Asian African Journal of Economics and Finance
Vol. 1 No. 1 (January-June, 2021)

A Causal Analysis of Competitiveness and Exports for the Greek Agricultural Sector

***Melfou K.*[*], *Theocharopoulos A.*[**], *Michaelidis A.*[***]**

* Department of Agricultural Products Marketing and Quality Control, TEI of Western Macedonia - Florina Branch, Terma Kondopoulou, 53100 Florina, Greece.

[**] Department of Agricultural Economics, School of Agriculture, Aristotle University of Thessaloniki, (P.O. box 232) 541 24 Thessaloniki, Greece.

[***] Department of Agricultural Products Marketing and Quality Control, TEI of Western Macedonia - Florina Branch, Terma Kondopoulou, 53100 Florina, Greece.

Abstract

This paper explores the development of competitiveness of the Greek agricultural sector with regard to eight countries which are the principal export markets for Greek agricultural goods. The relative level of agricultural total factor productivity between these countries and Greece is taken as the indicator of competitiveness and evidence suggest that Greek agricultural sector experienced a decline of competitiveness overtime relative to some of these countries. During the same period Greek agricultural exports lost a share in their traditional markets. Agricultural export demand functions are estimated for all trading partners and results suggest an elastic demand with respect to the importing country's income. The changes in competitiveness of the Greek agricultural sector are not reflected on export performance in a significant manner, thus placing Greek agricultural exports in a subsidiary position in foreign markets.

Key Words: competitiveness, agriculture, total factor productivity, exports

1. Introduction

The causal relationship between the growth rate of exports and the growth rate of total factor productivity of a country or sector remains a relatively ambivalent issue despite the large volume of empirical work and several theoretical advances in this field during recent decades. Depending on the theoretical framework that is adopted and the empirical approach that is applied, different inferences can be made as to which constitutes the cause and which the effect. It appears quite useful to look into such linkage at country specific level considering the implications the direction of causality might have on the suitability of policies aiming at the development of the particular sector or country (Baldwin 2000, Marin 1992, Nesset, 2004).

This paper has a twin objective: firstly to explore the development of competitiveness of the Greek agricultural sector relative to major trading partners, using relative total factor productivity as the competitiveness indicator and, secondly, to investigate the effect that any changes in the sector's competitiveness and in foreign demand may have on Greek agricultural exports.

The second section reviews the major theoretical underpinnings concerning the association of exports and productivity. The third section refers to the competitiveness of Greek agriculture and looks into total factor productivity over time and its relative performance to the agricultural sectors of countries which constitute the main export markets for Greek agricultural goods. The fourth section includes an empirical investigation with the econometric estimation of export demand functions for eight of the country's main export markets. The final section offers some concluding remarks.

2. Theoretical Framework

In the classical Ricardian model, international differences in labour productivity determine the comparative advantage of a sector/country and constitute the driving force which influences their performance in international trade. In that context, countries are expected to export those goods the production of which is achieved with relatively higher labour productivity. Another factor affecting a country's exports is its relative factor endowments and the intensity of their utilization in the production process. In the Heckscher-Ohlin model of factor endowments relative factor availability and productive capacity are the factors that shape an economy's capability to export. In this framework countries are expected to engage in exporting goods which use at higher intensity factors of production that are in abundance (Kenen, 1994; Krugman and Obstfeld, 2000).

According to these theories, productivity, resource endowment and production technology as well, represent endogenous factors determining the growth rate of exports for each country. Moreover, the view that productivity growth is the factor affecting export growth is supported by research results from various countries. When tested in the case of Austria's industrial sector, Granger causality points to labour productivity improvements being the causal effect for this sector's export growth. (Kunst and Marin, 1989). Similar results are found for Norway where labour productivity is identified as the factor having a clear structural impact on the volume of total exports (Nesset, 2004). Apart from the linkage between productivity and export growth other studies seek out the direction of causality from a country's output growth to the growth of exports. Characteristic examples are two countries, Japan and Canada, which engage in a lot of exporting activities. Evidence produced in both cases indicate that it is the endogenous factors which influence GDP growth and in turn affect the course of exports, rather than the opposite (Boltho 1996, Henriques and Sadorsky, 1996). Similar are the findings of Panas and Vamvoukas (2002) for Greece where the GDP growth rate appears to be the factor which affects the country's growth rate of exports during the period 1948-1997.

Contrary to the classical approach, the more recent export-led growth hypothesis identifies the growth of exports as the stimulus that leads to productivity improvements in a sector or an economy. The view that is being put forward is that positive externalities occurring from raising exports tend to improve the growth rate in total factor productivity with apparent benefits for economic development. The argument that has been extended runs as follows: Rising foreign demand offers the opportunity to a country to benefit from economies of scale due to its opening out

in foreign markets, turns home firms more competitive and leads to anticipated productivity improvements[1]. When a country is exposed to international competition motives arise for the adoption of technological innovations that improve productivity. At the same time, the engagement in exporting activities results in the concentration of investments in the more efficient sectors of an economy where the country has the comparative advantage. Increasing specialization in these sectors is expected to raise productivity. It should be stressed, however, that the direction of causality is not clear-cut as both exports and productivity are linked in an interactive way (Helpman and Krugman 1985, Kunst and Marin 1989, Leichenko 2000, Nesset, 2004).

One of the earliest works to empirically test the view that GDP growth and ceteris paribus, productivity is export-led is by Feder (1982) for a large group of developing countries. The evidence indicate that marginal factor productivity is larger in export-oriented sectors a finding that has been partly attributed to positive externalities that stem from their engagement in exporting activities.

Marin (1992) extended the analysis to developed countries, looking into the relationship between exports and productivity for the USA, Germany, Japan and the UK. Econometric analysis (VAR) showed that the outward orientation of these economies favors the growth rate in productivity. Yamada (1998) employing the same methodology in a group of industrial countries produced somehow mixed results. The hypothesis regarding the direction of causality from exports to productivity has not been rejected only in the case of Italy, while for the USA, Canada, France, Japan and the UK it has not been confirmed[2].

The linkage between exports and productivity may be bi-directional as is supported by Biswal and Dhawan (1998) for Taiwan and by Leichenko (2000) for the USA industrial sector, a view that is founded in Kaldor's 'cumulative causation' theory.

The question of the direction of causality between exports and productivity is treated as an empirical problem and the econometric methodologies applied are more data-driven rather than theory based. Panas and Vamvoukas, (2002) employ an error correction model and Granger causality in the case of Greece and show unidirectional causation from GDP growth to exports, This finding is also supported by the relatively small share of exports in the country's GDP. Taking these into account it seems plausible to explore whether the change in TFP has any effect in the growth rate of exports. More specifically, to consider the influence of relative total factor productivity of Greek agriculture, a competitiveness indicator, on the growth rate of agricultural exports.

3. Exploring the competitiveness of Greek agricultural sector

[1] The linkage between exports and productivity has been explored at the micro economic level as well, as in Sjoholm 1999 and Wagner 2002, for particular industries in Indonesia and Germany respectively. Results for both countries suggest firm's orientation towards exports tends to improve the labour productivity.

[2] Especially for Canada Awokuse, (2003) finds that causality does run from exports to GDP growth a result that differs, nevertheless, from previous work for this particular country.

A country is internationally competitive when it possesses a large concentration of competitive productive sectors and firms. One criterion for the assessment of a sector's competitiveness is the progress made in its total factor productivity growth over time which can bring systemic benefits extending to the whole economy. The factors determining productivity growth are technological progress, productive efficiency, scale economies, changes in the stock of quasi-fixed inputs and various external factors. The result from the direct effect and the interaction between these factors is the change in labour and capital productivity which in turn affects the competitiveness of firms and of productive sectors (Mergos and Karagiannis 1997, Pitelis 1998).

Research results for the Greek agricultural sector, irrespective of the methodological approach that is adopted, agree that the TFP growth rate slowed down near the end of the 70's, a course that continued in the 80's and intensified in the 90's. Mergos and Karagiannis (1997) estimate a cost function in a situation of temporary equilibrium for the period 1961-1993 and find that the TFP growth rate of Greek agriculture falls from 2.98% in the 70's to 1.98% in the 80's. The observed decline in TFP growth rate is attributed to the following factors: 1) The effect of adjustment of quasi-fixed factors of production to their long run equilibrium levels which is positive but falling between the two sub-periods. 2) The effect of scale economies which although it is moderate (16% in the 70's) is further reduced to 7% in the next decade. These impacts were partially offset by the positive effect of technological progress which was sizeable in the 70's (47%) and rose to 75% in the 80's.

Fousekis and Papakonstantinou (1997), estimate the TFP growth rate for Greek agriculture during the period 1971-1993 and find that it declines from 2.52% in the 70's to 0.64 in the 80's. In addition, if changes in the degree of capacity utilization are accounted for, the growth rate in TFP appears to be even smaller, amounting to 2.31% in the first sub-period and 0.58% in the second. Similarly, the TFP growth rate may again be overestimated if other exogenous factors determining productivity are not taken into consideration (Fousekis, 1997). Velentzas (1998) finds the TFP growth rate to amount to 1.68% during the period 1961-1976 and then substantially dropping to -0.07% in the next period 1976-1993. This fall in the TFP growth rate is interpreted as being the result of the path followed for output growth by Greek agriculture which mainly relied on the expansion of input use.

Total factor productivity growth is an indicator that can be used to evaluate the performance of a sector over time and to make comparisons between similar sectors across various countries. It is an index that reveals the ability of a particular sector or an economy to use efficiently the factors of production. A more comprehensive indicator that reflects the competitiveness of a sector is the index of relative productivity which gives the relative change in TFP of a sector between two countries. This index of competitiveness will be used in the present paper first in order to assess the relative performance of the Greek agricultural sector to that of other countries that are main trading partners. The data are taken from Ball et al (2001) who compare the relative levels of farm sector productivity[3] for the USA and nine European countries for the period 1973-1993. The index of relative productivity that is used in this paper is the ratio of the total factor productivity level of Greek agriculture to the corresponding TFP level of each other country.

[3] They employ a purchasing power parity to convert the nominal values of output and input ratios between each pair of countries in order to be able to compare the levels of output, input and productivity.

When the index is greater to one the level of total factor productivity is higher than the TFP level in the other country and vice versa.

The share in total Greek agricultural exports of the countries that are included in this analysis is 54.2% during the period 1973-1993, as can be seen in Table 1.

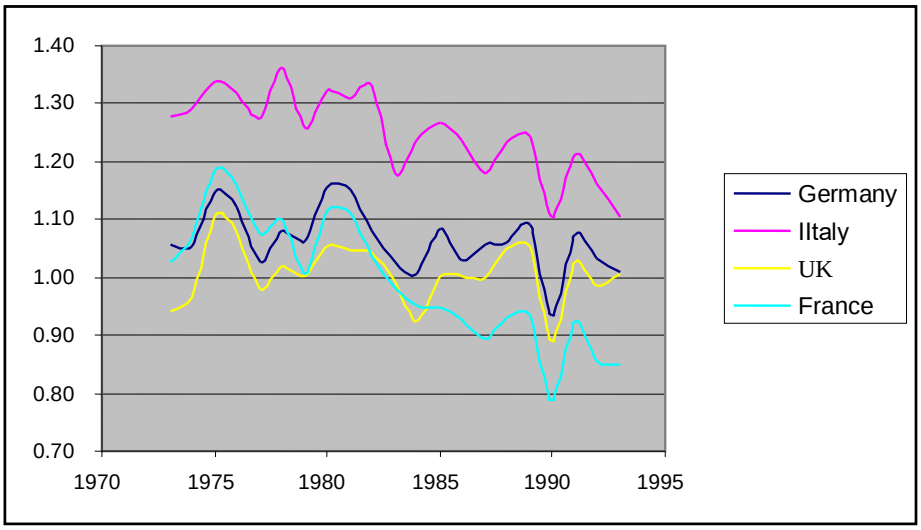
Table 1. Share in total agricultural exports (1973-1993)

Country	Percentage
Germany	18.90%
Italy	14.30%
United Kingdom	7.60%
France	5.30%
Netherlands	5.10%
Belgium	2.30%
Denmark	0.40%
Irland	0.30%
TOTAL	54.20%

Source: OECD

The course of relative productivity between the Greek agricultural sector and that of Germany, Italy, U.K. and France which are the most important export markets is presented in Graph 1. The index is falling over time mostly in relation to Italy and France and less in relation to Germany and the U.K. a fact that derives from either the convergence in the levels of productivity between the agricultural sectors, when the index is greater to one or the divergence in productivity levels when the index is less than one.

Graph 1. Relative productivity (TFP) of Greek agriculture

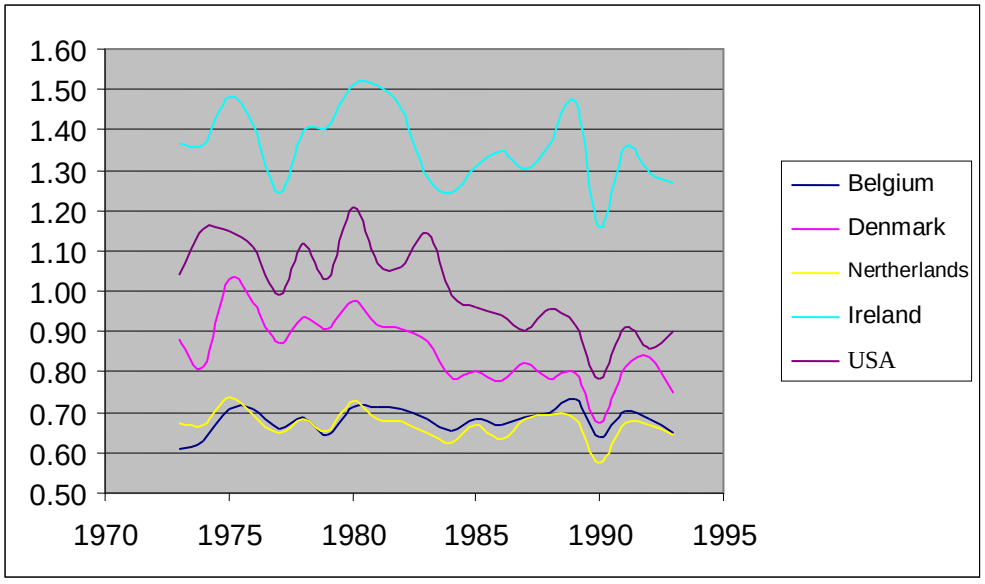


Source: Based on Ball et al (2001)

More specifically, in the case of Greece and Italy, although the original levels of total factor productivity of Greek agriculture where higher in 1973 than that of Italy, the decline in the index overtime suggests a convergence in the levels of productivity between the two countries. The same holds for Germany even though the initial difference in productivity was not as large. Convergence was observed in the case of France as well, until the beginning of the 80's, but subsequently there was a divergence and the levels of productivity in France ranged at levels higher than Greece. The levels of productivity between Greece and U.K. despite some fluctuations do not show marked differences over time.

The levels of productivity of Belgium and the Netherlands remain higher than that of Greece for the whole period (Graph 2). With an exception in 1975, the same happens with Denmark whose productivity levels diverge even further in the 80's and 90's when compared to Greek productivity levels, as can be seen by the falling index. A similar divergence occurs in the case of the USA in the early 80's and 90's, with its productivity levels being higher and rising compared to Greece, an opposite development to what was the case in the previous period. Productivity levels in Ireland remain lower than Greece but the small decline in the index suggests there may be some convergence between the two countries.

Graph 2. Relative productivity (TFP) of Greek agriculture



Source: Based on Ball et al (2001)

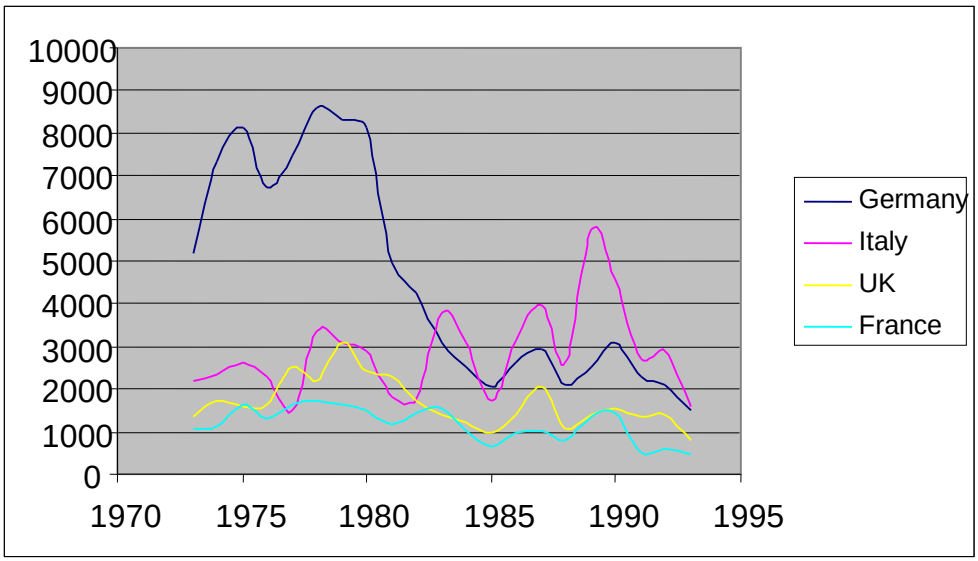
The reduction in relative productivity of Greek agriculture, in the period 1973-1993, to Italy, Germany and Ireland whose productivity levels were originally lower to those of Greece, can be interpreted in the context of the 'catch-up hypothesis' (Ball et al 2001). This hypothesis states that countries which are initially lagging behind in productivity levels eventually eliminate the distance due to the diffusion of technological innovations and the subsequent faster productivity growth rate they can achieve.

Nevertheless, divergence is observed in the productivity levels relative to France, Denmark and the USA, countries which increase the difference with Greek agriculture since the beginning of the 80's. The productivity

levels of the agricultural sector in Belgium and the Netherlands remain steadily at higher levels than Greece throughout this period, with a slight tendency to diverge further.

Turning to Greek agricultural exports, some of the issues that are a cause of concern are the lack of competitiveness, the loss of share in traditional export markets and a limited expansion to new markets, which cause the trade deficit in agricultural products to rise continuously. Graphs 3 and 4 that follow, present the value of Greek agricultural exports, adjusted to the corresponding exchange rates, towards the eight European countries which are Greece's main trading-partners.

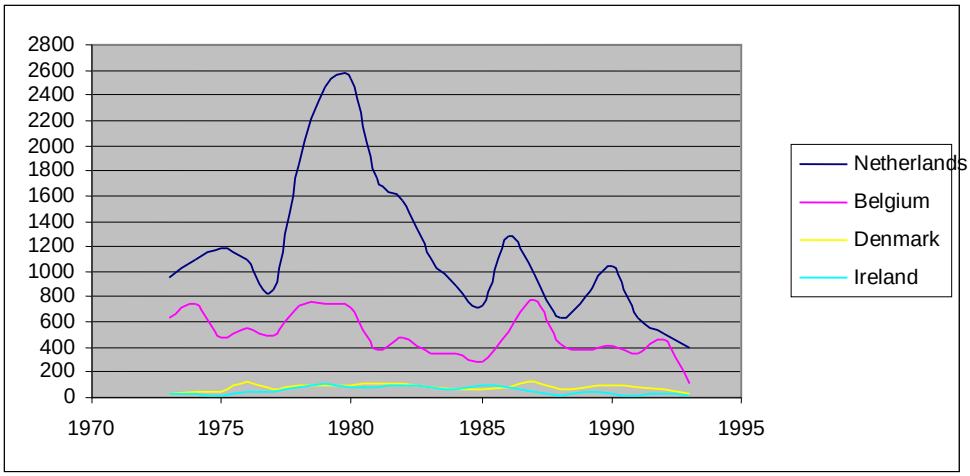
Graph 3. Greek agricultural exports



Source: OECD

Agricultural exports to Germany, France and the UK have been rising steadily until 1980 but after the country's accession in the European Union in 1981, were sharply reduced and become stable, with certain fluctuations, at lower levels than before entry. Exports to Italy continued to increase until 1990 and dropped in the following period (Graph 3). Exports to Belgium, Denmark, Ireland and the Netherlands, countries which account for a smaller share of Greek agricultural exports, were also reduced after 1981 (Graph 4).

Graph 4. Greek agricultural exports



Source: OECD

The conclusion that can be drawn by observing these trends is that with the exception of Italy, in which case the decline in exports occurred in the beginning of the 90's, Greek agricultural exports lost a share in their traditional markets after 1981. At the same time, the competitiveness of the Greek agricultural sector relative to some of these countries has been diminished. More specifically, the farm sector productivity levels of Germany, Italy and France increase over this period and converge to productivity levels of Greece. Especially in the case of France, a turnaround takes place in the beginning of the 80's with the levels of productivity achieved being higher than Greece and diverging further in the next period. As regards Belgium, Denmark and the Netherlands, they maintain the productivity edge over Greece throughout the period and appear to diverge further after 1981. Taking all these into account the issue that will be examined next is to what extent the change in Greek agricultural exports is affected by swaying foreign demand and to what degree by the falling competitiveness of the Greek agricultural sector.

4. Export demand functions

The factors determining a sector's exports are foreign demand and the relative prices of exported goods or alternatively the real exchange rate. The general functional form is as follows:

$$X = f\,(Y_F,\ P_X/P_F,)$$

where X is the volume of exports, Y_F, the income of the importing country , P_X is the index of export prices and P_F is the price index of competitive products. In empirical applications prices are either used as separate variables or as a ratio reflecting relative prices. The exchange rate may also be included as it affects price competitiveness (Stern et al 1976, Goldstein and Khan 1985). However, international competitiveness is a broader notion to price competitiveness as it is also dependent on structural competitiveness. The real exchange rate between two countries is an indicator of competitiveness which reflects relative labour costs adjusted for the extent of trade transactions between countries. Hence, a rise in this index means that costs increase in the home country and competitiveness deteriorates. Arghyrou (2000) estimates demand functions for total Greek exports to eight large foreign markets for

the period 1970-1993 using the foreign country's income and the real exchange rate as explanatory variables. The approach of the present paper differs in two ways: it estimates demand functions specifically for agricultural exports and uses as a competitiveness indicator the relative productivity of the home agricultural sector to that of foreign trade partners, as oppose to the real exchange rate.

The empirical model is in logarithmic form and has the following representation:

$Ln(EXP)t=\alpha+ \beta_1 Ln(GDP)t + \beta_2 Ln(RTFP)t + u_t$

where, EXP is Greek agricultural exports per country-destination adjusted for the exchange rate, GDP is each importing country's real income, RTFP is the ratio of productivity levels of the Greek agricultural sector to the productivity levels of the importing country. The source of data regarding the value of Greek exports and income of foreign trading partners come from OECD.

The coefficient β_1 in the equation gives the income elasticity of export demand. OLS is used for the econometric estimation and the usual assumptions hold for the error term u_t. Table 2 presents the estimated coefficients for each of the eight importing countries. The coefficient of determination is, with the exception of Ireland, quite high for all equations, which means that a considerable part of the variation in the dependent variables is explained by the model. The coefficients β_1 which express the income elasticity of export demand for agricultural products have the expected sign for all countries and are statistically significant at the 5% level of significance, with the exception of Ireland which has a positive sign but is statistically not significant. The coefficient β_2 which reflects the responsiveness of exports to changes in relative productivity is not statistically significant for any country.

Table 2. Estimated coefficients

Agricultural export demand functions							
Country	C	*t-Stat*	**LnGDP**	*t-Stat*	**LnRTFP**	*t-Stat*	R^2
Germany	-10.1	*-0.98*	1.50	*2.15*	-0.81	*-0.87*	0.71
Italy	-62.8	-2.56	3.25	2.83	-1.54	-0.62	0.68
France	-15.5	*-1.39*	1.62	*2.26*	-0.97	*-0.95*	0.61
UK	-18.7	*-1.27*	2.36	*2.12*	-1.62	*-1.38*	0.71
Belgium	-50.6	*-3.54*	3.68	*4.00*	0.68	*0.28*	0.60
Denmark	-64.3	*-5.59*	5.26	*6.14*	0.53	*0.56*	0.83
Netherlands	-32.3	*-1.92*	3.26	*2.50*	-0.64	*-0.47*	0.67
Ireland	0.2	*0.02*	0.85	*0.86*	-0.21	*-0.12*	0.32

The results of the econometric tests are included in table 3. The values of the Schwarz and Akaike information criteria are relatively low, indicating the suitability of this specification. The existence of autocorrelation in the regression residuals is tested with the Breusch- Godfrey test, which is based on the Lagrange multiplier.

Table 3. Statistical tests

Country	Breusch-Godfrey LM	ARCH-LM	Ramsey RESET	Jaque Berra	Akaike info crit	Schwarz criterion.
Germany	0.513	0.281	0.087	1.645	0.101	0.350
Italy	1.832	2.099	0.565	0.559	1.31	1.51
France	1.757	0.681	0.241	0.099	0.504	0.653
UK	0.791	0.199	0.300	0.269	0.475	0.724
Belgium	0.715	1.010	0.182	1.861	1.349	1.598
Denmark	1.605	0.101	2.790	0.000	0.619	0.818
Netherlands	0.682	0.003	0.633	0.656	0.994	1.243
Ireland	6.778	7E-07	0.847	0.269	1.761	1.960

The null hypothesis of no autocorrelation in the residuals can not be rejected at the 5% level of statistical significance. The Ramsey Regression Specification Error Test (RESET) indicates that at the 5% level the null hypothesis of no specification errors cannot be rejected. The null hypothesis of homoscedastic residuals cannot be rejected at the 5% level of statistical significance as indicated by the Lagrange multiplier (LM) test for autoregressive conditional heteroskedasticity (ARCH) in the residuals.

5. Conclusions

This paper looks first at the development of Greek agricultural sector's competitiveness compared with the equivalent sectors in eight of the most important destinations for Greek agricultural exports. The indicator of competitiveness which is used is the relative levels of total factor productivity between Greece and each partner country. Greek agriculture had a competitive edge with regard to the farm sectors of Germany, Italy and France which diminished over time for the first two countries and was lost for the third. Belgium, Denmark and the Netherlands, maintained the competitive advantage over Greece and their farm sector productivity levels continue to diverge from the productivity levels of Greek agriculture, further reducing its competitiveness.

Secondly, agricultural export demand functions are estimated for the eight trading partners with the intention to consider the effect of foreign demand and of competitiveness of the farm sector, on Greek agricultural exports. Demand for Greek agricultural exports is found to be elastic with respect to the importing country's income. In the markets which have the largest share in exports namely, Germany, Italy, UK, France and the Netherlands the income elasticity of export demand takes values from 1.5 to 3.2. The fluctuation in relative total factor productivity of the Greek agricultural sector does not have a statistically significant effect on exports. Hence, it can be concluded that any changes in the competitiveness of the agricultural sector are not transferred and do not appear to influence export performance, leaving a supplementary role for Greek agricultural exports in foreign markets.

References

Arghyrou, M. G. (2000). EU participation and the external trade of Greece: an appraisal of the evidence. *Applied Economics*, 32, p.151-159

Awokuse, T.O. (2003). Is the Export-Led Growth Hypothesis Valid for Canada? *The Canadian Journal of Economics*, 36(1), 126-136.

Baldwin, R.E. (2000). Trade and Growth: Still Disagreement About The Relationships Economics Department, Working Papers No. 264, ECO/WKP(2000)37.

Ball V.E., Bureau, J.C., Butault, J.P., Nehring, R. (2001). Levels of Farm Sector Productivity: An International Comparison, *Journal of Productivity Analysis*, 15, 5–29.

Biswal B., Dhawan, U. (1998). Export-led growth hypothesis: cointegration and causality analysis for Taiwan, *Applied Economic Letters*, 5, 699-701.

Boltho, A.(1996). Was Japanese Growth Export-Led? *Oxford Economic Papers*, 48(3), 415-432.

Feder, G.,(1982). On Exports and Economic Growth, *Journal of Development Economics*, 12, 59-73.

Fousekis P., Papakonstantinou, A. (1997). Economic Capacity Utilization and Productivity Growth in Greek Agriculture, *Journal of Agricultural Economics*, 48, 38-51.

Fousekis, P. (1997). Internal and External Scale Effects in Productivity Analysis: A Dynamic Dual Approach, *Journal of Agricultural Economics*, 48 (2), 151-166.

Goldstein, M., Khan, M.S., (1985). Income and Price Effects in Foreign Trade, in *Handbook of International Economics* vol.2, eds Jones, R.W. and Kenen P.B., Elsevier Science Publishers.

Helpman, E., Krugman, P. (1985). *Market Structure and Foreign Trade*, Cambridge: MIT Press.

Henriques, I., Sadorsky, P. (1996). Export-Led Growth or Growth-Driven Exports? The Canadian Case, *The Canadian Journal of Economics* 29(3), 540-555.

Kenen, P. (1994). *The International Economy*, Cambridge University Pres.

Krugman, P, Obstfeld, M. (2000). *International Economics – Theory and Policy*, Harper Collins Publishers

Kunst, R.M., Marin, D. (1989). On Exports and Productivity: A Causal Analysis, *The Review of Economics and Statistics*, 71(4), 699-703.

Leichenko, R.M. (2000). Exports, Employment, and Production: A Causal Assessment of U.S. States and Regions, *Economic Geography*, 76(4), 303-325.

Marin, D. (1992). Is the Export-Led Growth Hypothesis Valid for Industrialized Countries? *The Review of Economics and Statistics*, 74 (4), 678-688.

Mergos,G., Karagiannis, G., (1997). Sources of Productivity Change under Temporary Equilibrium and Application to Greek Agriculture, *Journal of Agricultural Economics*, 18 (3), 313-329.

Nesset, E., (2004). Exports and productivity in a small open economy: a causal analysis of aggregate Norwegian data, *Journal of Policy Modeling*, 26, 145-150.

Panas, E., Vamvoukas, G. (2002). Further evidence on the export-led growth hypothesis, *Applied Economic Letters*, 9, 731-735.

Pitelis, C.N. (1998).Productivity, Competitiveness and Convergence in the European Economy: Supply-SideConsiderations, *Contributions to Political Economy*, 17, 1-20.

Sjoholm, F.(1999). Exports, Imports and Productivity: Results from Indonesian Establishment Data, *World Development*, 27(4), 705-715.

Stern, R. M., Francis, J., Schumacher, B. (1976). *Price Elasticities in International Trade*, Basingstoke, London.

Velentzas, K. (1998). Technical Change and Productivity Growth in Greek Agriculture, Agricoltura Mediterranea, 128, 1-6.

Wagner, J. (2002). The causal effects of exports on firm size and labor productivity: first evidence from a matching approach, *Economics Letters* 77, 287–292.

Yamada H., (1998). A note on the causality between export and productivity: an empirical re-examination, *Economics Letters,* 61, 111–114.