# Intra-industry Trade in Agricultural Products at intra-EC level: The Impact of the Common Agricultural Policy (CAP) Funds

## Constantinos Katrakilidis[1] and Dimitris Mardas[2]

**Abstract**

*This paper aims at specifying the main determinants of the intra-industry trade in agricultural products, associated with the funds of the Common Agricultural Policy (CAP) of the EC, and more precisely, with its "price support mechanism" and its "structural reform policy". It presents CAP's reformed main tools and mechanisms, and explains the choice of selected variables as determinants of intra-industry trade in agricultural products at intra-EC trade. The econometric analysis covers the period 1973-2005, following recent developments in time-series analysis employing the ARDL approach to cointegration. The empirical results provide evidence of Granger causal effects in both the short-run and long-run horizons running from the CAP's above mentioned policy tools to intra-industry trade.*

**Key words:** *Common Agricultural Policy (CAP), Economic integration, intra-industry trade, Cointegration, Granger Causality*
**JEL Classification:** *Q17, F15, C22, C32*

## Introduction

The Treaty of Rome (1957) made specific reference to a Common Agricultural Policy (CAP) for the European Community (EC) in Articles 39 to 47. However, the CAP started being formulated in 1962. Indeed, in 1960 the Commission proposed to make a first step of downward adjustment with the prices of cereals and sugar during 1961/62, which was strictly opposed by the German Bauernverband (DBV). After tough negotiations a compromise, which protected Community farmers against low world market prices ("Community Preference") was reached. The implementation of this "temporary" system began with 14 January 1962, when a package determining the final state of support and thus the definitive common market organization was adopted. This decision came into force with 30 July 1962 for cereals and cereals-based products, which later served as the role model for other commodities.

During the first twenty five years of its operation, CAP focused on a price support policy while the structural reforms policy remained a secondary task. The latter has been progressively reinforced since 1992. Although this approach boosted production and intra-EC trade, it created imbalances in EC external trade relations in agricultural

---

[1] Associate Professor, Department of Economics, Aristotle University of Thessaloniki, P.O. Box 213, 54124 Thessaloniki, e-mail: katrak@econ.auth.gr
[2] Associate Professor, Department of Economics, Aristotle University of Thessaloniki, P.O. Box 188, 54124 Thessaloniki, e-mail: mardas@econ.auth.gr (corresponding author)

products. Indeed, the price policy, operating in protected by CAP's mechanism context, favored high market prices in agricultural products, introducing however different budgetary support among products, within the EC member-states markets. The prices under consideration, used to be higher than the international ones. This, in turn introduced a protection system against competitive extra-EC imports and subsidies mechanism favoring extra-EC exports (Demekas *et al*. 1988; Borrell and Hubbard, 2000).

In recent years, the CAP has been in favor of structural intervention and of a selective price policy. However, all these CAP mechanisms since 1962, despite the ensuing criticism, have managed to promote GDP per capita, the convergence process and cohesion among EC member-states (Esposti, 2007; Zanias, 2002; Badinger, 2005). In terms of the intra-EC trade relations, since 1962, the above price policy resulted in a significant Customs Union "trade creation effect" in agricultural products (Balassa 1965), which in turn favored intra-industry trade within the EC member-states. Besides, the comparative advantage of each member state, which may be very different with respect to the commodities produced, can be also considered as a major driver for intra-EU trade flows. We have to point out however that European agriculture was quite homogenous only at the origin of the EC with only 6 member states. Afterwards, it became more and more heterogeneous with each round of enlargement.

This paper aims at specifying the main determinants of intra-industry trade in products under examination, which are associated with expenditures for agriculture, and more precisely with the CAP price support and structural reform policies. The analysis is organized as follows: Section two presents the reformed main tools and mechanisms of CAP; section three presents the determinants and the specification of the model employed in the empirical analysis. The next section presents briefly the ARDL cointegration technique. Section five reports the empirical results, while the final section summarizes and concludes.

**The CAP Reform Process**

During the Stressa Conference in July 1958, an ad hoc Committee was created in order to specify the basic tools of the CAP. In this frame, the discussions focused on two alternative solutions: the first supported low market prices and income subsidies while the second supported the creation of a single market in agricultural products, which would be based on high market prices (common per product and per quality) and, consequently, not on income subsidies. The latter policy implied an increased protection against competitive imports. Although five EC founding member-states were more in favor of the first scenario, under French political pressures and for the sake of European integration the second alternative solution in favor of a protectionist CAP, was finally adopted in 1966, via "Luxemburg Compromise", (Tangermann, 1983; Sampson and Yeats, 1977; Koester and Tangermann, 1986).

In the frame of the Kennedy Round (1964-1967), the first efforts were made to open the agricultural markets to international competition. Through the Rabot report, the Americans tried to gear Europeans towards an agricultural policy favoring low market prices and income subsidies. However, because of the timeframe proposed, the EC denied any further discussions on this issue and thus the agriculture dossier was not included in the agenda of the Kennedy Round.

In 1968, the first proposal for restructuring the EC agriculture has appeared, through

the Manshold plan. Although this plan was initially rejected by the governments of the member-states, because of the drastic measures proposed for the agriculture restructuring process, the first measures in favor of structural interventions appeared from 1972 to 1978. By the end of the 70's, and under US pressure again, the first agreements on agriculture have been signed on a multilateral level in the context of the Tokyo Round (1973-1979). This development marked the beginning of the opening up of agricultural products to competition, which was finally materialized fifteen years later via the Uruguay Round agreements (1994).

Following the European Summit in Stuttgart in June 1984, the CAP was slightly revised to adopt more rational and selective measures, which could lead to better market adjustments and mainly to the control of production surpluses and budget expenditures towards agriculture. The mechanism of restricting production surpluses, in conjunction with a more selective price policy were the main policy tools of that period. During the same period, a series of new regulations focused on measures dealing with investments in agriculture. They had however a poor impact on agricultural reforms, because of restricted budget expenditures. Despite interventions favoring restructuring, the community preference of high prices persisted. The CAP's price mechanisms operating in the context of a protected Customs Union environment, was reflected into the "guarantee policy" of the "European Agricultural Guarantee and Guidance Fund" (EAGGF) and hence into the budget expenditures.

In 1992, significant changes took place in EC agriculture following the Mac Sharry report. Since that period, for the sake of agricultural income support, income subsidies started being a main tool in the hands of policymakers. Thus, the lower price support policy was overcompensated by additional direct payments (Thompson *et al.*, 2002). However, EC agricultural prices still remained higher compared to international ones. In 1994, the agreement on agriculture in the context of the Uruguay Round was signed. Following this agreement, competition in agriculture would become the main determinant of trade flows in the long term horizon. Consequently, all production subsidies schemes and tariffs had to be abolished in the future.

This agreement had a significant impact on the reform of the EC agricultural policy. Indeed, in 1997, in the frame of the preparation of "Action Plan 2000", the European Commission produced a report entitled "Common Agricultural and Rural Policy for Europe" (CARPE). This report introduced the revision of the price support policy-under the constraints of the Uruguay Round agreement- and the continuation of income subsidies. This new policy, besides market stability and rural development, could serve, inter alia, additional goals such as environmental protection, cultural aspects etc.

In Berlin, March of 1999, a political agreement took place for the "Agenda 2000." The opening up of the agricultural markets to competition was the new challenge for EC agriculture. Regarding structural interventions, agricultural policies on development and structural changes absorbed only 14% of the total budget of the CAP during the medium term period 2000-2006, a situation which, however, could change, because the reform process continued. In conclusion, the poor impact of structural reforms to EC agriculture was a main characteristic of the CAP, since 1962 (Shucksmith *et al.*2005).

By mid-2002, a new series of negotiations on the terms of acceding the CAP restarted. In the light of the Doha Round expectations for market openness in agricultural products, and in conjunction with the new enlargement of the EC and the Berlin EU

Summit decisions for the period 2000-2006, a new reform took place in 2003, which made price and income policies more selective (Ackrill, 2003). Demand constraints and quality and environmental standards became the main determinants of the policy under examination (Latacz-Lohmann and Hodge, 2003). All the above mentioned policies, through their funds have been developed in an environment favoring the increase of intra-industry trade of agricultural products, in intra-EC trade.

**Intra-industry Trade: Determinants and the Model Structure**

Intra-industry trade, i.e. the simultaneous exports and imports of the same good, is associated with differentiated products and intermediate goods (Grubel, 1967; Grubel and Llloyd 1971, 1975; Balassa, 1963, 1965, 1986a; Gray, 1973, 1980; Finger, 1975; Greenaway and Milner, 1987; Tharakan, 1981). Horizontally differentiated products are close substitutes to both production and consumption while vertically differentiated products, which constitute the dominant pattern of intra-industry trade, are close substitutes to consumption, mainly due to quality characteristics (Gray and Martin, 1980; Willmore, 1978; Lancaster, 1979, 1980; Caves, 1981; Caves and Williamson, 1985; Brander, 1981; Shaked and Sutton, 1987).

Regarding the measurement of intra-industry trade, despite the discussion about the choice of the appropriate level of statistical aggregation, the international practice considers the three digit aggregation level of SITC code as an acceptable level for that, because at this level of aggregation, it is possible to efficiently capture product differentiation (Lloyd, 1994). Thus, the three digit level of aggregation has been used in the present study to construct the dependent variable of the model, which is the intra-industry trade in (n) agricultural products on intra-EC level (LIB) expressed in logarithms. Grubel and Lloyd (1975) proposed an index $\overline{B_i}$, properly constructed to be used for this goal. The $\overline{B_i}$ is an expression of a weight average of intra-industry trade for (n) products, for all member-states. Specifically, when a value of $\overline{B_i}$ is equal to 0, that country exports without importing and vice versa. On the other hand, a value of 1 indicates a two-way trade flow for similar products with exports equal to imports. For industry (i), B is given as follows:

$$B_j = \frac{(X_{ij} + M_{ij}) - |X_{ij} - Mij|}{(X_{ij} + M_{ij})} \qquad O \leq B_i \leq 1 \qquad (1)$$

For (n) industries $B_i$ is given as follows:

$$\overline{B}_j = \frac{\Sigma(X_{ij} + M_{ij}) - \Sigma|X_{ij} - Mij|}{\Sigma(X_{ij} + M_{ij})} \qquad (2)$$

Where:
i = 1,…… n, industries

$X_{ij}$= product exports (i) of country (j)

$M_{ij}$=  product imports (i) of country (j)

Following the empirical researches, intra-industry trade flows behavior is affected by various determinants. Among them, the more important are considered to be: product differentiation, economies of scale, distance, income similarity, similarity in development levels, low trade barriers, the similarity of non tariff barriers, the Customs Union effects etc. In the context of the empirical analysis, this paper focuses on the detection of causal impacts from CAP funds towards intra-industry trade flows of agricultural products at the EC level.

Two independent variables are constructed for this goal following data availability:

i) LVG, which stands for the EC budget expenditures to support price policy (guarantee section of the EAGGF) and is expressed in logarithms and reflects the increased importance of the EC price policy in agriculture, favoring higher common prices on EC level compared to international ones. Thus, it depicts the impact of price policy on production and trade. Due to CAP protection mechanisms against extra-EC imports, high prices in agricultural products of all possible qualities are expected, in the long-run, to increase production in the EC member-states and at the same time to reinforce differentiation. Thus, following the existing empirical investigations, (Toh, 1982; Pagoulatos and Sorensen, 1975; Greenaway and Milner, 1984; Culem and Lundberg, 1986; Tharakan, 1984, 1986; Balassa, 1986a), the LGV variable, which is a proxy of product differentiation –as a result of the "production effect" of CAP– is expected to be positively correlated to LIB. Consequently, LGV reflects the impact of expenditures, associated with the price policy effect of the CAP, on product differentiation.

ii) LVD, expressed also in logarithms, which stands for the EC budget expenditures to promote structural reforms policy (guidance section of the EAGGF), and is represents the impact of structural funds and reforms. As funds are used to support structural reforms aiming at reducing the average cost, the LVD variable could be considered as a proxy for the economies of scale. Following the empirical results, the extent of economies of scale is negatively related to the extent of intra-industry trade. Indeed, the extent of economies of scale tends to create "dominant suppliers" on industry level and thus it tends to reduce intra-industry trade. In contrast, the lack of economies of scale tends to create an environment favoring many suppliers and hence product differentiation. This in turn leads to increase in intra-industry trade (Loertscher and Wolter 1980; Caves, 1981; Balassa, 1986b; Jacquemin and Sapir, 1988).   The relatively poor EC budget expenditures towards structural reforms in favor of agriculture did not push extensive economies of scale on national and industry level. Thus, the process of creating a dominant supplier in agricultural products for all qualities did not take place. As expected, the poor economies of scale caused inverse impacts on intra-industry trade.

**The Model**

Following the previous discussion, an econometric model for the investigation of the intra-EU agricultural trade could have the general specification presented below:

LIB=f (LVD, LVG, X)                                                    (3)

Where, X, is a vector of other relevant variables with total demand being of major importance among them.

In this direction, a model including LVD, LVG and EUGDP as dependent variables was initially specified, with EUGDP approximating total demand and measured by the log of the total EU gross domestic product.

However, given the rather limited size of our data sample (33 observations from 1973 to 2005) the inclusion of all these three explanatory variables would result in unreliable statistical inference due to lack of degrees of freedom. Therefore, we applied correlation analysis among LVD, LVG and EUGDP and the findings suggested that EUGDP was not significantly correlated to any of the other two explanatory variables (the correlation coefficient was found equal to 0.438 and 0.526 respectively). Econometrically, these findings suggest that even if we drop from the initial specification the theoretically important variable EUGDP which has been included to capture demand effects, the final reduced model would not suffer from the well known problem of "important omitted variables" and the estimates will be unbiased ( see Green, 2003, section 8.21, pp.148-149).

According to the above discussion and in conjunction with our primary focus which is to identify causal effects from EC funds towards intra-EC agricultural trade flows, the econometric model specified to investigate the relationship in question is of the following general form:

$$LIB = f ( LVD, LVG) \tag{4}$$

As it was mentioned previously, the dependent variable is the log of index B, constructed to measure intra-EU agricultural trade and is a censored dependent variable since index B takes values between 0 and 1. In such cases, the Tobit estimation technique is suggested instead of OLS, in order to avoid biased and inconsistent estimates (see Green, 2003, section 22.3, pp. 761-773, for a discussion of how OLS coefficients are biased and inconsistent in the presence of censoring). Nevertheless, in the context of our empirical analysis we decided to proceed by means of time series techniques and not by applying the Tobit maximum likelihood method. This decision could be justified by the following:

First, the problem of applying ordinary linear regression is that the model may predict values beyond the range 0 to 1. Besides, the relationship is sigmoidal i.e.linear in the middle but flattened at the ends. As a rule of thumb, if the data are between 0.2 and 0.8, that is, they belong to the linear section of the curve, the predicted values will not be much beyond these values and certainly not beyond 0 or 1. Accordingly, we applied an historical simulation on our model and examined the anti-logs of the fitted values of the dependent variable. The findings (see Figure 1), confirmed no deviations out of the range between 0 and 1, and thus we could proceed considering a linear relationship.

Second, our intention is to detect possible causal long-run and short-run effects running towards LIB. This requires testing for cointegration and estimation of Error Correction specifications which combine both short-run and long-run dynamics and thus constitute a way to obtain improved estimates compared to other proposed methodologies.

**Figure 1: Plot of Observed and Predicted Values of Intra-EC Trade Index.**
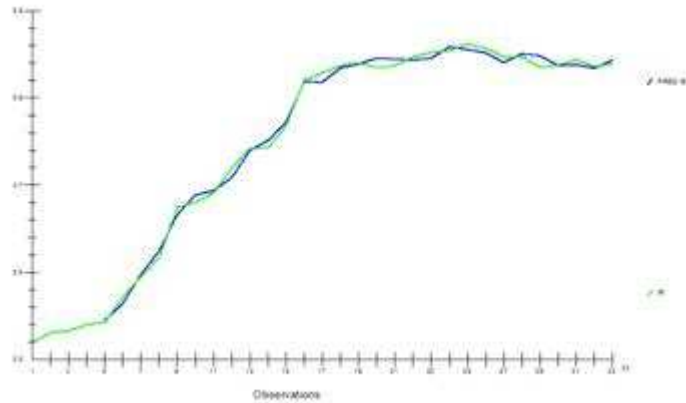


## Methodological Issues

The autoregressive distributed lag (ARDL) approach to cointegration applied in this paper is a relatively new technique for detecting possible long-run relationships among economic variables. The ARDL approach is considered a more efficient technique for determining cointegrating relationships in cases with small data samples available. An additional advantage of the ARDL approach is that it can be applied irrespective of the regressors' order of integration (Pesaran and Shin, 1999); that is, it can be applied regardless of the stationary properties of the variables in the sample, thus allowing for statistical inferences on long-run estimates which are not possible under alternative cointegration techniques. Hence, we are not concerned whether the applied series are I(0) or I(1). The general form of the ARDL model is defined as:

$$\Phi(L)y_t = \alpha_0 + \alpha_1 w_t + \beta'(L)x_{it} + u_t,$$ 

(5)

where: $\Phi(L) = 1 - \sum_{i=1}^{\infty} \Phi_t L^i,$ and $\beta(L) = \sum_{j=1}^{\infty} \beta_j L^j,$

with (L) being the lag operator and $(w_t)$ being the vector of deterministic variables such as the intercept, seasonal dummies, time trends or any exogenous variables (with fixed lags). This approach follows three steps: Step one is the establishment of the long-run relationship between the examined variables (unrestricted error correction mechanism regression). Step two is the estimation of the ARDL form of equation (4), where the optimal lag length is chosen according to the Akaike Information Criterion (AIC) or the Schwarz Bayesian Criterion (SBC). Step three refers to the estimation of the error correction equation, using the differences of the variables and the lagged long-run solution, where the speed of adjustment to equilibrium is determined.

## Empirical Results

### Integration Analysis

In the first step of the empirical analysis we examine the integration properties of the variables involved by means of the conventional Augmented Dickey-Fuller (ADF) test.

It should be noted that statistical inference with non-stationary data may lead to invalid results. The findings (Tables 1 and 2), demonstrate that the examined series are non stationary in levels while they become stationary when tested in first difference form.  In particular, when the Dickey-Fuller (ADF) test is applied on the levels of the variables and the testing statistic includes only an intercept LIB and LVD are non stationary but LVG exhibits stationary properties. However, when the test statistic includes a linear trend all variables become non-stationary.

### Table 1: Unit-Root Tests for the Variables in Levels

| Variable | k | with intercept no trend | k | with intercept and linear trend |
|---|---|---|---|---|
| LIB | 2 | -2.8319 | 2 | -.52227 |
| LVG | 2 | -4.5638 | 2 | -3.5572 |
| LVD | 1 | -2.2249 | 1 | -2.5169 |

*95% critical value for the augmented Dickey-Fuller statistic with intercept  but not a trend  =  -2.949*

*95% critical value for the augmented Dickey-Fuller statistic with intercept and a linear trend  =  -3.546*

Furthermore, when the variables are tested in first difference form, in the case where only an intercept is included in the testing equation DLVD is found stationary while DLVG is stationary at the 10% and DLIB is clearly non-stationary. Finally, when the testing equation includes both an intercept and a trend all variables exhibit stationarity.

### Table 2: Unit-Root Tests for the Variables in First Differences

| Variable | k | with intercept no trend | k | with intercept and linear trend |
|---|---|---|---|---|
| DLIB | 0 | -2.4987 | 0 | -5.3393 |
| DLVG | 0 | -3.5602 | 0 | -4.2106 |
| DLVD | 0 | -3.8757 | 0 | -4.0477 |

*95% critical value for the augmented Dickey-Fuller statistic with intercept but  not a trend  =  -2.9665*

*95% critical value for the augmented Dickey-Fuller statistic with intercept and a linear trend  =  -3.5731*

Since the results might be considered vague and having in mind that the conventional stationarity tests are of low power, we decided at this step, to consider that all series are I(1) and proceed with the examination of the joint integration properties of the series using the cointegration methodology which implies the possible existence of a long run equilibrium relationship (cointegration) among them and hence causal interactions among the examined variables in the short and long run time horizons.

*Cointegration and Granger Causality Analysis*

Instead of employing the traditional methodology proposed by Johansen (1988) and Johansen and Juselius, (1990), which requires clearly non-stationary variables of integration order I(1), we apply the ARDL cointegration method proposed by Pesaran, *et al.*, (2001). Actually, the ARDL method has the advantage of avoiding the problem of pre-testing for the order of integration of the individual series; besides, ARDL is a singe

equation estimation technique and requires the estimation of a fairly smaller number of parameters compared to the Johansen method. Consequently, the ARDL approach proves to be more efficient when small data samples are available.  In the next step, we estimate the unrestricted error correction model (1), with DLIB as the dependent variable and apply an F-test on the group of the lagged level variables.

The optimal lag structure of the model is chosen based on the Akaike Information Criterion (AIC), using a max lag length of four periods. The F-test along with the critical value bounds are reported in Table 3. The evidence is in favor of the existence of a long-run equilibrium relationship with long-run causality running from LVD and LVG towards LIB.

**Table 3: Testing the Existence of a Long Run Relationship**

| Dependent Variable | F-statistic | Intercept | Trend | Bounds Testing (at 90%) | |
|---|---|---|---|---|---|
| DLIB | 9.298 | yes | no | lower: 4.042 | upper: 4.778 |

Having confirmed the existence of cointegration among the involved variables, we proceed with the estimation of the appropriate ARDL model for the LIB variable. The optimal ARDL (1,4,3) specification has been chosen based on the Schwarz Bayesian Criterion and is presented in Table 4. The corresponding diagnostic tests (lower part of Table 4), validate the estimates while the plots of the corresponding CUSUM and CUSUMSQ tests, based on the recursive residuals (Figures 2 and 3), identify long-run structural stability for the model's coefficients.

**Figure 2: Plot of Cumulative Sum of Recursive Residuals**



The straight lines represent critical bounds at 5% significance level
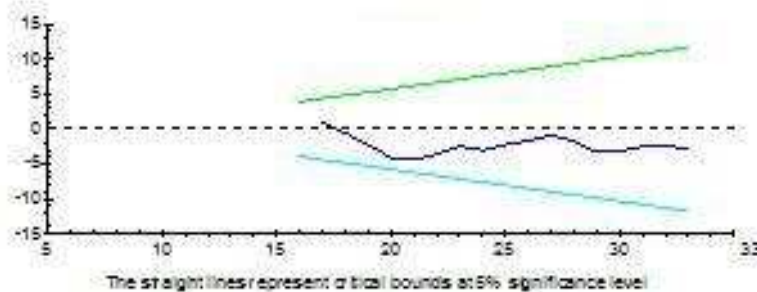
**Figure 3: Plot of Cumulative Sum of Squares Recursive Residuals**



The straight lines represent critical bounds at 5% significance level
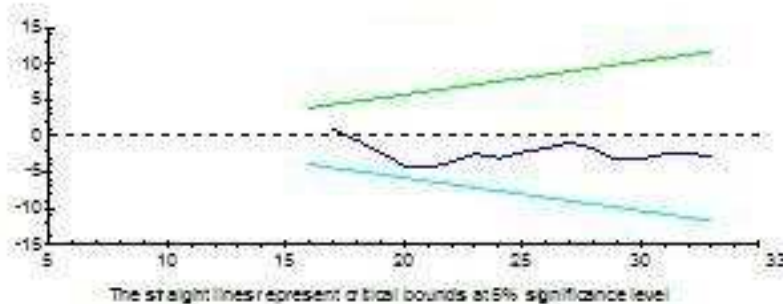
Hansen (1992), stresses that unstable over time parameters result in model misspeci-fication and potentially produce biased estimates.

**Table 4: Autoregressive Distributed Lag Estimates. ARDL(1,4,3) selected**

```
*******************************************************************************
 Dependent variable is LIB
 29 observations used for estimation from   5 to   33
*******************************************************************************
 Regressor            Coefficient      Standard Error      T-Ratio[Prob]
 LIB(-1)                 -.089131            .17071         -.52213[.608]
 LVG                      .17431            .044553         3.9125[.001]
 LVG(-1)                 -.052088           .049886        -1.0441[.310]
 LVG(-2)                  .067520           .050301         1.3423[.196]
 LVG(-3)                  .049846           .046258         1.0776[.295]
 LVG(-4)                  .14904            .043403         3.4338[.003]
 LVD                     -.060096           .021673        -2.7728[.013]
 LVD(-1)                  .039933           .031139         1.2824[.216]
 LVD(-2)                 -.048266           .029561        -1.6328[.120]
 LVD(-3)                 -.037445           .021148        -1.7706[.094]
 C                       1.6283             .25230          6.4540[.000]
*******************************************************************************
 R-Squared                  .99589   R-Bar-Squared                  .99360
 S.E. of Regression         .010939  F-stat.   F( 10,  18) 435.8230[.000]
 Mean of Dependent Variable 4.3429   S.D. of Dependent Variable     .13676
 Residual Sum of Squares   .0021541  Equation Log-likelihood       96.7122
 Akaike Info. Criterion    85.7122   Schwarz Bayesian Criterion    78.1921
 DW-statistic               2.0969   Durbin's h-statistic      -.66267[.508]
*******************************************************************************
                           Diagnostic Tests
*******************************************************************************
 *    Test Statistics  *      LM Version      *        F Version           *
*******************************************************************************
 *                     *                      *                            *
 * A:Serial Correlation*CHSQ(  1)=  .14454[.704]*F(  1,  17)= .085155[.774]*
 *                     *                      *                            *
 * B:Functional Form   *CHSQ(  1)=  .30974[.578]*F(  1,  17)=  .18353[.674]*
 *                     *                      *                            *
 * C:Normality         *CHSQ(  2)= 1.1028[.576]*     Not applicable        *
 *                     *                      *                            *
 * D:Heteroscedasticity*CHSQ(  1)= 1.6779[.195]*F(  1,  27)= 1.6581[.209]*
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values
```

The estimated long-run coefficients from the implied ARDL structure are reported in Table 5. The estimates reveal strong causal effects (at a smaller than the 1% level of statistical significance) directed from LVG and LVD towards LIB.

**Table 5: Estimated Long Run Coefficients using the ARDL Approach. ARDL(1,4,3) selected**

```
*******************************************************************************
 Dependent variable is LIB
 29 observations used for estimation from   5 to   33
*******************************************************************************
 Regressor            Coefficient      Standard Error      T-Ratio[Prob]
 LVG                      .35682            .012319         28.9658[.000]
 LVD                     -.097210           .0070967       -13.6981[.000]
 C                       1.4951             .094514         15.8185[.000]
*******************************************************************************
```

Finally, Table 6 presents the estimates from the error correction specification. The existence of a long-run causal relationship among the examined variables is confirmed once again since the coefficient of the lagged error correction term is found statistically significant (the p-value of the applied t-test is smaller than the 1%) and has the correct negative sign suggesting that any deviation from the long-term income path is corrected by 54 percent in the following year.

**Table 6: Error Correction Representation for the Selected ARDL Model**
**ARDL(1,4,3) selected**

```
Dependent variable is dLIB
 29 observations used for estimation from   5 to   33
*******************************************************************************
 Regressor             Coefficient       Standard Error      T-Ratio[Prob]
 dLVG                    .17431              .04455           3.9125[.001]
 dLVG1                  -.26640              .04141          -6.4326[.000]
 dLVG2                  -.19888              .04913          -4.0474[.001]
 dLVG3                  -.14904              .04340          -3.4338[.003]
 dLVD                   -.060096             .02167          -2.7728[.012]
 dLVD1                   .085712             .02303           3.7214[.001]
 dLVD2                   .037445             .02114           1.7706[.092]
 dC                     1.6283               .25230           6.4540[.000]
 ecm(-1)                -0.5432              .10201          -5.3321[.000]
*******************************************************************************
 R-Squared                    .86833   R-Bar-Squared                    .79518
 S.E. of Regression           .010939  F-stat.    F(  8,  20)   14.8386[.000]
 Mean of Dependent Variable   .015195  S.D. of Dependent Variable     .024172
 Residual Sum of Squares      .0021541 Equation Log-likelihood        96.7122
 Akaike Info. Criterion       85.7122  Schwarz Bayesian Criterion     78.1921
 DW-statistic                 2.0969
*******************************************************************************
 R-Squared and R-Bar-Squared measures refer to the dependent variable
 dLIB and in cases where the error correction model is highly
 restricted, these measures could become negative.
```

With regard to the short-run dynamics of the estimated relationship, (Table 7) there is evidence of significant Granger-type causal effects running from LVG to LIB (the p-value of the applied Wald test is smaller than the 1%) as well as from LVD to LIB (p-value=0.012).

**Table 7: Wald test of restriction(s) imposed on parameters**

```
Based on ARDL regression of dLIB on:
 dLVG           dLVG1           dLVG2           dLVG3           dLVD
 dLVD1          dLVD2           dC              ecm(-1)
 29 observations used for estimation from   5 to   33
*******************************************************************************
 Coefficients A1 to A9 are assigned to the above regressors respectively.
 List of restriction(s) for the Wald test:
 a2=0;a3=0;a4=0;
*******************************************************************************
 Wald Statistic               CHSQ( 3)=  45.3016[.000]
*******************************************************************************
            Wald test of restriction(s) imposed on parameters
*******************************************************************************
 Based on ARDL regression of dLIB on:
 dLVG           dLVG1           dLVG2           dLVG3           dLVD
 dLVD1          dLVD2           dC              ecm(-1)
 29 observations used for estimation from   5 to   33
*******************************************************************************
 Coefficients A1 to A9 are assigned to the above regressors respectively.
 List of restriction(s) for the Wald test:
 a6=0;a7=0;
*******************************************************************************
 Wald Statistic               CHSQ( 2)=  15.7586[.000]
```

## Concluding Remarks

In this paper we attempted to specify the main determinants of the intra-industry trade in agricultural products, in the context of the price support mechanism and the structural reform policy of the Common Agricultural Policy (CAP). Since the beginning of the 1970's, all CAP's reforms and mainly the price support mechanism –operating in a protected environment for agriculture– through high common prices, favored product differentiation and consequently intra-industry trade. We could expect an inverse effect if the structural reform policy was the dominant policy instrument, which could create dominant suppliers at the product level. This did not happen and thus the poor impact of the structural reform policy has been reflected by the increasing trend of intra-industry trade.

This, in turn, shows that CAP's new mechanisms intended to support structural reforms, in the context of an open world competitive environment may operate against intra-industry trade in agricultural products. These new rules, in line with the Doha Round negotiations on agricultural products, are expected to reduce the less competitive agricultural exploitations. On the other hand, structural reforms could contribute to the creation of an environment favoring dominant suppliers, as a result of their capability to benefit the most from structural funds. This can create an increased trend towards economies of scale by a lower number of farmers, a result which is compatible with our empirical investigation.

The empirical analysis used the autoregressive distributed lag (ARDL) approach to cointegration. ARDL is considered more efficient in cases with small data samples available and can be applied irrespective of the integration order of the involved variables. The evidence supports the existence of long-run causality running from both EC major policy measures towards intra-industry trade. Moreover, Granger-causality tests provide evidence in favor of the existence of significant short-run causal effects from both the policy instruments under consideration towards intra-industry trade.

## References

Ackrill R., 2003, EU Enlargement, the CAP and the Cost of Direct Payments: A Note, *Journal of Agricultural Economics,* 54, 73-78

Badinger, H., 2005, Growth Effects of the European Integration: Evidence from the EU Member-states. *Weltwitschaftliches Archiv.* 141, 50-78

Balassa, B. 1963, European Integration: Problems and Issues, *American Economic Review*, Papers and Proceedings, 53, 175-84.

Balassa, B. 1965, Trade Liberalisation and 'Revealed' Comparative Advantage, *Manchester School of Economics and Social Science*, 33, 99-123.

Balassa, B. 1986a, The Determinants of Intra-industry Specialisation in United States Trade, Oxford Economic Papers, 38, 220-33.

Balassa, B. 1986b, Intra-industry Specialisation, *European Economic Review*, 30, 27-42.

Borrell B. and Hubbard L., 2000, Global Economic Effects of the EU *Common Agricultural Policy, Economic Affairs,* 20, 18-26.

Brander, J. 1981, Intra-Industry Trade in Identical Commodities, *Journal of International Economics*, 11, 1-14.

Caves, R. 1981, Intra-Industry Trade and Market Structure in the Industrial Countries, *Oxford Economic Papers*, 33, 203-23.

Caves, R.E. and Williamson P. 1985, What is Product Differentiation Really?, *Journal of Industrial Economics*, 34, 113-32.

Culem C. and Lundberg L. 1986, The Product Pattern of Intra-industry Trade: Stability among Countries and over Time, *Weltwirschaftliches Archiv.*, 122, 113-129

Demekas, D. Bartholdy, K. Cupta S, Lipschitz, L. and Th. Mayer, (1988), "The Effects of Common Agricultural Policy of the European Community: A Survey of the Literature", *Journal of Common Market Studies*, 17,113-145.

Esposti R. 2007, Regional Growth and Policies in the European Union: Does the Common Agricultural Policy have a Counter-treatment Effect?, *American Journal of Agricultural Economics*, 89, 116-134

Finger, J.M. 1975, Trade Overlap and Intra-industry Trade, *Economic Inquiry,* 13, 581-589.

Gray, P. 1973, Two Way International Trade in Manufactures, *Weltwirschaftliches Archiv.*, 109, 19-39.

Gray, P. 1980, The Theory of International Trade among Industrial Nations, *Weltwirchaftliches Archiv.*, 116, 447-517.

Gray, P. and Martin, P.J. 1980, The Meaning and Measurement of Product Differentiation in International Trade, *Weltwirschaftliches Archiv.,* 116, 322-29.

Greenaway, D. and Milner, C. 1984, A Cross Section Analysis of Intra-industry Trade in the UK, European Economic Review, 25,  319-44.

Greenaway, D. and Milner, C. 1987, Intra-industry Trade: Current Perspectives and Unresolved Issues, *Weltwirschaftliches Archiv.*, 123, 39-57.

Green, W.H., 2003, *Econometric Analysis*, 5th ed., Prentice Hall.

Grubel, H.G. 1967, Intra-industry Specialisation and the pattern of Trade, *Canadian Journal of Economics*, 33, 347-88.

Grubel, H.G. and  Lloyd P.J. 1971, The Empirical Measurement of Intra-Industry Trade, *Economic Record,* 47, 494-517.

Grubel H.G and Lloyd,P.J. 1975, *Intra-industry Trade: The Theory and Measurement of International Trade in Differentiated Products*, (London: Macmillan).

Hansen, E. B. 1992, Testing for Parameter Instability in Linear Models, *Journal of Policy Modeling*, 14, 517-33

Jaquemin, A. and Sapir, A. 1988, International Trade and Integration of the European Community, *European Economic Review*, 32, 1439-50

Johansen S. 1988, Statistical Analysis of Cointegration Vectors, *Journal of Economic Dynamics and Control*, 12, 231-54.

Johansen, S. and Juselius K., 1990, Maximum Likelihood Estimation and Inference on Cointegration with Applications to the Demand for Money. *Oxford Bulletin of Economics and Statistics*, 52, 169-210.

Koester, U. and Tangermann, S. 1986, *European Agricultural Policies and International Agriculture* (Washington DC: International Bank for Reconstruction and Development) background paper for the International Bank for  Reconstruction and  Development, World Development Report.

Lancaster, K. 1979, *Variety, Equity and Efficiency*,(Oxford: Blackwell).

Lancaster, K. 1980, Intra-industry Trade under Perfect Monopolistic Competition, *Journal of International Economics*, 10, 151-75.

Latacz-Lohmann U. and HodgeI. 2003, European Agri-environmental Policy for the 21st Century, *The Australian Journal of Agricultural and Resource Economics,* 47, 123-39.

Lloyd, P.J. 1994, Aggregation by Industry in High-Dimensional Models, *Review of International Economics*, 2, 97-111.

Loertscher, R. and Wolter, F. 1980, Determinants of Intra-industry Trade: Among Countries and across Industries, *Weltwirschaftliches Archiv.*, 116, 280-91.

Pagoulatos, E. and Sorensen, R. 1975, Two-Way International Trade: An Econometric Analysis, *Weltwirschaftliches Archiv.*, 111, 454-65.

Pesaran, H., and Shin, Y. 1999, An Autoregressive Distributed Lag Modeling Approach to Cointegration Analysis. In S. Strom (Ed.), *Econometrics and Economic Theory in the 20th Century: The Ragnar Frisch Centennial Symposium,* Cambridge Un. Press, Cambridge.

Pesaran, M.H., Shin,Y. and R.J. Smith, 2001, Bounds Testing Approaches to the Analysis of Level Relationships, *Journal of Applied Econometrics*, 16, pp. 289-326.

Sampson, G.P and Yeats A.J. 1977, An Evaluation of the Common Agricultural Policy as a Barrier Facing Agricultural Exports to the European Economic Community, *American Journal of Agricultural Economics*, 59, 235-46.

Shaked, A. and Sutton, J. 1987, Product Differentiation and Industrial Structure, *Journal of Industrial Economics*, 36, 131-46.

Shucksmith, M, Thompson, K.J. and Roberts, D. (2005) (Eds), *The CAP and the Regions: the Territorial Impacts of the Common Agricultural Policy*, CABI Publishing, CAB international, Wallingford, UK.

Tangerman, S. 1983*, What is Different about European Agricultural Protectionism?, World Economy*, 16, 39-58.

Tharakan, P.K.M. 1981, On the Economics of Intra-industry Trade, *Recherches Economiques de Louvain*, 47, 259-90.

Tharakan P.K.M. 1984, Intra-industry Trade between the Industrial Countries and the Developing World, *European Economic Review*, 26, 213-27

Tharakan P.K.M. 1986, The Intra-industry Trade of Benelux with the Developing World, *Weltwirschaftliches Archiv*. 122, 131-149.

Thompson S., Gohout W. and R. Herrmann. 2002, CAP Reforms in the 1990s and their Price and Welfare Implications: The Case of Wheat*, Journal of Agricultural Economics,* 53, 1-13.

Toh, K. 1982, A Cross Section Analysis of Intra-industry Trade in U.S Manufacturing Industries, *Weltwirschaftliches Archiv*. 118, 281-88.

Willmore, L. 1978, The Industrial Economics of Intra-industry Trade and Specialisation, in: H. Giersch (Ed.), *On the Economics of Intra-industry Trade*, (Tubingen:J.C.B. Mohr), pp.185-205.

Zanias G. 2002, The Distribution of CAP Benefits among Member States and the Impact of a Partial Re-nationalisation : *A Note, Journal of Agricultural Economics*, 52, 108-12.