Do Government expenditures on agriculture affect agricultural exports?

Evidence from (COMESA) countries

(Capstone)

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ABSTRACT:

The paper aims to estimate the effect of Agricultural government subsidies on Agricultural exports measured by agricultural raw materials exports as a percentage of merchandise exports. It delivers simple estimate equation across nine COMESA members. The data covers the period (1980-2012). Using two-way fixed effect and controlling for GDP per capita, rural population, inflation rate, real effective exchange rate and Agricultural areas, I find a significant and positive effect of agricultural government expenditures on agricultural exports, an increase in agricultural government expenditures by 1 billion dollar will increase agricultural raw material exports as percentage of merchandise exports per 1.8%.

KEYWORDS: ***Trade, Agricultural Exports, Government subsides, Government expenditure.***

1. Introduction:

Agriculture plays a decisive role in achieving economic growth, and many development economists consider it as a necessary pre-condition for the industrialization process and hence economic growth (Awokuse, 2009). On the other hand, some scholars have argued that increase in government expenditure can be an effective tool to motivate aggregate demand for stagnant

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economies and to bring about crowding-in effects on private sector (Chude & Chude, 2013). In particular, Agricultural commodity trade has played a key role in Africa's economic development. As suppliers of raw materials to developed countries, they have continued to produce primarily crops for export. Thus, the agricultural exports sector is still the most important single activity for African countries. (AMORO & Shen, 2013).

The results of empirical studies varied on the impact of government spending on agricultural exports. For instance, Nadu (1993) finds public expenditure as an important determinant of agricultural growth. Alexiou (2009) found a positive and significant effect of government expenditure on economic growth. On the other hand, Fölster & Henrekson (2001) found that government expenditure is most likely to have a negative effect on economic growth in rich countries.

This paper attempts to answer the question: Do government expenditures on agriculture affect agricultural exports? It focuses on nine countries out of 19 COMESA members (The Common Market for Eastern and Southern Africa) -free trade area region-, which are Burundi, Egypt, Ethiopia, Kenya, Madagascar, Malawi, Rwanda, Sudan, and Zambia) from 1980-2012. The choice of the aforementioned countries depends necessarily on data availability.

This paper contributes to the growing macro-literature on the impact of agricultural government subsidies on agricultural exports. It uses the two-way fixed effect method that comprises the country fixed effect, which allows controlling time-invariant unobserved heterogeneity (i.e. agricultural institutions, culture, agricultural patterns, etc…) and the time fixed effect, which controls country-specific trend (time dimension). The paper also controls for GDP per capita, rural population, inflation rate, real effective exchange rate and agricultural areas.

I have found a significant and positive effect of agricultural government expenditures on agricultural exports. An increase in agricultural government expenditures by 1 billion dollar will increase agricultural row material export as percentage of merchandise exports per 1.8%.

Section 2 provides a listing and discussion of the previous literature. Then, Data and descriptive statistics are presented in Section 3. The model is specified in Section 4. A discussion of the results and empirical analysis follows. In the end, we summarize the results and mention the limitations of the paper. In the final section, I provide policy recommendations.

2. Literature review:

The issue of the government subsidies and exports has been tackled by several studies in previous economic and policy macroeconomic literature. For instance, Brander and Spencer (1985) clarified why export subsidies could be a convenient policy tool from a domestic perspective by providing a study founded on imperfect competition.

The main argument provided by the authors is that the government's retaining of a substantial stake of the production of imperfectly competitive profit-earning industries, is actually beneficial to the country. The focal finding of the study is that governments can grant strategic advantages to domestic firms.

Particularly, what makes export subsidies appealing "weapons" is that they upgrade the relative position of domestic firms facing non-cooperative competitiveness with foreign firms and enable them to enlarge their market share. Even though the terms of trade would act against the subsidizing country, the price would still be above the marginal resource cost of exports and consequently the generated growth of exports can increase domestic welfare.

This paper focuses on reviewing the existing empirical literature rather than the theoretical framework. In fact, there are various viewpoints concerning the government spending's impact on growth in general, and on exports specifically. The following part is a review of previous empirical literature.

Nadu (1993) studied the impact of government expenditure on the performance of the agricultural sector. Using time series data for the periods 1951/1952 to 1988/1989 from the national income data in India; the research provides a multiple regression model choosing the agricultural GDP as a proxy variable for the agricultural sector, the government expenditure on agriculture as an independent variable, the gross cropped area calculated by thousands of hectares and the agricultural labor force as control variables. The major output of the paper is that public expenditure is a key determinant of agricultural growth.

Alexiou (2009) Presented further evidence on the relationship between economic growth and government spending from South Eastern Europe (SEE). Using annual data for seven countries from 1995 to 2005 and 5 main variables namely government spending on capital formation, development assistance, private investment, population growth and trade openness, and by using

FEM and RCM[2], the study found positive and significant effect to government expenditure on economic growth.

On the other hand, some articles suggest that there are negative impacts of government expenditure on growth. For instance, Fölster & Henrekson (2001) try to investigate the relationship between government size and economic growth. The paper used an econometric panel study, which is conducted on a sample of rich countries covering the 1970–95 period (OCED countries). The study included two measures of government size: total taxes as a share of GDP and total government expenditure as a share of GDP; controlling (gross investment as a share of GDP, the growth rate of the labor force, and the growth of human capital measured as the growth rate of the average years of schooling and unemployment rate as a measure of business cycle. The results found that government subsidies is most likely to have a negative effect on economic growth in rich countries.

Jambo (2017) Searched in the Impact of Government Spending on Agricultural Growth using four countries as case studies (Zambia, Malawi, South Africa and Tanzania). The study utilized a separate time series analysis models for each country individually. The explained variable of models is agricultural gross domestic product whereas the explanatory variables are government spending on agricultural research, government spending on infrastructure, government spending on price support programs and government spending on input subsidy programs, private investment and net trade. The results of the empirical analysis revealed that agricultural growth responds differently to the agricultural spending across the countries.

3. Data and descriptive statistics:

The first and main dependent variable is Agricultural raw materials exports as a percentage of merchandise exports. It includes Section 2 SITC (Standard International Trade Classification) of

Table (1)

Data and descriptive statistics

Variable	Mean	Std. Dev.	Min	Max	Observations

[2] FEM stands for Fixed Effects Model, RCM stands for Random Coefficient Model

Country	overall	5	2.586347	1	9	N= 297
	between		2.738613	1	9	n = 9
	within		0	5	5	T= 33
Agricultural Exports	overall	7.898668	9.143796	.1959934	55.89071	N = 219
	between		6.323256	2.783437	21.36243	n= 9
	within		7.056497	-12.32857	42.42695	T-bar= 24.3333
Agricultural exports t-1	overall	1.024369	1.641829	.0005872	8.631762	N= 218
	between		1.510075	.0404529	4.880702	n= 9
	within		.6713237	-1.078618	4.775429	T-bar= 24.2222
Rural population	overall	77.53296	12.23422	56.046	95.661	N = 297
	between		12.39616	56.75812	92.47367	n = 9
	within		3.552992	64.00638	87.01299	T = 33
LnGDPpc	overall	6.355148	.6933246	5.097567	7.86422	N =296
	between		.7114545	5.404936	7.478641	n = 9
	within		.1754205	5.699576	6.952834	T-bar = 32.8889
Agricultural Lands	overall	48.30092	22.00819	2.445869	82.67134	N = 297
	between		22.73773	3.104809	76.62843	n= 9
	within		4.821648	37.16727	61.71033	T = 33
Inflation rate	overall	18.60849	24.83184	-9.808765	183.312	N = 288
	between		14.09033	6.837532	45.68939	n = 9
	within		21.21478	-20.6515	156.2311	T-bar = 32
Real Effective Exchange Rate	overall	125.6118	53.32969	28.45992	318.1829	N = 297
	between		30.77558	68.90746	156.0432	n= 9
	within		44.71368	50.68817	332.485	T = 33

Notes: Table (1) provides a descriptive statistics for the main model for all variables. N refers to the total number of observations for each variable. n refers to the number of countries. T-bar for Years in the unbalanced data.

the United Nations Statistics Deviation category, which covers 97 types of agricultural raw materials, except for "fuels, minerals, coal, oil, precious stones, ores and scrap"[3]. The study focuses on Agricultural government expenditure as an independent variable involving all government support for the agriculture, forestry and fisheries sector as included in the official government budgets. The study uses a 1-year lag following (Jambo, 2017) results that suggest the short run impact of agricultural expenditure on agricultural growth. Other control variables consist of GDP per capita, Agricultural land as a percentage of total land, rural population as a percentage of total population, and, Real Effective Exchange rate.

I suspect that omitted variable bias might affect results due to the absence of weather factors in the model which in turn do have an effect on the agricultural exports directly by impacting the amounts of agricultural crops, especially for countries where the most popular type of agriculture is rain-fed cultivation. These factors include essentially precipitations, temperature, and climate.

[3] united nations statistics deviation
https://unstats.un.org/unsd/cr/registry/regcst.asp?Cl=14

However, there are solid arguments suggesting that the impact of these factors is relatively small. Firstly, by taking average precipitation in depth per year as a proxy variable for weather factors, this rate is constant for all countries of interest (except for Sudan), where rainfall rates dropped from 1712mm per year in 2012 to 250 mm per year in 2011. Moreover, temperature data are aggregate data for the whole world (not specific countries). In addition, COMESA countries mostly have fixed or relatively fixed geographical characteristics; so the study assumes that the weather factors are fixed for COMESA countries except for Sudan (World Bank data set). Appendix (1) provides more detailed data definitions and sources for variables of interest. Annual data covers the period 1980-2012.

It is important to note that the study focuses on nine countries out of 19 (COMEA countries) due to a shortage in data. The study uses secondary data sources, which include all forms of information documented, organized and published by official institutions or organizations (schutt & o'neil, 2014) (for e.g. World Bank, International Monetary Fund, and International Food Policy Research Institute.) Table (1) provides descriptive statistics for both main and control variables in the first model.

4. Econometric Model

Consider the following simple econometric model, which will be the basis of my work to estimate the impact of government expenditure on agricultural exports:

$$AGEX_{it} = \boldsymbol{a_1} + \boldsymbol{a_2} AGE_{i\,t-1} + \boldsymbol{a_3} X_{it} + \delta_i + \mu_t + £_{it}$$

Where AGEXit is Agricultural exports as a percentage of merchandise exports of country i in period t. The main variable of interest is $AGE_{i\,t-1}$ which is the agricultural government expenditure of country i in period t. X_{it} is a vector of All other control variables that potential covariates agricultural exports ($GDPpc_{it}$, $REER_{it}$, Agricultural lands, rural population and inflation). The parameter a_2 therefore measures the effect of Agricultural Government Expenditure on Agricultural Exports. In addition, δ_i denote a full set of country dummies and μ_t denote a full set of time effects that capture common shocks to common trends in the agricultural exports of all countries. $£_{it}$ is an error term, capturing all other omitted factors, with E ($£_{it}$) = zero for all i and t.

It has been agreed upon in the literature that trade policy recommendation depends very much on the actual market conduct (Ma, 2008). For example, if the export industry firms' competition is in Cournot manner, then the chosen strategy is to subsidize exports (Brander and Spencer, 1985). Otherwise, meaning if firms compete in Bertrand form, then the government decides to go for export taxation. (Eaton and Grossman, 1986).

Accordingly, the level-results might indicate a correlation between the two variables but not causal relationship, due the reverse causality between two main variables at level. It is expected that the high levels of government expenditure on exports lead to increase agricultural exports and vice versa. The level of exports might determine the extent of subsidizing the agricultural sector.

In our case, the reverse causality is unlikely for the reason that ex ante government spending (year t-1) indeed has an effect on ex post agricultural exports (year t), but not the other way around.

As for the estimation of the equation, the study will use two-way fixed effect estimator that allows for controlling the individual characteristics of countries, (i.e. institutions, culture, etc…) and to catch the time trend. Moreover, the study uses random effect estimator just for comparison reasons.

5. Empirical results:

The goal of the empirical analysis is to test whether agricultural government expenditures affect agricultural raw materials exports or not. Before performing the main estimation technique, I run pooled OLS to get a general glance over the correlation between variables. The main variable of interest have a positive sign but not significant. It is clear that pooled OLS regression is biased due to the unobserved effects between countries; many unobserved factors may affect results, for instance: agricultural culture and patterns, Institutions that operate in the agricultural sector, etc. (Wooldridge, 2010). Appendix (3) reports Pooled OLS regression coefficients.

Table (2)

Structural parameters estimation: Fixed effect

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	AGEX	AGEX	AGEX	AGEX	AGEX	AGEX

AGEit-1	-0.296	2.223***	2.392***	1.913**	1.666**	1.816**
	(0.621)	*(0.668)*	*(0.664)*	*(0.780)*	*(0.794)*	*(0.780)*
LnGDPpc		-30.09***	-30.71***	-30.88***	-30.66***	-32.15***
		(4.634)	*(4.580)*	*(4.576)*	*(4.556)*	*(4.504)*
REER			0.0321**	0.0329**	0.0355**	0.0468***
			(0.0148)	*(0.0148)*	*(0.0148)*	*(0.0152)*
RPOP				0.365	0.565*	0.756**
				(0.314)	*(0.339)*	*(0.341)*
Inflation rate					0.0341	0.0408*
					(0.0226)	*(0.0223)*
Agricultural Lands						0.387**
						(0.153)
Constant	10.79***	198.5***	197.6***	169.6***	151.8***	129.4***
	(2.730)	(29.01)	(28.62)	(37.34)	(39.00)	(39.24)
Observations	176	176	176	176	176	176
R-squared	0.144	0.349	0.371	0.378	0.388	0.417
Number of country1	9	9	9	9	9	9

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table (2) shows the main results. The results support the hypothesis that the agricultural subsidies has a positive and significant effect on agricultural exports. Column (1) shows the impact of agricultural expenditure on agricultural exports without including control variables. The coefficient is significantly negative. However, this result is biased and that might be due to omitted variables, which affect agricultural exports and are not included in the model .By adding lnGDPpc, REER, RPOP, inflation rate and agricultural lands respectively to each column; column (6) shows the main results. The coefficient for (AGE_{it-1}) is statistically significant at 5% and has an expected-positive sign. This means that an increase in agricultural government expenditures per 1 billion dollar will increase agricultural raw material exports as percentage of merchandise exports per 1.8%.

The estimate of the (lnGDPpc) coefficient is negative and significant, as expected. The coefficient is -32.15, which means 1% increase in GDP per capita will decrease agricultural raw materials exports per (.3215%). This can be explained by the negative effect of GDP per capita on export value especially by quality (Xu, 2016). Moreover, the increase in GDP per capita might increase domestic demand and hence domestic consumption thus decreases exports. An

additional argument is, on average, an increase in the per capita income of the destination country is associated with an increase in the product scope of exporters (Macedoni, 2015). This implies that agricultural exports' share will decrease as the product scope increases.

For the other control variables: an increase by 1 % on real effective exchange rate will increase agricultural exports by 0.04%.This implies that policymakers in COMESA countries should not use exchange rate policy to improve agricultural exports. See Begović and Kreso (2017). The estimate of the rural population and agricultural lands coefficient is positive and significant, as expected. An increase by 1% will increase AGEX by 0.75% and 0.38% respectively. The inflation rate has a positive and insignificant sign. The Intra-class correlation (rho) shows that 98% of the variance is due to differences across panels. Appendix (4) shows random effect estimation, the results indicate positive insignificant relationship between agricultural government expenditure and agricultural exports. However, random effect estimation assumes that the error term is not correlated with the explanatory variables, which is not the case here; Differences between countries necessarily correlate with the variables included in the model. Greene (2012) suggests that: "The crucial distinction between fixed and random effects is whether the unobserved individual effect embodies elements that are correlated with the regressors in the model, not whether these effects are stochastic or not".

6. Conclusion:

This paper aims to estimate the effect of agricultural government subsidies on agricultural exports. Agricultural exports measured by agricultural raw materials as a percentage of merchandise exports. The paper employs two-way fixed effect as a main technique of estimation using data for nine COMESA member countries (Burundi, Egypt, Ethiopia, Kenya, Madagascar, Malawi, Rwanda, Sudan, and Zambia) from 1980 to 2012.

The study estimates clearly indicate strong and statistically significant effects of agricultural government expenditure on agricultural exports. It finds that an increase in agricultural government expenditures by 1 billion dollar will increase agricultural raw material exports as percentage of merchandise exports per 1.8%.

7. Policy recommendations:

As long as the study tries to answer the question: Do Government expenditures on agriculture affect agricultural exports, thus, the limits of the recommendations are restricted by research limits:

- Improving subsides and payments to agricultural sector (input support, price support, etc.).
- Work on the expansion and prepare arable spaces.

Appendix (1): data reports and sources

Agricultural raw materials exports: 1980-2012, Agricultural raw materials comprise SITC section 2 (crude materials except fuels) excluding divisions 22, 27 (crude fertilizers and minerals excluding coal, petroleum, and precious stones), and 28 (metalliferous ores and scrap); as a percentage of merchandise exports. *Data source: World Bank.*

Agricultural Government expenditure 1980-2012: Purchasing Power Parity Basis: All government support for the agriculture, forestry and fisheries sector as such is included in the official government budgets. *Data source: International Food Policy Research Institute (IFPRI).*

http://ebrary.ifpri.org/cdm/ref/collection/p15738coll2/id/128001

Rural population (As a percentage of total population): Rural population refers to people living in rural areas as defined by national statistical offices. It is calculated as the difference between total population and urban population. *Data source: World Bank.*
Real Effective Exchange rate: (Darvas,2012) consumer price index-based REER generated by Using data on exchange rates and consumer price indices and a weighting matrix for 178 countries. Data source: ZSOLT DARVAS database.

http://bruegel.org/publications/datasets/real-effective-exchange-rates-for-178-countries-a-new-database/

Inflation rate: Inflation as measured by the consumer price index reflects the annual percentage change in the cost to the average consumer, of an acquiring basket of goods and services that may be fixed or changed at specific intervals (e.g. annually). *Data source: World Bank.*

Agricultural land refers to the share of land area that is arable, under permanent crops, and under permanent pastures. Arable land includes land defined by the FAO as land under temporary crops (double-cropped areas are counted once), temporary meadows for mowing or for pasture, land under market or kitchen gardens, and land temporarily fallow. Land abandoned as a result of shifting cultivation is excluded. Land under permanent crops is land cultivated with crops that occupy the land for long periods and need not be replanted after each harvest, such as cocoa, coffee, and rubber. This category includes land under flowering shrubs, fruit trees, nut trees, and vines, but excludes land under trees grown for wood or timber. Permanent pasture is land used for five or more years for forage, including natural and cultivated crops.. Source: Food and Agriculture Organization, electronic files and web site.. *Data source: United Nations. http://data.un.org/_Docs/WDIseries_2016_10_12.pdf*

GDPpc, Purchasing Power Parity Basis, Constant U.S dollar 2011. *Data source: World Bank.*

Data covers nine members of COMESA union (Burundi, Egypt, Ethiopia, Kenya, Madagascar, Malawi, Rwanda, Sudan, and Zambia) due to the unavailability of data on the main variables in the other countries. Time: 1980-2012.

Appendix (2): country codes

Country	**code**	**country**	**code**
Burundi	BDI	Malawi	MWI
Egypt, Arab Rep.	EGY	Rwanda	RWA
Ethiopia	ETH	Sudan	SDN
Kenya	KEN	Zambia	ZMB

Madagascar	MDG

Appendix (3)

Pooled OLS

VARIABLES	(1) AGEX	(2) AGEX	(3) AGEX	(4) AGEX	(5) AGEX	(6) AGEX
Lag1_AGE	0.00859	-0.203	0.0612	-0.0413	0.635	0.208
	(0.395)	(0.499)	(0.527)	(0.553)	(0.545)	(0.632)
LnGDPpc		0.911	0.396	-0.432	-0.803	-1.137
		(1.314)	(1.352)	(1.898)	(1.800)	(1.814)
REER			-0.0260	-0.0249	-0.0189	-0.0234
			(0.0172)	(0.0173)	(0.0164)	(0.0167)
RPOP				-0.0708	0.00157	0.0308
				(0.114)	(0.109)	(0.111)
Inflation rate					0.139***	0.137***
					(0.0308)	(0.0308)
Agricultural Lands						-0.0691
						(0.0519)
Constant	8.422***	2.806	8.758	19.42	12.30	16.25
	(0.840)	(8.148)	(9.014)	(19.36)	(18.41)	(18.61)
Observations	176	176	176	176	176	176
R-squared	0.000	0.003	0.016	0.018	0.123	0.132

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix (4)

Random effect estimation

VARIABLES	(1) AGEX	(2) AGEX	(3) AGEX	(4) AGEX	(5) AGEX	(6) AGEX
Lag1_AGE	-0.00890	-0.108	0.734	0.514	1.076*	0.948
	(0.415)	(0.531)	(0.569)	(0.579)	(0.571)	(0.673)
LnGDPpc		0.425	-1.758	-4.403**	-4.370**	-4.400**
		(1.408)	(1.501)	(2.139)	(2.040)	(2.048)
REER			-0.0790***	-0.0817***	-0.0733***	-0.0736***
			(0.0231)	(0.0230)	(0.0221)	(0.0222)
RPOP				-0.205*	-0.129	-0.117
				(0.119)	(0.115)	(0.120)
inflation rate					0.138***	0.138***

					(0.0357)	(0.0359)
Agricultural Lands						-0.0198
						(0.0546)
Constant	14.71***	12.02	36.75***	70.95***	60.82***	61.04***
	(4.889)	(10.18)	(12.20)	(23.24)	(22.32)	(22.39)
Observations	176	176	176	176	176	176
Number of country1	9	9	9	9	9	9

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

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