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Luka, Oksana; Levkovych, Inna

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

DISCUSSION PAPER

Institute of Agricultural Development in Central and Eastern Europe

INTRA-INDUSTRY TRADE IN AGRICULTURAL AND
FOOD PRODUCTS: THE CASE OF UKRAINE

OKSANA LUKA, INNA LEVKOVYCH

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Dr. Oksana Luka is an assistant in the State Regulation Department of the National Agricultural University, Kiev, Ukraine. Her research focuses on agricultural trade and trade policy analysis.

Mailing address:	National Agricultural University
	Heroyiv Oborony str. 15
	03041 Kiev
	Ukraine
Phone:	+38-044-267-86-48
Fax:	+38-044-267-30-06
E-mail:	oksana_luka@wm.nauu.kiev.ua
Internet:	http://www.nauu.kiev.ua

Inna Levkovych is a research assistant at the Institute of Agricultural Development in Central and Eastern Europe (IAMO), Department of Agricultural Markets, Marketing and World Agricultural Trade, in Halle, Germany. Her research focuses on agricultural trade analysis, trade policy and WTO accession issues.

Mailing address:	Institute of Agricultural Development in Central and Eastern Europe (IAMO)
	Theodor-Lieser-Straße 2
	06120 Halle/Saale
	Germany
Phone:	+49-345-29 28 238
Fax:	+49-345-29 28 299
E-mail:	levkovych@iamo.de
Internet:	http://www.iamo.de

ABSTRACT

The process of economic transformation in Ukraine is characterized by, among other things, a change in agricultural and food product trading patterns. Ukraine has remained a net exporter of agro-food products, but the total volume and worth, as well as the geographical structure of trade flows, has altered significantly, and further adjustments can be expected to take place in upcoming years. This paper examines Ukrainian agro-food trade, particularly focusing on different aspects of intra-industry trade (IIT), which is usually associated with low adjustment costs. To examine the development of IIT in agro-food products between Ukraine and its trading partners, two approaches are adopted. The Grubel-Lloyd Index is used to calculate the intensity of IIT and thus to determine its relative importance compared to inter-industry trade. IIT values estimated across separate product groups and for selected trading partners differ significantly and exhibit high variability over time, but generally the level of IIT is very low. The results show that the major part of agro-food trade is of the inter-industry type, and thus a product of underlying comparative advantages. Secondly, the paper examines changes in trade flows over time. For this purpose, different measures of marginal intra-industry trade are applied. Marginal IIT appears to be low, therefore, the structure of the change in agro-food trade flows between Ukraine and its trading partners during the analyzed period (1996-2002) is shown to be predominantly inter-industry, which implies potentially high adjustment costs.

JEL: Q17, F14
Keywords: Intra-industry trade, marginal intra-industry trade, agro-food products, Ukraine.

ZUSAMMENFASSUNG

INTRASEKTORALER HANDEL IM LANDWIRTSCHAFTLICHEN UND NAHRUNGSMITTELSEKTOR: DAS BEISPIEL DER UKRAINE

Der Transformationsprozess in der Ukraine ist unter anderem durch Änderungen der Handelsstruktur von landwirtschaftlichen und Nahrungsmittelprodukten charakterisiert. So haben sich das Gesamthandelsvolumen, die Warenstruktur sowie die geografische Struktur der Handelsströme bedeutsam geändert. Weitere Änderungen sind demnächst zu erwarten. Dennoch bleibt die Ukraine Netto-Exporteur von landwirtschaftlichen und Nahrungsmittelprodukten.

Das Ziel von diesem Papier ist, die Landwirtschaft und den Nahrungsmittelhandel der Ukraine detailliert zu untersuchen. Hauptaugenmerk liegt dabei auf verschiedenen Aspekten des intrasektoralen Handels, welcher gewöhnlich mit niedrigen Anpassungskosten verbunden ist. Um dessen Entwicklung zu untersuchen, wurden zwei Ansätze verwendet. Zunächst nutzen wir den Grubel-Lloyd Index für die Bewertung der Intensität des intrasektoralen Handels. Herausgestellt werden soll die Bedeutung des intrasektoralen im Vergleich zu zwischensektoralem Handel. Das Niveau des intrasektoralen Handels, welches für Produktgruppen sowie für ausgewählte Handelspartner berechnet wurde, unterscheidet sich wesentlich und weist große Schwankungen im Zeitablauf auf. Insgesamt ist das Niveau aber sehr gering. Die Ergebnisse zeigen, dass der intersektorale Handel überwiegt. Dies wird durch komparative Vorteile verursacht. Danach untersucht die Arbeit außerdem die Änderungen der Handelsströme im Zeitablauf. Dafür wurden verschiedene Maße des marginalen intrasektoralen Handels angewendet. Die marginalen Indizes sind niedrig, was bedeutet, dass die Änderungen in den Handelsströmen zwischen

Ukraine und ihren Handelspartnern während der untersuchten Periode (1996-2002) intersektoralen Charakter haben, und somit potenzielle höhere Anpassungskosten mit einschließt.

JEL: Q17, F14

Schlüsselwörter: Intrasektoraler Handel, marginaler intrasektoraler Handel, landwirtschaftliche und Nahrungsmittelproduktion, Ukraine.

РЕЗЮМЕ

ВНУТРИОТРАСЛЕВАЯ ТОРГОВЛЯ СЕЛЬСКОХОЗЯЙСВЕННОЙ ПРОДУКЦИЕЙ И ПРОДОВОЛЬСТВИЕМ: НА ПРИМЕРЕ УКРАИНЫ

Изменение структруры внешней торговли сельскохозяйственной продукцией и продовольствием, среди прочего, является одной из важных характеристик процесса трансформации экономики Украины. Украина остается нетто-экпортером агропродовольственной продукции, однако общий объем торговли, а также ее товарная и географическая структура существенно изменились, и ожидается, что в ближайшем будущем будут происходить дальнейшие ее изменения. Целью данной работы является детальное изучение украинской агропродовольственной торговли с акцентом на исследовании различных аспектов внутриотраслевой торговли, наличие которой обычно подразумевает меньшие затраты, связанные с трансформацией внешней торговли в процессе ее либерализации. Для анализа развития внутриотраслевой торговли между Украиной и ее торговыми партнерами использованы два подхода. Индекс Грубеля-Ллойда определяет интенсивность внутриотраслевой торговли и ее весомость по сравнению с межотраслевой. Значения индекса существенно варьируют по товарным группам, торговым партнерам и годам, однако его уровень в целом очень низкий. Полученные результаты свидетельствуют, что торговля агропродовольственной продукцией в основном является межотраслевой, что обусловлено сравнительными преимуществами страны. Кроме того, в работе анализируются изменения торговых потоков на протяжении 1996-2002 гг. с использованием различных показателей маржинальной внутриотраслевой торговли. Поскольку уровень маржинальной внутриотраслевой торговли достаточно низкий, изменения потоков агропродовольственной продукции между Украиной и ее торговыми партнерами на протяжении анализируемого периода являются межотраслевыми, что подразумевает потенциально высокие затраты в связи структурными изменениями в отрасли.

JEL: Q17, F14

Ключевые слова: Внутриотраслевая торговля, маржинальная внутриотраслевая торговля, агро-продовольственная продукция, Украина.

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LIST OF ABBREVIATIONS

CEE	Central and Eastern Europe
CEEC	Central and Eastern European countries
CIS	Commonwealth of Independent States
COMTRADE	United Nations Commodity Trade Statistics Database
EU	European Union
GDP	Gross domestic product
GL	Grubel and Lloyd
GLIIT	Grubel-Lloyd index of intra-industry trade
HS	Harmonized System (Harmonized Commodity Description and Coding System)
IIT	Intra-industry trade
MIIT	Marginal intra-industry trade
OECD	Organization of Economic Cooperation and Development
WTO	World Trade Organization

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 has been discussed: From causes, significance, determinates of IIT, link to trade liberalization to conceptual and statistical problems involved in trying to measure IIT[1]. The studies of RUFFIN (1999), GREENAWAY and 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[2] (KANDOGAN, 2003a; KÖSEKAHYAOGLÜ, 2001).

Nowadays, there is an increasing number of studies of IIT between Western Europe and transition countries, generally between the EU and CEE countries[3]. The core reason of these investigations has been to examine the effects of trade liberalization on trade flows for the CEE countries that signed the Association Agreement with the EU. All authors reported significant increases in the level of intra-industry trade between the EU and examined CEE countries. At the same time, these studies focus mainly on the trade of manufactured goods and tend to neglect agro-food trade.

The relative importance of intra-versus inter-industry trade in agro-food products for the CEE countries is difficult to predict *ex ante*. Some of the countries involved are well-endowed with natural resources; many are also relatively well-endowed with human and physical capital. Real wage costs are significantly lower than in Western Europe. Such factors will result in trade patterns predicted by the standard Heckscher-Ohlin theory, with countries exporting goods that use relatively abundant production factors. The study of FERTÖ and HUBBARD (2001) confirm this hypothesis. They reported a slight growth in IIT in agro-food sector between Hungary and EU countries, but its level is low for the majority of countries and product groups. They also pointed out that the structure of the change in agro-food trade between these countries during 1992-1998 was predominantly intra-industry. Analyzing Slovenian trade flows BOJNEC and HARTMANN (2004) conclude that the relevance of IIT in Slovenian agricultural and food trade is fairly low, but varies among the different sub-sectors and trade partners. In addition, most of the change in trade over time has been of the inter-industry type.

This paper investigates Ukrainian agricultural and food trade, particularly focusing on different aspects of intra-industry trade (IIT). Our interest in 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

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[1] BALASSA (1963); GRUBEL and LLOYD (1975); AQUINO (1978); RUFFIN (1999); GREENAWAY and MILNER (2003) etc.

[2] KRUGMAN (1981) has formally shown that when countries have sufficiently similar factor endowments, both partners tend to gain from trade liberalisation and the consequent IIT poses fewer adjustment problems than in the standard case.

[3] Some recent studies are DJANKOW and HOEKMAN (1996); BRENTON and GROSS (1997); ATURUPANE et al. (1999); GABRISH and SEGNANA (2002) and KANDOGAN (2003b).

of population are economically active in this sector. Agricultural products and food have accounted, on average, for 13.2 per cent of the country's total exports (IER, 2003). Second, the necessary step in the economic development of Ukraine is trade liberalization. It presumes the possibility of a Free Trade Agreement implementation with three CIS countries and most important the expected WTO accession[4]. Trade theory suggests that the removal of trade barriers can have a considerable impact on a country's production structure and income distribution. As mentioned above adoption of 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 of Ukraine over 1996-2001. This analysis of the nature of trade provides an insight into the potential consequences of further trade liberalization for the agro-food sector, namely expected structural adjustment. We apply recent developments in the theoretical literature to identify those measures of IIT considered the most appropriate for studying a general pattern of IIT in agro-food products, possible differences according to single products and countries, and changes in trade flows over time.

The remaining chapters of the paper are 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[5], 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 $GLIIT_i$ is the Grubel-Lloyd index of IIT in industry i, and X_i and M_i are, respectively, the values of exports and imports in industry i.

The value of $GLIIT_i$ ranges from 0 to 100. If there is no IIT (i.e., either X_i or M_i is zero) $GLIIT_i$ takes the value of 0. If all trade is IIT (i.e., $X_i = M_i$), $GLIIT_i$ 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

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[4]   In 2003 President of Ukraine signed an Agreement on the Formation of a Single Economic Space between Belarus, Kazakhstan, Russia and Ukraine, which foresees implementation of a Free Trade Agreement and eventually transformation towards a Customs Union.

[5]   In this paper we will not discuss all indices of measuring IIT. For detailed information see GULLSRAND "Does the Measurement of Intra-Industry Trade Matter?".

specific product i in total trade j:

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

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. Two main points of contention are aggregation and adjustment for aggregate payment imbalance. The latter refers to the argument stating that when aggregate goods trade is unbalanced, IIT indices may be biased downwards. GRUBEL and LLOYD (1975) suggested a 'correction' for aggregate trade imbalance, as have AQUINO (1978) and BERGSTRAND (1983). Quite apart from the technical shortcomings of particular corrections, GREENAWAY and MILNER (1981; 2003) pointed out that there were no strong *a priori* arguments for adjustment, since we have no *ex ante* knowledge of what constitutes a particular set of 'equilibrium' transactions. Moreover, VONA (1991) argues that the correction argument is theoretically unsound and leads to an unreliable adjustment procedure. His example suggests that more plausible values are generated by the unadjusted Grubel-Lloyd index. For these reasons, in our study we employ an unadjusted Grubel-Lloyd index to compute the extent of IIT.

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[6].

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. FINGER (1975) argued that the classification of trade statistics lump together products of different factor intensity. That is, IIT may just be a statistical phenomenon due to the mis-categorization of products. However, GRAY (1979) and GREENAWAY and MILNER (1983) find that intra-industry trade is not simply derived from aggregation. Though some exaggeration of the importance of IIT obviously exists, it retains its status as a phenomenon of significance. And nowadays we still find rather large volumes of IIT at very low aggregation levels, which implies that IIT is not just a statistical phenomenon. Besides the aggregation of final goods with various factor intensities, another source of the industrial aggregation problem stems from the increased fragmentation of production processes. An industry consists of both final and intermediate products, and measuring IIT at

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[6] For instance, BLANES and MARTIN (2000) calculate IIIT at the country level and aggregated to OECD and non-OECD countries; CHIARLONE (2000) use bilateral data for Italian trade with the EU; FERTÖ and HUBBARD (2001; 2002) estimate IIT based on bilateral trade flows between Hungary and EU members. On the other hand, many studies use multilateral trade flows to calculate IIT (e.g., BOJNEC and HARTMANN, 2004; KANDOGAN, 2003; MORA, 2002; THOM and McDOWELL, 1999).

a high aggregation level may imply that we measure an exchange between final products and intermediates.

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[7] 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.

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.

The first attempt to construct an index of marginal intra-industry trade was made by HAMILTON and KNIEST (1991), who argued that for the purpose of evaluating the adjustment consequences of trade expansion it was important to focus on how IIT changes at the margin. They offered an index which effectively calculated the proportion of the changes in exports or imports. There are a range of shortcomings associated with the Hamilton-Kniest index, as set out in GREENAWAY et al. (1994) and BRÜLHART (1994) (both of which offer alternatives). At the same time, their fundamental insight is an important one – if we are interested in adjustment, appropriate measures of MIIT are essential.

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:

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

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[7] This approach is similar to ATURUPANE et al. (1997; 1999) and GULLSTRAND (2002), while GREENAWAY et al. (1994; 1995; 1999) and CHIARLONE (2000) used a 5-digit level of SITS, FONTAGNÉ et al. (1998) used an 8-digit level of the Combined Nomenclature, BLANES and MARTIN (2000) and MORA (2002) use the 6-digit level of Combined Nomenclature.

where *n* stands for the number of years constituting the relevant adjustment period[8]. This is also written as:

$$A = 1 - \frac{|\Delta X - \Delta M|}{|\Delta X| + |\Delta M|}. \tag{4}$$

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 100 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)[9].

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

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:

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

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[8]   There exists no consensus on the appropriate choice of n. OLIVERAS and TERRA (1997) have shown that there is no general relationship between the A index in a certain period and the corresponding indices of the constituent sub-periods. An intuitive case could be made for a medium-term interval of, say, two to five years, which is likely to be a realistic time span for inter- and intra-sectoral re-employment of redundant workers.

[9] OLIVERAS and TERRA (1997) pointed out that two properties of the A index differ from those of the GL index. First, as was mentioned above, the values of A indices for the sub-periods do not have an unequivocal relationship to the index value for the overall period. Second, there is no general relationship between the A index of a certain industry and the corresponding indices of its sub-industries. Therefore, OLIVERAS and TERRA recommended that the MIIT be measured for different levels of aggregation and a sensitivity analysis with varying levels of aggregation should be carried out where possible.

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.

Trade performance is particularly relevant where MIIT is low, that is, where inter-industry change dominates. We say that the marginal intra-industry trade measured using B index can reflect a country's specialization "*into*" or "*out of*" a particular industry. If, in a certain industry, exports expand faster (or contract more slowly) than imports, this means that the country specializes in this particular activity. Accordingly, a country specializes in other industries when the opposite composition of trade exists (BRÜLHART, 1999).

More recent studies attempt to measure changes in marginal intra-industry trade. THOM and MCDOWELL (1999) suggest an alternative method of classifying marginal trade flows considering the existence of differences among traded goods. AZHAR and ELLIOTT (2003) confirm adjustment pressure in accordance with the theoretical underpinning of the smooth adjustment hypothesis[10], and develop a tool that allows the visual representation of changes in trade patterns for any period and at any level of aggregation.

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 export. 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 export has fluctuated from 21,2 percent in 1996 to only 9.5 percent in 2000 (Figure 1).

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[10]   BALASSA (1966) was the first to mention the smooth adjustment hypothesis (SAH) directly. Over the following three decades, the SAH has become firmly established. For further discussion, see BRÜLHART (1999).

Figure 1:   Ukrainian agro-food trade, 1995-2002
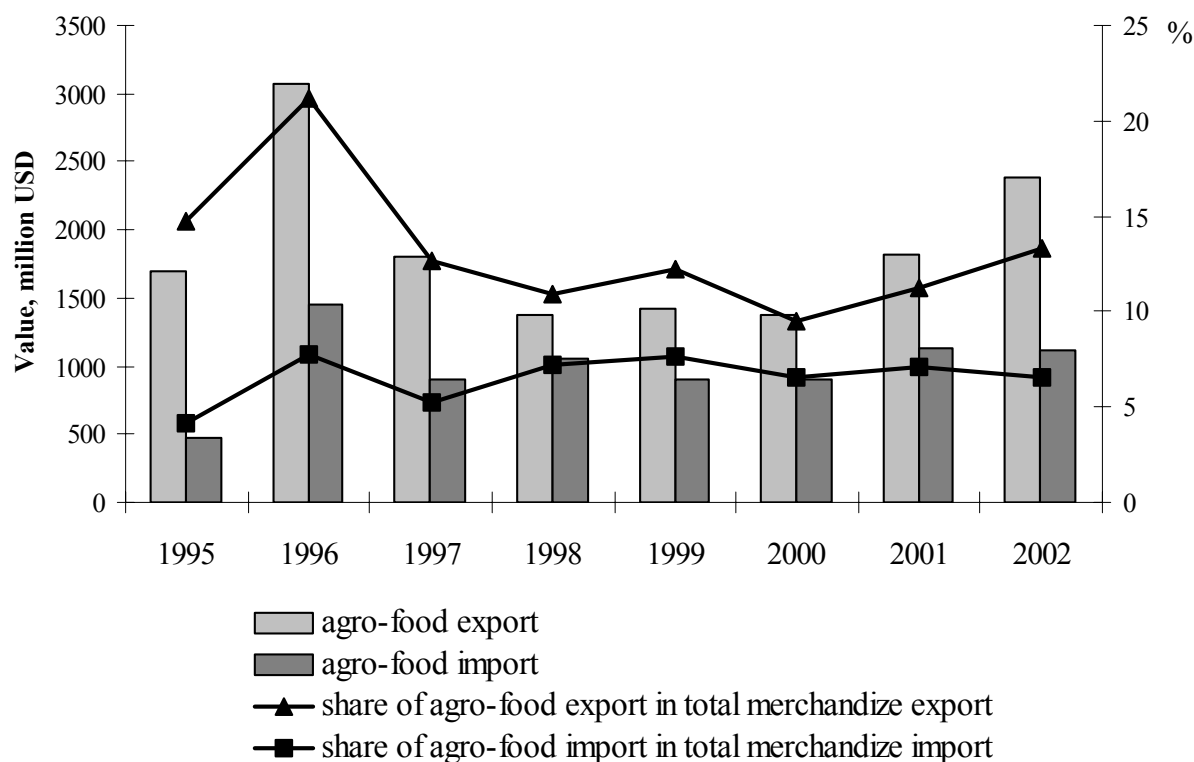
Source: Own calculations based on data provided by STATE STATISTICS COMMITTEE OF UKRAINE.

The share of corresponding imports is significantly lower, and during 1995-2002 constituted, on average, 6.5 percent of total merchandise import. 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. Favorable prices on the world market and a comparatively high domestic 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).

Figure 2:   Commodity composition of Ukrainian agro-food exports, 2000-2002, on average
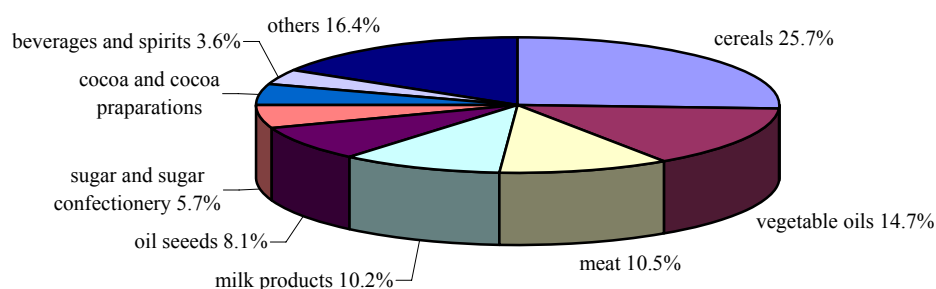
Source: Own calculations based on data provided by STATE STATISTICS COMMITTEE OF UKRAINE.

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 (Figure 3).

Figure 3:   Commodity composition of Ukrainian agro-food imports, 2000-2002, on average
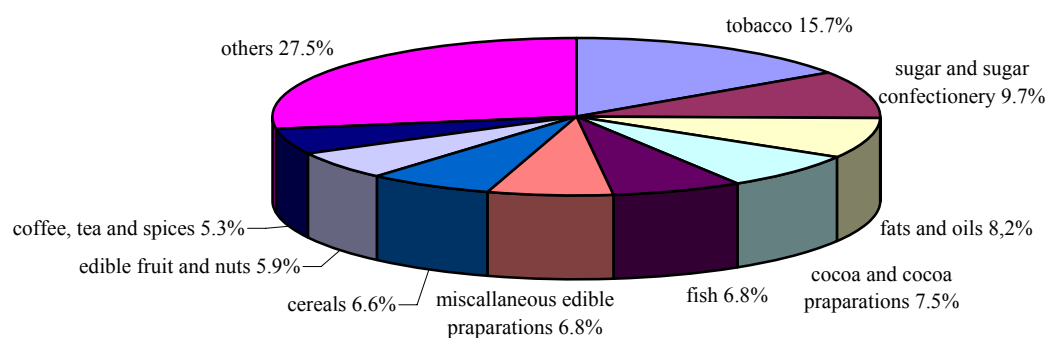
Source: Own calculations based on data provided by STATE STATISTICS COMMITTEE OF UKRAINE.

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 export of agricultural and food products.

Figure 4:   Geographic structure of Ukrainian agro-food export, 1996-2002
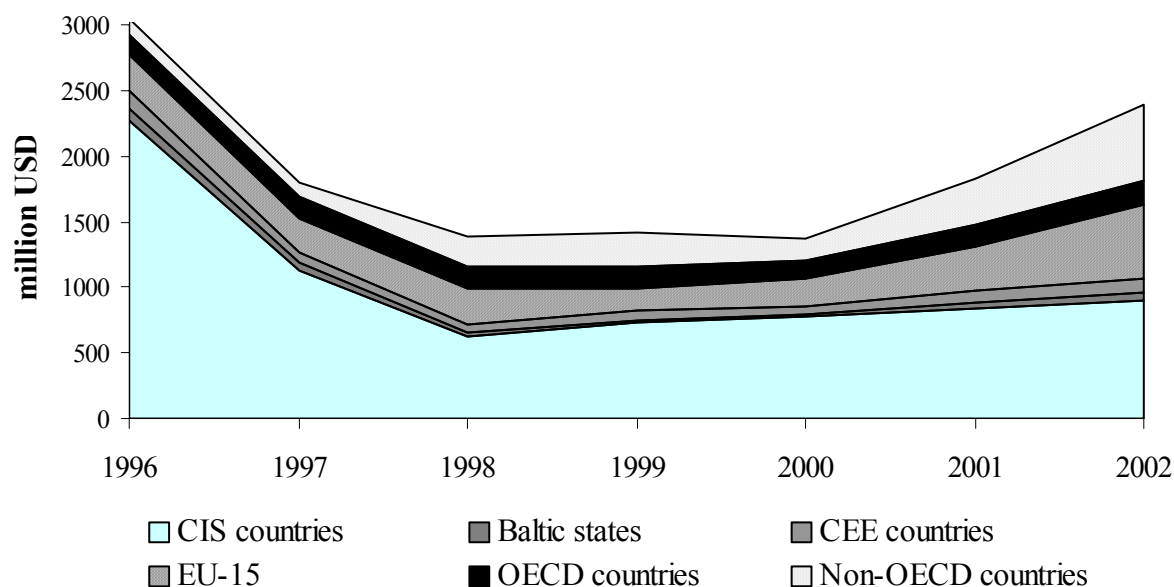
Source: Own calculations based on data provided by STATE STATISTICS COMMITTEE OF UKRAINE.

The value of agro-food exports to CIS countries fell sharply in 1997 and continued to decrease in 1998 (see Figure 4). 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. 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.

Figure 5:   Geographic structure of Ukrainian agro-food imports, 1996-2002
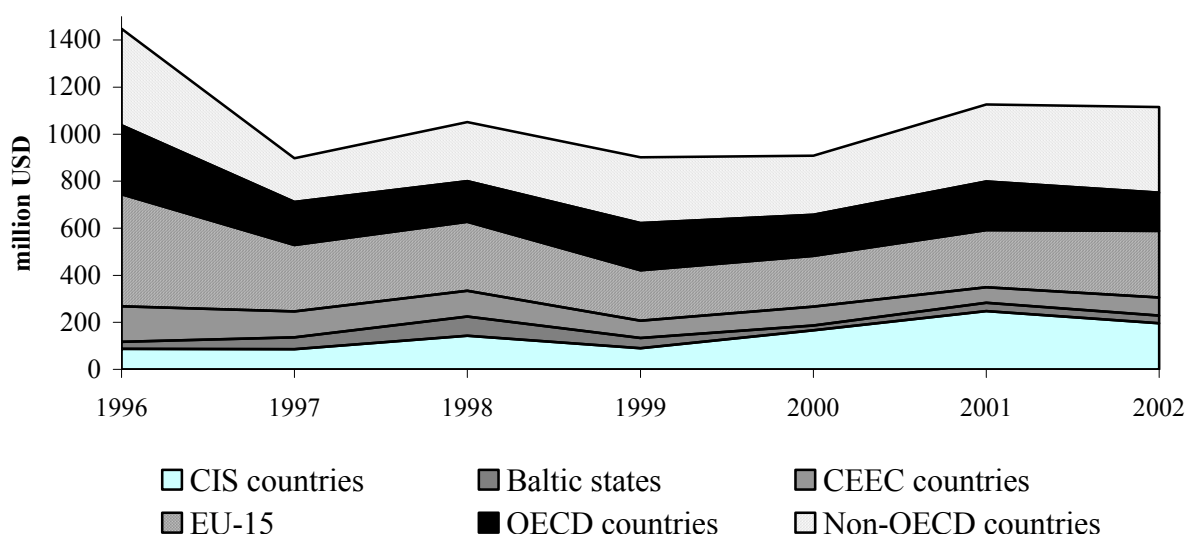
Source: Own calculations based on data provided by STATE STATISTICS COMMITTEE OF UKRAINE.

The geographic origin of agro-food imports to Ukraine in more stable. 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.

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.

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. Trade data for measuring intra-industry trade were obtained from the COMTRADE database according to HS 1992.

The analysis of Ukrainian intra-industry trade in agro-food products is based on unadjusted Grubel-Lloyd (GL) indices, calculated at HS 6-digit levels. 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[11] and non-OECD countries[12]. 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.

Trade with OECD and non-OECD countries is predominantly inter-industry trade, which reveals the low level of the GLIIT index (1.89 and 1.34 percent, respectively), reflecting the significant difference in the structure of their economies compared to Ukraine. In addition, the low level of GLIIT 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 level of import tariffs on food. On the export side, Ukrainian agricultural and food products tend to lack international competitiveness, particularly the EU.

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[11]   This group includes OECD countries, excluding EU-15 members and CEE countries.
[12]   This group covers the rest of the world.

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.

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 with 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 be explanations for the above-mentioned tendencies.

In Annex 2 the GL indices calculated for each Ukrainian trading partner between 1996-2002 is presented. The level of IIT varies significantly by country and by year and is the highest with Moldova, Serbia and Montenegro, France, Hungary, Russian Federation, Macedonia, Germany and Bulgaria. A 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. But the significance (weight) of each factor varies from case to case (from trade partner to trade partner). Therefore, the above-mentioned traditional reasons that generally motivate the relative importance of IIT could explain the existing higher level of IIT with Moldova and the Russian Federation, but they seem to be insignificant for other countries with a relatively high magnitude of IIT (Germany, France).

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	
								simple	weighted
01-Live animals	0.54	1.99	3.98	9.55	5.79	11.02	11.16	6.29	3.64
02-Meat and edible meat offal	1.97	3.82	4.13	7.18	3.55	3.82	3.82	4.04	3.85
03-Fish and fish products [13]	34.79	37.84	19.69	9.79	37.15	27.11	26.07	27.49	27.57
04-Dairy, eggs, honey etc.	9.95	17.80	13.20	26.19	6.21	4.11	4.95	11.77	9.38
05-Product of animal origin	35.79	45.10	28.73	48.58	20.45	11.93	10.75	28.76	27.37
06-Live trees, cut flowers etc.	18.10	8.39	13.13	5.47	4.90	5.50	3.87	8.48	7.05
07-Edible vegetables etc.	11.42	4.74	5.33	10.60	9.43	10.56	6.77	8.41	8.22
08-Edible fruits, nuts etc.	8.35	3.49	2.61	2.20	1.93	2.36	4.03	3.57	3.77
09-Coffee, tee, mate etc.	9.18	8.92	5.24	2.11	2.23	1.88	2.94	4.64	4.12
10-Cereals	5.34	3.87	1.09	1.73	32.89	12.19	0.99	8.30	6.07
11-Milling products, malt, starches	7.01	7.86	6.22	3.52	5.78	3.90	9.35	6.23	6.52
12-Oil seeds, seeds etc.	13.09	13.05	12.62	14.96	11.70	11.47	39.29	16.60	14.02
13-Lac, gums, resins etc.	22.68	15.73	16.40	14.66	13.00	8.09	3.97	13.50	14.72
14-Vegetable plaiting materials	7.39	3.16	8.39	16.73	29.02	14.04	3.12	11.69	8.83
15-Animal or vegetable fats etc.	9.09	10.00	17.51	7.06	0.80	1.22	1.50	6.74	5.47
16-Preparations of meat, of fish	14.64	7.38	24.41	27.29	18.12	57.69	49.72	28.46	21.24
17-Sugars and sugar confectionery	16.51	8.77	17.82	8.63	14.20	11.08	24.61	14.52	14.92
18-Cacao and cacao preparations	26.05	12.62	16.51	12.82	12.77	13.97	7.90	14.66	13.30
19-Preparations of cereals, flour	51.23	42.03	30.28	30.06	23.86	28.77	29.03	33.61	36.45
20-Preparations of vegetables etc.	41.92	32.85	28.17	25.18	21.40	24.28	21.01	27.83	28.44
21-Miscellaneous edible preparation	16.81	18.20	11.38	8.51	10.69	21.36	18.06	15.00	15.96
22-Beverages, spirits and vinegar	19.07	35.20	32.71	23.39	25.57	40.64	31.62	29.74	26.85
23-Residues from food industry etc.	15.41	43.32	33.06	38.88	17.05	10.57	10.48	24.11	17.92
24-Tobacco etc.	39.56	27.77	25.69	38.51	31.62	32.92	26.79	31.84	31.58
01-15 **Total agricultural products**	9.44	11.34	9.53	6.96	11.67	7.82	4.28	8.72	8.43
16-24 **Total food products**	21.06	20.81	24.10	23.04	20.57	22.98	21.38	21.99	21.78
01-24 **Total agro-food products**	15.26	15.51	14.83	12.17	14.95	13.17	10.07	13.71	13.68

Source: Own calculations based on COMTRADE Database.

Table 2 shows the evolution of GL indices calculated by commodity groups[14]. 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 can be seen, the intra-industry values for some commodity groups exhibit high variability over time, which, partly at least, reflects the structural changes underway in Ukraine[15]. The average GL indices reveal that a high magnitude of IIT exists in the following products: Fish (HS 3), products of animal origin n.e.s. (HS 5), preparationы 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). Low levels of IIT are observed for live animals (HS 1), meat (HS 2), edible fruits and nuts (HS 8), coffee, tea and spices (HS 9) and animal or vegetable fats and oils (HS 15). As expected, IIT indices are higher for food (22 percent on average) than for agricultural products (about 8 percent). This confirms the suggestion that IIT is more common

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[13] Detailed classification of 2-digit product groups in accordance with Harmonized System is represented in Annex 1.
[14] Calculation based on 6-digit data and aggregated to 2-digit level according to equation (2).
[15] For this reason, we also computed an average index for the period 1996-2002 by pooling together the seven-year data on exports and imports for each six-digit product and then aggregated to 2-digit level (weighted average) and as simple average.

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 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, trade in 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 (Annex 3). 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

The analysis has so far 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. MIIT was quantified in this study according to BRÜLHALT's (1994) *A* and *B* indices.

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). 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.

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.

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 (Annex 4). The highest levels of MIIT for the period 1996-1999 are found in HS sections 3 (fish), 20 (preparations of vegetables, fruits and nuts) and 19 (preparations of cereals, flour, starch or milk); for the period 1999-2002 the highest *A* levels are for the HS 17 (sugars and sugars confectionery), HS 24 (tobacco) and HS 19 (preparations of cereals, flour, starch or milk) sections.

The BRÜLHALT'S (1994) *B* index is used as a measure of sectoral trade performance and MIIT. As was mentioned above, one of the main shortcomings of *B* index is that it cannot be meaningfully aggregated across products. Possible way to overcome this problem and obtain the summary statistic results from the calculations on the disaggregated product *i* level is to sum up separately the number of products with different categories of *B* indices. In Table 4 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[16] 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 ($50 \leq B < 100$) groups cover those products that reflect a good trade performance, however, while the third group characterizes products where marginal IIT prevails, the vise versa holds for the forth group.

The grouped analysis of marginal IIT applying *B* measure is performed for Ukrainian agro-food trade with CIS, Baltic states, CEEC, EU, OECD and non-OECD countries, and with all countries (world total). As can be seen from the Table 4, the majority of products display *B* indices close to -100 or 100, hence low MIIT. 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 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 export towards new trading partners.

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

Group	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.

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[16]   Groups are defined as I, II, III, IV in Table 4.

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 Bs relative to those with negative Bs (Figure 6).

Figure 6:   Ukrainian agro-food trade performance, 1996-2002 (ratios of positive to negative B indices)
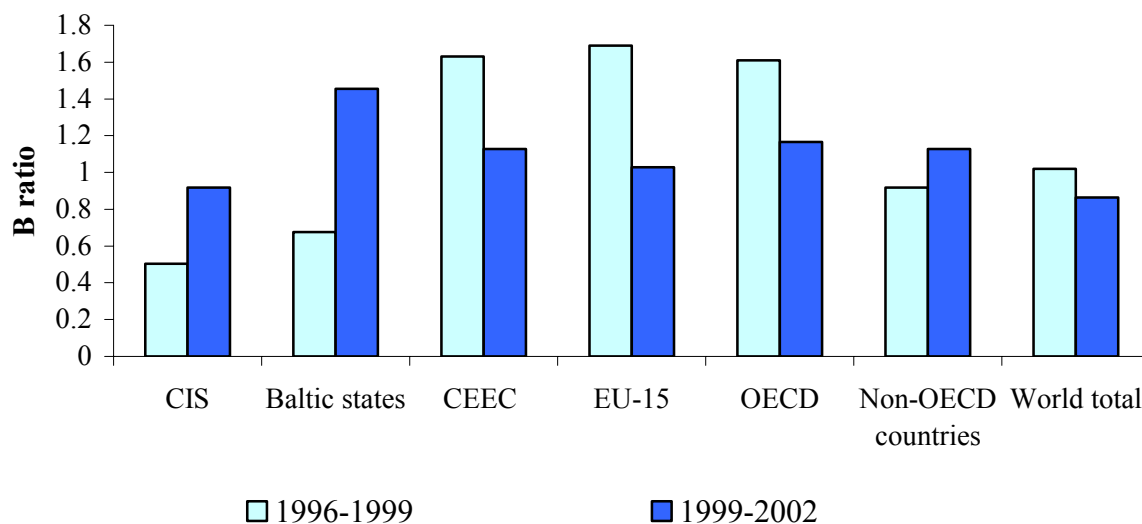
Source: Own calculations.

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.

As with the B ratio for agro-food products on the whole, the ratios of the numbers of industries with positive Bs relative to those with negative Bs were calculated by product groups, based on 6-digit data within the particular HS 2-digit sectors. The B ratios differ considerably among distinct product groups and between separate trading partners (Annex 5). Obtained results do not exhibit a clear pattern, though they do help determine sectors with positive and negative performance on different markets. More or less stable and also positive trade performance were observed over all periods for meat (HS 2), vegetable products (HS 14) and beverages and spirits (HS 22).

Interestingly, agro-food trade performance determined as B ratio does not correspond with trade development in terms of changes in export and import flows on a product group level. A remarkable example is trade in cereals. While during the period of 1996-1999, the net export of grain increased from 377 million USD to 507 million USD, displaying improvement of the country's trade position on the world market, B ratio values of 0.78 indicate negative trade performance. Similar results are observed in the second concerned period: A further increase of net exports by two (to 973 million USD), but the B ratio value merely being 1.

5 Conclusions

The process of economic transformation in Ukraine, as in other Former Soviet Countries, *inter alia* 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 the weight of both the EU and developing countries on total trade being increased. These adjustments to a large extent are connected with the evolution of the commodity structure, especially concerning exports. It is interesting to note that the significance of non-OECD developing countries has increased since 1996, both in agro-food imports and in exports. Thus, Middle East and North-African countries are important consumers of Ukrainian agricultural products (mainly cereals), and Far East and Latin-American countries are essentially suppliers of specific agro-food products not produced in Ukraine. 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. As expected, the major part of agricultural and food trade is of the inter-industry type, and thus caused by underlying comparative advantage of the country. The average level of intra-industry trade for the reported period (1996-2002) is only 13.7 percent and shows a negative tendency. 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 and ZORYA, 2001). The generally low levels of GLIIT and marginal IIT indexes indicate that trade-induced reallocation of production factors has occurred between sectors rather than within sectors, which implies high adjustment costs. But IIT 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 trading partners such as CIS and CEE countries. The plausible explanation of 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 liberalization 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 theory and previous empirical studies. The same tendency was found by analyzing marginal IIT: Food-processing sub-industries show higher index value than primary sectors. These sub-sectors face relative low level of adjustment costs and should use these premise to strengthen its market position by realizing product differentiation and marketing strategies.

Finally, we examined the Ukrainian pattern of IIT and marginal IIT in agro-food products, using traditional measures. It is a currently-accepted view that products can be differentiated

horizontally (different varieties of a given good) and vertically (different qualities of a given variety), so it would be meaningful to further investigate the nature of IIT in Ukraine by separating these two types of IIT. In addition, as the obtained results do not exhibit a clear pattern, it would be worthwhile to analyze the determinants of each component of total trade (inter-industry trade, vertical and horizontal IIT) using a variety of gravity models.

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ANNEXES

Annex 1:   Classification of 2-digit product groups according to Harmonized Commodity Description and Coding System, revision 1992

HS group	Group heading
1.	Live animals
2.	Meat and edible meat offal
3.	Fish, crustacean, mollusk, aquatic invertebrate
4.	Dairy products, bird eggs, honey, edible animal products
5.	Product of animal origin, not elsewhere specified
6.	Live trees, plants; bulbs, roots, cut flowers etc
7.	Edible vegetables and certain roots and tubers
8.	Edible fruit, nuts, peel of citrus fruits, melons
9.	Coffee, tea, maté and spices
10.	Cereals
11.	Milling products, malt, starches, inilin, wheat gluten
12.	Oil seeds, oleagic fruits, grains, seeds, fruit etc not elsewhere specified
13.	Lac; gums, resins, vegetable saps and extracts
14.	Vegetable plaiting materials, vegetable products not elsewhere specified
15.	Animal, vegetable fats and oils and their cleavage products etc
16.	Meat, fish and seafood food preparations
17.	Sugars and sugar confectionery
18.	Cocoa and cocoa preparations
19.	Cereals, flour, starch, milk preparations and products
20.	Vegetable, fruit, nut etc. food preparations
21.	Miscellaneous edible preparations
22.	Beverages, spirits and vinegar
23.	Residues, waste of food industry, animal fodder
24.	Tobacco and manufactured tobacco substitutes

Source: COMTRADE Database.

Annex 2: Grubel-Lloyd indices of intra-industry trade in agro-food products between Ukraine and its trading partners, 1996-2002

Country	1996	1997	1998	1999	2000	2001	2002	Average
Armenia	0.00	0.36	0.00	0.00	0.51	0.88	0.37	0.30
Azerbaijan	0.00	0.08	0.47	0.00	0.18	0.97	0.17	0.27
Belarus	0.45	0.40	1.48	1.25	0.26	0.56	0.74	0.73
Georgia	0.01	0.07	0.02	0.02	0.18	0.64	0.10	0.15
Kazakhstan	0.02	0.00	0.00	6.09	0.00	0.16	0.09	0.91
Kyrgyzstan	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00
Moldova	11.17	6.74	8.02	24.97	8.31	14.17	7.76	11.59
Russian Federation	1.33	1.48	2.93	2.82	6.45	10.19	8.91	4.87
Tajikistan	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Turkmenistan	0.00	0.00	0.00	0.00	0.23	0.58	0.00	0.12
Uzbekistan	0.53	0.27	1.33	3.08	2.55	0.09	1.39	1.32
CIS aggregated	**1.24**	**1.25**	**2.74**	**2.90**	**5.26**	**8.54**	**6.91**	**4.12**
Estonia	1.86	1.11	2.72	2.46	1.97	3.97	2.41	2.36
Latvia	1.35	1.60	1.75	0.93	0.79	1.79	2.21	1.49
Lithuania	2.06	1.17	0.39	1.64	0.97	0.89	1.50	1.23
Baltic states aggregated	**1.79**	**1.23**	**1.64**	**2.07**	**1.38**	**2.31**	**2.05**	**1.78**
Albania	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bosnia Herzegovina	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bulgaria	2.35	2.32	11.11	8.18	0.44	0.32	0.64	3.62
Croatia	3.84	2.09	0.00	0.00	0.00	0.00	0.00	0.85
Czech Republic	8.24	3.94	1.45	0.02	1.61	0.85	1.30	2.49
Hungary	15.81	15.59	2.68	10.22	1.72	2.27	0.21	6.93
Macedonia	6.18	8.02	3.80	1.75	4.64	4.27	0.00	4.09
Poland	1.67	3.65	1.63	2.28	2.90	3.43	2.49	2.58
Romania	0.08	0.01	0.10	0.16	7.80	0.01	10.10	2.61
Serbia and Montenegro	0.00	0.00	0.00	32.96	7.90	9.55	15.38	9.40
Slovakia	7.52	1.00	0.18	0.28	0.12	0.45	0.76	1.47
Slovenia	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CEEC aggregated	**6.35**	**5.60**	**3.02**	**6.61**	**2.16**	**2.53**	**1.75**	**4.00**
Austria	1.21	1.67	0.18	0.33	4.80	0.31	0.44	1.28
Belgium	0.44	0.42	0.83	0.00	0.16	0.35	0.47	0.38
Denmark	0.36	2.01	0.18	0.08	0.23	0.09	0.50	0.49
Finland	0.00	0.00	0.00	8.11	0.00	0.00	0.00	1.16
France	9.93	8.34	9.18	7.37	6.17	5.56	6.74	7.61
Germany	3.64	6.37	2.11	3.55	3.23	5.21	3.02	3.88
Greece	0.48	0.30	0.61	0.51	0.05	3.40	0.04	0.77
Ireland	2.19	2.12	0.00	0.00	0.00	0.40	0.00	0.67
Italy	0.86	0.59	0.92	0.86	1.43	0.67	0.69	0.86
Luxemburg	–	–	–	0.00	0.00	0.00	0.00	0.00
Netherlands	7.70	7.07	1.71	0.89	1.36	1.07	0.29	2.87
Portugal	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Spain	1.68	0.46	6.93	3.67	4.30	0.55	0.45	2.58
Sweden	0.00	0.03	0.00	0.00	0.00	0.08	0.19	0.04
United Kingdom	1.50	2.41	0.30	0.39	3.07	2.08	5.57	2.19
EU-15 aggregated	**3.63**	**3.66**	**2.95**	**2.41**	**2.87**	**1.94**	**1.20**	**2.67**
Australia	0.00	0.00	0.00	0.00	0.00	0.00	2.26	0.32
Canada	0.12	3.38	0.00	0.78	0.00	0.00	0.33	0.66
Iceland	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Japan	2.22	0.00	0.30	0.00	0.00	0.00	0.00	0.36
Mexico	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
New Zealand	0.00	0.00	0.00	0.00	0.00	2.03	15.57	2.51
Norway	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Republic of Korea	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Switzerland	0.59	0.20	0.05	0.00	1.30	0.28	0.01	0.35
Turkey	0.39	0.67	0.67	1.00	2.50	0.01	0.40	0.81
United States	0.96	1.17	0.95	0.95	2.53	2.06	4.17	1.83
OECD aggregated	**0.68**	**0.84**	**0.54**	**0.62**	**1.77**	**0.72**	**1.00**	**0.88**
Cyprus	0.04	0.08	0.00	0.50	0.83	0.00	0.00	0.21
Egypt	0.00	1.05	0.00	0.00	0.11	0.06	0.00	0.17
Israel	0.17	0.40	0.20	0.03	0.43	0.36	0.04	0.23
Mauritania	0.47	0.07	0.00	3.00	1.13	19.49	19.67	6.26
Morocco	1.06	0.00	0.00	0.00	0.01	0.00	0.00	0.15
Rest non-OECD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Non-OECD aggregated	**0.04**	**0.05**	**0.03**	**0.07**	**0.11**	**0.34**	**0.40**	**0.15**

Source: Own calculations based on COMTRADE Database.

Annex 3: Intra-industry trade by commodity groups with separate trading partners, 1996-2002 in average

HS code	CIS countries	Baltic states	CEE countries	EU-15	OECD countries	Non-OECD countries
1	21.86	0.00	0.31	0.90	0.07	0.05
2	0.82	0.00	7.83	3.88	0.08	0.28
3	4.14	2.83	17.21	20.27	3.60	8.97
4	2.03	1.06	8.24	5.14	2.39	0.79
5	32.31	14.45	6.58	6.07	4.82	0.24
6	7.71	5.81	5.25	0.25	0.22	0.07
7	5.13	0.04	11.68	2.60	1.51	1.45
8	4.22	0.46	8.13	2.70	0.15	0.12
9	10.12	3.93	1.82	2.49	0.92	0.04
10	8.59	0.79	3.81	4.31	1.27	0.09
11	2.14	4.10	6.28	3.78	1.99	1.10
12	25.43	1.56	23.16	10.71	3.64	0.57
13	11.88	0.00	16.32	0.61	2.80	0.18
14	5.33	0.00	11.07	0.55	0.00	0.35
15	2.48	0.96	17.15	0.51	0.47	5.83
16	8.78	0.49	15.15	2.55	3.98	6.57
17	5.72	23.31	19.65	4.98	5.61	1.40
18	9.50	7.11	1.82	3.46	3.96	0.52
19	15.73	16.69	0.76	4.11	4.97	7.39
20	21.22	5.97	7.24	5.16	12.09	1.14
21	34.03	16.47	11.09	0.73	1.10	0.37
22	16.27	10.05	5.54	6.15	32.33	7.97
23	7.29	2.49	12.29	5.46	1.00	5.77
24	20.50	0.39	7.91	1.49	0.82	0.06
1-15	*3.68*	*1.88*	*9.30*	*6.16*	*1.52*	*1.33*
16-24	*11.78*	*5.49*	*8.58*	*3.41*	*3.02*	*1.10*
1-24	**7.71**	**3.26**	**9.04**	**5.25**	**1.89**	**1.25**

Source: Own calculations based on COMTRADE Database.

Annex 4: Marginal intra-industry trade in agro-food products in Ukraine by industry, 1996-2002 (*A* indices)

HS code	1996-1999							1999-2002						
	Trading partner (group)							Trading partner (group)						
	CIS	Baltic states	CEEC	EU-15	OECD	Non-OECD	World total	CIS	Baltic states	CEEC	EU-15	OECD	Non-OECD	World total
1	0.091	0.000	0.004	0.004	0.000	0.000	**0.004**	0.048	0.000	0.000	0.021	0.000	0.002	**0.140**
2	0.002	0.000	0.001	0.097	0.001	0.003	**0.007**	0.010	0.000	0.012	0.017	0.000	0.001	**0.081**
3	0.153	0.000	0.012	0.267	0.099	0.053	**0.426**	0.008	0.000	0.665	0.095	0.039	0.106	**0.036**
4	0.014	0.012	0.057	0.185	0.056	0.001	**0.062**	0.001	0.001	0.004	0.008	0.103	0.021	**0.006**
5	0.113	0.258	0.187	0.084	0.031	0.012	**0.113**	0.000	0.000	0.004	0.000	0.218	0.004	**0.014**
6	0.285	0.224	0.000	0.001	0.000	0.003	**0.002**	0.037	0.000	0.001	0.000	0.000	0.003	**0.066**
7	0.122	0.000	0.035	0.012	0.005	0.052	**0.109**	0.017	0.000	0.046	0.028	0.002	0.006	**0.036**
8	0.060	0.000	0.022	0.001	0.000	0.006	**0.132**	0.015	0.000	0.122	0.071	0.005	0.000	**0.091**
9	0.012	0.048	0.000	0.010	0.003	0.000	**0.056**	0.043	0.028	0.012	0.001	0.014	0.000	**0.021**
10	0.086	0.000	0.046	0.018	0.000	0.000	**0.063**	0.001	0.000	0.162	0.018	0.000	0.000	**0.012**
11	0.003	0.001	0.057	0.031	0.029	0.003	**0.031**	0.009	0.015	0.005	0.007	0.011	0.033	**0.025**
12	0.084	0.003	0.234	0.053	0.051	0.006	**0.147**	0.095	0.005	0.108	0.019	0.009	0.005	**0.037**
13	0.120	0.000	0.630	0.006	0.046	0.000	**0.116**	0.222	0.000	0.000	0.000	0.135	0.001	**0.015**
14	0.000	0.000	0.000	0.000	0.000	0.001	**0.023**	0.000	0.000	0.000	0.000	0.000	0.001	**0.001**
15	0.024	0.006	0.328	0.006	0.002	0.010	**0.067**	0.040	0.008	0.015	0.002	0.000	0.000	**0.014**
16	0.017	0.000	0.001	0.027	0.007	0.017	**0.058**	0.076	0.000	0.023	0.000	0.137	0.022	**0.016**
17	0.000	0.000	0.004	0.001	0.000	0.025	**0.084**	0.203	0.000	0.024	0.111	0.098	0.074	**0.301**
18	0.086	0.011	0.025	0.013	0.000	0.110	**0.019**	0.064	0.001	0.021	0.004	0.113	0.000	**0.053**
19	0.003	0.131	0.000	0.002	0.000	0.004	**0.336**	0.308	0.104	0.002	0.027	0.219	0.029	**0.227**
20	0.059	0.056	0.042	0.019	0.139	0.013	**0.344**	0.097	0.002	0.072	0.030	0.138	0.002	**0.180**
21	0.079	0.026	0.003	0.000	0.001	0.000	**0.198**	0.291	0.105	0.044	0.002	0.026	0.000	**0.091**
22	0.016	0.001	0.034	0.028	0.387	0.052	**0.141**	0.356	0.211	0.044	0.008	0.032	0.035	**0.215**
23	0.013	0.000	0.052	0.001	0.020	0.051	**0.032**	0.115	0.000	0.005	0.024	0.007	0.032	**0.081**
24	0.020	0.000	0.031	0.001	0.021	0.000	**0.040**	0.093	0.000	0.126	0.001	0.000	0.000	**0.233**
1-24	**0.017**	**0.004**	**0.075**	**0.047**	**0.021**	**0.014**	**0.096**	**0.099**	**0.009**	**0.045**	**0.017**	**0.014**	**0.009**	**0.076**

Source: Own calculations based on COMTRADE Database.

Annex 5:   **Ukrainian agro-food trade performance by commodity groups, 1996-2002 ratios of positive to negative (*B* indices)**

HS code	1996-1999							1999-2002						
	Trading partner (group)							Trading partner (group)						
	CIS	Baltic states	CEEC	EU-15	OECD	Non-OECD	World total	CIS	Baltic states	CEEC	EU-15	OECD	Non-OECD	World total
1	1.75	0.50	0.83	1.00	0.50	0.00	**0.88**	1.00	0.25	0.80	1.00	0.50	2.00	**1.17**
2	0.32	0.10	1.33	1.60	2.18	0.29	**1.24**	1.33	1.00	1.09	1.00	5.00	0.87	**1.32**
3	1.29	1.91	5.20	2.69	3.14	1.76	**2.41**	2.33	3.20	1.00	0.58	0.68	0.66	**0.92**
4	0.21	0.12	0.54	2.13	0.78	0.35	**0.39**	1.63	1.67	1.25	0.60	1.13	2.14	**1.27**
5	0.80	1.00	1.00	0.67	4.00	2.00	**2.67**	1.00	1.50	0.20	3.00	1.50	0.50	**0.83**
6	1.00	0.25	0.00	0.25	2.00	0.50	**0.30**	0.50	+	1.00	0.50	0.25	1.00	**0.30**
7	0.52	1.13	1.29	1.41	1.17	0.88	**0.93**	0.93	1.29	1.36	1.60	2.44	1.30	**1.08**
8	0.27	0.73	3.88	2.58	1.56	2.58	**1.08**	0.77	0.80	0.68	3.44	1.06	0.73	**0.79**
9	0.40	0.50	3.17	2.14	1.13	0.63	**0.63**	0.80	1.67	0.35	0.64	2.17	0.88	**0.58**
10	0.78	0.30	0.78	0.86	3.00	3.67	**0.78**	0.60	4.00	1.14	1.14	0.50	0.75	**1.00**
11	0.13	0.62	0.64	1.00	5.50	0.42	**0.45**	0.50	1.43	3.00	0.75	0.80	3.67	**0.30**
12	0.69	0.83	1.23	0.75	1.20	0.30	**0.76**	0.69	0.67	1.15	1.07	0.67	0.71	**0.50**
13	0.40	0.67	2.00	0.50	0.50	1.00	**0.50**	0.67	0.20	0.00	0.50	0.50	0.60	**0.11**
14	4.00	x	1.00	0.33	x	6.00	**1.67**	0.25	x	+	4.00	0.00	0.67	**1.33**
15	1.77	0.50	1.36	1.60	1.33	0.73	**2.00**	1.73	1.17	1.70	0.80	0.67	1.00	**0.92**
16	0.54	0.60	5.00	6.33	3.50	1.40	**1.67**	0.50	2.00	1.67	2.80	3.00	0.92	**0.71**
17	0.71	0.13	0.83	1.00	0.83	2.50	**0.88**	0.67	1.00	8.00	2.25	1.40	1.33	**0.88**
18	0.80	2.00	0.38	1.20	1.33	2.33	**0.57**	0.40	0.67	1.20	2.00	0.40	0.67	**0.83**
19	0.08	1.25	+	13.00	+	1.14	**2.75**	0.40	3.00	0.57	1.00	2.75	4.33	**1.29**
20	0.26	1.18	3.78	2.58	0.90	0.91	**0.52**	1.35	7.33	1.83	1.22	2.36	1.26	**1.39**
21	0.27	0.33	3.67	14.00	1.33	6.50	**2.00**	0.88	1.40	1.17	0.36	2.00	4.00	**1.14**
22	0.00	0.75	2.60	1.63	1.25	0.46	**1.33**	0.73	1.00	2.75	1.50	1.13	4.00	**1.33**
23	0.14	0.86	0.40	1.20	3.00	2.33	**0.36**	1.14	1.00	0.33	0.50	0.29	1.40	**0.82**
24	3.00	1.00	1.00	0.75	0.40	0.00	**1.25**	0.75	1.00	2.00	1.67	1.00	1.00	**1.00**
1-24	**0.50**	**0.68**	**1.63**	**1.69**	**1.61**	**0.92**	**1.02**	**0.92**	**1.45**	**1.13**	**1.03**	**1.16**	**1.13**	**0.86**

Source: Own calculations.

Note: *B* ratio equals the value of 0 means that all *B* indices are negative;

Lower than 1 – the number of products with negative *B* exceeds corresponding number of products with positive *B* indices, so trade performance is negative;

Equals the value of 1 – the number of products with negative *B* equals the number of products with positive *B* indices;

Above 1 – the number of products with positive B exceeds corresponding number of products with negative *B* indices (positive trade performance);

+ – stands for when all products demonstrate positive B indices;

x – indicates no trade within the sector.

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