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Measuring the Intensity of Competition in the Greek Imported Meat Market

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Abstract

Greece is self-sufficient in crop production but it relies heavily on meat and dairy imports. The Greek balance of trade for agricultural products has steadily declined due to the heavy imports of meat and dairy products. The estimation of elasticities of import and export demand functions has always been used in international economics to determine the causes of trade deficits and to explain the past as well as, to forecast the future. Despite the published research on the analysis of import meat demand for several counties, there is just one work concerning the analysis of Greek import meat demand. However, the results of this work are not differentiated by supply source. In order to alleviate this shortcoming, this paper analyzes the Greek meat import demand differentiated by source. The model explains more than 86% of data variation. The empirical results indicate that due to inelastic demand, German beef exporters could gain market share in the Greek market through competitive prices. The expenditure elasticities for beef imported from France and Germany reflects the strong long-running preferences of Greek market from these countries in terms of beef. Also, expenditure elasticities reveal that pork imports from Germany have the most to gain from an increase in meat import expenditure followed by Italian and Dutch poultry meat and French pork meat. Hence, a Greek exit from the financial crisis which most probably will lead to an expansion in meat market is favorable for above mentioned meats and counties. Moreover, the results indicate that in the pork market, France has a competitive advantage compared with the rest of the pork suppliers (Germany, Netherlands and ROW). Finally, poultry from Italy has a competitive advantage compared with the poultry from the Netherlands. The estimates of cross-price elasticities indicate asymmetric substitutability relationships between beef from France and various countries (ROW) and as regarding the lamp sector complementarity relationships between Bulgaria and New Zealand. Also, the competition is strong between France and Germany in the pork sector and between France and Others Counties (ROW) in the poultry sector. Finally, seasonality is found to have a significant effect in determining Greek meat imports.

Key words: imported demand, Greek meat imports, AIDS model, source differentiation.
JEL Classification: D12, F14, Q17

1. Introduction

Rapid economic growth and rising per capita income especially during the first decade of second millennium along with the abolishment of technical, legal and bureaucratic barriers to free trade and free movement between the EU's member countries have been given as reasons for the increase in Greece imports especially from EU countries. Although EU counties are the main suppliers of meat in the Greek market, the imports have been negatively affected by the economic crisis.

Greece has a historical record of protracted trade deficits and low openness. It has been running a negative trade balance of around 10% of GDP between 1995 and the late2000s, peaking at 14.5% in 2008. Since then, the gap has been closing. However, the increasing export-to-GDP ratio masks the effect of falling GDP. Correcting for this denominator effect reveals that the narrowing of the trade balance took place mainly on the back of falling imports while exports remained largely flat. While Greece is a world renowned producer of agricultural products, the country is dependent on imports of many key products to meet its needs. The agricultural sector is basically self-sufficient in crop production, but it relies heavily on meat and dairy imports. According to the Greek Statistics Authority, (EL.STAT), the balance of trade for agricultural products for the period 2004-2009 was steadily decreasing. Meat products represent almost the 46% of the agricultural trade deficit. During the period 1992-2003, quantities of imported meat increased by 5.6% annually while between 2005 and 2008 the meat imports increased by 14%. France, Germany and Netherlands are the main suppliers to Greece. Also, some quantities of meat, especially turkey, are imported from Italy. Domestic products cover almost 35% of bovine meat consumption and the rest is covered by imports. In recent years the level of agricultural imports has decreased. Due to the ongoing recession, imports were reduced, with the trade deficit dropping by 5.7%, while between January and October of 2013 the trade balance deficit dropped by 13.1%. Finally, the trade deficit of agricultural products decreased significantly in the first quarter of 2013 dropping to € 280,2 million from € 353.5 million of the first quarter of 2012 due to the significant increase in exports and smaller increase in imports (Alpha Bank 2013)

In applied International Economics, the analysis of the effects on trade flows caused by the changes of income and prices, is a very interesting issue. The econometric specifications of import and export demand functions and then the estimation of the elasticities have always been used in international economics to determine the causes of trade because of their capacity both to explain the past and to forecast and, consequently, plan the future. The increasing interdependence among countries and their efforts to maximize benefits from international trade makes the import and export demand specifications essential not only for forecasts, planning and policy formulation but also for the quantification of welfare gains from trade (Hamori S., Yin F., 2011). Consequently, policy evaluations and simulations require reliable estimates of demand responsiveness to prices and expenditures. Welfare analysis is also based on accurate demand estimates.

In recent years efforts have been made to estimate the behavior of the imports (among others Brenton P., 1989; Clarida, R, 1996; Boonsaeng T. and M.K. Wohlgenant, 2009) The similarity of these works is the use of aggregate good which becomes a limitation if one wishes to obtain detailed results with respect to each individual product. Hence, an analytical approach that differentiates goods by origins appears to be a convenient way to complete an exhaustive study of imports. Import allocation models have been used to investigate import demand for several products. Among others, Yang and Koo (1994) and Henneberry and Hwang (2007) and Mutondo and Henneberry (2007) for meat imports, Molina (1997) for imports of vehicles, Carew et al (2004) for imports of Table wine and Andayani and Tilley (1997) for imports of fruits. However, little effort has been made to estimate Greek meat import demand with the only exception being the work of Pantzios and Fousekis (1998; 1999) in which they estimated meat import behavior of Greece using data from FAO and alternative

differential demand systems. Although, both of these studies addressed meat import demands in Greece, meats are not differentiated by source of supply.

In this light, the general objective of this study is to estimate the Greek demand for meats from different sources. More specifically, the objective of this study is to analyze the impact of economic factors on several EU countries' competitiveness in the Greek meat import market and to provide estimates of meat import demand elasticites for this market. To this end, we have chosen a source differentiated version of the Almost Ideal Demand System (AIDS) proposed by Deaton and Muellbauer (1980), where the expenditure function is rewritten to approximate import behavior that differentiates meat goods by origin. The remainder of this study is organized as follows: in the next section, the model of the Greek meat demand is presented. That section is followed by a discussion of empirical results. The summary and conclusion are given in the final section.

2. Model specification

The early literature of the trade modelling was mostly concerned with individual countries and large aggregates of commodities due to the fact that researchers were interested in predicting gross trade flows and evaluating the impact of exchange rate fluctuations on balance of payment. However, moving the interest of empirical research into analyzing intervention policies and competitiveness of different exporters, the methodologies shifted towards microeconomic foundations.

The Argmington trade model was one of the most popular models that was used as a vehicle in empirical trade analysis. (among others Babula, 1987; Penson and Babula1988; Duffy et al, 1990). The Armington model provides an insight into the international trade theory providing a way to account for the fact that commodities are differentiated by place of origins. Thus this model allows for imperfect substitution among goods from different origins. However, this models suffers from the restrictive assumptions of a constant elasticity of substitution (CES), and homotheticity which may lead to biased parameter estimates (Alston et al, 1990; Winters, 1984)

Over the last twenty years, a wide range of solutions has been implemented to overcome the weaknesses of the Armington model. More flexible functional forms for estimating demand systems have become available and extensively used in domestic demand analysis. Hence, following the seminal paper of Winters (1984), a long list of econometric studies have been published, dealing with the estimation of import demand models by geographical sources using flexible functional forms such as AIDS, Rotterdam, translog, generalized Leontief and normalized symmetric quadratic functional forms, etc.

The AIDS model of Deaton and Muellbauer (1980) is one of the most widely used models. It represents a a flexible compete demand system and it does not require the additivity of the utility function. It satisfies the axioms of choice exactly and under certain conditions aggregates perfectly over consumers. De Gorter and Maike (1987) and Alston et al (1990) are among the first researchers that used the AIDS specification in the context of estimating source-differentiated demand for imported commodities. Although all imports of commodities considered in their study are aggregated into a single commodity, the common assumption of weak separability between imported and domestic demand is relaxed. Even though, theoretically formulation of source-

differentiated AIDS model for more than one good is straightforward, in practice such a model will grow in size very fast. For instance, for five groups of products and three sources of imports in each group, an unrestricted AIDS model will have 18 equations and 18 x (18+2) = 360 parameters to estimate. Under such circumstances, even the standard assumptions of adding-up, homogeneity and symmetry may not be sufficient to solve the degrees-of-freedom problem.

To reduce the number of parameters to be estimated, Yang and Koo (1994) specify an AIDS model and introduce an assumption of block- substitutability (BLSUB). Contrary to the Armington model which requires two-stage budgeting, according to the assumption of block-substitutability, expenditures are allocated simultaneously over all products under consideration. This allows for direct cross-price effects among the products belonging to different groups. Their model assumes, however, that while allocating expenditures among different sources of the same good, consumers do not distinguish among sources of other goods.

Following Yang and Koo, the Source Differentiated AIDS (SDAIDS) model is specified as:

$$w_{ih} = a_{ih} + \sum_j \sum_k \gamma_{ihjk} \ln(p_{jk}) + \beta_{ih} \ln\left(\frac{E}{P^*}\right) \text{ όπου} \quad (1)$$

where subscripts i and j indicate goods (i,j=1,2,….,N) and h and k indicate countries of origin of sources. Good I may imported from m different origins, while good j may have n origins (where i≠j , h=1,….,m) and k=1,…,n). wih measures the budget share of good I imported from source h (product ih), pjk is the price of good j imported from source k (product jk). E is the total expenditure on all goods in this demand system and P* is the price index defined as:

$$ln(P^*) = a_0 + \sum_i \sum_h a_{ih} \ln(p_{ih}) + \frac{1}{2} \sum_i \sum_h \sum_j \sum_k \gamma^*_{ihjk} \ln(p_{ih})(p_{jk}) \quad (2)$$

The model in equation (1) is nonlinear as a result of nonlinear price index in equation (2). To make the system linear, as Deaton and Muellbauer suggest, we substitute the nonlinear price index with the linear one specified by Stone as: $P^* = \sum_i \sum_h w_{ih} \ln(p_{ih})$. In order to avoid the simultaneous equation bias since wih is used as dependent variable in equation (1) is employed as an independent variable in the Stone's price index, we employed a lagged wih in the Stone's price index as proposed by Eales and Unnevehr (1988).

Model's specification (1) allows for different responses on the part of an importing country to different goods and origins. Nevertheless, the SDAIDS may suffer from a degree of freedom problem in empirical specification depending on the number of goods and origins as was mentioned before. To avoid this and in order to reduce the number of parameters, Yank and Koo introduced the assumption of block substitutability where $\gamma_{ihjk} = \gamma_{ihj} \; \forall \; k \in j \neq i$ which indicates that cross-price effects on different sources in good j on the demand for origin h in good i are the same for all the goods from different sources in good j. For example, block substitutability says that the Greek demand for German beef shows the same cross-price response as pork meat from Denmark or pork meat from Netherlands. Hence, this assumption transformed the proposed SDAIDS model in (1) as:

$$w_{ih} = a_{ik} + \sum_k \gamma_{ihk} \ln(p_{ik}) + \sum_{j \neq i} \gamma_{ihj} \ln(p_j) + \beta_{ih} \ln\left(\frac{E}{P}\right) \quad (3)$$

where $\ln(P_{j(t)}) = \sum_k w_{jk(t-1)} \ln(p_{jk(t)})$.

This restricted version of SDAIDS (RSDAIDS) has *m+(n-1)+2* parameters to be estimated in each equation whereas the SDAIDS model has *mn+2* coefficients in each equation if all goods have the same number of import origins(Yang and Koo, 1994).
The basic demand restrictions for import behavior are expressed in terms of the coefficients of the RSDAIDS model as:

Adding up $\sum_i \sum_h a_{ih} = 1;\ \sum_h \gamma_{ihk} = 0; \sum_i \sum_h \gamma_{ihk} = 0; \sum_i \sum_h \beta_{ih} = 0\ ;$ (4.1)

Homogeneity $\sum_k \gamma_{ihk} + \sum_{j \neq i} \gamma_{ikj} = 0$; and (4.2)

Symmetry $\gamma_{ihk} = \gamma_{khi}.$ (4.3)

Because of Block substitutability, symmetry restriction cannot be applied among goods but only within group goods.

Marshallian measures of price elasticities are computed from the estimated parameters as:

$$\varepsilon_{ihh} = -1 + \frac{\gamma_{ihh}}{w_{ih}} - \beta_{ih} \quad (5.1)$$

$$\varepsilon_{ihk} = \frac{\gamma_{ihk}}{w_{ih}} - \beta_{ih}[\frac{w_{jk}}{w_{ih}}] \quad (5.2)$$

$$\varepsilon_{ihj} = \frac{\gamma_{ihj}}{w_{ih}} - \beta_{ih}[\frac{w_j}{w_{ih}}] \quad (5.3)$$

Equation (5.1) represents own-price elasticities, equation (5.2) represents cross-price elasticities between the same goods from different sources and equation (5.3) represents cross-price elasticites between different goods. Expenditure elasticity is specified as:

$$n_{ih} = 1 + \frac{\beta_{ih}}{w_{ih}} \quad (6.)$$

It should be noted that these elasticities are derived by assuming $\partial lnP^* / \partial lnP = w_j$ (Chalfant, 1987). Also, since the model is highly disaggregated and expenditure shares are small, the compensated elasticities are approximately equal to uncompensated elasticities (Green and Alston, 1990)

3. Data, estimation and empirical results

3.1 Data Description

Quarterly data from 1995 to 2014 was employed for this study. Greek's meat imports are grouped into five goods: beef, lamp, pork, poultry and other meats. Import quantities and values were taken from EUROSTAT data base, International Trade,

Standard International Trade Classification. Imported quantity is reported in 100Kg and values in Euros. Imported prices for individual meats by origin are not publicly available. Hence, as a proxy for imported price was employed the unit value obtained by dividing the value by the quantity was used. However, the unit price is not what consumers actually pay. According to Yang and Koo (1994), it is difficult if not impossible to construct a data set with imported values and domestic prices. This is especially so when the marketing channels are different between import and domestic goods. Thus, this study assumes separability between domestic and import meats.

Table 1: Summary statistics for Expenditure shares for Greek Meat Imports 1995-2014

	Mean	Std. Dev.	Min	Max
Beef	**0.3938**	**0.0821**	**0.1208**	**0.5789**
Germany	0.0389	0.0109	0.0212	0.0724
France	0.2137	0.0491	0.0481	0.3193
Netherlands	0.0637	0.0262	0.0184	0.1577
Rest of World	0.0774	0.0224	0.0307	0.1314
Lamp	**0.0428**	**0.0223**	**0.0059**	**0.0951**
Bulgaria	0.0117	0.0100	0.0000	0.0428
New Zealand	0.0188	0.0100	0.0027	0.0471
Rest of World	0.0123	0.0073	0.0014	0.0352
Pork	**0.3308**	**0.0762**	**0.1658**	**0.5125**
Germany	0.0321	0.0230	0.0055	0.0940
France	0.0603	0.0215	0.0167	0.1086
Netherlands	0.1620	0.0376	0.0905	0.2531
Rest of World	0.0764	0.0278	0.0429	0.2472
Poultry	**0.1867**	**0.1283**	**0.0642**	**0.5007**
France	0.0245	0.0236	0.0027	0.1034
Italy	0.0578	0.0474	0.0055	0.2086
Netherlands	0.0343	0.0247	0.0096	0.1094
Rest of World	0.0700	0.0499	0.0219	0.2333
Other Meats	**0.0459**	**0.0099**	**0.0258**	**0.0752**

The Standard International Trade Classification (S.T.I.C.) headings were used are: for beef 011.11 011.12 011.21 and 011.22 for lamp 012.11 012.12 and 012.13 for pork meat the headings 012.21 and 012.22 and finally for poultry 012.31, 012.32, 012.34 and 012.35. The rest of the headings belonging in the Division 01 were aggregated into a single category "Other meats". The sample statistics of expenditure shares for each product is summarized I Table 1. Among the five meat items, the larger import accounts on the average for beef nearly 39% followed by Pork (33%) and then Poultry (18%) and Lamp (4%).

According to the literature review on the meat import models (Yang and Koo; 1994, Mutondo and Henneberry; 1997, Henneberry and Hwang; 2007) a country is identified as an import origin if it exported in terms of values over 10% for each meat category. Import sources that took less than 10% were combined into a single country named "Rest of Word" for each meat category. As was mentioned in the introduction,

individual EU countries are the main suppliers concerning meat imports in Greece. The main beef exported countries for the Greek market are France and then Netherlands and Germany. Poultry was imported mainly from Italy followed by France and Netherlands. According to the trade data of Eurostat (see Figure 1), since 1995 the main supplier of import beef in Greece has been France, covering almost 60% of the total beef imports and 30% of the total meat imports. The Dutch beef imports followed a downward trend while the German beef exports to Greece exhibited a more or less stable trend. Although, after 2010 the German beef exports in the Greek market shows an upward trend.

Imports of lamp meat represent a negligible part of total meat imports since Greece has a self-sufficiency of 85%. However, these imports mainly cover the high demand for lamp in the spring season due to Greek Orthodox Easter. The main suppliers for lamp are traditionally New Zealand and Bulgaria because of the proximity with the Greek market. Due to a Foot Mouth Disease (FMD) outbreak in Bulgaria (EU, 2011), the lamp imports after 2006 followed a downward trend.

Moreover, the main supplier in pork meat for the Greek market is the Netherlands for the whole period under examination. Remarkable is the downward trend that followed the French pork exports in Greece (Figure 3), which were substituted by imports from Germany which since 2004 have exhibited an upward trend most likely as a result of the investments that the supermarket chains LIDL and ALDI realized in Greece. The upward trend the Italian poultry exports to Greece exhibit up to the end of 2003 (see Figure 4) is mainly due to turkey exports which substitute for other meat products (mainly ham and bacon) for the sake of a healthier diet. The last two years however, Denmark and then Germany appear as the main suppliers of poultry meat in the Greek market.

Figure 1: Evolution of Beef imported shares

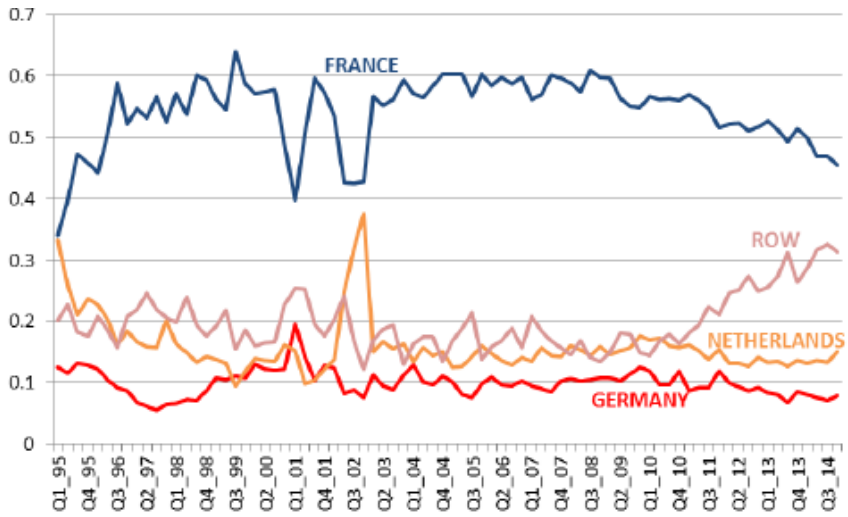


Figure 2: Evolution of Lamp imported shares

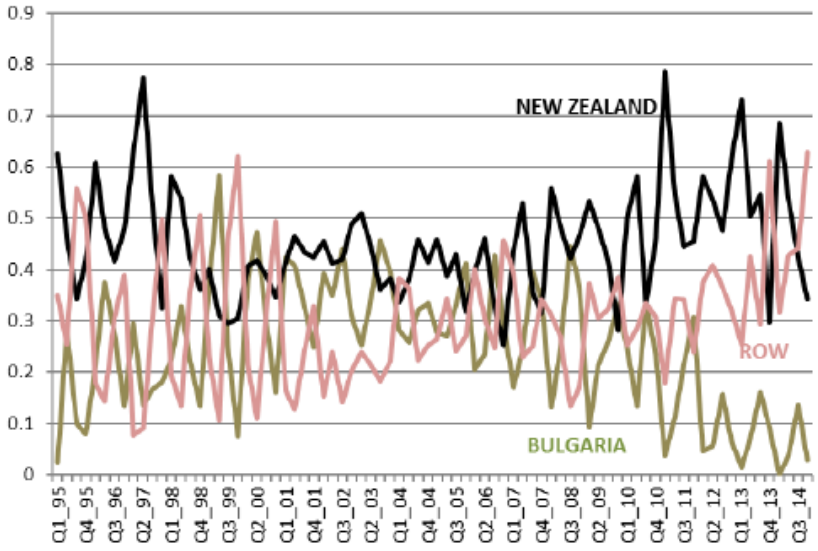


Figure 3: Evolution of Pork imported shares

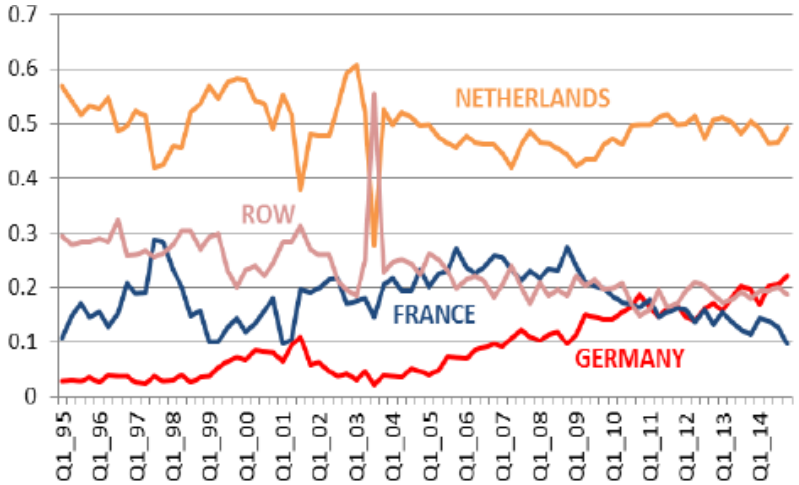
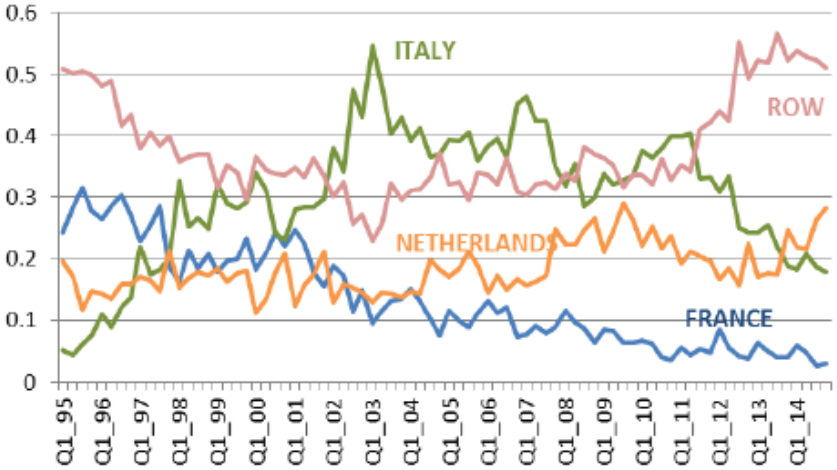


Figure 4: Evolution of imported Poultry shares



3.2 Estimation Procedure

Since the Greek import model consists of five meat items and four origins for beef three origins for lamb and four origins for pork and poultry, the restricted SAIDS model consist of sixteen equations. Because meat expenditure shares (wih) sum to one, the demand system composed of expenditure share equations for the five source-differentiated meats would be singular. Hence, the last equation of "Other meats" was dropped in order to avoid singularity. The coefficients of the dropped equation were recovered from the adding-up condition. In order to capture seasonality effects, the RSDAIDS model (3), seasonal dummies variables were included as an intercept shifter. So, the final version of the estimated model is given as:

$$w_{ih} = a_{ik} + \sum_{s=1}^{3} \delta_{is} D_s + \sum_k \gamma_{ihk} \ln(p_{ik}) + \sum_{j \neq i} \gamma_{ihj} \ln(p_j) + \beta_{ih} \ln\left(\frac{E}{P}\right) \qquad (7)$$

Since the model is a simultaneous equation system, and there are restrictions across equations (group symmetry), Seemingly Unrelated Regression (SUR) do take them into account which Least Square (LS) do not. For this reason, SUR is more efficient than LS estimator. Also, in order to avoid endogeneity problems, for the estimation of price index in equation (3) the budget sharers that employed are one time lagged. Therefore, the system of equations is estimated using seemingly unrelated regression method. The STATA/MP 13 (2013) software is used to estimate fifteen equations by the SUR method with homogeneity and symmetry conditions imposed. Because of block substitutability, symmetry conditions among goods are not applicable. Symmetry is applied only within each good. In the empirical analysis of the demand system the properties of homogeneity and/or symmetry are often rejected. This is normally because consumers are unlikely to adjust instantaneously to changes in price incomes or other determinants of demand. Such consumers' behavior might be caused by psychological factors such habit formation, habit persistence, or inventory adjustments. So, both homogeneity and symmetry tests were conducted using likelihood ratio test. Both restrictions were rejected by the data (LR statistics are 51,39 with 15 degree of freedom and 90,23 with 36 degree of freedom respectively for homogeneity and both homogeneity and symmetry).

Following Hayes et al (1990), the hypothesis of block separability among goods and product aggregation were tested. The following constraints in terms of known shares and estimate parameters of RSDAIDS model were tested:

Block Separability

$$\gamma_{ikj} = w_{ih} w_{jk} \gamma_{ij} \quad \forall\, j \neq i \qquad (8)$$
$$a_{ih} = a_i$$

Product Aggregation

$$\gamma_{ihjk} = \gamma_{ij} \qquad (9)$$
$$\beta_{ih} = \beta_\iota$$

Where γij is the cross-price parameters between groups i and j. The γij are estimated from an aggregate (non-source-differentiated) meat model five-goods AIDS model where perfect substitutability is assumed. Wald F-test was employed to test both hypotheses. These tests were conducted by imposing the restrictions in (8) and (9) on the RSDAIDS model.

The test results for product aggregation and block separability are presented in Table 2. According to the test results we conclude that the data support the RSDAIDS. More specifically, the tests for the aggregation over sources for all meat products are strongly rejected. Moreover, the null hypotheses that the meat import demand can be estimated separately for each good is rejected as well at 1% significant level but lamp that is rejected at 5% significant level.

Table 2: Results of Product Aggregation and Block Separability for the RSDAIDS Model

Type of Test	Null Hypothesis	F-test	DF	P-value
Product Aggregation	Beef can be aggregated	5.70E+05	18	0.000
	Lamp can be aggregated	1.60E+05	12	0.000
	Pork can be aggregated	1.00E+05	18	0.000
	Poultry can be aggregated	19320.01	18	0.000
	All the above	1.20E+06	66	0.000
Block Separability	Beef is separable from all other meats	97.95	16	0.000
	Lamp is separable from all other meats	23.70	12	0.022
	Pork is separable from all other meats	91.52	16	0.000
	Poultry is separable from all other meats	48.25	16	0.000
	All the above	392.57	60	0.000

3.3 Empirical Results

The results of the SUR system are shown in Table 3. The majority of the estimated equations contain a number of statistically significant coefficients. The goodness of fit of the whole system was measured by the McElroy's R2 value (McElroy, 1977): $R^2 = 1 - \frac{\hat{u}'\hat{\Omega}^{-1}\hat{u}}{y'\left(\hat{\Sigma}^{-1}\otimes\left(I-\frac{ii'}{T}\right)\right)y}$ where T is the number of observations in each equation, **I** is an T × T identity matrix and *i* is a column vector of T ones. Overall, the model fits the data well since *McElroy* R^2 is equal to 0.83). The expenditure coefficients are statistically significant for the most of the goods while most of the own-price coefficients are positive and statistically significant as well. The seasonal dummy variables in beef equations show that German beef tend to decrease during the spring and summer while French beef tends to decrease as well during the spring something that is accordance with the Greek religious habits. In contrast with the beef market, the seasonality for lamp imports was confirmed since the dummy variables show that imports of lamp meat from Bulgaria and New Zealand tend to increase primarily during spring and summer mainly due to Orthodox Easter and increased tourism respectively. Also the seasonal dummy variables in poultry equations show that poultry meat tend to increase during the first quarter due to the increased imports of turkey since it is the traditional meal for the Christmas eve dinner.

Table 4 presents the uncompensated elasticities. Prior to further interpreting the elasticity estimates, the methodological framework that typically underlies demand system should be brought to attention. In analyzing demand systems, the consumer is assumed to follow a multi-stage approach in allocating his income (expenditure). In the first stage, the consumer (in our case Greece) allocates expenditure among food and non-food categories, assumed to be separable with each other. In a second stage, food

expenditure allocated to each food category (among others meat), which is further allocated among the goods making up the meat category. Hence, the price and expenditure elasticities estimated here must be interpreted as conditional on the country's expenditure allocated to the examined group of meat, as a whole. Also, price elasticities are calculated with regard to budget shares and not with respect to quantities. This implies that an increase in import price may lead to a decrease in budget share.

Concerning the beef market, all expenditure elasticities (last row of Table 4) are positive and statistically significant except beef from the Netherlands is negative and non-significant. The expenditure elasticities are below unity for beef from France and Germany reflecting the strong long-running preferences of Greek consumers for beef from these countries. Beef from France shows the highest expenditure elasticity (0.91) because of its perceived superior quality. Also, among the imported beef products, the demand for German beef is more expenditure elastic (0.71) compared with the demand for Rest of World (ROW) beef (almost 0.43), implying a higher percentage of beef would be imported from Germany compared to various countries, given an increase in the size of the meat market in Greece after the end of the debt crisis that hits Greece.

With regard to lamp market, all the expenditure elasticities are positive and statistically significant. The expenditure elasticity is high for lamp from Bulgaria (2.54) followed by New Zealand lamp (1.30) and ROW lamp (1.56). These results suggest that given a percentage increase in Geek meat import expenditures, a significantly higher percentage of lamp demanded in Greece would be imported from Bulgaria compared to lamp from New Zealand and/or ROW countries. The proximity of Bulgaria to the Greek market is the reason that the expenditure elasticity of Bulgarian lamp is higher than the expenditure elasticity of New Zealand.

As far as the pork market is concerned, all the expenditure elasticities are positive and statistically significant. The expenditure elasticities of German and French pork imports (2.98 and 1.28 respectively) are positive and highest than those of Dutch imports pork from rest of World (0.90 and 0.81 respectively).

Finally, concerning poultry market, all the elasticities are positive and statistically significant except the imported poultry from France which is negative and statistically significant. The high value of expenditure elasticity of Italian poultry imports (2.37) imply that in a given percentage increase in Greek meat imports, higher percentage of poultry from Italy will be imported to Greece compared to Dutch where the expenditure elasticity is (1.86) and the ROW counties (1.03). Also, the negative expenditure elasticity for French poultry reports this product as inferior good reflecting that given an increase of the imports of poultry market, birds from France will lead to a fall of demand and may lead to changes to more luxurious substitutes such as poultry from Italy and/or Netherlands.

Consistent with what is expected from economic theory, the results of this study show negative Marshallian own price elasticities and statistically significant for all individual meats except the own-price elasticity of pork from France which is positive but nor statistically significant. Regarding the beef market, own-price elasticities for beef from different sources are less than one in absolute values indicating inelastic demand, except for beef imported from Germany that is elastic (-1.93) indicating that German beef exporters could gain market share in the Greek market through competitive prices. As far as the lamp market is concerned, the own-price elasticities indicate elastic demand for the main sources (Bulgaria and New Zealand, -2.22 and -1.31 respectively) while within pork group the own-price elasticities suggest inelastic

demand for all sources. Finally, for the poultry market, own price elasticities are below unity for Italy and Netherlands (0.95 and 0.55 respectively) and for poultry from France and ROW counties are greater than one (-2.16 and -1.47 respectively) indicating elastic demand.

The significance cross-price elasticities between differentiated sources of various imported meats imply significant impact on imported meats as a result of imported meat price changes. In the context of trade, a positive cross-price elasticity suggests that the product in question face competition each other. Products are not competing, if their cross-price elasticity is not significantly different from zero. On the other hand, a negative cross-price elasticity is more difficult to be explained. Cross-price elasticities between German, French and Dutch beef are not significant. This reflects the fact that these three beef products do not substitute for each other in the same segment of the market, possibly due to quality differences. The estimates of cross-price elasticities indicate substitutability relationships between beef from France and various countries (ROW). The volume of beef from various countries is more sensitive to a change of price of French beef than the volume of French beef to a change of price of beef from others countries. Also, the empirical results reveal weak substitutability between beef from various counties (ROW) and Netherlands as well as between beef from various counties (ROW) and France. As far as the lamp sector is concerned, the cross price elasticities between Bulgaria and New Zealand are negative indicating complementary among them. This result is related to the fact that imports from New Zealand are subject to quotas, reducing price competitiveness. Also, Dutch pork exports show a weak substitution with pork imports coming from Germany Regarding the pork market, the statistically significant and positive cross-price elasticities between German and French pork imports indicates that there is a certain degree of substitutability. In all other cases, the lack of competitiveness might be due to different pork products and cuts of meat are imported in the Greek market from the above mentioned sources. Also, several restrictions imposed on the data such those of symmetry and homogeneity, might account for the complementary relationships. Finally, as regards the poultry market, the competition is strong between France and ROW but asymmetric. Greek imports from France are more sensitive to a price change of poultry meat from various countries (ROW) (1.14) than the opposite i.e. imports from ROW to a French price change (0.34). Also, weak complementarity relationship is shown between poultry from Netherlands and France. On the other hand, a weak substitutability is shown between Netherlands and. Italy.

4. Summary and Conclusions

This paper models the demand of imported meat for Greece during the period 1995-2014. This is the first study that analyzes the Greek import meat demand differentiated by source. Meat imported by Greece categorized into five goods: beef, lamp, pork poultry and other meat. Each good was imported from different sources with different number of origins. The restricted version of source differentiated AIDS model was employed as the vehicle and assuming block substitutability this study estimates the impact of prices and expenditures on the Greek demand of source differentiated meats. Tests of two hypotheses regarding the behavior of Greek meat consumers were conducted: (a) separability of meat categories from one another (beef, lamp, pork, poultry and other meats), (b) non-source differentiation (product aggregation) of individual meats.

Results of separability tests indicate that the various studied meats are not separable from one another. Additionally, non-source differentiation was rejected, and therefore meats from various sources were treated as different products and demand estimation was conducted for these disaggregated products.

Results of this study shed light on Greek market with regard to imported meats. The calculated expenditure elasticities indicate that France and Germany have the most to gain from an increase in the size of the imported meat market in terms of their pork exports. In the same spirit, Bulgaria and Italy have the most to gain from an increase in the size of the imported meat market in terms of their lamp and poultry exports respectively. Hence, a quick exit of Greece from the financial crisis that has overwhelmed the last seven years will work partly for the benefit of French, German Bulgarian and Italian foreign trade.

Competitive advantage may be defined as an advantage over competitors gained by offering consumers a greater value either by lowering prices or by providing greater benefits and services, such as high-quality products, different meat cuts that justify higher prices (Porter, 1985). Regarding this study, any meat product that carries a higher and statistically significant expenditure elasticity compared to other meats is assumed to be perceived by the consumer as a higher-value product. Moreover, suppliers that supply higher-value meat products associated with their meats, compared to other meats from other suppliers, will result in an increase in their total revenues (ceteris paribus). Hence in this study, a source county that supplies higher-priced meat products, such as the European ones, is said to have a competitive advantage in a market that has a price-inelastic and expenditure–elastic demand. Thus, as regards the pork market, empirical results shown that France has a competitive advantage compared with the rest of the pork suppliers (Germany, Netherlands and ROW). This is determined by France's relatively low own-price elasticity and high expenditure elasticity. Therefore, the growing per capita income in Greece is expected to expand the marketing potentials mostly for French pork exporters and then for German ones. Also, Italian poultry can be said to have a competitive advantage in the Greek market compared to the poultry from the Netherlands and ROW counties.

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Table 3: Estimated Parameters of the RSDAIDS with Homogeneity, Symmetry and Block Substitutability imposed

	Beef				Lamp			Pork				Poultry			
	GE‡	FR	NL	ROW	BG	NZ	ROW	GE	FR	NL	ROW	FR	IT	NL	ROW
Pbf_{GE}	-0.0080*	0.0048	-0.0024	0.0093											
Pbf_{FR}	0.0048	0.0265	0.0078	0.0216**											
Pbf_{NL}	-0.0024	0.0078**	0.0049	-0.0140**											
Pbf_{ROW}	0.0093	0.0216**	-0.0140**	0.0472**											
Plm_{BG}					-0.0142**	-0.0143**	-0.0032								
Plm_{NZ}					-0.0143**	-0.0058**	-0.0018								
Plm_{ROW}					-0.0032	-0.0018	0.0007								
Ppk_{GE}								0.0487**	0.0194**	0.0161	-0.0010				
Ppk_{FR}								0.0194**	0.0080	-0.0032	0.0083				
Ppk_{NL}								0.0161**	-0.0032	0.0330**	0.0040				
Ppk_{ROW}								-0.0010	0.0083	0.0040	0.0449**				
$Ppul_{ROW}$												-0.0300**	0.0043	-0.0101*	0.0239**
$Ppul_{FR}$												0.0043	0.0072	0.0075**	0.0062
$Ppul_{IT}$												-0.0101*	0.0075**	0.0165**	0.0018
$Ppul_{NL}$												0.0239**	0.0062	0.0018	-0.032**8
P_{beef}					-0.0084	-0.0072**	0.0068	0.0431**	-0.0665**	-0.0693**	-0.0797**	-0.0646**	-0.0619**	0.0032	0.0187
P_{lamp}	0.0563**	0.2901**	0.1715**	0.0510				-0.2079**	0.0009	-0.0453**	0.2046**	0.0872**	0.0693*	-0.0498**	-0.1327**
P_{pork}	-0.0608**	-0.3568**	-0.1125**	-0.0210	0.0235	0.0241**	-0.0223**					-0.0295	-0.0187	0.0251	0.1072**
P_{pultry}	0.0007	0.0026	-0.0660*	-0.0731**	0.0168	0.0075	0.0190*	0.0852**	0.0282	0.0608	-0.1770				
$P_{Ot.Meat}$	0.0002	0.0034	0.0109	-0.0209**	-0.0003	-0.0025	0.0008	-0.0037	0.0050	0.0039	-0.0040	0.0043	-0.0140**	0.0056	0.0075
Y	-0.0114	-0.0189	-0.0684*	-0.0444**	0.0181**	0.0057	0.0069**	0.0636**	0.0170**	-0.0152**	-0.0145*	-0.0577**	0.0792**	0.0296**	0.0023
D_1	-0.0094**	-0.0685**	-0.0031	-0.0145**	-0.0050	-0.0009	-0.0074	-0.0338**	-0.0222**	-0.0613**	-0.0108**	0.0570**	0.0707**	0.0458**	0.1041**
D_2	-0.0077*	-0.0324*	0.0030	0.0153*	0.0112**	0.0192**	0.0004**	-0.0171**	-0.0116	-0.0365	0.0251	-0.0076*	-0.0137*	0.0029	0.0072
D_3	-0.0072**	-0.0093	-0.0112	0.0046	0.0130**	0.0142**	0.0059	0.0017	0.0062	0.0048	-0.0066	-0.0018	-0.0095	0.0003	-0.0011
cons	0.2614*	0.5789	1.3448**	0.8595*	-0.2920*	-0.0679	-0.1113	-1.1985**	-0.2473	0.4547	0.3516	1.1105	-1.3922**	-0.5403**	-0.0309

‡GE mean Germany, FR mean France, NL means Netherland, ROW means Rest of World, BG means Bulgaria, NZ mean New Zealand, IT means Italy and ROW: Rest of World,
Single and Double asterisks (*) denote significant at 5% and 1% level respectively

Table 4: Marshallian Elasticities for of Greek Meat Import Demand using Restricted Source Differentiated AIDS (Columns are prices)

	Beef				Lamp			Pork				Poultry			
Price	GE‡	FR	NL.	ROW	BG	NZ	ROW	GE	FR	NL.	ROW	FR	IT	NL.s	ROW
Beef															
Germany	**-1.193****	0.026	0.003	0.142*											
France	0.185	**-0.857****	0.191	0.402**											
Netherlands	-0.044	0.042	**-0.855****	-0.145*-											
ROW†	0.261	0.108**	0.137	**-0.346****											
Lamp															
Bulgaria					**-2.226****	-0.761**	-0.267								
New Zealand					-1.246**	**-1.316****	-0.157								
ROW					-0.291	-0.099	**-0.954****								
Pork															
Germany								**0.454**	0.313*	0.102**	-0.007				
France								0.485*	**-0.885****	-0.014	0.120				
Netherlands								0.180	-0.098	**-0.781****	0.083				
ROW								-0.181	0.115	0.032	**-0.398****				
Poultry															
France												**-2.169****	0.041	-0.315*	0.341*
Italy												0.313	**-0.955****	0.170*	0.087
Netherlands												-0.331	0.083	**-0.550****	0.025
ROW												1.143**	0.012	-0.007	**-1.470****
Beef					-1.415*	-0.519*	0.302	0.446	-1.231**	-0.385**	-0.957**	-1.572**	-1.690**	-0.296	0.252
Lamp	1.458**	1.361**	2.737**	0.684				-6.562**	0.003	-0.276	2.685**	3.665**	1.139	-1.487**	-1.896**
Pork	-1.474**	-1.643**	-1.446*	-0.101	1.545	1.188**	-1.984**					-0.506	-0.731	0.475	1.521**
Poultry	0.064	0.026	-0.867	-0.854**	1.190	0.353	1.457*	2.343**	0.423	0.390*	-2.287**				
Other Meats	0.017	0.020	0.220	-0.244**	-0.094	-0.147	0.038	-0.205	0.069	0.028	-0.044	0.286	-0.305*	0.125	0.106
Expenditure	**0.707****	**0.912****	**-0.073**	**0.426****	**2.541****	**1.303****	**1.566****	**2.980****	**1.282****	**0.906****	**0.810****	**-1.356****	**2.370****	**1.862****	**1.032****

‡GE mean Germany, FR mean France, NL means Netherland, ROW means Rest of World, BG means Bulgaria, NZ mean New Zealand, IT means Italy and ROW: Rest of World,
Single and Double asterisks (*) denote significant at 5% and 1% level respectively