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National Agricultural
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Promoting market access for South African agriculture

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Is there justification for levy expenditure on export promotion and market development in the agricultural sector in South Africa?

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Working Paper (NAMC/WP/2017/01) (Revised)



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Abstract

South Africa's industries in the agricultural sector spend some of the statutory levy income on export promotion and market development (EPMD) activities. Some industries argue that levy expenditure on EPMD activities generates satisfactory returns on investment but empirical evidence is yet to be presented to support the argument. Hence, this study fills this gap by building a unique dataset based on levy expenditure on EPMD for four industries (*citrus, deciduous fruits, table grapes and wine*) and using econometric analysis to assess the impact of EPMD on exports, net agricultural income and social welfare over a ten years' period (2006-2015). Furthermore, we estimate the returns generated on exports, agricultural net income and social welfare per Rand of levy expenditure on exports, net agricultural income and social welfare. In the analysis, we control for unobserved heterogeneity, multi-collinearity and reverse causality. Results suggest that levy expenditure on EPMD has a statistically significant positive impact on exports, net income and social welfare across all industries. On average, a unit increase in levy expenditure on EPMD leads to an increase in exports by 7.3 percent (table grapes and deciduous fruits), 5.6 percent (wine), 5.25 percent (citrus). For agricultural net income, a unit increase in levy expenditure on EPMD is on average associated with a 7.5 percent, 4.9 percent, 4.3 percent and 3.6 percent increase for table grapes, citrus, wine and deciduous fruits, respectively. Across all industries, the range of social welfare improvement lies between 0.2 percent and 0.4 percent per unit increase in levy expenditure on EPMD. Furthermore, results suggest that one Rand spent on EPMD for the four industries in question on average generates a R404 increase in exports, R39 of additional agricultural net income and a US\$26 worth of improvement in social welfare. All in all, levy expenditure on EPMD plays a key role in fostering exports, agricultural net income and social welfare improvement. Policy wise, there is need for mobilisation of more resources to facilitate the EPMD initiative into new markets and products for the industries.

JEL classification: F13, F14, F15

Key words: Levy expenditure on export promotion, social welfare, citrus, deciduous fruits, table grapes, wine

1. Introduction

Following the establishment and approval of statutory measures as provided for by the Marketing of Agricultural Products Act, No. 47 of 1996 (MAP Act), industries through the administrator bodies oversee the implementation of various statutory measures (i.e. registration, records and returns, and levies). Although the former measures (registration, records and returns) are very important in the administration and inspection of the latter, this study focuses only on statutory levies paid by stakeholders (usually producers and/or exporters and importers) depending on the nature of the industry. By definition, a statutory levy refers to a charge per unit of an agricultural commodity at any point in the marketing chain between the producer and the consumer, collected for specific functions such as export promotion and market development (EPMD), quality control, research, transformation, etc. (NAMC, 2015). This study puts particular emphasis on levy expenditure on EPMD.

Over the years, about 15percent of the levy expenditure has generally been allocated for EPMD, particularly for the citrus, deciduous fruit, fynbos (proteas), potato, table grapes, wine and winter cereals industries. Empirical literature (e.g. Olarreaga *et al.*, 2015; Hayakawa *et al.*, 2014; Lederman *et al.*, 2010) indicates that expenditure on EPMD fosters export growth but such studies focus on EPMD agencies and expenditure sourced from the government. In the case of South Africa, previous studies (*see*: Boonzaaier, 2015; Ndou & Obi, 2013; Van Rooney & Stroebel, 2011; Mashabela & Vink, 2008; Mather, 2003) clearly articulate the factors influencing the competitiveness of some of the above-mentioned industries but they do not address how levy expenditure on EPMD impacts on trade - most importantly how the impact varies across industries, leave alone the overall social welfare impact on the economy.

Titus *et al.* (2013) tackle the subject of EPMD but they focus on a comparative analysis of the various strategies used in a few countries (South Africa inclusive). Work by Jordaan (2011) provides industry case studies of the impact of generic promotional campaigns but the study was only exploratory. Thus, our study differs from what the mentioned studies offer in a number of aspects as shall be seen in the subsequent sections. Although NAMC (2015; 2013) argues that stakeholders in the horticulture industries are certain that levy expenditure on EPMD generates satisfactory returns on investment, there is no empirical evidence from any agricultural industry to support this assertion.

Moreover, in the case of the horticulture industries, it is not certain whether the generated returns from the investment translate into higher incomes, and ultimately social welfare improvement. Furthermore, even though industries may have measurement systems through which they may acknowledge returns to investment, it is challenging to provide proof beyond the basic anecdote that EPMD generates satisfactory returns at industry, national or even social levels. Thus, the need to empirically reveal to stakeholders whether levy expenditure on EPMD generates any returns to industries, contributes to economic growth through higher incomes and how it influences social welfare. Specifically, this study is aimed at, (i) quantifying the impact of EPMD levy expenditure in fostering exports, net income to the agricultural sector and social welfare within the economy; and (ii) estimating the marginal returns generated per unit of EPMD levy expenditure on exports, agricultural net income and social welfare.

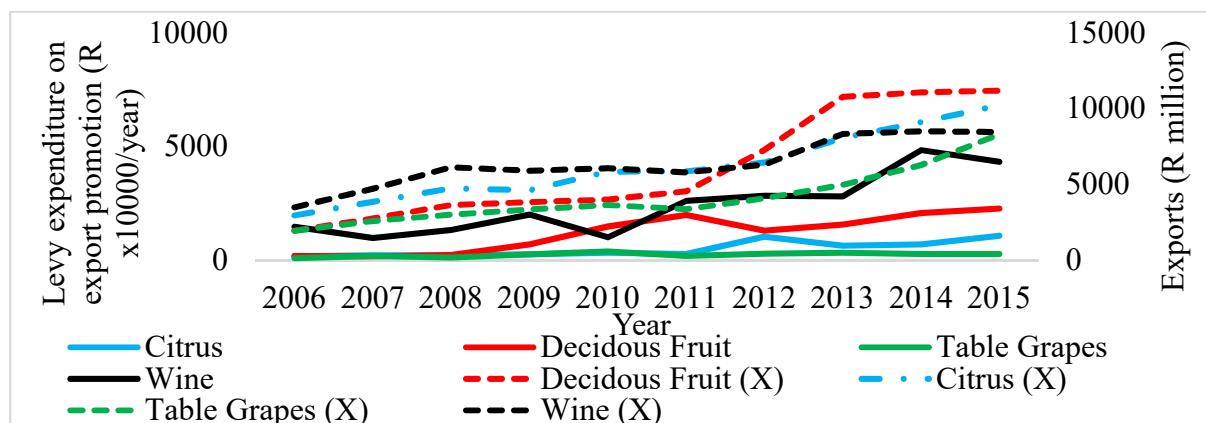
This study is relevant given that insights from this work may be used to support resource mobilisation efforts based on the empirical evidence on the return(s) on investment from the various industries. In addition, this paper contributes to the existing pool of knowledge in two ways, (i) we empirically quantify the impact of levy expenditure on EPMD on exports, agricultural net income and social welfare at industry level, (ii) we quantify the returns generated on exports, agricultural net income and social welfare for each Rand spent on EPMD from levy expenditure. This is the first study to make this undertaking, particularly in South Africa. The link between levy expenditure on EPMD and social welfare is very important given that the ultimate purpose of EPMD initiatives is to achieve improved living standards of the citizens. Furthermore, it is in the NAMC's interest to show the impact of statutory levies expenditure, and whether there is justification for it for society. The NAMC is the institution responsible for liaison between industry and the Minister of Agriculture, Forestry and Fisheries on issues pertaining to statutory levies. It also has the broad mandate, as specified in the Marketing of Agricultural Products Act of 1996, to enhance foreign exchange earnings.

The rest of the paper is organised as follows. In section 2, we provide trends of levy expenditure on EPMD and exports by industries as well as the overall agricultural net income and per capita Gross Domestic Product (GDP). Section 3 provides a brief review of related literature. Section 4 focuses on the methodology. Empirical results are presented and discussed in section 5. Conclusions and policy recommendations are provided in section 6. However, it should be noted that this study in any way does not aim at comparing impacts, exports, net agricultural

income, social welfare, levy expenditure, and the associated returns amongst the industries considered in this work.

2. Levy expenditure on EPMD, exports by industry and selected economic indicators

Since the introduction of levies during the mid-2000s, each industry through an administrative body collects the statutory levies which are used in accordance with stakeholders' consensus. For the purpose of this study, focus is on the citrus, deciduous fruit, table grapes industries which introduced levy collection in August 2004, October 2007 and November 2006, respectively (NAMC, 2008). The NAMC compiles and disseminates the status of levy incomes and expenditures through the annual statutory measures status report. Over a ten years' period (2006-2015), **Figure 1** illustrates that exports have increased as levy expenditure on EPMD has also been increasing but this observation does not provide the empirical evidence of the impact on exports. For the four industries (on average), about R43.8 million of the levy income was used for EPMD while R20.8 billion worth of goods were exported (NAMC publications, TradeMap database).



(X) denotes exports

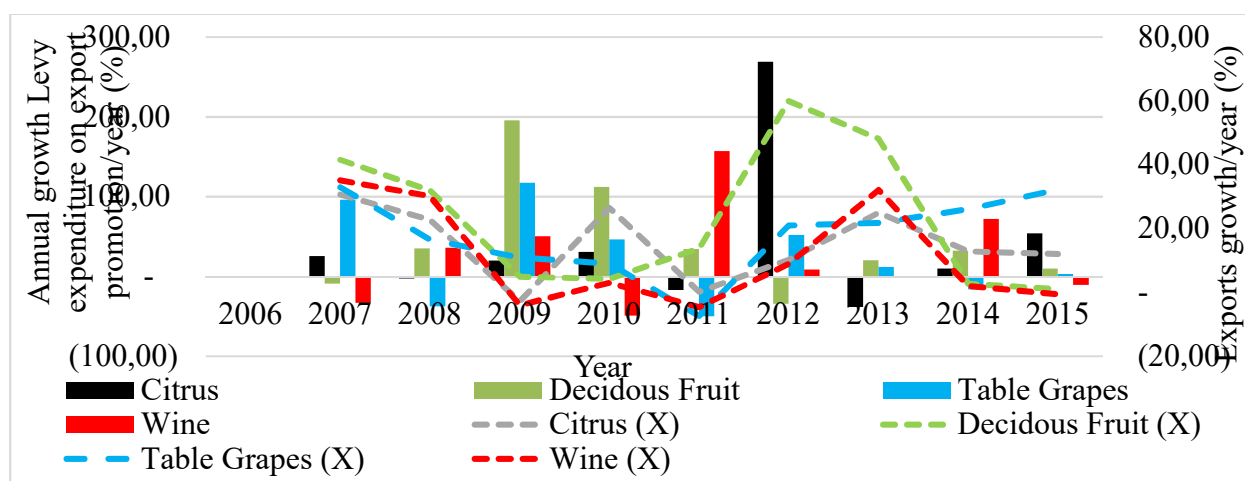
Data sources: DAFF (2016), Statutory measures publications of NAMC and TradeMap database, Industry associations¹

Figure 1: Exports and levy expenditure on export promotion and market development by industries

¹ HORTGRO services, Citrus Growers' Association (CGA), SA Table Grape industry, and Wines of South Africa (WOSA)

On average, the wine industry spent the most on EPMD (R24.3 million), followed by deciduous fruits (R12 million), citrus (R5 million) and table grapes (R2.5 million). Similarly, the wine industry registered most exports, valued at R6.4 billion, followed by citrus (R6.2 billion), table grapes (R4.2 billion) and deciduous fruits (R4.1 billion). During the ten-year period considered in this study, annual growth rates in levy expenditure on EPMD highly fluctuated within and between industries. Figure 2 reveals that the citrus industry registered the highest annual growth rate (269 percent) between 2011 and 2012, followed by the deciduous fruits industry (196 percent) between 2008 and 2009. For the table grapes and wine industries, highest growth rates in levy expenditure on EPMD were registered at 117percent for the 2008 – 2009 period and 157 percent for the 2010-11 period, respectively.

Interestingly, the stated periods of highest annual growth rates do not necessarily match with periods of the highest annual export growth rates, e.g. 2011-2012 period for citrus. This identifies with view by Olarreaga *et al.* (2015) that benefits of export promotion activities are realised over time after the promotional activities. Lowest growth rates in exports were observed during the 2008-9 (-2.8percent for citrus), 2014-15 (1.0 percent for deciduous fruits), 2010-11 (-7.4 percent for table grapes) and 2010-11 (-4.6 percent for wine) periods.

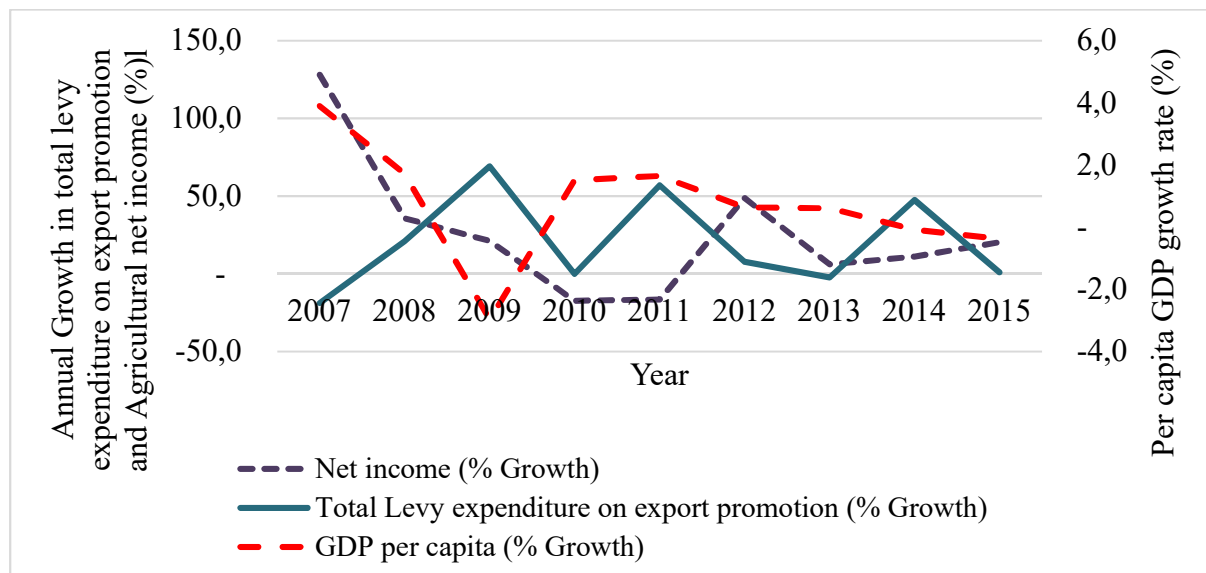


(X) denotes exports

Data sources: DAFF (2016), Statutory measures publications of NAMC and TradeMap database, Industry associations

Figure 2: Annual growth rate of exports and levy expenditure on export promotion and market development by industries

With regards to net income to the agricultural sector and per capita Gross Domestic Product (GDP), Figure 3 reveals that the annual growth rate of net income to the agricultural sector drastically dropped from 128 percent in 2007 to -17percent in 2010 before rising again, while annual growth in per capita GDP ranged between -3percent (2009) and 4percent (2007) but with relatively small fluctuations, especially after 2010. On the other hand, annual growth rate in total levy expenditure on EPMD across the citrus, deciduous fruits, table grapes and wine industries highly fluctuated over the ten-year period. The highest growth rate of 69.2 percent was registered between 2008 and 2009 while the lowest (-18.7 percent) was between 2006 and 2007, with an overall mean annual rate of 20.3percent. At industry level, all industries had positive annual growth rates in levy expenditure on EPMD, i.e. Deciduous fruits (43.9 percent), citrus (38.9 percent), wine (25.5 percent) and table grapes (24.6percent).



Data sources: DAFF (2016), Statutory measures publications of NAMC and World Development Indicators database of the World Bank (2016)

Figure 3: Annual growth rate of agricultural net income, per capita GDP and total levy expenditure on export promotion and market development of the four industries

3. Literature review

There is growing body of literature about the role of export promotion agencies (EPAs) in enhancing exports (for example see: Olarreaga *et al.*, 2015; Hayakawa *et al.*, 2014; Lederman *et al.*, 2010; Lederman *et al.*, 2009; Martincus and Carballo, 2008; Gil-Pareja *et al.* 2008) and literature based on firm-level analysis (Jalali, 2012; Volpe & Carballo, 2008; Schminke & Van Biesebroeck, 2013). No literature directly focussing on income and social welfare has been

come across. Literature used various indicators to capture the role of EPAs while employing either firm-level data (e.g. Lederman *et al.* 2016; Van Biesebroeck *et al.* 2016; Schminke and Van Biesebroeck, 2013; Martincus and Carballo, 2010; Gil-Pareja *et al.* 2008; Volpe and Carballo, 2008) or aggregated data (e.g. Hayakawa *et al.*, 2014; Rose, 2007). Furthermore, various models were used e.g. the gravity model (Gil-Pareja *et al.* 2008; Rose 2007). With the exception of Keesing and Singer (1992, 1991) who criticise the performance of EPAs in non-developed economies, later studies generally suggest that EPAs boost exports and that money spent on promotional activities generate some returns.

For instance, Rose (2007) notes that existence of a consulate abroad, through which export promotion is done increases exports by about 8 percent, on average. Martincus and Carballo, (2008) used an econometric model to assess the impact of export promotion on trade margins. Their results indicate that export promotion boosts bilateral trade. According to Lederman *et al.* (2010) who conducted a global survey on the impact of EPAs, a unit increase in export promotion budget increases exports by 0.05 percent. Olarreaga *et al.* (2015) used semi-parametric methods to assess if export promotion works for some European and non-European countries. Their findings suggest that a unit increase in export promotion budget leads to a 0.08 percent increase in exports and each dollar spent on export promotion generates a US\$ 15 increase on exports. Analysis based on firm level data generally suggests that export promotion is more effective through the extensive margins (i.e. increasing the number of export destinations and new products) (Martincus & Carballo, 2008; Schminke & Van Biesebroeck, 2013; Vargas da Cruz, 2014) and that it generates returns to investment. However, there is very scanty literature focusing on South Africa, more particularly at industry level while addressing the aspects of income and social welfare.

4. Methodology

4.1. Data

The study focused on four industries, namely; citrus, wine, table grapes and deciduous fruits. A dataset of levy expenditure on EPMD was generated from statutory measures survey reports compiled by the NAMC. Data on net income to the agricultural sector was obtained from the agricultural abstract of the Department of Agriculture, Forestry and Fisheries (DAFF) while per capita GDP at (constant 2010 US\$) was obtained from the World Bank's Development Indicators (WBDI) database for a ten-year period (2006-2015). Per capita GDP was used as a

proxy for social welfare, synonymously referred to as “standard of living”, despite the fact that it is not supported by macroeconomic theory (Van den Bergh and Antal, 2014)². Although levy expenditure on EPMD and net income to the agricultural sector are generally aggregated at annual level, equal distribution among the quarters throughout the year was assumed, hence divided by four to obtain datasets at quarterly level. This gave rise to 160 pooled observations and 40 observations for each industry. A summary of the descriptive statistics is presented in Table 1.

Table 1: Summary statistics per quarter of a calendar year

| Description | Pooled mean (n= 160) | Citrus (n= 40) | Deciduous Fruits (n= 40) | Table grapes (n= 40) | Wine (n= 40) |
|---|---------------------------------|---------------------------|-------------------------------------|---------------------------------|-------------------------|
| Levy expenditure (R million) | 2.74 (2.85) | 1.25 (0.83) | 3.01 (1.97) | 0.62 (0.22) | 6.07 (3.22) |
| Exports (R million) | 1170.87 (551.03) | 1544.95 (560.89) | 1018.32 (584.91) | 1040.83 (457.13) | 1079.41 (422.97) |
| Net income to agricultural sector (R million) | 12040.67 (4273.03) | 12040.67 (4313.92) | 12040.67 (4313.92) | 12040.67 (4313.92) | 12040.67 (4313.92) |
| GDP per capita (constant 2010 US\$) | 1863.15 (39.12) | 1863.15 (39.12) | 1863.15 (39.12) | 1863.15 (39.12) | 1863.15 (39.12) |

Note: standard deviations are in parenthesis

On average, the four industries (citrus, deciduous fruits, table grapes and wine) used R10.9 million worth of levy expenditure for EPMD per quarter (about R43.8 million a year) and R5198 million worth of exports were collectively exported per quarter. On the other hand, net income to the agricultural sector was estimated at R12041 million per quarter (R48163 million per annum). The mean values for net income and per capita GDP are representative of the entire economy per quarter. Unlike firm level data, aggregated data is advantageous given that it gives a clear illustration of how EPMD impacts on exports and economic growth in a broader sense. Furthermore, the International Trade Centre (ITC, 2016) urges that firm level data is severely affected by the problem of selection bias, thus, we directly use aggregated data to circumnavigate the mentioned drawbacks associated with firm level data.

² See Van den Bergh and Antal (2014) for the detailed reasons and a list of respected economists that discredit the use of GDP based measures as indicators of social welfare.

4.2 Unit root test

When using time series data, it is important to ascertain if the statistical properties of the series such as mean, variance, autocorrelation, etc. are constant over time. The Levin–Lin–Chu (LLC) (2002) test with trend option was used to test for unit roots given that the panels were balanced, the number of periods outweighed the number of panels, and the panel series were increasing over time. We tested the hypothesis that the series follow a unit root process. Table 2 (Appendix A) indicates that we cannot reject the null hypotheses that the natural logs of exports, levy expenditure on EPMD, agricultural income and social welfare (per capita GDP) exhibit unit roots but at various levels of significance. Thus, conventional estimation techniques were appropriate to use.

4.3 Model specification

In this study, we take cognisance of earlier work by Boonzaaier (2015), Ndou and Obi (2013), Van Rooney and Stroebel (2011), and Mashabela and Vink (2008), among others who note that export competitiveness of the wine, citrus, deciduous fruit and grape industries is influenced by a number of factors, including inadequately educated workforce, poor infrastructure, lack of trust in the political system, high transportation costs, to mention but a few. In concurrence with Jordaan (2011) and Ward and Hogan (2009) who urge that it is challenging to evaluate the impact of promotional programmes due to a number of other drivers that influence demand, we limit our independent variables to only two. Additionally, limiting the variables was due to perfect multi-collinearity of the variables mentioned in the earlier studies with levy expenditure on EPMD. Thus, the specified models are restricted to capturing the effects export promotion and the incidence of export ban that was sanctioned on South Africa’s citrus exports to the European Union (EU) due to the citrus black spot (CBS) outbreak in the country. European Union’s ban of South Africa’s citrus exports into their market was severely felt by South African farmers between November 2013 and 2015 (EU, 2013; DAFF, 2013).

Econometric evaluation of the impact of- and returns to- EPMD expenditure on exports, agricultural net income and social welfare was done using a panel data framework at two levels, i.e. at industry level and when the four industries are aggregated (pooled). The panel dataset is advantageous given that it controls for unobserved heterogeneity over time (Olarreaga *et al*, 2015; ITC, 2016). Furthermore, given the nature of industries, it is expected that industries that collect significant amounts of levies are likely to spend more on EPMD activities hence

more exports, and the reverse is also true. This is referred to as the reverse causality problem. To overcome this challenge, we also used lagged variable of levy expenditure on EPMD. To capture the effect of EPMD levy expenditure on exports, net income to the agricultural sector and social welfare, linear models were used at the aggregated level (Equations 1, 2 and 3).

$$\ln(X)_{q,t} = \alpha_1 \ln(Levy)_{q,t} + \alpha_2 EUBAN_{q,t} + \varepsilon_{q,t} \dots\dots\dots (1)$$

$$\ln(AgrK)_{q,t} = \alpha_1 \ln(Levy)_{q,t} + \alpha_2 EUBAN_{q,t} + \varepsilon_{q,t} \dots\dots\dots (2)$$

$$\ln(Kapito)_{q,t} = \alpha_1 \ln(Levy)_{q,t} + \alpha_2 EUBAN_{q,t} + \varepsilon_{q,t} \dots\dots\dots (3)$$

A country's economic size has a causal relationship with exports thereby inclusion of Gross Domestic Product (GDP) as a proxy for size may lead to endogeneity bias. Thus, population was introduced in the model used given that it has no direct relation with exports but due to serial correlation, it was also dropped. Equations from 4 to 6 represent models disaggregated at industry level.

$$\ln(X)_{i,q,t} = \alpha_1 \ln(Levy)_{i,q,t} + \alpha_2 EUBAN_{i,q,t} + \varepsilon_{i,q,t} \dots\dots\dots (4)$$

$$\ln(AgrK)_{i,q,t} = \alpha_1 \ln(Levy)_{i,q,t} + \alpha_2 EUBAN_{i,q,t} + \varepsilon_{i,q,t} \dots\dots\dots (5)$$

$$\ln(Kapito)_{i,q,t} = \alpha_1 \ln(Levy)_{i,q,t} + \alpha_2 EUBAN_{i,q,t} + \varepsilon_{i,q,t} \dots\dots\dots (6)$$

In all the equations, X, AgrK, Kapito and Levy denote the log of exports, net income to agricultural sector from the four industries (wine, citrus, grapes and deciduous fruits), social welfare and levy expenditure on EPMD, respectively. Subscripts *i*, *q* and *t* represent industry, quarter and year, in that order while ε is the error term. *EUBAN* is a dummy relating to the ban of South Africa's citrus exports to the EU during the CBS outbreak in the country. The dummy variable equals one if the industry encountered an export ban in the international markets and zero, otherwise. The dummy addresses the question of whether EPMD had a role to play during such critical times. The α_1 s are the coefficients of interest capturing the effects of EPMD levy expenditure on exports, agricultural net income and social welfare. The coefficients are defined as elasticities associated with a unit increase in levy expenditure on EPMD.

To avoid solely relying on the simplistic Ordinary Least Squares (OLS) linear regression analysis which is anchored on strong linearity assumptions, we also use Poisson model estimation techniques. The Poisson model assumes that the mean and variance of the errors are

equal. Poisson models are advantageous over OLS linear regression models in a sense that they can deal with zero values and discrete distributions, among others. To some extent, ordinary linear regressions identify with Poisson models, except that with the latter, error terms are assumed not to follow a normal distribution, and it models the natural log of the response variable as a function of the coefficients (Long, 1997; Gardner et al., 1995). Although the lagged natural log of levy expenditure was earlier on presented as a control for the unobserved heterogeneity, it was also used to capture the benefits of EPMD initiatives over time given that such benefits accrue after a plausible time period (Olarreaga *et al.*, 2015). Hence models with the lagged variable are described as the dynamic models and were estimated for each of the equations (1-6).

To estimate the marginal returns generated per Rand of levy expenditure on exports, agricultural net income and social welfare, we obtained the derivative of each equation (1-6) with respect to the log of levy expenditure on EPMD and the corresponding elasticities were computed at the mean values. For the dynamic models, the marginal returns were calculated as the sum of the products of the coefficients of log levy expenditure on EPMD elasticities and the mean values. This was done both at pooled and specific industry levels.

5.0 RESULTS

Pooled results from the estimation of equations 1 to 3 are provided in Table 3 for the four industries using OLS and Poisson analysis. For all the specifications, levy expenditure on EPMD has a statistically significant positive effect on exports, agricultural net income and social welfare. In the case of exports, a unit increase in levy expenditure on exports is associated with an increase ranging between 2.4 percent and 16.8 percent, depending on the models used. For net income, a 1 percent increase in EPMD levy expenditure is associated with about 2 percent (OLS) and 18 percent rise in net income to the agricultural sector while a similar increase in expenditure translates into an improvement in social welfare ranging between 0.1 percent and 0.8 percent. It is also important to note that EU's ban of South Africa's citrus stimulated³ more exports (overall), as well as an increase in agricultural net income and social welfare. This may be attributed to the fact that citrus was only banned in the EU yet South Africa explores many other markets. Secondly, the ban may have had a stimulus to export more of the other commodities that were not necessarily affected.

³ The coefficient of the dummy should not be interpreted as an elasticity.

Table 3: Average impact of EPMD levies on exports, net income to the agricultural sector and social welfare for the four industries (*Static models*)

| Exports (LnX) | OLS (n=160) | Poisson (n=160) |
|--|---------------------|------------------------|
| Export promotion and market development (LnLevy) | 0.168*** (0.028) | 0.024*** (0.004) |
| Citrus ban (EUBAN) | 0.659*** (0.612) | 0.091*** (0.008) |
| Intercept | 4.53*** (0.410) | 1.59*** (0.59) |
| R ² | 0.252 | |
| Wald chi ² | | 147.34 |
| Pseudo R ² | | 0.002 |
| Fit of the model (Goodness-of-fit chi ²) | | 3.948 |
| Net income to sector (LnAgrK) | | |
| | OLS (n=160) | Poisson (n=160) |
| Export promotion and market development (LnLevy) | 0.176*** (0.031) | 0.019*** (0.003) |
| Citrus ban (EUBAN) | 0.288*** (0.044) | 0.030*** (0.005) |
| Intercept | 6.783*** (0.456) | 1.959*** (0.049) |
| R ² | 0.200 | |
| Wald chi ² | | 65.45 |
| Pseudo R ² | | 0.001 |
| Fit of the model (Goodness-of-fit chi ²) | | 2.886 |
| Social welfare (LnKapito) | | |
| | OLS (n=160) | Poisson (n=160) |
| Export promotion and market development (LnLevy) | 0.008*** (0.001) | 0.001*** (0.0002) |
| Citrus ban (EUBAN) | 0.019*** (0.002) | 0.003*** (0.0003) |
| Intercept | 7.421*** (0.021) | 2.00*** (0.003) |
| R ² | 0.198 | |
| Wald chi ² | | 110.61 |
| Pseudo R ² | | 0.000 |
| Fit of the model (Goodness-of-fit chi ²) | | 0.008 |

***, ** and * denote significance at 1 percent, 5 percent and 10 percent level respectively

Results of dynamic models are presented in Appendix B (**Table 4**). Levy expenditure on EPMD only significantly boosted net income to the agricultural sector. The insignificant results of exports and social welfare may be attributable to the overall pooling effect of the four industries. Only Poisson model results are presented in the subsequent tables at industry level.

Table 5, provides the estimated impact of EPMD levy expenditure on exports at industry level. Export promotion and market development levy expenditure was found to exhibit a statistically significant positive impact on exports across all industries, with table grapes being in the lead, followed by wine, deciduous fruits and citrus, in that order. A unit increase in levy expenditure on EPMD leads to an increase in exports across all industries, ranging between 3.3 percent and 9.6 percent, irrespective of the model used. Table grapes industry registered the highest response (0.073 on average) to EPMD, followed by the wine industry (0.056), deciduous fruit (0.073) and the citrus (0.052) industry. The slight variation in the coefficients may be attributable to industry specific characteristics.

Table 5: Average impact of export promotion and market development levies on exports, by industry (2006-2015)

| | Citrus | | Deciduous Fruits | | Table Grapes | | Wine | |
|-------------------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| | Static | Dynamic | Static | Dynamic | Static | Dynamic | Static | Dynamic |
| EPMD (LnLevy) | 0.067*** (0.008) | 0.036*** (0.009) | 0.073*** (0.007) | 0.030 (0.024) | 0.096*** (0.014) | 0.050*** (0.019) | 0.076*** (0.008) | 0.037*** (0.010) |
| Previous EPMD levy (LgLnLevy) | | 0.033*** (0.011) | | 0.042* (0.024) | | 0.049*** (0.018) | | 0.043*** (0.010) |
| Citrus ban (EUBAN) | 0.006 (0.011) | -0.002 (0.012) | - | - | - | - | - | - |
| Intercept | 1.063*** (0.111) | 1.022*** (0.111) | 0.839*** (0.103) | 0.862*** (0.104) | 0.645*** (0.181) | 0.609*** (0.192) | 0.755*** (0.126) | 0.682*** (0.126) |
| Wald chi2 | 84.74 | 89.27 | 102.16 | 99.02 | 48.10 | 45.54 | 86.56 | 98.09 |
| Pseudo R2 | 0.004 | 0.004 | 0.009 | 0.008 | 0.003 | 0.003 | 0.003 | 0.003 |
| Log pseudolikelihood | -76.974 | -75.085 | -75.730 | -73.90 | -75.992 | -74.130 | -76.004 | -74.104 |
| N | 40 | 39 | 40 | 39 | 40 | 39 | 40 | |

***, ** and * denote significance at 1 percent, 5 percent and 10 percent level respectively

Table 6 reveals the impact of EPMD levy expenditure on agricultural net income at industry level. Across all the industries, EPMD levy expenditure has positive significant impact on agricultural net income within the economy. On average, the table grapes industry contributes about 7.5 percent rise in net income with a 1 percent increase in EPMD levy expenditure, followed by citrus (4.9 percent), wine (4.3 percent) and deciduous fruits (3.6 percent) industries. However, only the citrus and wine industries show a statistically significant positive impact on agricultural net income over time as a result of levy expenditure on EPMD.

These results are consistent with earlier findings on exports in Table 5, whereby it was found that the table grapes industry is a key player among the industries that benefit from the EPMD initiative. However, although the wine industry was the second highest in terms of exports fostered through EPMD, the industry's contribution to agricultural net income follows after the citrus industry which is ranked second. This observation may be associated with variations in the industries' characteristics which may differently have an influence on exports and

agricultural net income. It is also worthwhile to note that the wine industry contributes over 40 percent more to agricultural net income over time than the citrus industry. This may be associated with highly advanced agro-processing component of the wine industry.

Table 6: Average impact of export promotion and market development levies on net income to agricultural sector, by industry (2006-2015)

| | Citrus | | Deciduous Fruits | | Table Grapes | | Wine | |
|-------------------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| | Static | Dynamic | Static | Dynamic | Static | Dynamic | Static | Dynamic |
| EPMD (LnLevy) | 0.058*** (0.010) | 0.039*** (0.010) | 0.035*** (0.007) | 0.037** (0.018) | 0.089*** (0.019) | 0.061*** (0.023) | 0.055*** (0.009) | 0.030** (0.012) |
| Previous EPMD levy (LgLnLevy) | | 0.017* (0.010) | | -0.005 (0.015) | | 0.024 (0.017) | | 0.024* (0.012) |
| Citrus ban (EUBAN) | -0.004 (0.007) | -0.007 (0.007) | - | - | - | - | - | - |
| Intercept | 1.430*** (0.138) | 1.454*** (0.139) | 1.719*** (0.108) | 1.766*** (0.106) | 1.050*** (0.250) | 1.111*** (0.265) | 1.384*** (0.149) | 1.402*** (0.138) |
| Wald chi2 | 37.68 | 34.87 | 23.93 | 20.49 | 22.70 | 18.37 | 34.73 | 38.87 |
| Pseudo R2 | 0.003 | 0.003 | 0.003 | 0.002 | 0.003 | 0.002 | 0.002 | 0.002 |
| Log pseudo likelihood | -81.916 | -79.902 | -81.945 | -79.93 | -81.920 | -79.919 | -82.005 | -79.967 |
| N | 40 | 39 | 40 | 39 | 40 | 39 | 40 | 39 |

***, ** and * denote significance at 1 percent, 5 percent and 10 percent level respectively

In terms of social welfare, results provided in Table 7 suggest that levy expenditure on EPMD leads to a 0.2 to 0.4 percent increase in social welfare. In absolute terms, this seems a small contribution but it is not necessarily the case given the fact that focus is on a few industries, within the agricultural sector. Table grapes industry was the biggest contributor towards social welfare, implying that a unit increase in levy expenditure on EPMD leads to 0.4 percent improvement in social welfare. Among other factors, the slight variations in the coefficients on EPMD across industries may be due to industry specific characteristics. The positive and statistically significant coefficient (0.001, $p < 0.05$) of the dummy variable for the ban of citrus exports to the EU suggests there was improved social welfare as a result of the ban. This may be explained by the fact that a ban on a specific commodity into a specific market like the EU could have boosted trade with other markets, thereby increasing the income base of the producers, traders and other actors along the value chains.

Table 7 Average impact of export promotion and market development levies on social welfare (US\$), by industry (2006-2015)

| | Citrus | | Deciduous Fruits | | Table Grapes | | Wine | |
|---------------|----------|----------|------------------|---------|--------------|---------|----------|---------|
| | Static | Dynamic | Static | Dynamic | Static | Dynamic | Static | Dynamic |
| EPMD (LnLevy) | 0.003*** | 0.002*** | 0.002*** | -0.0001 | 0.004*** | 0.0002 | 0.003*** | 0.002** |

| | | | | | | | | |
|-------------------------------|---------------------|---------------------|---------------------|---------------------|---------------------|----------------------|---------------------|---------------------|
| | (0.000) | (0.001) | (0.000) | (0.001) | (0.001) | (0.001) | (0.000) | (0.001) |
| Previous EPMD levy (LgLnLevy) | | 0.001* (0.001) | | 0.002** (0.001) | | 0.003*** (0.0017) | | 0.001 (0.001) |
| Citrus ban (EUBAN) | 0.001*** (0.000) | 0.001** (0.000) | - | - | - | - | - | - |
| Intercept | 1.979*** (0.007) | 1.980*** (0.007) | 1.991*** (0.006) | 1.993*** (0.006) | 1.970*** (0.016) | 1.972*** (0.016) | 1.969*** (0.000) | 1.971*** (0.007) |
| Wald chi2 | 50.63 | 50.98 | 23.46 | 26.68 | 9.58 | 14.47 | 48.62 | 53.88 |
| Pseudo R ² | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Log pseudolikelihood | -77.578 | -75.641 | -77.578 | -75.641 | -77.578 | -75.641 | -77.578 | -75.641 |
| N | 40 | 39 | 40 | 39 | 40 | 39 | 40 | 39 |

***, ** and * denote significance at 1 percent, 5 percent and 10 percent level respectively

With regards to the returns to investment, pooled results provided in Table 8 reveal that one Rand of levy expenditure spent on EPMD generates R 404 worth of more exports, R 39 (static model) and R 3937 (dynamic model) worth of additional net income to the agricultural sector and social welfare improvement of US\$ 26 (at constant 2010 prices). This means that people's standard of living, as measured by GDP per capita improved by US\$ 26 for each Rand spent on EPMD. The high returns to agricultural net income in the dynamic model are attributable to the fact that actual realisation of returns occurs after some period following promotional activities.

Table 8: Returns to exports, net income to agricultural sector and social welfare per R1 of levy expenditure on export promotion and market development

| | Pooled | | Citrus | | Deciduous Fruits | | Table Grapes | | Wine | |
|-----------------|--------|---------|--------|---------|------------------|---------|--------------|---------|--------|---------|
| | Static | Dynamic | Static | Dynamic | Static | Dynamic | Static | Dynamic | Static | Dynamic |
| EPMD (Rand) | 404 | - | 21 | 1 489 | 1 090 | 621 | 1 332 | 1 372 | 1 273 | 1 351 |
| Net income (R) | 39 | 3 937 | 9 657 | 9 404 | 6 165 | 6 490 | 14 208 | 9 693 | 10 199 | 10 018 |
| †Social welfare | 26 | - | 75 | 509 | 52 | 50 | 89.43 | 82 | 93 | 73 |

† measured as GDP per capita at constant 2010 US\$ while blanks imply insignificant marginal elasticities, hence left out.

At industry level, variation in returns to exports is noted. For instance, while returns in the table grapes and wine industries do not differ much between static and dynamic models, the opposite is true for the citrus and deciduous fruits industries. In the citrus industry, returns to exports in the dynamic model are over 70 times more as compared to the static model while for the deciduous fruits industry, returns to exports are about twice in the static model as much as in the dynamic model. This suggests that the levy expenditure on EPMD in citrus industry generates more returns to exports overtime unlike for the deciduous fruits industry. These findings concur with the earlier findings of the impact of EPMD levy expenditure on exports (Table 5) where we see that the deciduous fruits industry exhibited a higher statistically coefficient (static model) as compared to the citrus industry. Average values imply that table

grapes generate the highest returns to exports (R1352), closely followed by wine (R1312), deciduous fruits (R856) and citrus (R755) per Rand of levy expenditure on EPMD.

For agricultural net income, highest average returns per Rand spend on EPMD were realised by the table grapes industry (R11950), followed by the wine industry (R10109), then citrus (R9531) and deciduous fruits (R6328) industries. In terms of social welfare, estimates suggest that the citrus industry generates the highest returns per Rand spent on EPMD, followed by the table grapes industry, wine industry and then the deciduous fruits industry, in that order. The variations in the returns across industries on the various components of the economy are attributable to the various industry characteristics.

6.0 Conclusion

Levy expenditure on EPMD plays a critical role in boosting exports, increasing net income to the agricultural sector as well as improving the country's social welfare. The table grapes industry exhibits the highest positive impact on exports, agricultural net income and social welfare. Levy expenditure on EPMD mostly boosts exports from the table grapes, wine, deciduous fruits and citrus industry, in that order. For agricultural net income, table grapes industry is still the most positively impacted industry, followed by the citrus, wine and deciduous industries. Much more returns to agricultural net income are realised overtime as a result of levy expenditure on EPMD. For social welfare, the citrus and wine industries follow the table grapes industry and then the deciduous fruit industry exhibits the smallest impact on social welfare as a result of levy expenditure on EPMD.

In terms of returns generated from levy expenditure on EPMD, highest returns to exports and net agricultural income accrue to the table grapes industry but the citrus industry delivers the highest returns to social welfare per Rand spent. For the wine industry, the highest returns per Rand spent equally accrue to exports and agricultural net income. The deciduous fruit industry generates most returns on exports per Rand spent on EPMD than on net agricultural income and social welfare. Conclusively, the impact of EPMD levy expenditure on exports, net agricultural income and social welfare varies across industries. In response to the question embedded in the title of this paper, it could be concluded that levy expenditure matters in the agricultural sector and the economy at large. Policy wise, it is important to mobilise more resources to facilitate the EPMD initiative for all industries.

Recommendation for further research

The variation in the results across the industries may have been due to industry-specific factors, hence the need to further assess how levy expenditure on EPMD influences exports, net agricultural income and social welfare while taking into consideration some of these factors. It is upon such industry specific factors that succinct recommendations may be drawn so as to fully harness the envisaged benefits of the EPMD initiative. Furthermore, this work was limited to only four industries, yet other industries such as cotton, fynbos and potatoes also use levies for EPMD activities. Thus, further research should include these industries.

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Appendix A

Table 2 shows Adjusted t statistics for the LLC test

| | Adjusted t statistic | p-value | Remark |
|--|-----------------------------|----------------|--------------------------------|
| Exports (LnX) | -1.1657 | 0.2833 | Accept Ho at all levels |
| EPMD levy expenditure (LnLevy) | -1.8136** | 0.0349 | Accept Ho at 5% and 10% levels |
| Agricultural Net income (LnAgrK) | -1.9721** | 0.0243 | Accept Ho at 5% and 10% levels |
| Social welfare (GDP per capita (LnAgrK)) | -1.9795** | 0.0239 | Accept Ho at 5% and 10% levels |

Appendix B

Table 4: Average impact of export promotion and market development levies on exports, net income to the agricultural sector and social welfare for the four industries (Dynamic models)

| Exports (LnX) | OLS (n=156) | Poisson (n=156) |
|--|---------------------|------------------------|
| EPMD (LnLevy) | 0.093 (0.131) | 0.014 (0.019) |
| EPMDprevious period (Lg LnLevy) | 0.066 (0.128) | 0.009 (0.018) |
| Citrus ban (EUBAN) | 0.642*** (0.623) | 0.089*** (0.008) |
| Intercept | 4.66*** (0.416) | 1.61*** (0.610) |
| R ² | 0.2405 | |
| Wald chi2 | | 140.82 |
| Pseudo R ² | | 0.002 |
| Fit of the model (Goodness-of-fit chi ²) | | 3.962 |
| Net income to sector (LnAgrK) | OLS (n=156) | Poisson (n=156) |
| EPMD (LnLevy) | 0.213** (0.083) | 0.023*** (0.003) |
| EPMD previous period (Lg LnLevy) | -0.054 (0.078) | -0.005 (0.008) |
| Citrus ban (EUBAN) | 0.269*** (0.444) | 0.029*** (0.005) |
| Intercept | 7.039*** (0.444) | 1.988*** (0.047) |
| R ² | 0.193 | |
| Wald chi2 | | 58.71 |
| Pseudo R ² | | 0.001 |

| | | |
|--|---------------------|------------------------|
| Fit of the model (Goodness-of-fit χ^2) | | 2.865 |
| Social welfare (LnKapito) | OLS (n=160) | Poisson (n=160) |
| EPMD (LnLevy) | 0.002 (0.005) | 0.0002 (0.001) |
| EPMD previous period (Lg LnLevy) | 0.005 (0.005) | 0.001 (0.001) |
| Citrus ban (EUBAN) | 0.018*** (0.002) | 0.002*** (0.0002) |
| Intercept | 7.429*** (0.020) | 2.01*** (0.003) |
| R ² | 0.192 | |
| Wald χ^2 | | 107.97 |
| Pseudo R ² | | 0.000 |
| Fit of the model (Goodness-of-fit χ^2) | | 0.007 |

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