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

Inter-American Development Bank
Environment, Rural Development and Disaster Risk Management Division

August 2016

Public Expenditures and the Performance of Latin American and Caribbean Agriculture

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

*Pontificia Universidad Catolica de Chile
**Inter-American Development Bank

August 2016

Cataloging-in-Publication data provided by the
Inter-American Development Bank
Felipe Herrera Library
Public expenditures and the performance of Latin American and Caribbean agriculture / Gustavo Anríquez, William Foster, Jorge Ortega, Cesar Falconi, Carmen Paolo De Salvo.
p. cm. — (IDB Working Paper Series ; 722)
Includes bibliographic references.
1. Agriculture and state-Latin America. 2. Agriculture and state-Caribbean Area. 3. Agriculture-Economic aspects-Latin America. 4. Agriculture-Economic aspects-Caribbean Area. I. Anríquez, Gustavo. II. Foster, William. III. Ortega, Jorge. IV. Falconi, Cesar. V. De Salvo, Carmine Paolo. VI. Inter-American Development Bank. Environment, Rural Development and Risk Management Division. VII. Series.
IDB-WP-722

http://www.iadb.org

Public Expenditures and the Performance of Latin American and Caribbean Agriculture

Gustavo Anríquez*, William Foster†, Jorge Ortega‡, Cesar Falconi§ and Carmine Paolo De Salvo∇

Abstract:

Economic theory and econometric evidence support the thesis that the displacement of government expenditures on public goods by subsidies to private goods inhibits the performance of the farm sector. This paper presents an analysis of the influence of the mix of expenditures related to agriculture on net income generation, using data for 19 Latin American and Caribbean countries during 1985–2012. The econometric results demonstrate that total government spending on the farm sector positively impacts agriculture's performance. More importantly, and of greater practical economic significance, increasing the share of expenditures committed to public goods, *ceteris paribus*, would significantly raise rural income as measured by sector value added per capita of the rural population.

Keywords: Public Expenditure, Agricultural Policy, Agriculture, Economic Development.
JEL Classifications: H50, O13, Q16, Q17, Q18.

* Pontificia Universidad Católica de Chile
† Pontificia Universidad Católica de Chile
‡ Pontificia Universidad Católica de Chile
§ Inter-American Development Bank
∇ Inter-American Development Bank

Public expenditures and the performance of Latin American and Caribbean agriculture

1. Introduction

Government agricultural policy is a well-known mix of the redistribution of incomes and the promotion of public goods (see the literature review of de Gorter, 2002). Governments intervene to constrain commodity prices, restrict imports and promote exports, and subsidize inputs and credit; but the public sector also finances rural infrastructure and scientific research, and supports systems of standards, consumers' food safety assurance, and protection against invasive species and animal disease outbreaks. Over the course of the last four decades, rural and trade policy analysts have developed a better appreciation of the negative welfare impacts and the often-hidden inefficiencies associated with the use of market interventions and price distortions via regulation. And in broad terms such interventions in agricultural and food markets have diminished across most of the world, in conjunction with unilateral trade liberalization and the rise of more open economies under the auspices of GATT and the WTO (Anderson, 2009).

Economists historically have directed less attention to the welfare consequences of the mix of public spending in comparison with market price distortions. Nevertheless, fiscal outlays related to the agricultural sector have been subject to broad criticism from economists for being distorting, socially inefficient, and driven by rent-seeking, (de Ferranti, et al., 2005). Taxpayer-financed subsidies for investments and other activities that yield returns primarily or wholly internalized by agricultural firms and private interests are considered especially egregious, carrying large opportunity costs in terms of the foregone benefits of public-good investments that could otherwise have been promoted with those same resources (Fan, Hazell and Thorat, 1999 and 2000; Allcott, Lederman, and López, 2006; López and Galinato, 2007). In addition to the undersupply of public goods, taxes raised to support private goods burden other private sector actors, discouraging their own productive investments and income generation. And among the costs of fewer public goods, the lower productivity of complementary private investments should be included. More insidiously, not only do lower private investments compound the negative effect on sectoral productivity growth of the under provision of public goods, but a political system seen ready to bankroll private interests at the expense of the public also invites a diversion of private resources from productive projects toward rent-seeking activities in search of more subsidies (e.g., Helpman and Grossman, 1994).

Underinvestment in public goods in countries where smaller-scale farmers of limited capital predominate is particularly debilitating for sectoral growth. The lack of a developed base of complementary public goods related to infrastructure, technology, and knowledge limits the returns to private investments in land improvements, in machinery and physical plant, in human capital, and in the experimentation with cropping systems, all of which leads to slower growth in agricultural productivity and income generation. Foregone public good expenditures related to agriculture in developing countries are often associated with two problems that restrain longer-run sectoral growth: inadequately performing R&D

systems and underinvestment in education (Lederman and Maloney, 2003). The second problem is made more acute by a simultaneous lack of attention to resolving institutional obstacles to improving imperfect credit and insurance markets, aggravating the difficulties facing the poor in financing investments in human capital.

The empirical work of López and Galinato was particularly useful for understanding the importance of the public expenditure mix for rural Latin America and the Caribbean. Applying panel regression methods to rural sector spending data for 15 countries during the period 1985-2002 (see Soto, Santos and Ortega, 2007), the authors found that, while government expenditures spurred per-capita agricultural value added, the composition of spending was important: holding total spending constant, increases in the share of subsidies going to private interests had notably large and negative long-run effects on sectoral value added per capita of the rural population. For many Latin American and Caribbean countries there is a substantial crowding-out of public goods by subsidies in rural expenditures. López and Galinato estimated that, by a shift of 10 percentage points in the expenditures mix from subsidies to public goods, say from 50 percent going to subsidies (their sample average) to 40 percent, per capita sectoral income would increase in the long run by between 4 and 5 percent – without spending a dollar more of taxpayers' money on agriculture.

Over a decade has passed since the end of the data series employed by López and Galinato. The purpose of this study is to update the previous analysis of the impacts of the composition of government expenditure on agricultural performance, extending the original coverage of rural spending to four additional Latin American and Caribbean countries, and incorporating a new data set (Agrimonitor) on *agricultural* spending for recent years prepared by the Inter-American Development Bank.[1] The original data collection effort, which ended in 2001, attempted to account for agricultural and non-agricultural *rural* government spending; the more recent data focuses only on the farm sector, following the OECD's basic template to assess country-comparable producer support estimates for agriculture. The difference between data sets is that rural spending includes infrastructure projects (e.g., rural roads, electrification) and social supports (e.g., health, education), usually managed by government agencies unrelated to agricultural production, such as ministries of public works, education, and health.

The first question is to ascertain if the original panel-data regression analysis for 1985-2001 holds when extended from 15 to 19 countries and when, instead of the total and mix of *rural* spending, only the total and mix of *agricultural* spending are employed to explain the variation of per-capita sectoral value added. The answer is yes; the original estimation results hold; and an increase in public expenditures, either rural or limited to agriculture, keeping the composition of spending constant, has relatively little impact on stimulating farm sector income. Instead, a shift in the mix of spending toward public goods, keeping the total expenditure constant, has a notably large effect on the sector's value added per

[1] Agrimonitor is the database maintained by the IDB for tracking Producer Support Estimates (PSE) at the country level in Latin America and the Caribbean. It is meant to serve analysts and policy makers in assessing the composition and magnitude of agricultural policies. It is available at agrimonitor.iadb.org

capita. Moreover, introducing into the regression model, as separate explanatory variables, the share of private goods in *agricultural* spending and the share of private goods in *non-agricultural* rural spending, confirms that it is the variation of the agricultural component of the expenditure share that goes to private goods, not the non-agricultural component; that explains the variation in agricultural value added per capita.

With evidence that the empirical results are driven by agricultural spending and not rural spending more generally, the second question concerns the extension of the analysis to include the recent IDB data on agricultural expenditures. We take a consistent approach to assign various agricultural budget items to categories (public, private and mixed); then,we splice the original FAO data (excluding the non-agricultural spending) with the Agrimonitor data for 2006-2012. Next, applying panel data, we estimate the relation between value added per rural person and the total and the mix of agricultural spending, accounting for the possible endogeneity of explanatory variables. The results show that, again, the composition of agricultural expenditures significantly impacts the sector's performance. A shift of 10 percentage points of the agricultural budget from private to public goods, maintaining total spending constant, leads to an approximately 5 percent increase in value added per capita. To achieve the same increase, while holding the mix constant, would require an increase of approximately 25 percent or more in total spending. In short, the study confirms what economic thinking and earlier empirical studies have found: *ceteris paribus*, diverting taxpayer funds from public goods to privately internalized subsidies decreases farm sector performance. In practical terms, shifting the composition of expenditures is far more beneficial to per-capita sectoral income than increasing proportionally across the board the total of government spending on the sector.

The paper continues in Section 2 with a review of the basic model linking agriculture's performance to the level and composition of government spending on private goods and public goods. A discussion of data sources follows in Section 3, with a summary of the rules employed to assign expenditure items to various categories. Section 4 contains the econometric results and Section 5 concludes.

2. Public goods versus private subsidies and the agriculture sector's performance.

2.1 Public goods, subsidies, and the crowding out of productive investments

Taxes, regulation and public spending are the main tools of state intervention in the economy. Traditionally public spending is economically justified to provide public goods, correct market failures and alleviate poverty. Public goods (characterized by non-excludability and non-rivalrous consumption) are subject to the problem of "free riding." Some examples of what might be called pure public goods are investments in basic science research, territorial defense, universal immunization, and air quality. Other investments have some aspects of public goods and can be regarded as semi-public, often serving to reduce transaction costs. Examples include universal education, government involvement in correcting failures of coordination between economic actors, the definition and maintenance of standards, the promotion of national brands, etc.

Certainly, although it is possible to rationalize government expenditures based on the idea of public goods, economists and policy analysts recognize that there is a temptation to use the public-good excuse to justify spending on goods that are not public or semi-public. The identification of real public goods, however, serves as a guide to direct taxpayer resources to their most efficient uses.

In addition to financing pure public goods, such as basic research and monitoring of invasive pests, economists often include under the broad category of spending on public goods those activities that mitigate the welfare consequences of inefficiencies linked to poorly functioning markets (Rausser, 1992; López, 2007). In developing countries, poorly defined and protected property rights, and weak credit and risk-sharing markets often limit the ability of farmers and other smaller-scale entrepreneurs to realize viable projects that would otherwise attract investors. Shallow or poorly functioning resource markets can be addressed, for example, via public spending on registries and programs to promote land and water titling. Regional and country-specific taxpayer-funded farm research is rationalized by coordination problems: the potential, internalizable returns for large, international biotechnology firms are limited where there are high costs to develop locally appropriate products in order to market to many, unsophisticated small farmers, especially where the ability to maintain control over the product's diffusion is uncertain. (See, Hoff and Stiglitz, 2000.)

One particularly notable type of project limited by such market imperfections is the investment in a person's human capital (as stressed in López, 2007). Credit markets could (and do so in developed countries) link a broad base of investors to a portfolio of many persons seeking to increase their future marginal productivity and income-generating potential. Without well-functioning credit markets, other institutions, such as the extended family, might substitute to some degree, but not wholly. A young worker from a low-income background would face high transactions costs to signal credibly to a limited number of (risk-averse) local investors his future potential productivity gains – and the willingness to discharge the debt. Therefore, public spending on agricultural schools and training, and on basic education more generally, oriented to the rural young of modest means, is usually considered a productive intervention (Rausser, 1992) and a mixed public good.

As summarized by López and Galinato, the primary mechanism by which the performance of the agricultural sector, as measured by value added per capita, is linked to the mix of subsidies and public good spending is the displacement or "crowding out" of productivity-enhancing investments. Given the limited resources of governments and private actors in the economy, crowding out takes several analytically interesting forms. The first is the aforementioned link between the lower productivity of private investments and reduced investment in complementary public goods (Foster, et al.).[2]

[2] The literature on the complementarities of policy instruments shows that with communications and roads, households diversify income sources, and improved rural infrastructures can improve the access to schooling and healthcare (e.g., Escobal and Torero, 2005.) Improved road networks (via improved transportation and safety) leads to improved school attendance. Better rural accessibility to electricity produces a range of benefits, one notable being more time for school study, which improves school

A second form of crowding out is associated with the nature of political markets. Within the government budget, the self-interest of decision makers and the political pressures from rent seekers tends to shift limited resources to private goods away from goods that have higher – sometimes much higher – rates of returns in terms of overall social benefits. The literature on the political economy of public choice in agriculture has explored this process in depth (de Gorter, 2002), and various empirical studies have verified the high rates of return on public good investments, especially those related to agricultural research and rural infrastructure (Alston, et al., 2000).

A third type of crowding out occurs when private interests, instead of investing immediately, scale back investments or delay projects anticipating an advantage from available government subsidies in the future. The un-invested private capital shifts to consumption or to shorter-term projects. If a government were capable of credibly committing to avoid spending on private goods, then private investors would be forthcoming. But otherwise, even if primarily motivated by the public good, policy makers, once presented with an apparent failure of the private sector to take advantage of profitable investments, have the incentive to fill the gap in the form of subsidies to non-public goods, thus confirming the rational expectations of private interests that the government would in fact eventually subsidize their activities.

Related, but not necessarily deleterious for sectoral value added, is the incentive to displace resources to activities that give private interests less costly access to subsidies. In search of the highest private return, farmers and others are induced to withdraw resources from investments with returns determined in the market and to over-invest (in terms of social surplus) in projects with returns determined in part by taxpayer support. Consider fertilizer subsidies, where lowering the cost of the input would cause rational farmers to reallocate land and invest in non-transferable capital for crops that tend to be more intensive in fertilizer use. For example, artificially low fertilizer costs might provoke a conversion of forested land to improved pastures and investments in beef cattle. There is a displacement of land and a reduction in specific investments to activities with a lower marginal product of fertilizer.[3]

2.2 A model linking government spending to the agriculture sector's performance

Following the arguments (and algebraic notation) of López and Galinato, we briefly summarize here the basic conceptual model that motivates the econometric specification of a relation between per-capita agricultural value added and the total and mix of

---

performance. Investments in water and sanitation reduce child and maternal mortality, and increase educational performance. But Fan, Zhang and Zhang (2002) show for China that the magnitudes of poverty effects and other welfare indicators depend on the type of government spending and on regional differences in resources, demographics and level of development.

[3] One should note that, in assessing the impact of the mix of public spending on sectoral income measured by value added, governments often subsidize intermediate inputs, such as fertilizer and fuel. To the extent that subsidies to private agricultural interests lower the cost of intermediate inputs or raise the value of production sold to consumers and other sectors, an increase in the proportion of government spending in the form of private goods would act to increase sectoral value added. This is more likely to be the case when analyzing the mix of agricultural spending in contrast to broader rural spending.

government rural expenditures. The basic model is based on the aggregate level of agricultural production, Q, as a concave, linearly homogeneous function of three-sector specific factors and aggregated intermediate inputs, X. The sector-specific factors are labor, L, land, Z, and specific capital, K. Given the price of the output, p, and a price of intermediate inputs, v, and a productivity indicator, A, the model assumes that, all else held constant, intermediate inputs are chosen by individual, price-taking, profit-maximizing producers with the result of maximizing the sector's aggregate returns to sector-specific factors, or value added:

$$G(p, v, L, Z, K|A) = \max_{X} p \cdot Q(L, Z, K, X|A) - v \cdot X$$

Government policies can affect output and input prices as well as the productivity level. We focus on three summary indicators of policy: total sectoral expenditures, E, the share of spending on private goods, S, and a measure of trade openness, T. In addition, domestic prices are, at least to some degree, influenced by world prices, p_w, v_w ; and both domestic prices and productivity are influenced by conditions in non-agricultural sectors, Y. Making use of the linear homogeneity of the production function, one can write the per capita value added in terms of sector-specific capital intensity per worker, k = K/L, and land per worker, z = Z/L. The final, generic specification for a reduced-form expression of per-capita value added becomes:

$$g = \frac{G}{L} = g(p_w, v_w, E, S, T, Y, k, z)$$

In estimating this relationship one should recognize the likelihood of endogeneity for some variables. In the practical application below, we instrument the level of land per capita and the indicator for non-agricultural sector conditions, which we measure in terms of per-capita GDP in the rest of the economy. We also consider the possibility that the level of total expenditures per capita is endogenous.

A priori one expects that sectoral performance should increase with increases in output price, p_w, total government expenditures, E, the performance of the rest of the economy, Y, and the per capita, sector-specific factors, k and z. Performance should decrease with increases in the price of intermediate inputs, v_w, and the share of government spending on private goods. The impact on sectoral performance of an increase in trade openness is ambiguous.

There are some practical issues to consider in order to implement this model. First, instead of separating output and intermediate input prices, we make use of a price index of agricultural production in real terms, q. Second, data are unavailable for sector-specific capital, and so we further concentrate the estimated reduced form by excluding the variable k. In effect, we are positing a long-run equilibrium relationship, where the regression coefficients account for the equilibrium, reduced-form relation between per-capita sector-specific capital and the exogenous variables. Third, there are undoubtedly unobserved country-specific determinants of the aggregate production function and the influence of the aggregate measures of government policy (e.g., climate, culture and

institutions). We therefore take a panel regression approach, where these country-specific factors are captured by a fixed or random effects terms.

To summarize, using the López and Galinato notation, in the empirical exercise we apply a panel approach for Latin American and Caribbean countries using data averaged in five-year (and three-year) periods and a simply linearization of the above reduced form:

$$lng_{it} = \beta_E E_{it} + \beta_S S_{it} + \beta_T T_{it} + \beta_Y Y_{it} + \beta_z z_{it} + \beta_p q_{it} + \mu_i + \varepsilon_{it}$$

where, for country i averaged during five-year period t,

lng_{it} represents the log of per capita agricultural GDP, or per capita value of production.
E_{it} – per capita rural or agricultural government spending.
S_{it} – the share of subsidies or private goods in government expenditures.
T_{it} – an index of trade policy openness (exports plus imports relative to GDP).
Y_{it} – per capita non-agricultural GDP.
z_{it} – per capita agricultural land.
q_{it} – real price index of agricultural production.
μ_i – country fixed or random effect.
ε_{it} – identically and independently distributed shocks.

3. Description of the data

3.1 Two sources: FAO, 1985-2001, and IDB Agrimonitor, post 2006.

We make use of two main sources of data. The first is from a FAO project (GPRural), beginning in 2001, to assess rural public expenditures in Latin America and the Caribbean and which collected annual data from 20 countries. For most countries the data spanned 1985-2001, although some countries extended the data until 2003 and 2005. The project description and data summary, and several studies based on the data collected, can be found in Soto, Santos and Ortega (2006). These FAO data are organized, following the functional classification of expenditure of the IMF, into three groups: Productive Development, Rural Infrastructure, Social and Public Expenditure. Each item is classified as a public good, or private good (subsidy), or mixed. López and Galinato reported that they divided in half the spending on mixed goods, but the present authors further classified mixed goods as mostly public (with one-third subsidy), mostly private (two-thirds subsidy), and half-and-half. The shares used in this present study tend to be lower than those of López and Galinato, although the coefficient of correlation between the two (using reported country averages for the original 15 countries) is 0.89. The list of budget items covered and in the FAO study is presented in Appendix Table A1, along with the proportions assigned to private goods. For the present study, we separated agricultural from non-agricultural spending. Table 1 presents the averages of rural and agricultural expenditure totals by country, and the share of spending on private goods.

The second source of data is that of the IDB project, Agrimonitor,[4] which uses the OECD's template for estimating country-comparable producer support estimates for the farm sector using data principally from ministries of agriculture, and so exclude rural spending not related to the farm sector.[5] These data are for the years 2006-2012 (with some countries having 2013 and 2014), and are also organized into three groups, but following the classification of the OECD to estimate agricultural support: producer support, general services, and transfers to consumers. We take the producer support and general services expenditures and again classify mixed goods as mostly public (with one-third subsidy), mostly private (two-thirds subsidy), and half-and-half (see Appendix Table A2). Table 2 presents the averages of the Agrimonitor data by country for the years available between 2006-2012 of the total and mix of government agricultural expenditures.

3.2 Merging the two data sets

There is substantial overlap between the items covered in the FAO and IDB data sets, although the IDB data do not contain rural, non-agricultural spending (the items in Tables A1 and A2 that are highlighted in yellow are those which are to be found in both data sets.) Focusing on agricultural spending and taking a consistent approach to assigning various budget items to categories (public, private and mixed), we can construct a joint data set that splices the two data sources and spans the period 1985-2012. There are certain complications to this merging of the two sources due to the different methods of collecting and organizing the data. Both the FAO GPRural dataset and the IDB's Agrimonitor policy and PSE monitoring dataset record spending in agricultural programs following expenditure on programs or budget lines. These programs are then assigned to different major spending categories (the Appendix shows the spending categories for both sources). Both sources cover completely all agricultural spending, and so – provided that there are good country statistics, and that both sources did an exhaustive collection of public programs – there should not be any difference in total public expenditure in agriculture. This is in fact what we observe in countries with good statistics, such as Mexico and Colombia, where, although spending levels are not exactly equivalent, both sources show the same spending trends (see Figure A1 in the Appendix). Given these conceptual equivalences a simple splicing of sources is justified, with minor differences on levels (depending on the source taken as baseline). Nonetheless, these level differences are not important for between country variability, but may have an impact on within variability.

In the case of public and private expenditure shares, the situation is different, as illustrated by the overlapping data for Brazil and Colombia (see Figure A2 in the Appendix). In the case of Brazil, the shares spent on private goods track well during the years of overlap of the two data sources. But in the case of Colombia, the shares vary noticeably. Both data

[4] http://www.iadb.org/en/topics/agriculture/agrimonitor/agrimonitor-pse-agricultural-policy-monitoring-system,8025.html

[5] The PSE Manual gives a complete description of the OECD's indicators of agricultural support, their classification and measurement and is found online at http://www.oecd.org/tad/agricultural-policies/psemanual.htm .

sources ultimately represent aggregation of expenditure programs in different classification sets. Since these sets are different, there will unavoidably be differences in estimated share of public/private goods. However since we are interested in multi-year averages these differences in levels are less marked. Again, we can splice sources, with levels that will vary depending on the source taken as baseline. In the results we present below, levels for both spliced variables are adjusted to the FAO GPRural dataset.

4. Empirical results

The strategy taken here is to first establish that we can reproduce the original López and Galinato panel-data analysis for 1985-2001 using the *rural* expenditure data at hand. We carry out this exercise with the original 15 countries in the López and Galinato study, and with an expanded data set for the same period frame with 19 countries. Second, in order to establish a reference for the analysis of a merge of the FAO and IDB data, we apply the model described in Section 2 to *agricultural* spending using the FAO data for 1985-2001. And, third, we apply the model to the merged data on agricultural expenditures for the complete period, 1985-2012. We apply the panel data approach, estimating both fixed and random effects models, to estimate the relationship between agricultural value added per rural person and the total, and the mix of agricultural spending, accounting for the possible endogeneity of explanatory variables. In explaining the time-series and cross-sectional variation of the natural logarithm of per capita sectoral value added, we are interested in two determinants: the logarithm of total per capita government rural or agricultural spending, and the share of that spending (measured in percentage points, ranging from 0 to 100) on private goods.

We account for possible endogeneity in the variables land per capita of the rural population, non-agricultural GDP per capita, and trade openness. The data are averaged for five-year periods, giving three periods for the FAO data and an additional three periods when appending the IDB data. While this averaging approach reduces the degrees of freedom, it aids in establishing the long-run effects of policy regimes, which is particularly important in clarifying the opportunity cost of shifting public good spending, such as on research or infrastructure, to private goods.[6] In addition, the policy-relevant performance of the agriculture sector is likely obscured by short-term random fluctuations in production (mainly due to weather) and in international prices.

4.1 Reproducing the López and Galinato results for rural spending, FAO data, 1985-2001

Table 3 presents panel regressions (fixed and random effects) using the FAO data, 1985-2001: the original results of López and Galinato (as reported in their 2007 paper on page 1084) for comparison, our estimation of the same specification with the original 15 countries and using our budget assignments, and our estimation with an expanded data with 19 countries. The first notable result is that the signs (negative) and magnitudes of

[6] We tested the model with 3-year averages and did not find major differences. Given the year-to-year volatility of agricultural output, and that we are interested in the longer-term impacts of the pattern of expenditures, the discussion here focuses on the results based on the 5-year means.

value of the marginal effect of the share of private-good spending on sectoral income per capita are similar across the various regressions and all estimated coefficients on this variable are statistically significant. The estimated coefficients associated with total government rural expenditures are positive and statistically significant for all models except that of our fixed effects regression using the original 15 countries. In contrast to the López and Galinato results, in our regressions the coefficients on the index of trade openness and agricultural land are statistically insignificantly different from zero; and the coefficient on non-agricultural per capita GDP is markedly higher. Also notable is the increase in the within sample goodness-of-fit of both the random and fixed effects model applied to all 19 countries.

Despite some differences in the estimated values associated with the control variables, our results confirm the main message of the previous work. The fixed and random effects models yield a coefficient associated with the rural expenditure share of approximately *negative* 0.5; and, although total government rural spending has a statistically significant positive impact on agriculture's performance, the composition of that spending is highly economically significant. Using these results for Latin America and the Caribbean in the period 1985-2001, a shift in government expenditures of 10 percentage points from private to public goods is correlated with a long-run increase of 5 percent in agriculture sector income per capita. Consider a 20-point shift in the spending mix from that of Mexico (about 40 percent private goods) to that of Chile (about 20 percent). This would result in a long-run increase in income per capita, *ceteris paribus*, of 10 percent. Achieving such an increase via an increase in total spending, maintaining the mix constant, would require an increase in expenditures of 50 percent.

4.2 Applying the model to agricultural spending, FAO data, 1985-2001

Table 4 presents panel regressions (fixed and random effects) again using the FAO data for 19 countries, 1985-2001, but only accounting for the total and composition of agricultural spending. The results of this regression suggest that the effect on per-capita agricultural GDP of private-good rural spending is to be found in private-good spending in agriculture. The marginal effects of the share of private-good spending on sectoral income per capita are statistically and economically significant. The estimated coefficients associated with total government agricultural expenditures are positive but smaller than in the previous case of rural expenditures; moreover the fixed effect coefficient is statistically insignificantly different from zero at the 10-percent significance level. The random effect model does produce a statistically significant coefficient on total agricultural spending of approximately the same value (between 0.1 and 0.2) as the results in Table 3 using rural spending. The results for the estimated coefficients on the control variables in Table 4 are similar to those reported in Table 3: the coefficients on the index of trade openness and agricultural land are statistically insignificantly different from zero; and the coefficient on non-agricultural per capita GDP is positive and of similar value and statistical significance.

To ascertain if the negative impact of private good spending is due primarily to private spending on agriculture, not rural non-agricultural spending, we introduce to the regression

model, as separate explanatory variables, the share of private goods in *agricultural* spending and the share of private goods in *non-agricultural* rural spending. We motivate this test by a decomposition of the private-good share of total rural spending (E_s/E_T) into an agricultural component and a non-agricultural component:

$$\frac{E_s}{E_T} = \frac{E_{sa} + E_{sn}}{E_T} = \frac{E_{sa}}{E_a}\frac{E_a}{E_T} + \frac{E_{sn}}{E_n}\frac{E_n}{E_T}$$

where E_{sa}/E_a is the private-good share of agricultural spending, E_{sn}/E_n is the private-good share of non-agricultural spending, E_a/E_T is the agricultural share of total rural spending, and E_n/E_T is the non-agricultural share of total rural spending. Separating the last two components in a regression would allow the data to confirm, or not, the hypothesis that it is the variation of the agricultural component of the expenditure share going to private goods, not the non-agricultural component, that explains the variation in agricultural value added per capita. Table 5 presents this regression with the separated components of the private-good share, showing that it is the variation in the agricultural component that can be confidently asserted to be the source of variation in agriculture's performance.[7] In both the fixed-effects and random-effects models, the coefficient on the agricultural component is statistically significant and similar to the values estimated for the private-good share of total rural expenditure in Tables 3 and 4. In the case of the random-effects model, the estimated coefficients on the agricultural and non-agricultural components are of similar values (approximately –0.67), but that of the non-agricultural component is statistically insignificant.

To summarize, the results using only agricultural spending in lieu of rural spending confirm the main lesson that the composition of government expenditure is important in determining the long-run performance of agriculture. Again the fixed and random effects models yield a coefficient associated with the rural expenditure share of approximately –0.5, if not higher, in absolute value. The evidence for the influence of total government agricultural spending is less convincing, although the random effects model in Table 4 reproduces the previous case when using rural spending. One possible reason for the loss of statistical significance of the total spending variable in the case of using agricultural budget items compared to that of using all rural budget items is that the long-run productivity enhancing effects of rural infrastructure, education and other public goods are left unaccounted in both the total and the share variables. Nevertheless, within the government's *agricultural* budget the importance of the private-to-public composition remains significant in practical terms. This has important policy implications, as we find that the composition of spending is important, but the composition matters in *agricultural* spending, not on non-agricultural rural spending, likely because non-agricultural rural spending is heavily biased towards public goods.

4.3 Applying the model to agricultural spending, merged FAO and IDB data, 1985-2012.

[7] The models in Table 5 are estimated without the data for Bolivia, because in that country's case one cannot differentiate spending between agriculture and non-agriculture.

Table 6 presents the panel regressions (fixed and random effects) using merged data from FAO and IDB for agricultural expenditures. Again these data are averaged in five-year periods, spanning 1985-2012, with the last period being an average of three years. The panel is unbalanced with a total of 120 observations. The results are presented in terms of four data subsets, beginning with the data for 1985-2000 and ending with 1985-2012. Once again, the marginal effects of the share of private-good spending on sectoral income per capita are statistically and economically significant, except for the fixed-effects regressions using data for the spans 1985-2010 and 1985-2012. The point estimates are, again, near those of the previously presented models, approximately –0.5. In all models the estimated coefficients associated with total government agricultural expenditures are positive, statistically significant, but again smaller than in the previous case of rural expenditures. The elasticity of per capita agricultural value added with respect to total government sectoral spending is in the range of 0.1 to 0.16 across all estimated models. Moreover, the coefficient estimates appear fairly stable across the four regressions using different time spans. The results for the estimated coefficients on the control variables in Table 5 are similar to those reported in Tables 3 and 4, with once again the coefficient on non-agricultural per capita GDP being positive and statistically significant. The estimated coefficient on the trade openness variable is statistically significant for the fixed effect regressions for the time spans 1985-2000 and 1985-2010, although insignificant elsewhere.

These results suggest that the merging of the FAO and IDB sources to create a nearly 30-year set for 19 Latin American and Caribbean countries yields very similar results to previous work in regards to the effects on agricultural performance of the total and the composition of government spending in the sector. And these results confirm the central lesson that the composition of government expenditure is important in determining the long-run sectoral performance. However, we expand these results by finding first that this composition effect is driven by misallocations in *agricultural* spending, not on rural spending. Also, we demonstrate that deleterious effect on welfare of misguided spending choices has remained relatively constant over the first decade of the 21st century, in spite of the progress in structural reforms that has expanded over the continent since the turn of the century.

5. Conclusion

With a better appreciation of the economic inefficiencies and welfare costs associated with government intervention in agricultural markets, price distortions and border protections have diminished. Consequently, the welfare effects of the mix of public spending in the agricultural sector become relatively more important. Government spending on investments and activities, the returns of which are internalized by agricultural firms and private interests, carry large opportunity costs in terms of the foregone benefits of public-good investments that could otherwise have been promoted with those same resources. Subsidies crowd out public goods, burden taxpayers, and lower productivity of complementary private investments. They could delay the timing of private investments and invite a diversion of private resources from productive projects toward rent-seeking

activities in search of more subsidies. The underinvestment in public goods due to crowding out by spending on private goods weakens agricultural growth and rural income generation, as previous research has found.

The purpose of this present study is to further the understanding of the role of the composition of government expenditure in agricultural performance. We have extended López and Galinato's original country coverage of rural spending in Latin America and the Caribbean to an additional four countries, and incorporated a new data set on agricultural spending (Agrimonitor) for recent years prepared by Inter-American Development Bank. Applying a panel data regression approach, accounting for the possible endogeneity of explanatory variables, we find that, in agreement with results using the total and mix of *rural* spending, the total and mix of *agricultural* spending are important determinants of agricultural value added per capita. Increases in total public expenditures, either rural or limited to agriculture, but maintaining the mix of spending constant, have relatively small effects on promoting farm sector income. A shift in the mix of spending toward public goods, however, while holding the total expenditure constant, has a significantly larger impact on the sector's value added per capita.

The results show that a shift of 10 percentage points of the agricultural budget from private to public goods, maintaining total spending constant, 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, while holding the mix constant. In summary, the study confirms what economic thinking and earlier empirical studies have found: *ceteris paribus*, diverting taxpayer funds from public goods to privately internalized subsidies decreases farm sector performance. In practical economic terms, shifting the composition of expenditures is far more beneficial to per-capita sectoral income than increasing proportionally across the board the total of government spending on the sector.

The results of this study show that the Agrimonitor data, while originally designed to compare producer support estimates, are useful for analyses of the effects of different types of agricultural spending. This invites some future research lines. First, from a political-economy perspective it would be interesting to explore the institutional and developmental differences between countries (and over time) that might explain the variation of total spending on agriculture and on the share of spending on private versus public goods. Second, the mechanisms by which the mix of spending impacts private investment decisions has been left implicit. A more explicit structural model that incorporates the investment behavior – and the incentives driving that behavior – would be useful in understanding the "crowding-out" effect in individual countries. But this would require good information about private investment in the agricultural sector. Third, the Agrimonitor data also contain information on market price supports that arise from regulations and border measures, government policies that do not result in state expenditures, but nevertheless have impacts on the farm sector's performance. Future research will seek to combine information on both the mix of expenditures and other interventions reflected by the additional information in the market price support indicators.

References

Allcott, H., D. Lederman, and R. López. 2006. "Political institutions, inequality, and agricultural growth: the public expenditure connection," Policy Research Working Paper Series 3902, The World Bank.

Alston, J., M. Marra, P. Pardey, P. Wyatt. 2000. Research return redux: a meta-analysis and the returns of R&D. *Australian Journal of Agricultural Economics,* 44, 1364–1385.

Anderson, K., ed. 2009. Distortions to Agricultural Incentives: A Global Perspective, 1955-2007. World Bank.

de Gorter, H. 2002. "Political Economy of Agricultural Policy," chapter 36 in B. Gardner and G. Rausser, eds., *Handbook of Agricultural Economics*, Volume 2b. Elsevier.

de Ferranti, D., G.E. Perry, W. Foster, D. Lederman and A. Valdés. 2005. Beyond the City: The Rural Contribution to Development, World Bank Latin American and Caribbean Studies, World Bank.

Escobal, J., and M. Torero. 2005. Measuring the impact of asset complementarities: The case of rural Peru. *Cuadernos de Economía (Latin American Journal of Economics)* 42(125): 137–161.

Fan, S., P. Hazell, and S. Thorat. 1999. "Linkages between Government Spending, Growth and Poverty in Rural India." Research Report No. 110. IFPRI, Washington, DC.

Fan, S., P. Hazell, and S. Thorat. 2000. "Government Spending, Growth and Poverty in Rural India." American Journal of Agricultural Economics 82: 1038–51.

Fan, S., L. Zhang, and X. Zhang. 2002. Growth, inequality and poverty in rural China: the role of public investments. Research Report 125. IFPRI, Washington, D.C.

Foster, W., A. Valdés, B. Davis and G. Anriquez. 2011. "The Constraints to Escaping Rural Poverty: An Analysis of the Complementarities of Assets in Developing Countries." Applied Economic Perspectives and Policy. 33(4): 528-565.

Grossman, G.M., and E. Helpman. 1994. "Protection for Sale," American Economic Review, 84(4): 833-50.

Hoff, K., and J. Stiglitz. 2000. "Modern economic theory and development," in Meier, G and J. Stiglitz, eds., *Frontiers of Development Economics*. Oxford University Pres and the World Bank.

Lederman, D., and W.F. Maloney. 2003. "Research and development (R&D) and development," Policy Research Working Paper Series 3024, The World Bank.

López, R. 2007. "Structural Change, Poverty and Natural Resource Degradation." Chapter 14 in Atkinson, G., S. Dietz, and E. Neumayer, eds., Handbook of Sustainable Development, Edward Elgar, North Hampton, USA.

Lopez, R., and G.I. Galinato. 2007. "Should governments stop subsidies to private goods? Evidence from rural Latin America." *Journal of Public Economics*, 91: 1071-94.

Soto Baquero, F., J. Santos Rocha and J. Ortega. 2006. *Políticas Públicas y Desarrollo Rural en América Latina y el Caribe: El Papel del Gasto Público*. Oficina Regional de la FAO, Santiago, Chile.

Table 1. Government expenditures in the rural and agricultural sector: annual country averages, 1985-2001 (millions US$ 2005)

Country (period covered)	Total rural expenditures	Total agricultural expenditures	Private as share of total rural expenditure, authors' criteria[a]	Private as share of total rural expenditure (L&G)[b]	Private as share of total agricultural expenditure, à la L&G[c]
Argentina (1985-2001)	349.60	198.20	0.28	0.59	0.28
Bolivia (1987-2001)	53.10	41.42	0.43	-	0.48
Brazil (1985-2001)	8,026.60	7,977.75	0.61	0.87	0.62
Chile (1990-2001)	906.67	452.63	0.21	-	0.39
Colombia (1990-2001)	440.85	280.46	0.28	-	0.36
Costa Rica (1985-2001)	254.07	218.43	0.48	0.48	0.50
Cuba (1985-2001)	4,686.76	4,477.87	0.38	0.69	0.39
Dominican Rep. (1985-2001)	424.09	307.87	0.50	0.80	0.68
Ecuador (1985-2001)	203.44	171.73	0.39	0.69	0.46
El Salvador (1985-2001)	289.19	164.43	0.23	-	0.40
Guatemala (1985-2001)	428.02	130.08	0.13	0.27	0.38
Honduras (1985-2001)	91.94	40.17	0.07	0.09	0.16
Jamaica (1990-2001)	58.35	55.76	0.51	0.58	0.53
Mexico (1985-2001)	12,159.87	10,895.26	0.43	0.66	0.49
Nicaragua (1985-2001)	207.23	99.13	0.19	0.37	0.38
Panama (1985-2001)	111.59	111.12	0.23	0.51	0.23
Paraguay (1985-2001)	51.06	44.88	0.16	0.32	0.18
Peru (1985-2001)	370.10	268.49	0.39	0.64	0.47
Uruguay (1985-2001)	298.25	220.29	0.12	0.19	0.15
Venezuela, RB (1985-2001)	839.37	526.27	0.29	0.54	0.42

Sources: a/Own calculations based on a different weighting scheme than López and Galinato (see appendix); b/ Reported by López and Galinato (2007); c/ Own calculation based on criteria classification from López and Galinato (2007). All calculations are based on the data from the FAO GPRural project as described in Soto, Santos y Ortega, eds. (2006).

Table 2. Government expenditure in the agricultural sector: annual country average 2006-2012 (millions US$ 2005)

Country	Total agricultural expenditures	Private as share of total agricultural expenditure
Argentina	131.4	0.62
Bolivia	111.8	0.60
Brazil	3,495.5	0.76
Chile	408.0	0.60
Colombia	700.8	0.69
Costa Rica	165.5	0.32
Dominican Republic	155.9	0.70
Ecuador	54.9	0.54
El Salvador	854.4	0.59
Guatemala	52.9	0.64
Honduras	231.1	0.52
Jamaica	76.9	0.68
Mexico	4,914.8	0.87
Nicaragua	255.2	0.24
Paraguay	88.5	0.69
Peru	295.1	0.50
Suriname	16.5	0.32
Uruguay	107.0	0.24

Source: Authors' calculations from Agrimonitor database of IDB: http://www.iadb.org/en/topics/agriculture/agrimonitor/agrimonitor-pse-agricultural-policy-monitoring-system,8025.html
Note: Averages are for the years 2006-2012, or for the years in which data are available for each country between 2006 and 2014.

Table 3. The effect of government *rural* spending on long-run per-capita agricultural sectoral value added

	López y Galinato (2007) as reported		Reproducing the LG results with original 15 Countries		Reproducing the LG results with 19 Countries	
	FE	**RE**	**FE**	**RE**	**FE**	**RE**
Total rural spending per capita (log, 5-year average))	0.186**	0202**	0.11	0.178**	0.104*	0.152**
	(0.053)	(0.051)	(0.079)	(0.090)	(0.059)	(0.071)
Subsidies as share of total spending (5-year average, 0-100)	-0.524**	-0.448**	-0.496**	-0.766***	-0.455***	-0.606***
	(0.144)	(0.136)	(0.199)	(0.260)	(0.151)	(0.190)
Trade openness index (5-year average)	0.002**	0.002**	0.115	-0.211	0.092	-0.145
	(0.001)	(0.001)	(0.198)	(0.235)	(0.155)	(0.213)
Non-ag GDP per capita (log, instrumented, 5-year average)	0.137	0.321***	0.959**	0.812***	0.694***	0.642***
	(0.139)	(0.097)	(0.419)	(0.178)	(0.197)	(0.119)
Land area in farming per capita rural (log, instrumented, 5-year average)	0.609**	0.409**	0.067	0.006	0.000	-0.039
	(0.236)	(0.064)	(0.841)	(0.114)	(0.830)	(0.110)
Farm price index (log, 5-year average)	0.010	0.038	-0.017	-0.023	-0.018	-0.027
	(0.107)	(0.106)	(0.026)	(0.027)	(0.023)	(0.024)
Constant	4.287**	2.925**	-1.817	-0.726	0.543	0.862
	(1.444)	(0.774)	(4.044)	(1.726)	(2.097)	(1.092)
R2			0.286	0.599	0.432	0.592
Valor-p>F			0	0	0	0
Obs.	45	45	44	44	56	56
Test Hausman (P-value Chi2)	0.51		0.985		0.262	

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

Table 4. The effect of government *agricultural* spending on long-run per-capita agricultural sectoral value added (19 Countries)

	Panel regression	
	FE	**RE**
Total agricultural spending per capita (log, 5-year average))	0.096	0.137*
	(0.056)	(0.073)
Subsidies as share of agricultural spending (5-year average, 0-100)	-0.516***	-0.737***
	(0.151)	(0.218)
Trade openness index (5-year average)	0.215	-0.045
	(0.144)	(0.220)
Non-ag GDP per capita (log, instrumented, 5-year average)	0.731***	0.619***
	(0.207)	(0.117)
Land area in farming per capita rural (log, instrumented, 5-year average)	-0.247	-0.063
	(0.812)	(0.110)
Farm price index (log, 5-year average)	-0.020	-0.028
	(0.024)	(0.026)
Constant	0.621	1.308
	(2.271)	(1.039)
R2	0.344	0.561
Valor-p>F	0	0
Obs.	56	56
Test Hausman (P-value Chi2)	0.000	

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

Table 5. Effect of rural expenditures on agricultural GDP per capita, using both private shares in agricultural and non-agricultural rural spending, separated

	Private share in Ag and Non AG	
	FE	**RE**
Total rural spending per capita (log, 5-year average))	0.136**	0.170***
	(0,057)	(0,050)
Share Agricultural Spending * Share Private expenditure in Agriculture	-0.668**	-0.787***
	(0,243)	(0,217)
Share Non Agricultural Spending * Share Private expenditure in Non Agriculture	-0,684	-0,393
	(0,929)	(0,863)
Trade openness index (5-year average)	0,029	-0,183
	(0,194)	(0,150)
Non-ag GDP per capita (log, instrumented, 5-year average)	0.765**	0.708***
	(0,298)	(0,183)
Land area in farming per capita rural (log, instrumented, 5-year average)	0,032	-0,013
	(0,658)	(0,080)
Farm price index (log, 5-year average)	-0,086	-0.097*
	(0,063)	(0,059)
Constant	0,145	0,571
	(2,397)	(1,521)
R^2	0,501	0,618
Valor-p>F	0,000	0,000
Obs.	53	53

Table 6. The effect of government *agricultural* spending on long-run per-capita agricultural sectoral value added using the merged data from FAO and IDB, 19 Countries, 1985-2012

	Period 1985-2000		Period 1985-2005		Period 1985-2010		Period 1985-2012	
	FE	**RE**	**FE**	**RE**	**FE**	**RE**	**FE**	**RE**
Total agricultural spending per capita (log, 5-year average))	0.116**	0.140***	0.133**	0.156***	0.126**	0.162***	0.101*	0.152**
	(0.048)	(0.052)	(0.051)	(0.058)	(0.046)	(0.056)	(0.051)	(0.062)
Subsidies as share of total spending (5-year average)	-0.603***	-0.710***	-0.508**	-0.692***	-0.391	-0.654**	-0.336	-0.655**
	(0.169)	(0.215)	(0.224)	(0.257)	(0.237)	(0.282)	(0.281)	(0.326)
Trade openness index (5-year average)	0.113	0.062	0.308*	0.153	0.370**	0.179	0.256	0.06
	(0.112)	(0.172)	(0.153)	(0.161)	(0.137)	(0.153)	(0.157)	(0.159)
Non-ag GDP per capita (log, instrumented, 5-year average)	0.674**	0.563***	0.644**	0.546***	0.801**	0.639***	0.906***	0.694***
	(0.287)	(0.153)	(0.252)	(0.144)	(0.282)	(0.152)	(0.306)	(0.166)
Land area in farming per capita rural (log, instrumented, 5-year average)	-0.624	-0.092	-0.201	-0.105	0.007	-0.095	-0.027	-0.073
	(0.718)	(0.111)	(0.885)	(0.112)	(0.605)	(0.113)	(0.554)	(0.109)
Farm price index (log, 5-year average)	-0.045	-0.047	0.039	0.045	0.091*	0.112**	0.134**	0.161***
	(0.031)	(0.029)	(0.030)	(0.035)	(0.047)	(0.049)	(0.061)	(0.057)
Constant	1.461	1.841	0.931	1.598	-0.774	0.521	-1.708	-0.11
	(2.732)	(1.285)	(2.432)	(1.160)	(2.183)	(1.183)	(2.241)	(1.272)
R2	0.198	0.475	0.353	0.475	0.339	0.485	0.413	0.549
Valor-p>F	0	0	0	0	0	0	0	0
Obs.	69	69	87	87	104	104	120	120
Test Hausman (P-value Chi2)	0.9224		0.312		0.099		0.262	

Appendix

Table A1. Classification of Rural Public Expenditure in FAO data base (1985-2005)

Type	Classification	Share Private
1. Productive promotion		
1.1 Others expenditures		
1.2.- Market development (Internal and external support and promotion)	Private goods	1
1.3.- Irrigation development	Mixed goods	1/2
1.4.- Scientific and Technological Research and Extension	Public goods	0
1.5.- Conservation and recovery of natural resources	Public goods	0
1.6.- Forest incentives	Mixed goods	1/2
1.7.- Phyto / Zoo sanitary capital	Public goods	0
1.8.- Information and communication services	Public goods	0
1.9.- Targeted productive programs	Mostly Private goods	2/3
1.10.- Integrated rural development programs	Mostly Private goods	2/3
1.11.- Productive incentives for aquaculture and fishing	Mostly Private goods	2/3
2. Rural Infrastructure		
2.1 Housing	Private goods	1
2.2.- Roads and related	Public goods	1
2.3.- Rural electric and telephony infrastructure	Public goods	1
2.4.- Rural basic sanitary	Public goods	1
2.5.- Rural drinking water	Public goods	1
2.6.- Land titling, agrarian regularization	Public goods	0
2.7.- Water rights regularization and titling	Mostly Public good	1/3
2.8.- Social infrastructure for rural communities	Mostly Public good	1/3
2.9.- Land bought and expropriations	Mostly Public good	1/3
3. Rural social expenditures		
3.1.-Other social services in rural areas	Public goods	0
3.2.- Health and nutrition	Public goods	0
3.3- Education	Public goods	0
3.4.- Justice	Public goods	0
3.5.- Recreation and sports	Public goods	0
3.6.- Promotion of native ethnic groups	Public goods	0
3.7.- Age specific groups promotion	Public goods	0
3.8.- Women promotion	Public goods	0
3.9.- Family promotion	Public goods	0
3.10.- Promotion of associations and other administrative expenses	Public goods	0
3.11.- Training	Public goods	0

Table A2. Classification of Agricultural Expenditure in AGRIMONITOR data base

Type	Classification	Share Private
III.1 Producer Support Estimate (PSE)		
A. Support based on commodity outputs (CO)	Private goods	
A1. Market Price Support (MPS)	Private goods	
A2. Payments based on output (PO)	Private goods	
B. Payments based on input use (PI)	Mixed goods	
B1. Variable input use (PIV)	Mixed goods	
B2. Fixed capital formation(PIF)	Mixed goods	
B3. On-farm services(PIS)	Mixed goods	
C. Payments based on current A/An/R/I, production required (PC)	Private goods	
D. Payments based on non-current A/An/R/I, production required (PHR)	Private goods	
E. Payments based on non-current A/An/R/I, production not required (PNNR)	Private goods	
F. Payments based on non-commodity criteria (PN)	Private goods	
G. Miscellaneous payments (PM)	Private goods	
IV. General Services Support Estimate (GSSET)		
H. Agricultural knowledge and innovation system (GSSEA)	Public goods	
H1. Agricultural knowledge generation (GSSEAA)	Public goods	
H2. Agricultural knowledge transfer (GSSEAB)	Public goods	
I. Inspection and control (GSSEB)	Public goods	
I1. Agricultural product safety and inspection (GSSEBA)	Public goods	
I2. Pest and disease inspection and control (GSSEBB)	Public goods	
I3. Input control (GSSEBC)	Public goods	
J. Development and maintenance of infrastructure (GSSEC)	Public goods	
J1. Hydrological infrastructure (GSSECA)	Public goods	
J2. Storage, marketing and other physical infrastructure (GSSECB)	Mixed goods	
J3. Institutional infrastructure (GSSECC)	Public goods	
J4. Farm restructuring (GSSECD)	Mixed goods	
K. Marketing and promotion (GSSED)	Private goods	
K1. Collective schemes for processing and marketing (GSSEDA)	Private goods	
K2. Promotion of agricultural products (GSSEDB)	Private goods	
L. Cost of public stockholding (GSSEE)	Private goods	
M. Miscellaneous (GSSEF)	Public goods	
N. Transfers to producers from consumers (-) (TPC)	Private goods	
O. Other transfers from consumers (-) (OTC)	Private goods	
P. Transfers to consumers from taxpayers (TCT)	Private goods	
Q. Excess feed cost (EFC)	Private goods	

Table A3. Type of data available from FAO's GPRural and IDB's Agrimonitor projects

No	Country	GP Rural			Agrimonitor		Work data
		Productive promotion	Rural Infrastructure	Rural social expenditures	Years	Comments	
1	Argentina	1985-2001 (more reliable since 1990)	1999-2001 (only aggregate data)	1994-2001 (only aggregate data)	2007-11		1990-2001; 2007-11
2	Belice	No	No	No	In Progress	In Progress	In Progress
3	Bolivia	1987-2001 (only others and aggregate data)	1991-2001 (only rural basic sanitary)	1991-2001 (only health and nutrition, and education)	2006-09		1987-2001; 2006-09
4	Brazil	1990-2005 (more reliable since 1994)	1991-2005 (more reliable since 1994)	1992-2005 (more reliable since 1997)	1986-2012	Cero values 1986-1994	1994-2012
5	Chile	1990-2004	1990-2004	1990-2004	1986-2013	Cero values 1986-1989	1990-2013
6	Colombia	1990-2001 (only aggregate data)	1990-2001 (only aggregate data)	1990-2001 (only aggregate data)	2008-09		1990-01; 2008-09
7	Costa Rica	1985-2001	1985-2001	1985-2001	2004-12		1985-2011; 2004-12
8	Cuba	1985-2001	1985-2001	1985-2001	No	No	No
9	Dominican Republic	1985-2001	1985-2001	1985-2001	2006-12		1985-2001; 2006-12
10	Ecuador	1985-2001	1985-2001	1985-2001	2006-12		1985-2001; 2006-12
11	El Salvador	1985-2003	1989-2003	1985-2003 (no data 1986-88)	2009-12		1985-03; 2009-12
12	Guatemala	1985-2001	1985-2001	1985-2001	2006-10		1985-2001; 2006-10
13	Haití	No	No	No	In Progress	In Progress	In Progress
14	Honduras	1985-2001	1985-2001	1985-2001 (only other expenditures)	2008-09		1985-2001; 2008-09
15	Jamaica	1987-2000	1987-2000 (no cero value only 1987-89(	1987-2000	2006-12		1987-2000; 2006-12
16	Mexico	1985-2001	1985-2001	1985-2001	1986-13		1985-2013
17	Nicaragua	1991-2002	1991-2002	1991-2002	2009-10		1991-02; 2009-10
18	Panamá	1985-01	1985-01 (more reliable 1999-01)	1985-01	In Progress	In Progress	In Progress
19	Paraguay	1985-01 (more reliable 1986-01)	1985-01 (more reliable 1986-01)	1985-01 (more reliable 1986-01)	In Progress	In Progress	In Progress

20	Perú	1989-01 (more reliable 1990-01)	1989-01 (more reliable 1990-01)	1989-01 (more reliable 1990-01)	2006-13		1990-01; 2006-13
21	Uruguay	1985-01 (more reliable 1990-01)	1985-01 (more reliable 1990-01)	1985-01 (more reliable 1990-01)	In Progress	In Progress	In Progress
22	Venezuela	1985-01	1985-01	1985-01	No	No	No

Source: FAO GP Rural and IDB Agrimonitor

Figure A1. Total public spending in agriculture, different data sources, Mexico and Colombia.

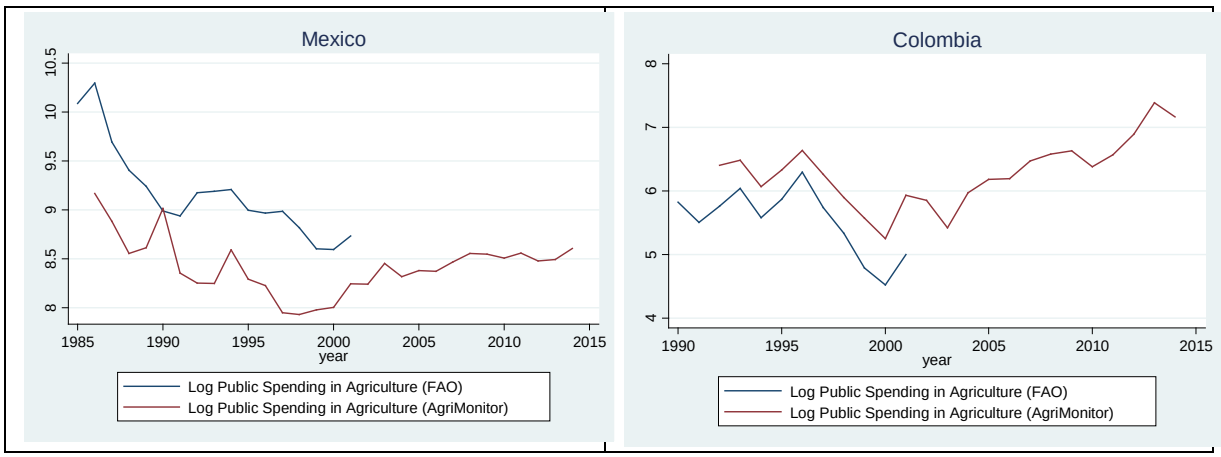

Figure A2. Share of private goods subsidies of public spending in agriculture, different data sources, Brazil and Colombia.