Intra-industry trade in agricultural and food products: The case of Ukraine

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Abstract

We present an analysis of agricultural and food trade in Ukraine over the period 1996-2002 focusing on different aspects of intra-industry trade. We estimated Grubel-Lloyd and marginal IIT indexes to examine the relevance of intra-industry trade between Ukraine and its trading partners and the changes in nature of trade flows over time. The results indicate that the major part of agro-food trade is of the inter-industry type, and thus a product of underlying comparative advantages. The low level of index seems to be typical for primary sectors in comparison to industries with higher product differentiation. Also marginal IIT appears to be low, the structure of the changes in agro-food trade flows between Ukraine and its trading partners during the analyzed period is shown to be predominantly intra–industry. These results imply that the restructuring process, associated with trade liberalization of Ukraine on bilateral and multilateral level, will induce higher adjustment costs than in an intra-industry trade environment.

Key words: *intra-industry trade, marginal intra-industry trade, agro-food products, Ukraine*
JEL: *F14, Q17*

1 Introduction

The emergence and growth of intra-industry trade (IIT), defined as the simultaneous export and import of goods within the same industry, has been one of the most important trends in world trade over the past few decades and has gained increasing attention in the economic literature. A number of questions concerning IIT have been discussed: from causes, significance, determinates of IIT, link to trade liberalization to conceptual and statistical problems involved in trying to measure IIT (Balassa, B., 1963; Grubel, H.G., Lloyd, P.J., 1975; Aquino, A., 1978; Aturupane, C. et. al., 1997; Blanes, J.V., Martin, K., 2000 etc.). The studies of Ruffin (1999), Greenaway, Milner (2003) emphasize that with IIT there exists an additional potential source of gain – increased variety, the exchange the scale economies and pro-competition effects. Intra-industry trade reduces the demands for protection because in any industry there are both exports and imports, making it difficult to achieve unanimity among those demanding protection (Ruffin, 1999). It is generally argued that industries with high levels of IIT undergo less structural change - and less adjustment costs - in response to trade liberalization than industries with low levels of IIT. The reason for this is that it is easier to transfer and adapt resources within firms or industries than to switch them from one industry to another (Kandogan, 2003a; Kösekahyaoglü, 2001; Krugman, 1981).

This paper investigate the intra-industry trade in Ukrainian agricultural and food trade. Our interest to this topic could be explained by the following reasons. First, agriculture and agricultural trade play a significant role in the Ukrainian economy. The share of agriculture in GDP is currently close to 15 percent. About 24 percent of population are economically active in this sector. Agricultural products and foodstuffs have accounted, on average, for 13.2 percent of the country's total exports (IER, 2003). Second, trade liberalization is a necessary step in the economic development of Ukraine. It presumes the possibility of a Free Trade Agreement implementation with three CIS countries in the line with Single Economic Space and most important the expected WTO accession. Trade theory suggests that removal of trade barriers can considerably impact countries production structure and income distributions. As mentioned above adoption to international competition occurs with more adjustment – and higher adjustment costs – in industries characterized by inter industry rather than intra-industry trade.

Therefore the aim of this paper is to examine the trend and extent of the intra-industry trade in the agro-food sector in Ukraine over the period 1996-2002. This analysis of the nature of trade provides an insight into the potential consequences of further trade liberalization for the sector, namely expected structural adjustment costs.

The paper is organized as follows. Section 2 considers the theoretical framework of intra-industry trade measurement. We present the traditional measure of IIT, the Grubel-Lloyd index, as

well as the more recent concept of marginal IIT. General patterns of Ukrainian agro-food trade and its developments over the concerned period are analyzed in section 3. In section 4, we apply various measures of IIT on a Ukrainian trade data set and discuss the derived empirical results. Conclusions and possible directions for further work in this field follow in the last section.

2 Theoretical framework of intra-industry trade measurement

2.1 Standard measure of intra-industry trade: the Grubel-Lloyd Index

There are various indices for measuring intra-industry trade, but the most widely used is the GRUBEL-LLOYD (1975) index. In this index, IIT for an industry *i* is:

$$GLIIT_i = \frac{(Xi + Mi) - |Xi - Mi|}{(X_i + M_i)} \times 100, \quad \text{or} \quad GLIIT_i = \left(1 - \frac{|X_i - M_i|}{X_i + M_i}\right) \times 100, \tag{1}$$

where GLIITi is the Grubel-Lloyd index of IIT in industry i, and Xi and Mi are, respectively, the values of exports and imports in industry i.

The value of GLIITi ranges from 0 to 100. If there is no IIT (i.e., either Xi or Mi is zero) GLIITi takes the value of 0. If all trade is IIT (i.e., Xi = Mi), GLIITi takes the value of 100. Grubel and Lloyd (1975) also suggested the following formula, which is a weighted average of the product indices in (1) for the individual product i, with the weights being based on the share of the specific product i in total trade j:

$$GLIIT_j = \left(1 - \frac{\sum_i |X_i - M_i|}{\sum_i (X_i + M_i)}\right) * 100 \tag{2}$$

The GLIIT index, as defined in equations (1) for the individual product i and (2) for the weighted aggregate j, provides information on the composition of trade flows for each year. More specifically, it presents the percentage of exports and imports of a similar product as an indication of the degree of external integration.

However, Greenaway and Milner (2003) pointed out that the Grubel-Lloyd index is far from uncontroversial. One of the main point of contention is aggregation. The aggregation problem has two dimensions: geographical and industrial. The geographical dimension underscores the problem of a multilateral approach, since the IIT measure may be upward-biased at a multilateral level due to export of a product to one trade partner, and import from another trade partner of the same product. If we seek to minimize the biases due to geographical aggregation, bilateral trade flows are preferred over multilateral trade flows (Fontagné and Freudenberg, 1997; Gullstrand 2002). In recent empirical studies both approaches are used.

The industrial dimension of the aggregation problem underscores the importance of calculating IIT at a rather low aggregation level. If we aggregate two sub-industries with opposite trade-imbalance signs at each sub-level, IIT becomes upward-biased. If these imbalances are due to inter-industry specialization, a part of IIT consists of trade that could be explained by traditional trade theory and comparative advantages.

There are two ways to solve the industrial dimension of the aggregation problem, thus allowing our IIT indices to preclude flows that could be explained by comparative advantages. One is to reclassify trade statistics, and the other is to calculate a weighted average IIT index based on disaggregated data (Greenaway and Milner, 1983; 1986). The practical problem and the lack of a

common reclassification standard of the former approach lead us to the latter, which is the trade-weighted average of sub-industry IIT levels. This will minimize the aggregation problem, since it does not cancel out the opposite trade-imbalance signs at a sub-industry level.

In order to minimize the aggregation problem, we use a 6-digit level of the Harmonized System nomenclature and then calculate the weighted average of sub-industry IIT levels across product groups for separate trading partners, countries' groups and the world as a whole over the observed period. Trade data for measuring intra-industry trade were obtained from the COMTRADE database according to HS 1992.

2.2 The measures of marginal intra-industry trade

It is generally assumed that adjustment costs associated with trade liberalization may differ depending upon whether emerging trade can be classified as inter- or intra-industry. Whereas the former implies a reallocation between industries, the latter implies a reallocation within industries and, to the extent that industries are defined in terms of the production space within which factor substitution can be classified as a relatively low cost, has a greater potential for lower adjustment costs.

The limitations of using changes in the standard GL index to capture the dynamics of changes in IIT are widely recognized. Adjustment process should be analyzed using indicators based on marginal trade flows, because adjustment is a strictly dynamic process; knowledge of changes in trade flows is required in order to infer reliable conclusions. By way of contrast, it would be inappropriate to compare static measures at different points in time. For instance, an increase in the IIT measures by the GL index at two points in time might suggest an intra-industry adjustment, although this could be due to an increase in the export of an import-oriented industry.

Some simple and now widely-used measures of MIIT were developed by Brülhart (1994). The Brülhart *A* index is a transposition of GL index to trade changes:

$$MIIT = A = \left(1 - \frac{\left|\left(X_t - X_{t-n}\right) - \left(M_t - M_{t-n}\right)\right|}{\left|X_t - X_{t-n}\right| + \left|M_t - M_{t-n}\right|}\right) * 100 \tag{3}$$

where n stands for the number of years constituting the relevant adjustment period. This is also written as:

$$A = 1 - \frac{\left|\Delta X - \Delta M\right|}{\left|\Delta X\right| + \left|\Delta M\right|} * 100 \tag{4}$$

The *A* index, like the GL index, varies between 0 and 100, where 0 indicates marginal trade in the particular industry to be completely of the inter-industry type, and 1 represents marginal trade to be entirely of the inter-industry type. The *A* index shares most of the statistical properties of the GL index, a comprehensive description of which is provided in Greenaway and Milner (1986).

When a country's exports and imports in a particular industry grow or shrink at a similar absolute rate (high *A),* trade-induced adjustment is likely to occur at the intra-industry level, while the overall performance of the industry is determined by factors which tend to affect all countries symmetrically, such as global demand or technology changes. The *A* index therefore captures the degree of cross-country symmetry in trade changes. Conversely, where a country's exports and imports in a particular industry show diverging trends (low *A*), both the trade-induced asymmetrical forces for the geographical inter-industry adjustment and the exogenous factors determining the fate of the industry

across all countries are likely to be relevant.

A can be summed, as can the GL index, across industries having the same level of statistical disaggregation by applying the following formula for a weighted average:

$$A_{tot} = \sum_{i-1}^{k} w_i A_i, \tag{5}$$

where

$$w_i = \frac{|\Delta X|_i + |\Delta M|_i}{\sum_{i=1}^{k} \left(|\Delta X|_i + |\Delta M|_i \right)}. \tag{6}$$

Thus, Brülhart's dynamic index, *A,* rather than the standard Grubel-Lloyd, is the appropriate indicator of the role played by intra-industry trade during the type of adjustment process evoked by trade liberalization.

The *A* index (like the GL index) can provide results which are relevant for multilateral studies by relating to overall adjustment pressures. Yet it does not contain any information as to the relative trade performance of industries in particular countries. In terms of net exports, inter-industry adjustment can reflect trade specialization into or out of particular industries. Hence, Brülhart (1994) suggested the following index:

$$B = \frac{\Delta X - \Delta M}{|\Delta X| + |\Delta M|} * 100 \tag{7}$$

where $|B| = 1 - A$.

This coefficient can take values ranging between –100 and 100. It is two-dimensional, containing information about both the proportion of MIIT and country-specific sectoral performance. First, the closer *B* is to zero, the higher is MIIT, whereas at both –100 and 100 it represents marginal trade as being entirely of the inter-industry type. Second, sectoral performance is defined as the change in exports and imports in relation to each other. When $B > 0$, ΔX was > ΔM. The opposite holds for $B < 0$. Unlike the *A* index, *B* cannot be meaningfully aggregated across industries. Therefore, *B* cannot be used for summary statistics resulting from calculations on a disaggregated level. Its applicability is thus confined to the industry-by-industry assessment of MIIT and performance.

Thus, measures of MIIT are designed to complement the GL index in analyses of trade change and adjustment. *A priori* reasoning suggests that MIIT relates more directly to structural adjustment than IIT, since high MIIT entails relatively low factor re-allocation between industries.

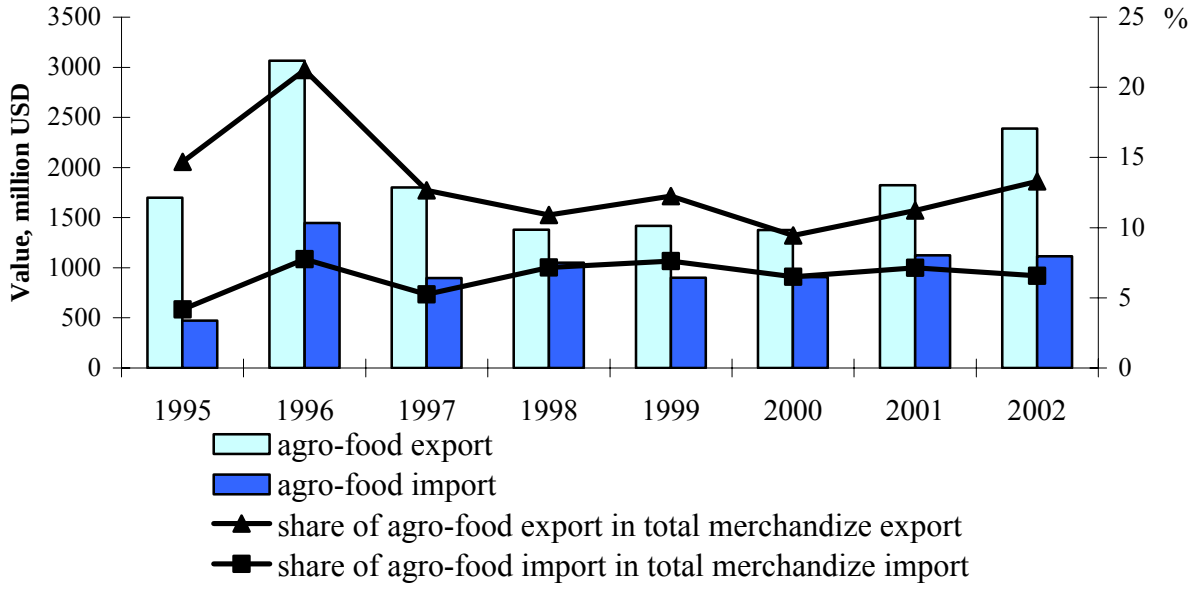
3 The general pattern of Ukrainian agro-food trade

Agro-food products hold a significant share of Ukraine's total merchandise exports. During the past eight years, agricultural products and foodstuffs have accounted, on average, for 13.2 percent of the country's total exports. The only exported commodity group that is larger is base metals and their products. However, the share of agro-food products in total merchandise exports has fluctuated from 21.2 percent in 1996 to only 9.5 percent in 2000 (Figure 1). The share of corresponding imports is significantly lower, and during 1995-2002 constituted, on average, 6.5 percent of total merchandise imports.

Ukraine traditionally has a surplus in agricultural and food trade, as agro-food exports exceed imports. The positive balance has fluctuated between USD 0.3 billion in 1998 and USD 1.6 billion in

1996.

A general reduction in world trade turnover, which occurred owing to an intensification of the financial crisis, affected the development of Ukraine's foreign trade after 1997. The 1998 financial crisis in Russia (the main trading partner of Ukraine) also had a substantial impact on foreign trade. In 2001, after a steady downfall of exports from 1997-2000, Ukraine exhibited positive tendencies in agro-food trade; these tendencies remain (Figure 1). Favourable prices on the world market and a comparatively high domestic



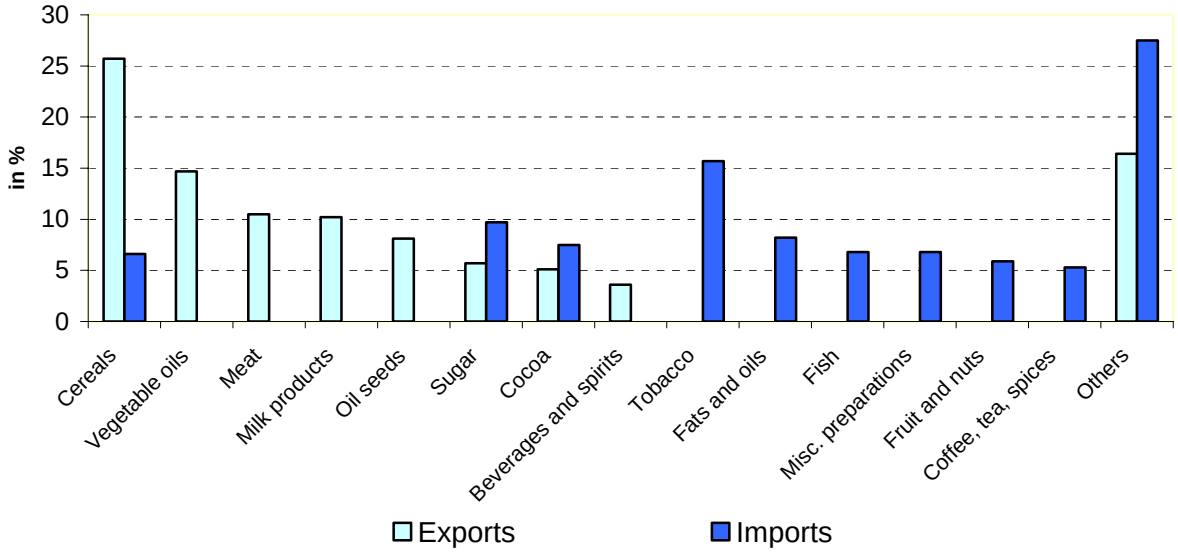
Source: Own calculations based on data provided by State Statistics Committee of Ukraine.

Figure 1. Ukrainian agro-food trade, 1995-2002.

supply of the main types of agricultural products were the main reasons for augmented agro-food export.

Ukrainian agro-food export is characterized by high concentrations on a limited number of product groups. The leading positions in the commodity structure of Ukrainian agro-food exports consist of cereals, vegetable oils (mainly sunflower oil), meat (principally beef), milk products and oil seeds (Figure 2). On the other hand, agro-food imports to Ukraine are more diversified than corresponding exports. Tobacco, sugar and sugar confectionery (mainly raw sugar from sugar cane), fats and oils, cocoa and cocoa products, fish and miscellaneous edible product in recent years have accounted for the largest share of agro-food imports. A substantial share of sugar in Ukraine's agro-food imports in the reported period can be explained by the low competitiveness of the domestic sugar refining industry and a number of laws passed in 2000-2001 which set quotas for raw sugar imports at privileged import duty rates.

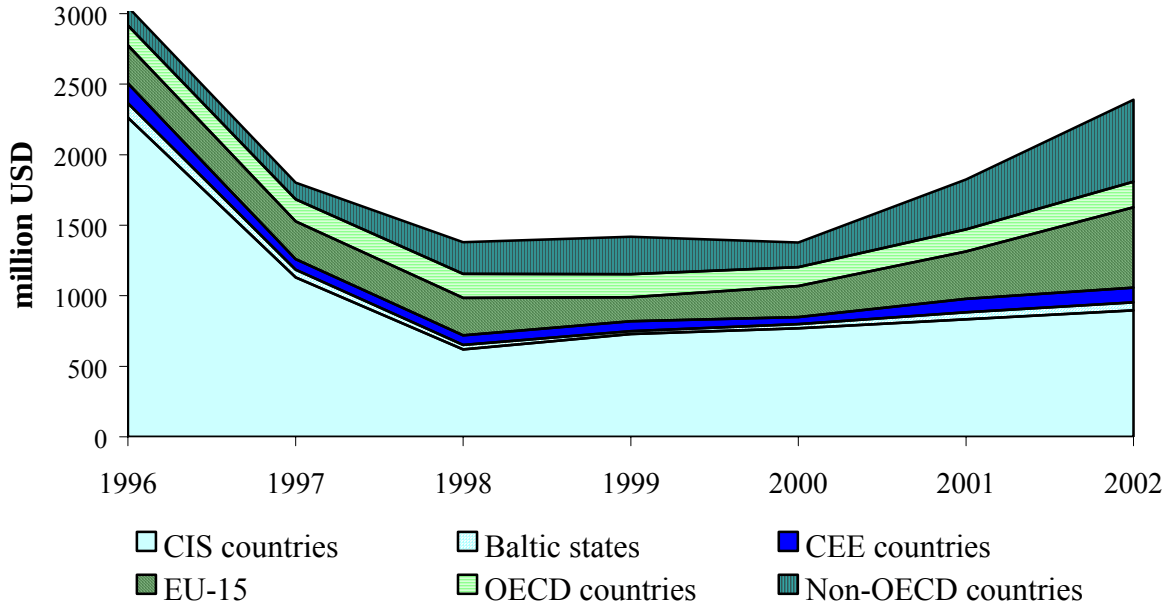
An analysis of the geographic structure of the agro-food trade indicates that Ukraine has been gradually redirecting its export orientation from CIS countries to non-CIS countries, mainly towards EU-15 and developing counties. But in general, CIS countries account for the largest share of Ukrainian aggregated exports of agricultural and food products.



Source: Own calculations based on data provided by State Statistics Committee of Ukraine.

Figure 2. Commodity composition of Ukrainian agro-food exports and imports, 2000-2002, on average.

The value of agro-food exports to CIS countries fell sharply in 1997 and continued to decrease in 1998 (see Figure 3). Therefore, the share of these countries' group in total Ukrainian agro-food exports shrank from 74.2 percent in 1996 to 44.8 percent in 1998. In 1999-2002, the value of agro-food exports to CIS countries remained steady, but the share of the group in total concerned with exports decreased to 37.5 percent in 2002 due to increased exports to other regions.

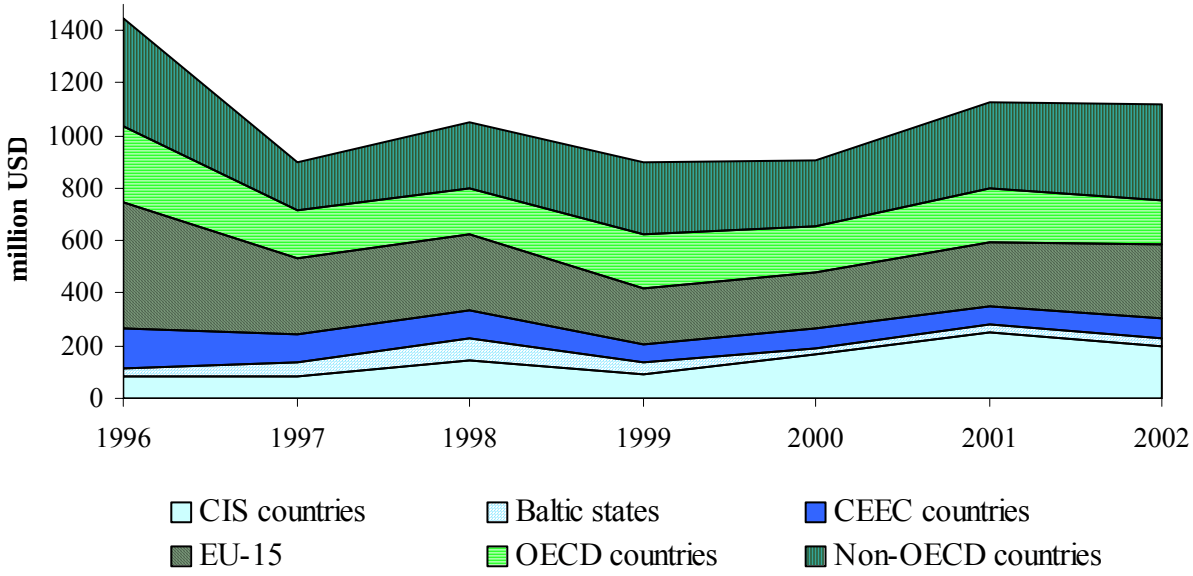


Source: Own calculations based on data provided by State Statistics Committee of Ukraine.

Figure 3. Geographic structure of Ukrainian agro-food export, 1996-2002.

On the other hand, during the past few years there has been a tendency for the value of agro-food exports to EU-15 and developing countries (i.e. non-OECD countries) to increase. In 2002, the share of Ukrainian total agro-food exports to these countries was 23.8 percent and 24.2 percent, respectively.

The evolution of the geographic structure of Ukrainian agro-food exports is associated with changes in its commodity structure. The CIS countries were the major consumers of processed food, but shrinkage of this market implies a reorientation to new trading partners that demand mainly raw agricultural products



Source: Own calculations based on data provided by State Statistics Committee of Ukraine

Figure 4. Geographic structure of Ukrainian agro-food imports, 1996-2002.

The geographic origin of agro-food imports to Ukraine are in more stable (Figure 4). The main importers of agricultural products and foodstuff to Ukraine are non-OECD countries and the EU, which in 2002 accounted for 32.6 percent and 25.4 percent of total agro-food imports, respectively. Also the significance of CIS countries (primarily Russia) has increased since 1999.

4 Ukrainian intra-industry trade in agro-food products: empirical results

4.1 The traditional measure of IIT

In this study we focus on Ukrainian agro-food trade over the period 1996-2002. GL indices of IIT for Ukrainian agro-food trade were calculated a) by commodity groups, b) by all trading partners (the world) and with respect to the following regional specification: CIS, Baltic states, CEE countries, EU-15, OECD countries and non-OECD countries. Moreover, to examine the possible impact of geographical aggregation, we have calculated GLIIT indices for Ukrainian trade in agro-food products in two ways: 1) based on bilateral trade flows with each trading partner, which were aggregated to the group level, and 2) based on multilateral trade flows on the group level. Results (see Table 1) confirm the sensitivity of GL indices to the choice of aggregation level. It can be seen that IIT measures are upward-biased at a multilateral level due to the export of a product to one trade partner and import from another trade partner of the same product. Nevertheless, in the following, we often use multilateral levels to examine IIT in more detail due to the extreme complexity of calculations on the bilateral level and subsequent aggregation to the group level.

Results presented in Table 1 reveal that generally, intra-industry trade of agro-food products in Ukraine is very low. The majority of total trade in the analyzed sector, 86.4 percent, is of the inter-industry type. The low level of the GLIIT index with OECD and non-OECD countries (1.89 and 1.34

percent, respectively) reflects the significant difference in the structure of their economies compared to Ukraine. In addition, the inter-industry nature of trade can be explained by the continuation of some trade constraints. On the import side, the liberalization of agro-food trade in Ukraine has been less substantial and more gradual than in other sectors, implying high levels of import tariffs on food. On the export side, Ukrainian agricultural and food products tend to lack international competitiveness, particularly to the EU.

The GL indices tend to be higher with CIS and CEE countries, although the tendencies of IIT evolution with these groups are the opposite: there is an upward trend in IIT with CIS and a downward trend for the CEEC. The existing free trade area between CIS countries, the expansion of their imports in Ukraine, accompanied by more stable corresponding exports in the first case and an interruption in communications between Ukraine and the CEEC, as well as the orientation of CEE countries to the EU market, could explain the above-mentioned tendencies. Moreover the high level of IIT is usually attributed to a number of country-specific factors, including its close geographical proximity, similar level of per capita income, similar level of development, similar consumer tastes, language, culture, institutional, political and transport links.

Table 1. Grubel-Lloyd indices of intra-industry trade in agro-food products between Ukraine and its trading partners, 1996-2002.

Group	1996	1997	1998	1999	2000	2001	2002	1996-2002, in average
CIS								
Total	2.40	4.30	7.04	5.71	11.78	14.41	14.75	8.63
Aggregated	1.24	1.25	2.74	2.90	5.26	8.54	6.91	4.12
Baltic states								
Total	2.62	3.14	2.98	3.57	3.15	4.28	3.56	3.33
Aggregated	1.79	1.23	1.64	2.07	1.38	2.31	2.05	1.78
CEE countries								
Total	11.17	10.29	9.03	12.90	8.39	5.16	5.13	8.87
Aggregated	6.35	5.60	3.02	6.61	2.16	2.53	1.75	4.00
EU-15								
Total	5.53	6.42	4.69	5.09	7.21	5.75	3.33	5.43
Aggregated	3.63	3.66	2.95	2.41	2.87	1.94	1.20	2.67
OECD countries								
Total	2.21	1.21	1.55	1.30	2.37	2.30	2.27	1.89
Aggregated	0.68	0.84	0.54	0.62	1.77	0.72	1.00	0.88
Non-OECD countries								
Total	1.40	0.70	4.67	0.41	0.83	0.71	0.69	1.34
Aggregated	0.04	0.05	0.03	0.07	0.11	0.34	0.40	0.15
World								
Total	15.26	15.51	14.83	12.17	14.95	13.17	10.07	13.71
Aggregated	1.78	1.83	1.92	2.01	3.11	3.88	2.79	2.47

Source: Own calculations based on COMTRADE Database.

Table 2 shows the evolution of GL indices calculated by commodity groups. We also computed weighted average indices across agricultural products (HS groups 1-15), food (HS groups 16-24) and total agro-food trade (HS groups 1-24) using as a weight the share of each industry's trade of total concerned trade. As expected, IIT indices are higher for food (22 percent on average) than for agricultural products (about 8 percent). The relative high magnitude of IIT exists in preparations of cereals, flour, starch or milk (HS 19), preparations of vegetables, fruit, nuts (HS 20), beverages, spirits and vinegar (HS 22), and tobacco (HS 24) and also in fish, products of animal origin. This confirms the suggestion that IIT is more common in sectors with significant production differentiation, and is insignificant in sectors with standardized products, such as natural resources and agricultural products, where most trade is inter-industry (Kandogan 2003b). It is also important to note that during the reported period, average indices of IIT for food were rather stable, while at the same time, indices for

Table 2. Intra-industry trade by commodity groups between Ukraine and all trading partners (the world), 1996-2002.

HS code	1996	1997	1998	1999	2000	2001	2002	Average weighted
01- live animals	0.54	1.99	3.98	9.55	5.79	11.02	11.16	3.64
02- meat and edible meat offal	1.97	3.82	4.13	7.18	3.55	3.82	3.82	3.85
03- fish and fish products	34.79	37.84	19.69	9.79	37.15	27.11	26.07	27.57
04- dairy, eggs, honey etc.	9.95	17.80	13.20	26.19	6.21	4.11	4.95	9.38
05- product of animal origin	35.79	45.10	28.73	48.58	20.45	11.93	10.75	27.37
06- live trees, cut flowers etc.	18.10	8.39	13.13	5.47	4.90	5.50	3.87	7.05
07- edible vegetables etc.	11.42	4.74	5.33	10.60	9.43	10.56	6.77	8.22
08- edible fruits, nuts etc.	8.35	3.49	2.61	2.20	1.93	2.36	4.03	3.77
09- coffee, tee, mate etc.	9.18	8.92	5.24	2.11	2.23	1.88	2.94	4.12
10- cereals	5.34	3.87	1.09	1.73	32.89	12.19	0.99	6.07
11- milling products, malt, starches	7.01	7.86	6.22	3.52	5.78	3.90	9.35	6.52
12- oil seeds, seeds etc.	13.09	13.05	12.62	14.96	11.70	11.47	39.29	14.02
13- lac, gums, resins etc.	22.68	15.73	16.40	14.66	13.00	8.09	3.97	14.72
14- vegetable plaiting materials	7.39	3.16	8.39	16.73	29.02	14.04	3.12	8.83
15- animal or vegetable fats etc.	9.09	10.00	17.51	7.06	0.80	1.22	1.50	5.47
16- preparations of meat, of fish	14.64	7.38	24.41	27.29	18.12	57.69	49.72	21.24
17- sugars and sugar confectionery	16.51	8.77	17.82	8.63	14.20	11.08	24.61	14.92
18- cacao and cacao preparations	26.05	12.62	16.51	12.82	12.77	13.97	7.90	13.30
19- preparations of cereals, flour	51.23	42.03	30.28	30.06	23.86	28.77	29.03	36.45
20- preparations of vegetables etc.	41.92	32.85	28.17	25.18	21.40	24.28	21.01	28.44
21- miscellaneous edible preparation	16.81	18.20	11.38	8.51	10.69	21.36	18.06	15.96
22- beverages, spirits and vinegar	19.07	35.20	32.71	23.39	25.57	40.64	31.62	26.85
23- residues from food industry etc.	15.41	43.32	33.06	38.88	17.05	10.57	10.48	17.92
24- tobacco etc.	39.56	27.77	25.69	38.51	31.62	32.92	26.79	31.58
01-15 total agricultural products	**9.44**	**11.34**	**9.53**	**6.96**	**11.67**	**7.82**	**4.28**	**8.43**
16-24 total food products	**21.06**	**20.81**	**24.10**	**23.04**	**20.57**	**22.98**	**21.38**	**21.78**
01-24 total agro-food products	**15.26**	**15.51**	**14.83**	**12.17**	**14.95**	**13.17**	**10.07**	**13.68**

Source: Own calculations based on COMTRADE Database.

agricultural products fluctuated significantly, from 4.28 percent in 2002 to 11.67 percent in 2000. These results correspond to the commodity structure of Ukrainian trade in agricultural products. As mentioned above, Ukraine has a high concentration of agro-food exports on a limited number of products, with a prevailing share of cereals, which is caused by the country's comparative advantage. In 2002, the share of cereals in Ukrainian agro-food exports was the highest compared to other examined years (41.8 percent of total agro-food exports). Consequently, the level of IIT was the lowest. In 2000, the situation was the opposite: Ukraine had the lowest level of grain exports (with significant corresponding imports) and, as a result, the highest level of IIT in agricultural products.

Altogether, IIT indices for agro-food products were low and fluctuated from 10.07 in 2002 to 15.51 in 1997. Thus, there is no strict trend in the IIT evolution, although GL indices tend to be lower in recent years than in the first sample years. This is contrary to the development of agro-food trade in CEE countries, where there is a distinct upward trend in IIT (Bojnec 2001; Fertö and Hubbard 2001, 2002; Bojnec and Hartmann 2004).

We also calculated GL indices by commodity group based on multilateral trade flows on the specified groups' level. It is interesting that IIT with CIS countries, Baltic States and OECD countries corresponds to the overall tendency to a higher level of GL indices for food, but agro-food trade with the EU-15 is characterized by higher IIT in agricultural products. IIT trade in agricultural and food products with CEE countries is more or less equal, and it is insignificant with non-OECD countries.

4.2 Marginal intra-industry trade

So far the analysis has been based on indices which measure the extent of IIT as a proportion of

total trade at a given point of time. But changes in the GL index may not capture potential adjustment costs, and measures of marginal intra-industry trade (MIIT) can, therefore, be used to complement traditional IIT analysis. We have calculated *A* indices for agro-food products from HS 6-digit trade figures over the periods 1996-1999 and 1999-2002 based on multilateral trade flows at the specified groups' level (Table 3).

Table 3. Marginal intra-industry trade in agro-food products in Ukraine, by trade partners, 1996-2002 (*A* indices).

Countries' group	1996-1999	1999-2002
CIS countries	1.7	9.9
Baltic states	0.4	0.9
CEE countries	7.5	4.5
EU-15	4.7	1.7
OECD countries	2.0	1.4
Non-OECD countries	3.8	0.9
World total	**9.6**	**7.6**

Source: Own calculations based on COMTRADE Database.

The highest share of marginal IIT is revealed for CIS countries over the period 1999-2002. For other trade partners was the level of marginal IIT less relevant over both period (excepting CEE countries over period 1996-1999). The generally low level of *A* indices (close to zero) indicates that most of change occurring in trade flows has been inter-industry by nature and therefore very likely have induced high adjustment costs.

If we look at average *A* indices across HS 2-digit sectors, we find that MIIT patterns resemble those of IIT in so far as food-processing industries exhibit consistently higher average index value than primary sectors. The highest levels of MIIT for the period 1996-1999 are the one's for fish, preparations of vegetables, fruits and nuts, and preparations of cereals, flour, starch or milk; for the period 1999-2002 the highest *A* levels are those for sugar and sugars confectionery, tobacco and preparations of cereals, flour, starch or milk sections.

Table 4 summarizes the results of the calculations of the Brülhalt's (1994) *B* index which measures the sectoral performance and MIIT. We classify 6-digit sectors of Ukrainian agricultural and food processing industries into four groups according to the size and the sign of this index. The first group includes products where $-100 \leq B < -50$ and refers to products with bad performance, where marginal trade is mainly of inter-industry type. The second group ($-50 \leq B < 0$) includes products where marginal IIT dominates, and the negative sign of B index indicates a weak performance of these products. The third ($0 \leq B < 50$) and forth ($50 \leq B < 1$) groups cover those products that reflect a good trade performance, however, while the third group characterizes products where marginal IIT prevails, the vice versa holds for the forth group.

Table 4. Allocation of *B* indices of marginal IIT for Ukrainian agro-food trade by trade partners, 1996-2002.

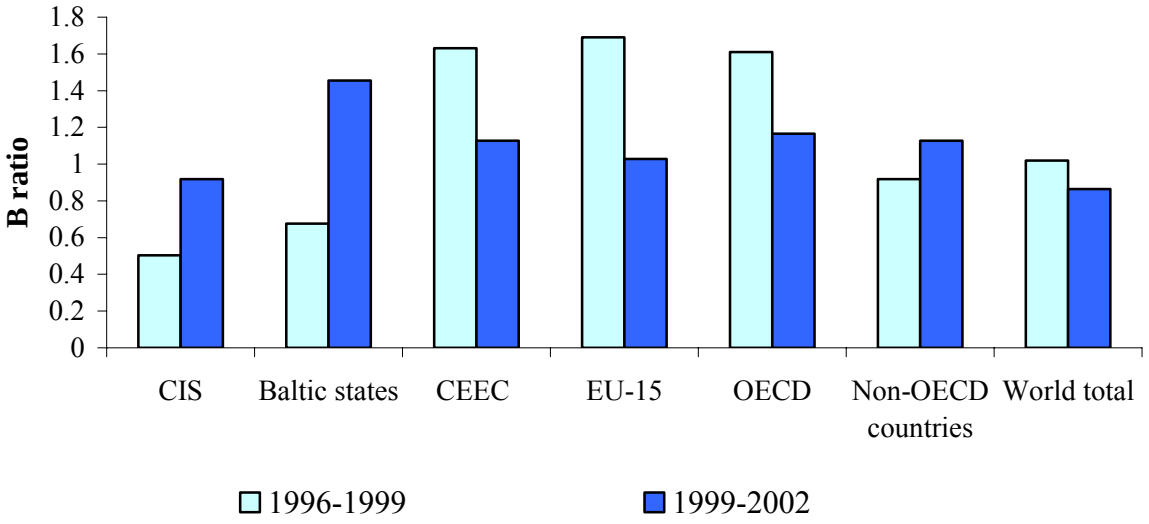
	1996-1999				1999-2002			
	I	II	III	IV	I	II	III	IV
CIS	302	16	13	147	214	20	16	199
Baltic states	180	3	6	116	107	3	6	154
CEE countries	169	7	11	276	177	11	14	198
EU-15	189	8	12	321	235	10	8	244
OECD countries	163	4	3	266	180	8	15	204
Non-OECD countries	268	15	11	251	248	2	14	268
World total	280	38	39	285	311	26	29	262

Source: Own calculations based on COMTRADE Database.

The results indicate that marginal trade in most Ukrainian agro-food products is of the inter-industry type (the majority of products belong to first and fourth groups). This applies to the trade relations with the world and all trading partners.

Looking at the trade performance measured by *B* indices, we find that the majority of products displayed negative *B* values (belonging to 1 and II groups) vis-à-vis the Former Soviet Union countries over the both examined periods indicating that there have been more agricultural and food products with a weak performance. In the trade with European and OECD countries, however, a narrow majority of industries displayed positive B indices. These results document declining trade competitiveness in traditional markets (CIS countries and Baltic states) and a reorientation of Ukrainian agro-food exports towards new trading partners.

The trade performance of Ukrainian agro-food sector deteriorated over second sub-period, if total trade with the world is considered. It reveals also the level of B ratio, calculated as relation between number of industries with positive *B*s relative to those with negative *B*s (Figure 6).



Source: Own calculations.

Figure 6. Ukrainian agro-food trade performance, 1996-2002.

Looking at the regional dis-aggregation there were opposite tendencies in trade performance with different groups: *B* ratios in 1999-2002 compared to the 1996-1999 increased for CIS countries, Baltic States and non-OECD countries, and decreased for the EU-14, CEEC and OECD countries. It indicates that the Ukrainian trade position on western markets (CEE countries, European Union and other OECD countries) improved considerably during the first analyzed period. But over 1999-2002, although trade performance remained positive, a continued upturn was not observed. In respect to trade with CIS countries the Ukrainian position on the concerned market during the second sub-period strengthened to some extent, however, trade performance was still negative, as *B* ratio stayed at a level lower than one. The reduction of B ratio over 1999-2002 reveals the decrease of the Ukrainian trade position on world agricultural markets.

4 Conclusions

The process of economic transformation in Ukraine, as in other Former Soviet Countries is characterized by changing trade patterns in agricultural and food products. Over the analyzed period, Ukraine has remained a net exporter of agro-food products, but the total volume, commodity and geographical structure of trade flows have altered significantly. The changes in commodity structure of agro-food exports include a shift away from processed products towards raw materials, mainly cereals and vegetable oils, followed by dairy and meat products. At the same time, the import structure

has remained rather steady and is more diversified than Ukrainian agro-food exports.

Major changes also occurred in the direction of trade flows, with an increasing importance of both the EU and developing countries. Despite the fact that in 2002, agro-food exports to CIS countries decreased by more than 50 percent compared to 1996, these countries (primarily Russia) absorb the largest share of Ukrainian exports. Furthermore, the Ukrainian export position on this market has recovered in recent years, mainly due to economic recovery in Russia after the crisis of 1998. Thus, the economic situation in CIS countries has a significant impact on Ukrainian export performance.

Further examination of Ukrainian agro-food trade flows using an intra-industry trade approach enables more detailed analysis of the structural changes in trade flows and the level of external integration. The analysis reveals, that intra-industry trade in Ukrainian agricultural and food trade had a little relevance over 1996-2002. More than 86% of trade in these products is of the inter-industry type and thus caused by underlying comparative advantage of the country. The explanation for the low level of external integration in the Ukrainian agro-food sector is that the protections scale has remained high over period analyzed and thus has hindered trade in general and intra-industry in particular (von Cramon-Taubadel, S., Zorya, S., 2001). But intra-industry values for distinct trading partners and specified commodity groups differ significantly and exhibit high variability over time. Among different countries' groups, higher levels of IIT are found between Ukraine and such trading partners as CIS and CEE countries. The plausible explanation of relative high integration levels between Ukraine and the above-mentioned countries in terms of IIT magnitude seems to be the similarities of per capita income, level of economic development, taste overlap, cultural, political and transport links, etc. Moreover, in the case of CIS countries, the efforts of liberalisation in line with CIS Agreement could be a factor which increased the extent of IIT (as IIT is positively correlated with trade intensity and liberalization agreements). Among specific product groups, the values of the GLIIT index are highest for sub-sectors with higher product differentiation, such as processed foods, which corresponds to the theory and previous empirical studies. The same tendency was found by analyzing marginal IIT: food products involving a greater degree of processing show higher index value than primary sub-sectors.

The low shares of GLIIT and marginal IIT indexes indicate that trade-induced reallocation of production factors has occurred between sectors rather than within sectors, implies high adjustment costs. The Ukrainian agro-food sector faces high pressure for adjustment in the course of further economical integration – the access of Ukraine in WTO. But it is a necessary step and the success will depend on the consistency and depth of reform in order to improve economical environment.

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