 0.33
- Inputs: land endowments, labor characteristics
- Output: agricultural GDP per rural capita

- **Types of Spending Analyzed**
- Producer transfers (input/capital subsidies)
- Consumer transfers (food aid, cash)
- R&D and extension services
- Infrastructure (irrigation, roads)
- Inspection, storage and marketing
- Administrative costs
- Forestry and environment protection

Africa: FAO (2021)

Key Findings

Type of Analysis	Component	Impact/Finding
Overall Spending Efficiency	Total per capita spending	Positive relationship up to ~$80/capita threshold
Correlation with Technical Efficiency	Producer transfers (subsidies)	Negative (-0.260***)
	Consumer transfers	Positive (0.224***)
	R&D and extension	Weak positive (0.090)
	Agricultural infrastructure	Weak positive (0.054)
	Inspection/storage/marketing	Negative (-0.185**)
	Administrative costs	No significant impact (-0.013)
Countries with More Advanced Agricultural Transformation	Producer transfers	Strong negative (-0.487***)
	Infrastructure	Strong positive (0.357***)
	R&D and extension	Positive (0.204)
	Consumer transfers	No significant impact (-0.031)
Countries with Less Advanced Agricultural Transformation	Consumer transfers	Strong positive (0.405***)
	Infrastructure	Negative (-0.212*)
	Inspection/marketing	Negative (-0.266**)
	Producer transfers	No sign

Significance levels: *** p<0.01, ** p<0.05, * p<0.10

Africa: FAO (2021)

Conclusions

❑ Composition of spending matters more than total amount:
•Input subsidies generally show negative returns
•R&D and infrastructure show positive returns, but are underfunded
•Consumer transfers more effective in less transformed agriculture
•Producer subsidies more harmful in more transformed agriculture

❑ Need for:
•Better execution of allocated funds
•Shift from input subsidies to public goods (R&D, infrastructure)
•Context-specific spending strategies based on transformation level
•Improved monitoring systems and data collection
•Greater focus on climate resilience and sustainability

❑ Both spending better and, when possible, spending more are needed, with emphasis on improving spending composition and execution given fiscal constraints.

Asia Region

Asia: Armas et al (2012)

WPS5977

Public Disclosure Authorized

POLICY RESEARCH WORKING PAPER 5977

Agriculture Public Spending and Growth in Indonesia

Enrique Blanco Armas
Camilo Gomez Osorio
Blanca Moreno-Dodson
Dwi Endah Abriningrum

Authorized

[Click here to download a copy of the paper]

Asia: Armas et al (2012)

Scope of the Study

Research Objective: Analyze impact of Ag public spending volume and composition on agricultural growth in Indonesia

Data and Methods

❑ **Data:**

- **Sources**: Indonesia Statistical Yearbook; Presidential addresses; LKPP; FAOSTAT; WDI; MoA; MoF
- **Timeframe:** 1976-2006

❑ **Methods:**

- GMM estimation with instrumental variables
- OLS

Types of Spending Analyzed

❑ **Public:**

- Research and Development
- Extension services
- Rural infrastructure/roads
- Irrigation systems
- Marketing assistance

❑ **Private input subsidies**

- Fertilizer
- Seeds
- Credit
- Equipment
- Others

Asia: Armas et al (2012)

Key Findings

Impact on Agricultural GDP per capita growth (%)

Variable & Specification	OLS Estimates	GMM Estimates
Fiscal Variables (Ratios to Agri-GDP)		
Agriculture & Irrigation Spending	+2.36 to +2.72***	+4.68 to +8.20***
Fertilizer Subsidies	-5.14 to -6.38**	-15.62 to -33.31***
Total Agricultural Spending	Not significant	+5.90**
Tax Revenue (ATR)	-6.65	-24.93***
Control Variables (Logs)		
Non-Agricultural GDP per capita	+0.84 to +0.93***	+0.83 to +0.97***
Agricultural Labor	+0.30 to +0.79**	-1.62**
Arable Land	-0.37 to -0.16	-1.88 to +0.99
Global Demand	-0.0000	-0.0002***
Binary Variable		
1998 Crisis Dummy	-0.19	-1.46*** to +0.36

Interpretation (Fiscal variables): Percentage point change in growth rate from a 1 percentage point change in spending

❑ **Public Goods (+)**

•Agriculture & irrigation spending shows positive impact on growth; Coefficients: +2.36 to +8.20

❑ **Private Goods (-)**

•Fertilizer subsidies show negative impact on growth; Coefficients: -5.14 to -33.31

Asia: Armas et al (2012)

Conclusions

❑ Volume AND composition of spending matter for growth

- Agriculture/irrigation spending: Significant positive impact
- Fertilizer subsidies: Significant negative impact

❑ Current spending effectiveness reduced by:

- Over-emphasis on private input subsidies
- Under-investment in public goods

❑ Policy Implication: Reallocate from subsidies to public goods

- Focus on irrigation, R&D, extension services

Asia: Fan et al (2008)

AGRICULTURAL ECONOMICS

Agricultural Economics 39 (2008) 163–170

Investment, subsidies, and pro-poor growth in rural India

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Click here to download a copy of the paper

Asia: Fan et al (2008)

Scope of the Study

Objective: To assess the relative impact of different types of government subsidies and investments on Agricultural growth and Poverty reduction in India; to help prioritize future government spending

Data and Methods

❑ Data

- State-level data covering 1960s-1990s

❑ Methods

- Analysis broken into three periods:
  - 1960s-1970s
  - 1980s
  - 1990s
- Simultaneous equation system estimated using three-stage least squares (3SLS)

Types of Spending Analyzed

❑ Public

- Agricultural R&D
- Roads
- Education
- Irrigation investment

❑ Subsidies

- Fertilizer subsidies
- Power subsidies
- Credit subsidies
- Irrigation subsidies

Asia: Fan et al (2008)

Key Findings

Impact on Agricultural GDP (Returns per Rupee Spent)

Type of Spending	1960s-1970s	1980s	1990s
Roads	19.99 [Rank #1]	8.89 [Rank #1]	7.66 [Rank #2]
Education	14.66 [Rank #3]	7.58 [Rank #3]	5.46 [Rank #3]
Agricultural R&D	8.65 [Rank #5]	7.93 [Rank #2]	9.5 [Rank #1]
Irrigation Investment	8 [Rank #6]	4.71 [Rank #4]	4.37 [Rank #4]
Credit Subsidies	18.77 [Rank #2]	3 [Rank #5]	4.26 [Rank #5]
Power Subsidies	12.06 [Rank #4]	2.25 [Rank #7]	1.19 [Rank #7]
Irrigation Subsidies	5.22 [Rank #7]	2.25 [Rank #7]	2.47 [Rank #6]
Fertilizer Subsidies	1.79 [Rank #8]	1.94 [Rank #8]	0.85 [Rank #8]

Impact on Poverty Reduction (# of Poor Reduced per Million Rupees)

Type of Spending	1960s-1970s	1980s	1990s
Roads	4124 [Rank #1]	1312 [Rank #1]	881 [Rank #1]
Education	1956 [Rank #2]	651 [Rank #2]	336 [Rank #3]
Agricultural R&D	643 [Rank #5]	409 [Rank #3]	436 [Rank #2]
Irrigation Investment	630 [Rank #6]	267 [Rank #4]	193 [Rank #5]
Credit Subsidies	1449 [Rank #3]	155 [Rank #5]	196 [Rank #4]
Power Subsidies	998 [Rank #4]	126 [Rank #6]	59 [Rank #7]
Irrigation Subsidies	394 [Rank #7]	116 [Rank #7]	113 [Rank #6]
Fertilizer Subsidies	90 [Rank #8]	110 [Rank #8]	37 [Rank #8]

Asia: Fan et al (2008)

Conclusions

- Agricultural research, education, and rural infrastructure were consistently the most effective for both agricultural growth and poverty reduction
- Initial subsidies helped small farmers adopt new technologies
- Returns to most subsidies declined significantly over time
- Recommendation: Reduce subsidies and increase investments in agricultural R&D, rural infrastructure, and education
- Small tradeoff between agricultural growth and poverty reduction among different spending types

ELSEVIER

Journal of Development Economics
Vol. 53 (1997) 115–137

JOURNAL OF
Development
ECONOMICS

Asia: Fan and Pardey (2008)

Research, productivity, and output growth in Chinese agriculture [1]

Shenggen Fan *, Philip G. Pardey

International Food Policy Research Institute, 1200 Seventeenth Street, N.W., Washington, DC 20036-3006, USA

Click here to download a copy of the paper

Asia: Fan and Pardey (2008)

Scope of the Study

Research Objective: Quantify agricultural research investments' contribution to China's agricultural output growth; and compare research impacts with institutional reforms and other factors

Data & Methods

❑ **Data**

- Panel data from 29 provinces
- Timeframe: 1965-1993

❑ Methods

- Production function estimation (OLS)
- Quasi-translog and Cobb-Douglas models

❑**Agriculture Spending Analysis**

- Provincial-level agricultural research expenditures
- Constructed "stock of knowledge" variable using 7-year weighted lag of spending

Asia: Fan and Pardey (2008)

Key Findings

Sources of Growth in Chinese Agricultural Output Over Time (% contribution)

Growth Factor	1965-78	1979-84	1985-93	Full Period (1965-93)
Conventional Inputs	82.4	24.2	20.0	45.7
- Labor	12.5	5.6	6.2	7.5
- Land	-1.8	-0.8	0.1	0.1
- Fertilizer	38.0	12.0	9.1	21.7
- Power	24.7	7.8	5.5	12.9
- Irrigation	9.0	-0.4	-0.9	3.7
Research	25.2	19.1	14.1	19.5
Institutional Changes	0.0	38.6	42.1	17.6
Residual	-7.6	18.1	23.7	17.1
Total Growth Rate	3.3%	8.1%	5.2%	4.7%

Asia: Fan and Pardey (2008)

Key Findings

Regional Variation in Sources of Growth 1965-93 (% contribution)

Growth Factor	Northeast	North	Northwest	Central	Southeast	Southwest	South	National
Conventional Inputs	56.1	48.3	42.3	46.6	46.2	58.3	32.2	45.7
- Labor	7.2	5.6	8.0	10.0	4.5	13.2	6.8	7.5
- Land	0.1	-0.3	-2.0	0.0	-0.0	2.1	0.7	0.1
- Fertilizer	25.4	23.7	23.9	23.3	20.6	27.2	13.1	21.7
- Power	11.5	12.3	10.6	13.5	16.8	14.8	11.5	12.9
- Irrigation	12.0	7.1	1.9	-0.2	3.3	3.0	0.12	3.7
Research	21.1	18.4	16.3	18.9	18.2	20.1	28.1	19.5
Institutional Changes	19.9	13.9	13.3	26.8	27.7	10.3	14.4	17.6
Residual	2.9	19.2	28.1	7.7	8.9	11.3	14.3	17.1
Growth Rate	4.9%	5.2%	4.3%	4.1%	4.5%	4.0%	5.3%	4.7%

Asia: Fan and Pardey (2008)

Conclusions

Research Impact

•Research contributed 20% to agricultural growth
- Previous studies overlooked this significant factor
- Impact remained substantial during reform periods
- Regional variation: 28.1% (South) to 16.3% (Northwest)

Reform Effects

•Institutional/market reforms contributed 17.6% to growth
- Lower than previous estimates
- Second phase reforms (post-1984) matched first phase impact
- More developed regions benefited most

Input Contributions

•Conventional inputs: 46% of total growth
- Modern inputs dominated traditional inputs
- Fertilizer: largest single input contribution (21.7%)
- Traditional inputs (land, labor) had minimal impact

Temporal Patterns

•Growth sources evolved significantly
- Pre-reform: conventional inputs dominated
- Reform era: decreased input dependence
- Institutional effects increased over time

Regional Variations

•Significant spatial differences in growth sources
- Research impact highest in South (28.1%)
- Less developed regions gained least from reforms
- Regional disparities in input effectiveness

Policy Implications

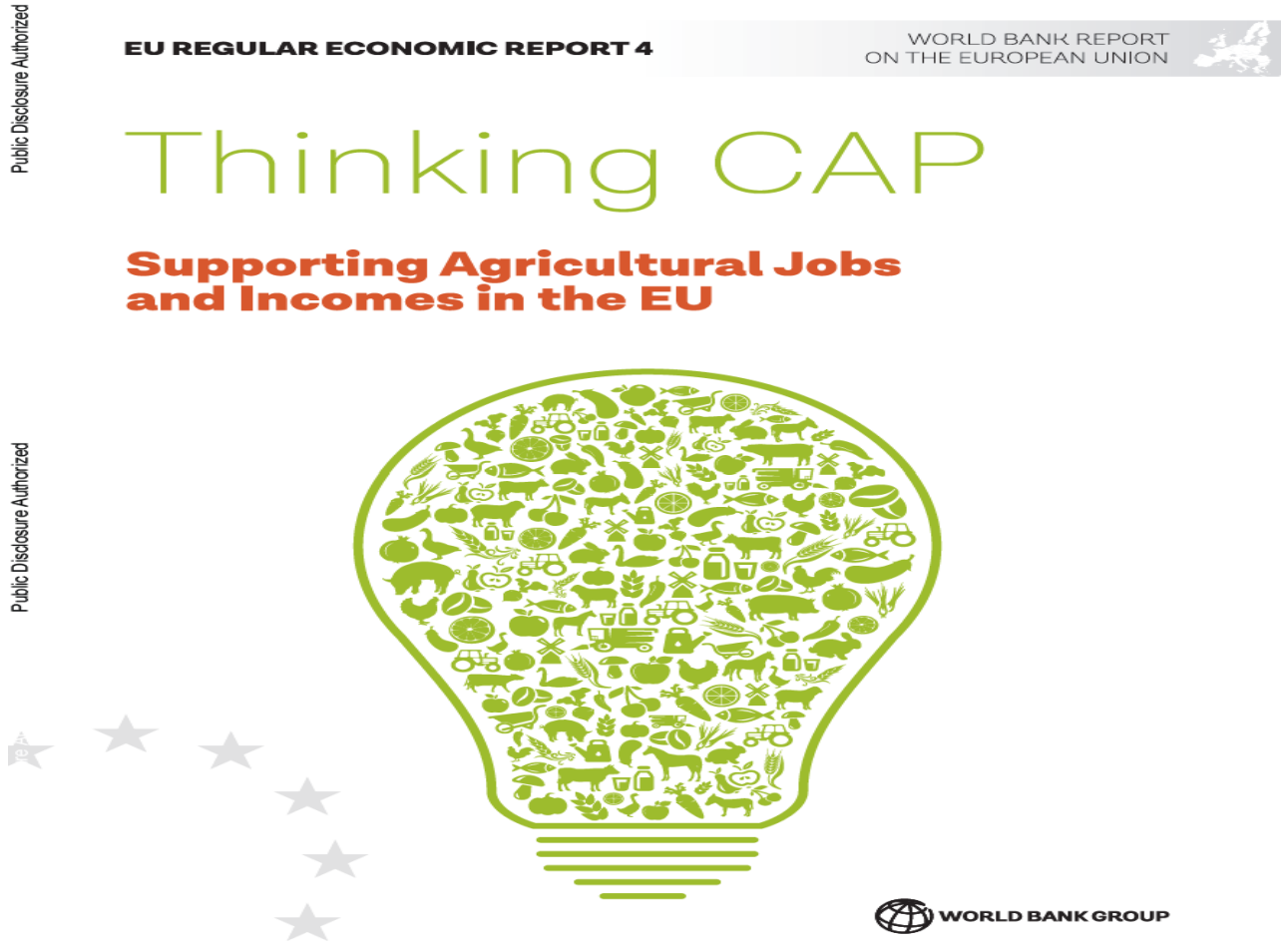
•Balanced approach needed
- Research investment crucial for long-term growth
- Technology systems vital for market reform success
- Combined technological/institutional development required

Overall Message

•**Sustainable agricultural growth requires both:**
- Strong research & technology development
- Effective institutional reforms
- Previous studies overemphasized reform impacts

EU Region

EU: World Bank (2018a)



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EU: World Bank (2018a)

Scope of the Study

Research Objective: To assess the impact of CAP expenditures on inclusive growth in the EU, examining effects on: Agricultural productivity; Employment retention; Poverty reduction

❑ Data

- **Sources:** CATS database; EU-SILC data; Cambridge Econometrics Regional Database
- 28 countries, 220 regions (NUTS2)
- Timeframe: 2002-2014 period

❑ Methods

•Fixed effects models controlling for regional differences
•Growth analysis based on Esposti (2007) estimation
•Key controls include:
  - Labor force growth
  - Population density
  - Unemployment rates
  - Agricultural employment shar

❑ CAP (Common Ag Policy) Spending Components

- **Pillar I (75% of budget)**
- Coupled payments: Linked to specific production
- Decoupled payments: Based on land area used
- **Pillar II (25% of budget)**
- Rural development funding
- Investment project support
- Requires co-financing

EU: World Bank (2018a)

Key Findings

Impact Estimates

❑ On Regional GDP Growth:

- Total CAP: No significant impact
- Coupled payments: Minimal positive effect (0.2 elasticity)
- Decoupled & Pillar II: No significant impact

❑ On Agricultural Productivity:

- Total CAP: Positive (elasticity 2.2 EU-28, 5.1 newer states)
- Decoupled: Strong positive (elasticity 0.11-0.76)
- Pillar II: Positive (elasticity 0.11-0.37)
- Coupled: No significant effect

❑ On Agricultural Employment:

- Total CAP: Reduces outflow (elasticity -0.3)
- Decoupled & Pillar II: Positive retention effect
- Coupled: No significant effect

❑ On Poverty & Inequality:

- Total CAP: Reduces poverty and inequality
- Pillar II: Strongest poverty reduction effect
- Decoupled: Strong poverty reduction
- Coupled: No significant effect

EU: World Bank (2018a)

Conclusions

- CAP supports productivity growth and job retention through decoupled payments
- Stronger productivity effects in newer member states
- Decoupled and Pillar II payments more effective than coupled payments
- No productivity-employment tradeoff observed
- CAP reaches poorer regions but effectiveness varies by local conditions

JAE Journal of Agricultural Economics

Journal of Agricultural Economics, Vol. 64, No. 3, 2013, 537–557
doi: 10.1111/1477-9552.12030

CAP Subsidies and Productivity of the EU Farms

EU: Rikov et al (2012)

Marian Rizov, Jan Pokrivcak and Pavel Ciaian[1]

(Original submitted June 2012, revision received March 2013, accepted May 2013.)

Click here to download a copy of the paper

EU: Rikov et al (2012)

Scope of the Study

Research Objective: 1) Investigate impact of Common Agricultural Policy (CAP) subsidies on farm total factor productivity (TFP) in EU-15; and examine how relationship changed after 2005/2006 decoupling reform

Data & Methods

❑ Data

- Farm Accountancy Data Network (FADN) 1990-2008
- EU-15 commercial farms across 6 farm types
- 83 farm-type country samples
- ~85% of FADN EU-15 farms covered

❑ Methods

- Modified Olley-Pakes structural estimation
- Two-stage estimation algorithm
- Spearman rank correlation analysis

Types of Spending Analyzed

❑ Coupled subsidies (pre-reform)
- Payments directly linked to production
- Examples: crop area payments, animal payments

❑ Decoupled subsidies (post-reform)
- Payments not linked to current/future production

❑ Rural development payments (not decoupled)
- Agri-environmental payments
- Investment payments
- Less Favored Area payments

EU: Rikov et al (2012)

Key Findings

Full Sample (Includes ALL types of subsidies: coupled, decoupled, rural dev payments etc.)

	TFP Level			TFP Growth		
	Pre-Reform	Post-Reform	Change	Pre-Reform	Post-Reform	Change
Belgium	-0.272	-0.250	↑	-0.015	+0.024*	↑↑
Denmark	+0.160	+0.206	↑	+0.018	+0.024*	↑
Germany	-0.526	-0.477	↑	+0.014	+0.027*	↑
Greece	-0.068	-0.034	↑	-0.081	-0.015	↑
Spain	-0.471	-0.402	↑	-0.022	+0.022*	↑↑
France	-0.539	-0.507	↑	-0.027	+0.013*	↑↑
Ireland	-0.502	-0.278	↑	-0.029	+0.025*	↑↑
Italy	-0.324	-0.304	↑	+0.013	+0.026*	↑
Luxembourg	-0.175	-0.032	↑	-0.047	+0.057*	↑↑
Netherlands	-0.648	-0.504	↑	-0.015	+0.018	↑↑
Austria	-0.060	+0.080	↑↑	-0.022	+0.028*	↑↑
Portugal	+0.253	+0.266	↑	-0.047	+0.001	↑↑
Finland	-0.162	+0.049	↑↑	+0.003	+0.070*	↑
Sweden	-0.222	+0.006	↑↑	-0.011	+0.016	↑↑
UK	-0.337	-0.206	↑	-0.038	+0.041*	↑↑

- ↑ = Improvement while maintaining same sign
- ↑↑ = Switched from negative to positive (or vice versa if decrease)

On TFP Level

❑ Pre-reform (coupled):
- Negative in most countries (-0.068 to -0.648)
- Positive in only Denmark & Portugal (+0.160, +0.253)

❑ Post-reform (decoupled):
- Less negative correlations overall
- Positive in several countries (Austria, Denmark, Finland, Portugal, Sweden)

On TFP Growth

❑ Pre-reform:
- Mostly negative (-0.081 to -0.047)
- Only Denmark, Germany, Italy slightly positive

❑ Post-reform:
- Majority positive (+0.013 to +0.070)
- Only Greece negative but insignificant

EU: Rikov et al (2012)

Key Findings

Decoupling Subsample (includes farms that received only COUPLED SUBSIDIES that were directly affected by the decoupling reform: i.e. crop area payments and animal payments; excluding others like rural dev payments

Country	TFP Level			TFP Growth		
	Pre-Reform	Post-Reform	Change	Pre-Reform	Post-Reform	Change
Belgium	-0.294	+0.063	↑↑	-0.031	+0.076*	↑↑
Denmark	+0.167	+0.251	↑	-0.016	+0.049*	↑↑
Germany	-0.592	-0.447	↑	-0.031	+0.037*	↑↑
Greece	-0.081	+0.055	↑↑	-0.128	+0.017	↑↑
Spain	-0.482	-0.144	↑	-0.026	+0.024*	↑↑
France	-0.565	+0.010	↑↑	-0.034	+0.051*	↑↑
Ireland	-0.542	-0.153	↑	-0.031	+0.030*	↑↑
Italy	-0.337	-0.258	↑	-0.008	+0.028*	↑↑
Luxembourg	-0.186	+0.069	↑↑	-0.111	+0.068*	↑↑
Netherlands	-0.654	-0.324	↑	-0.026	+0.020*	↑↑
Austria	-0.108	+0.178	↑↑	-0.028	+0.048*	↑↑
Portugal	+0.225	+0.290	↑	-0.041	+0.100*	↑↑
Finland	-0.238	+0.111	↑↑	-0.005	+0.032*	↑↑
Sweden	-0.247	+0.191	↑↑	-0.032	+0.035	↑↑
UK	-0.372	-0.180	↑	-0.055	+0.067*	↑↑

- ↑ = Improvement while maintaining same sign
- ↑↑ = Switched from negative to positive (or vice versa if decrease)

- The decoupling subsample shows stronger effects because it focuses only on subsidies that were directly affected by the reform:

- For example, in TFP Level:
  - -- Full sample: 5 countries switched to positive
  - -- Decoupling subsample: 8 countries switched to positive

- In TFP Growth:
  - -- Full sample: 10 countries switched to positive
  - -- Decoupling subsample: All 15 countries switched to positive

EU: Rikov et al (2012)

Conclusions

- Pre-decoupling: Negative association with productivity
- Post-decoupling: More nuanced relationship, often positive
- Decoupled payments less distortive and more productivity-enhancing
- Supports EU decoupling policy and WTO agenda
- Suggests improved future food availability capacity
- Positive decoupling effect may reflect corrected inefficiencies in agricultural sector

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AGRICULTURAL ECONOMICS
The Journal of the International Association of Agricultural Economists

WILEY

ORIGINAL ARTICLE

Subsidies and agricultural productivity in the EU

EU: Garrone (2019)

Maria Garrone[1] | Dorien Emmers[1] | Hyejin Lee[1] | Alessandro Olper[1,2] | Johan Swinnen[1,3,4]

Click here to download a copy of the paper

EU: Garrone (2019)

Scope of the Study

Research Objective: Investigate relationship between EU Common Agricultural Policy (CAP) subsidies and agricultural labor productivity growth

Data and Methods

❑ Data

- 213 EU regions (2004-2014)
- Covers both old member states (OMS) and new member states (NMS)
- Timeframe: 2004-2014

❑ Methods

- System GMM estimation
- Conditional convergence growth model

Types of Spending Analyzed

❑ Pillar I Spending

- Coupled subsidies (tied to production)
- Decoupled subsidies (not tied to production)

❑ Pillar II Spending

- Human Capital (HK) investments
- Physical Capital (PK) investments
- Agri-environmental payments (ENV)
- Less Favored Areas (LFA) payments
- Rural Development (RD) payments

EU: Garrone (2019)

Key Findings

Impact (Elasticities) on Agricultural Labor Productivity Growth

	EU-27	Old Member States (OMS)	New Member States (NMS)
Total CAP Subsidies	0.079***	0.068***	0.566***
Pillar I			
- Total Pillar I	0.055**	0.052**	0.017
- Decoupled Payments	0.080***	0.067***	0.532***
- Coupled Payments	-0.027**	-0.042***	-2.510**
Pillar II			
- Total Pillar II	0.178***	0.134***	0.127*
- Human Capital (HK)	0.657**	0.376	0.236
- Physical Capital (PK)	0.040	0.341***	0.057
- Environmental Payments (ENV)	0.612	-0.132	0.123
- Less Favored Areas (LFA)	-0.526	-0.298	2.474**
- Rural Development (RD)	0.105	0.274	-0.622

Significance levels: * p<0.10, ** p<0.05, *** p<0.01

EU: Garrone (2019)

Conclusions

❑ **General Pattern**

•Overall positive impact of CAP subsidies on agricultural productivity

•Different subsidy types show contrasting effects:

- Decoupled payments → Drive positive productivity growth
- Coupled subsidies → Decrease productivity growth

•Validates policy shift from coupled to decoupled payments

❑ **Regional Patterns**

•Faster productivity convergence in New Member States

•Different effectiveness by region:

- Human Capital investments work best EU-wide
- Physical Capital most effective in Old Member States
- LFA payments show benefits only in New Member States

❑ **Policy Recommendations**

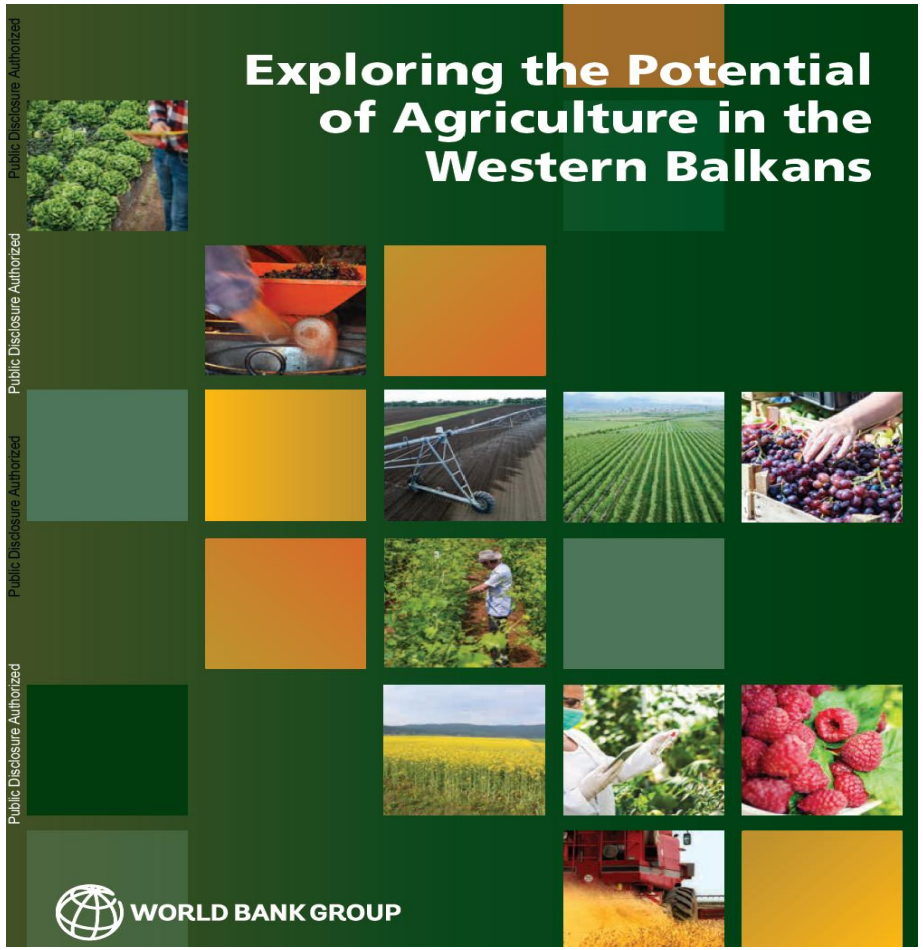
•Continue shift toward decoupled payments

•Target Pillar II payments based on regional needs

•Consider regional differences in policy design

•Tailor support mechanisms to local conditions

EU: World Bank (2018)



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EU: World Bank (2018)

Scope of the Study

Research Objective: Analyze drivers of agricultural transformation in Western Balkans Identify opportunities to improve agricultural productivity

Data & Methods

❑ Data

- Coverage:
  - 27 EU member states
  - 5 Western Balkan countries
- Sources: WDI, FAOSTAT, Eurostat; Country statistical offices
- Time period: 2000-2015

❑ Method:

- Fixed effects regression models

Types of Spending Analyzed

- Pillar 1 support:
  - Coupled support per hectare
  - Decoupled support per hectare
- Pillar 2: Rural development support
- R&D expenditure
- Capital investments per worker

EU: World Bank (2018)

Key Findings

Impact on labor productivity

Variable	Elasticity
Capital stock per worker	0.203* to 0.254**
R&D spending (% of GDP)	0.151** to - 0.180**
Fertilizer use per ha	0.0638* to 0.0779**
Coupled support per ha	-0.0176*
Decoupled support per ha	0.0117*
Rural development support	0.00922

p < 0.10, ** p < 0.05, *** p < 0.01

The evidence suggests that reforming support systems while increasing capital investment and R&D spending would yield the highest returns for agricultural transformation in the Western Balkans.

Productivity Gains from Closing 25% Gap with EU-28

Country	Capital Stock Impact	R&D Impact
Albania	+76%	+15%
BiH	+82%	+25%
North Macedonia	N/A*	+16%
Montenegro	+6%	+18%
Serbia	+30%	+6%

❑ **R&D Investment Impact**

•Albania: +15% - Would gain moderate productivity boost from R&D investment
•BiH: +25% - Largest potential gain from R&D improvement
•North Macedonia: +16% - Similar potential to Albania for R&D returns
•Montenegro: +18% - Significant room for R&D-driven improvement
•Serbia: +6% - Smaller gain potential due to higher existing R&D base

❑ **Capital Stock Impact**

•Albania: +76% - Major gains possible from capital intensification
•BiH: +82% - Largest potential return from capital investment
•North Macedonia: +594% - Extremely high potential due to very low current capital base
•Montenegro: +6% - Limited gain due to relatively high existing capital stock
•Serbia: +29% - Moderate potential for capital-driven productivity gains

EU: World Bank (2018)

Conclusions

1. Critical factors:
    1. Capital investment: Essential driver of productivity improvement
    2. R&D spending: Fundamental for knowledge creation and innovation

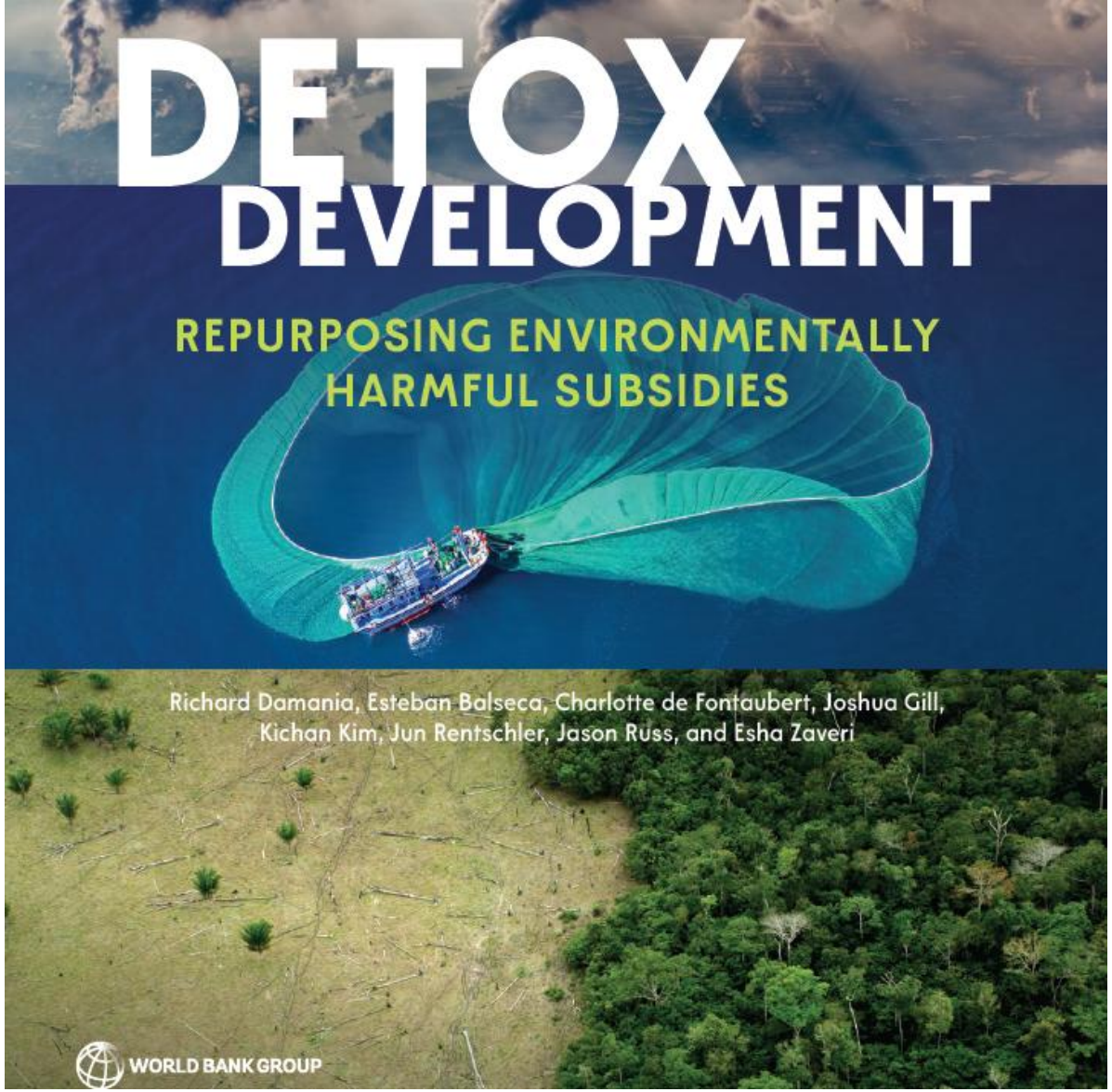
    Explanation: Analysis shows these two factors have strongest positive impact on productivity
2. Support impacts:
    1. Decoupled: Small positive impact on productivity
    2. Coupled: Negative effect on productivity
    3. Rural development: Insignificant due to low utilization

    Explanation: Current support system needs restructuring to better drive productivity
3. Reforming support systems while increasing capital investment and R&D spending would yield the highest returns for agricultural transformation in the Western Balkans.
4. Recommendations:
    1. Better target public spending: Align with productivity objectives
    2. Increase private sector investment: Critical for sector transformation
    3. Promote financial inclusion: Enable smaller producers to participate
    4. Leverage digital agriculture: Improve efficiency and market linkages
    5. Focus on productivity enhancement: Key to competitiveness
    6. Close R&D and capital gaps with EU: Substantial gains possible

    Explanation: These targeted interventions could accelerate agricultural transformation and boost competitiveness in the region

Global

Global: World Bank (2023)



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See pages 124-128 and Box 7.2 of the report

Global: World Bank (2023)

Scope of the Study

Research objective: Examine the impact of agricultural subsidies on productivity globally

❖ Data

- **Coverage**: 179 countries/regions
- **Timeframe**: 1961-2019
- **Data Sources**:
  - USDA ERS database
  - OECD
  - Inter-American Development Bank's Agrimonitor
  - FAO's MAFAP program

❖Methodology

- **Stochastic Frontier Analysis**
  - **Production Function**
    1. Dependent variable: Agricultural output value
    2. Controls: Land, labor, machinery, livestock, fertilizer
  - **Inefficiency Model**
    1. Measures impact of subsidies on technical inefficiency
    2. Three subsidy types analyzed:
       1. Producer Support (PS)
       2. Market Price Support (MPS)
       3. Decoupled Support (DC)

Global: World Bank (2023)

Key Findings

Impact of different support types on inefficiency

Support Type	Current Year	1-Year Lag	2-Year Lag
Producer Support	0.957***	Not significant	Not significant
Market Price Support	0.255***	0.226***	Not significant
Decoupled Support	Not significant	Not significant	Not significant

- **Producer Support (PS):**
  - Strong positive correlation with inefficiency (0.957) in the current year; 4 times larger
  - Effects are immediate, not lagged
  - Reasons: Distorts farmer decisions; Encourages suboptimal land use; Leads to inefficient input combinations; Benefits are more certain to farmers

- Market Price Support (MPS)
  - Moderate positive correlation with inefficiency (0.255) in the current year
  - One-Year Lag: Persistent effect (0.226)
  - Reasons for lower impact: Less certainty about benefit levels; Works through market mechanisms; Farmers less likely to make dramatic production changes

- Decoupled Support (DC)
  - No Significant Impact on efficiency
  - Possible reason: High variation between programs; May help cover fixed costs; Could reduce risk aversion; Might enable investments through reduced financial constraints

Global: World Bank (2023)

Conclusions

❖Messages

- Both coupled support measures reduce efficiency
- Producer support more distortionary than market price support
- Decoupled support shows no significant efficiency impact
- Implementation method matters for subsidy impact

❖Implications

- Consider decoupled support over coupled support
- If using coupled support, market price support may be less disruptive
- Need for country-specific analysis to understand local impacts
- Consider alternative policy tools for agricultural development

Overall Conclusions

Overall Conclusion from all the studies

❑ Composition Matters More Than Volume

- The way agricultural funds are allocated has a greater impact than the total amount spent
- Reallocation from private subsidies to public goods often yields better results than increasing total spending
- Evidence consistently shows that spending composition is the primary driver of agricultural sector performance

❑ Public Goods vs Private Subsidies

- Public goods investments consistently show positive returns across regions and time periods:
  - Agricultural research and development (R&D)
  - Rural infrastructure (especially roads)
  - Education and extension services
  - Environmental protection
- Private subsidies generally show negative or declining returns:
  - Input subsidies often prove ineffective
  - Coupled payments (tied to production) show poorer outcomes than decoupled support
  - Subsidies tend to benefit wealthy farmers more than poor ones

❑ Regional and Contextual Variations

- Impact of agricultural spending varies significantly across countries and regions
- No one-size-fits-all approach works; policies need to be tailored to local contexts
- Effectiveness depends on:
  - Level of agricultural transformation
  - Institutional capacity
  - Market development
  - Initial conditions

❑ Reform Patterns and Evidence

- Decoupling subsidies from production improves outcomes (EU evidence)
- Shifting from private to public goods brings greater benefits than increasing total budget
- Early-stage subsidies can help technology adoption, but returns decline over time
- Research and infrastructure show consistently high returns across development stages