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## UKRAINIAN EXPORT DIVERSIFICATION: MACRO LEVEL ANALYSIS

Complex microanalysis of Ukrainian goods exporting diversification on extensive and intensive basis was made. The national export structure deviations from the world one were formulated. Product codes groups characterized by the highest export concentration were detected.

*Keywords:* export, export diversification, export sector, export structure.

Зубрицкий А. Диверсификация украинского экспорта: анализ на макроуровне. Проведен комплексный макроанализ товарной диверсификации украинского экспорта на экстенсивной и интенсивной основе. Формализированы отклонения структуры отечественного экспорта от мировой. Выявлены группы товарных кодов, характеризующиеся высокой концентрацией экспорта.

*Ключевые слова:* экспорт, диверсификация экспорта, экспортный сектор, структура экспорта.

**Background.** Foreign trade is an important source of economic growth in economy globalization terms. It particularly refers to small open ones among which Ukraine can be ranked. One of the most important tasks in economic security sphere for such countries is the export sectors development by maximal diversification provision of export flows.

According to the state export support system creating Concept № 586-2013-p from 01.08.2013 "...the problem of Ukrainian export imbalance where the goods with low processing level exceed requires from the state

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new approaches to national export policy implementing directed to export diversification and its growth in goods with high value added". Among the problems preventing national economy's export potential implementation in full is the low product and geographic Ukrainian export diversification [1]. This thesis requires an adequate analytic background enabling not only to measure in terms of quantity national export diversification, but detect the export sectors, where this index is low. These are the sectors which are the focal points of maximal Ukrainian export potential implementation and they require a particular attention as an effective state support.

Analysis of recent research and publications. The considerable interest to export diversification problems appeared in the world science in the mid of the 1950-s of the XX century due to liberalization expending processes of international movement of goods and services. At present a considerable research base on export diversification both in developed countries, and in the developing ones is worked out. While the review and systematization of the whole range of foreign scientific works can be the subject for a separate research there are sufficient reasons to consult national materials and normative documents devoted to export diversification theory and analysis.

In the works by O. Pindyuk and O. Slabospitskaya using indices by Hirschman and Herfindahl-Hirschman is established that Ukrainian export concentration was low in 1996-2009 [2; 3]. Analyzing export diversification for Ukraine and Belarus, O. Bessedina uses Herfindahl-Hirschman indices reciprocal series. Such procedure applying complicates analysis results, because one can realize the real export diversification level only comparing it with indices reciprocal series for other countries. According to results obtained the diversified branch by assortment is machine building, agriculture is characterized by the highest market diversification [4]. The World Bank's experts determined on the basis of Herfindahl-Hirschman and diversification indices applying that in 2002 export concentration grew as a result of economic decline [5]. At the same time it is difficult to understand how much national export structure differs from the world one. The attempt to compute the appropriate diversification index was made by N. Sakalo [6]. But this index interpretation isn't right, because he estimates not the product structure level, but the degree of export diversification remoteness from the world one. I. Markovych analyzes the geographical export diversification according to separate product groups and makes a conclusion that among the priority product groups for Ukraine the market for railway machine building is the most concentrated one.

In whole in Ukraine export diversification is analyzed according to the world economic science, but rather irregularly and it doesn't enable to define clearly the main problematic export sectors [7].

<sup>&</sup>lt;sup>1</sup> So far as national services export is low as compared with goods export, only Ukrainian goods export is analized.

Taking this into consideration the **aim** of this article is Ukrainian goods export diversification analysis on the macro level to detect the segments having the potential to its intensification.

**Materials and methods.** In the research a statistic database by UN product trade (UN-COMTRADE) [8] and database on foreign trade by the World Bank (WITS) [9] comprising detailed bilateral data on export-import transactions in more than 170 countries of the world was used. To provide the ability of data comparing the Harmonized Commodity Description and Coding System (Harmonized System, hereinafter referred to as HS<sup>2</sup>) at different detailing levels was used. For the purpose of the of full data coverage the redaction HS 1996<sup>3</sup> is applied, as for this one the maximum amount of information on Ukraine's trade partners is available. The research period is 2004–2012.

**Results.** The export diversification can be defined as an available goods and/or geographical export structure transformation. For developed countries diversification is often considered as a transfer from traditional to new (nontraditional) export goods.

Let's define two main forms of export diversification: horizontal and vertical ones. Horizontal diversification occurs within one economy's sector and is new goods adding to the existing export basket in this sector for the purpose of lightening economic (related with price instability and general trend to price reducing) and political risks. Vertical diversification is a transfer from national export goods producing in primary economic sector to their producing in the secondary and tertiary ones. It includes searching further ways of national goods using with available means of their value added increasing, such as: deeper processing, marketing, and other services available [10].

Export diversification relative to goods and trade trends can carry out on extensive (export goods range expanding, searching new goods sales markets) and intensive (export value increasing for the same destination countries and within existing product assortment) basis. Thus, diversification on the extensive basis is closely associated with horizontal diversification, and at the same time the vertical one is the export diversification background on the intensive basis. On the assumption of export diversification theory, it is necessary to examine intensive and extensive national export diversification basis (table 1).

To detect export diversification by export product assortment expanding and searching new destination markets, it is sufficient to make a simple arithmetical calculation of export markets number and goods export amount. The necessary condition of this is the high data detailing level, that's why it is rational to analyze Ukrainian export diversification on the HS subheading

<sup>&</sup>lt;sup>2</sup> Ukrainian foreign economic activity goods classification is the complete analog of the Harmonized Commodity Description and Coding System (HS).

<sup>&</sup>lt;sup>3</sup> The main motivation for outdated HS redaction using is maximal data coverage on world export.

level (detailing level -6 product code digits). On making calculation export and import items, which cost estimate during the period analyzed exceeded \$10,000 per year ate taken into consideration.

 $\it Table\ 1$  Ukrainian export diversification indices at the extensive basis in 2004–2012

Index	2004	2005	2006	2007	2008	2009	2010	2011	2012
Goods items amount	2063	2122	2147	2292	2282	2147	2210	2242	2227
Export markets amount	117	126	126	129	130	130	129	123	95

<sup>\*</sup> Made by the author according to WITS [9]

As the *table 1* shows in 2007–2008 maximum export assortments expanding and Ukraine's geographical partners range occurred. However, in post-crisis period (2010–2012) the progressive export product assortment increasing together with destination market devoted loss occurs <sup>4</sup>.

So, in pre-crisis period Ukrainian export sectors actively utilized goods extensive product export diversification base, which expanding opportunities were leveled by the world economic crisis. A considerable export assortment reducing is the illustration that foreign trade can be communicating economic crises channel. On the other hand, a threatening trend is the substantial Ukrainian export destination markets reducing at the end of the period analyzed.

For the purpose of the real situation in Ukrainian goods and geographical export diversification comprehension there are sufficient reasons to compare the appropriate indices with the world ones. In the Figure 1 the indices of export items amount and destination markets for all the countries of the world in pre-crisis 2007 (figure 1a) and pos-crisis 2011 (figure 1b) periods are shown.

On Ukraine with small open economy world goods markets conditions affect. For the purpose of the effect visualization given in *figure 1* just 2007 and 2011 are compared, which are considered in the world economic research practice as the last pre-crisis year and the first world economy's rehabilitation thereafter.

As it is seen from the *figure 1* according to export product assortment and destination markets amount Ukrainian export sector is on the top of the world data indices allocation. Entirely, the best indices are typical for developed countries. Simultaneously by indices analyzed Ukraine is at the level of such countries as Hungary, Finland, Mexico, Bulgaria, Israel, Greece,

<sup>&</sup>lt;sup>4</sup> Partly such reduction is the result of statistic data used for the analysis quality worsening. If in 2004–2010 within WITS database data on export-import transactions of more than 160 countries of the world are available, in 2011 – 154 countries, in 2012 – 146 countries. Such differences were caused by data presentation delay by national statistic authorities. At the same time the data on Ukraine's trade partners neglect is so slight, that they can explain destination markets losses in 2012.

and Romania. It means that geographical and assortment national export diversification is rather high and equal to the developing countries level.

Data comparison of 2007 and 2011 enables to make a conclusion that product assortment reducing and export markets loosing typical for Ukraine are the world trends. In fact, Ukrainian export situation in pre-crisis and post-crisis periods in indices analyzed allocation remain unchangeable.

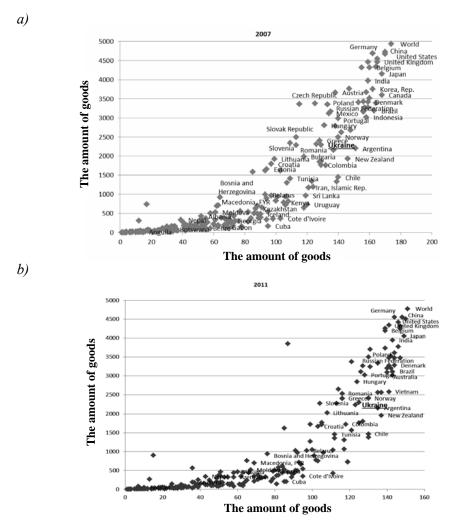


Figure 1. Export items and destination markets amount of the countries of the world in 2007 and 2011

(Calculated and made by the author according to the WITS data [9])

Export diversification on extensive basis is possible only to certain restrictions. At one hand, constant product assortment expanding is impossible due to existing world one and trade partners countries list, from the other hand, each export product or export market can be considered a "new" one during only a year, when export product assortment and export market list were expanded.

More desirable for the world practice of the world trade researching and regulating is export diversification at intensive basis. Such diversification form extending stimulates industries with high value added level, creates the prerequisites for employment growth in the economy, smoothes anywise a swing in the world economic activity, and reduces export risks.

For the purpose of Ukrainian trade export diversification research we apply two indices, used in the world practice of foreign trade analysis: normalized concentration index by Herfindahl, proposed by WTO experts (*Bacchetta, et al, 2012*) [11], and normalized one by Herfindahl-Hirschman, used by UNCTAD (*UNCTAD, 2013*) [12].

The simplest diversification index is the inverse one to Herfindahl concentration index, which is each industry (or product group) share sum of squares in the overall country's volume of exports. If the country is denoted as i, and its certain industry (or product group) as k, Herfindahl index can be written as a formula:

$$h^{i} = \sum_{k} \left( s_{k}^{i} \right)^{2}, \tag{1}$$

where  $s_k^i$  – is industry (or product group) share k in country's volume of exports i;

k – goods export amount.

According to modeling  $h^i$  fluctuates 1/k to 1. The index can be normalized within zero and unity, in such case it is Herfindahl index, that is in question  $nh^i$ :

$$nh^{i} = \frac{h^{i} - \frac{1}{k}}{1 - \frac{1}{k}}.$$
 (2)

If such concentration indices as Herfindahl index are calculated only within product assortment available, they measure concentration/diversification on intensive basis.

Herfindahl-Hirschman index *nHH* can be shown as a formula:

$$nHH = \frac{\sqrt{\sum_{i=1}^{k} \left(\frac{x_{ij}}{\sum_{i=1}^{k} x_{ij}}\right)^{2}} - \sqrt{\frac{1}{k}}}{1 - \sqrt{\frac{1}{k}}},$$
(3)

where  $x_{ii}$  is product value of exports i by the country j.

Both indices vary within  $0 \le nHH, nh^i \le 1$ ; index approximation to 1 means export concentration increasing (diversification decreasing), and values approximating to zero show high export diversification.

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One of the main problems of the indices mentioned is their dependence at the disaggregation level of statistic data used during the analysis. For the purpose of elimination of possible index understating Ukrainian product export diversification analysis will be made in two steps:

- 1) normalized concentration indices calculating is made on three HS detailing levels: at chapter level (two digits of Electronic Product Code), headings (four digits of Electronic Product Code), and subheadings (six digits of Electronic Product Code) without any updating and restricting;
- 2) for eliminating effecting the final result of the codes, which export transactions amounts are small, starting data limitation procedure is made<sup>5</sup>. It is a small product items withdrawal from calculations made by such principle: at the level of HS subheadings on calculating all product items, which export amount doesn't exceed 1 billion USD per year are taken into consideration; at the level of HS headings product items, which export amount doesn't exceed 10 billion USD per year; at the level of HS headings product items, which export amount doesn't exceed 100 billion USD per year aren't taken into consideration.

Ukrainian export diversification indices calculations on intensive basis results taking into account the restrictions are given in *table 2*.

Table 2

Ukrainian export diversification concentration indices
(according to detailing levels) in 2004–2012

Index	2004	2005	2006	2007	2008	2009	2010	2011	2012	
Unlimited data										
Herfindahl normalized concentration index at the level of										
HS chapters	0.124	0.127	0.126	0.125	0.130	0.086	0.097	0.092	0.074	
HS headings	0.025	0.028	0.027	0.025	0.032	0.023	0.026	0.027	0.024	
HS subheadings	0.0119	0.0133	0.0123	0.011	0.0139	0.0128	0.0138	0.0149	0.0149	
Herfindahl – Hirschman normalized concentration index at the level of										
HS chapters	0.292	0.297	0.296	0.294	0.301	0.230	0.249	0.241	0.207	
HS headings	0.134	0.145	0.142	0.136	0.155	0.128	0.138	0.140	0.130	
HS subheadings	0.096	0.102	0.097	0.092	0.105	0.100	0.104	0.109	0.109	
Limited data										
Herfi	Herfindahl normalized concentration index at the level of									
HS chapters	0.135	0.140	0.137	0.131	0.135	0.092	0.100	0.094	0.075	
HS headings	0.027	0.031	0.029	0.027	0.033	0.024	0.027	0.028	0.025	
HS subheadings	0.012	0.014	0.013	0.011	0.014	0.013	0.014	0.015	0.015	
Herfindahl – Hirschman normilised concentration index at the level of										
HS chapters	0.308	0.316	0.311	0.304	0.308	0.241	0.255	0.244	0.211	
HS headings	0.140	0.152	0.148	0.140	0.159	0.133	0.143	0.143	0.133	
HS subheadings	0.097	0.103	0.099	0.092	0.106	0.101	0.105	0.109	0.109	

\*Calculated by the author according to WITS [9] ma UN COMTRADE [10] data.

<sup>&</sup>lt;sup>5</sup> Such limitation is motivated by the fact, that each similar product item effects the calculations indices, which trade volume is low. As a result, such effect causes normalized Herfindahl and Herfindahl – Hirschman indices underrating.

According to the *table 2* data a preliminary conclusions can be made. *First*, national export diversification is high. Normalized Herfindahl and Herfindahl – Hirschman indices calculated values (both limited and unlimited) at all detailing levels testify about this. So, during the period analyzed Herfindahl concentration index at HS chapter level didn't exceed 0.15, at the same time at the higher foreign trade data detailing levels this index is 0.04. Herfindahl – Hirschman index shows higher values and in 2005 reaches HS chapter level 0.316 (for limited data). At the higher starting data detailing levels index value doesn't exceed 0.16. Based on formal Herfindahl and Herfindahl – Hirschman indices preliminary calculation conditions Ukrainian export concentration is low.

Second, according to the calculations a trend to Ukrainian product export decreasing to 2008 at HS chapter level can be observed. Analyzed export concentration indices increasing (with unstable dynamics) testify about this. However, crisis phenomena at the world markets stopped this trend and caused Ukrainian export diversification level increasing.

Such dynamics allows making a conclusion about Ukrainian export growth by individual product items in demand in world market in favorable years. At the same time detailed data using creates fundamentally different picture. At HS subheadings level unstable analyzed indices decrease changing to permanent indices increase after 2008 is observed. Based on contrary results obtained during calculating, a necessity of further detailing and trends detecting at product groups level appears.

Third, calculations testify about high analyzed indices dependence on starting data detailing degree. Besides, at different foreign trade data detailing levels contrary trends are observed. In whole normalized Herfindahl and Herfindahl – Hirschman indices calculating enables to make maximally impossible analysis quality decreasing due to indices mentioned disadvantages.

Analysis at macro level doesn't allow defining the sectors which export is the most concentrated, as values obtained is an average amount by all Ukrainian export product groups. In connection with this a necessity of similar calculations at the certain industries level or in case of foreign trade data – homogeneous product code groups appears.

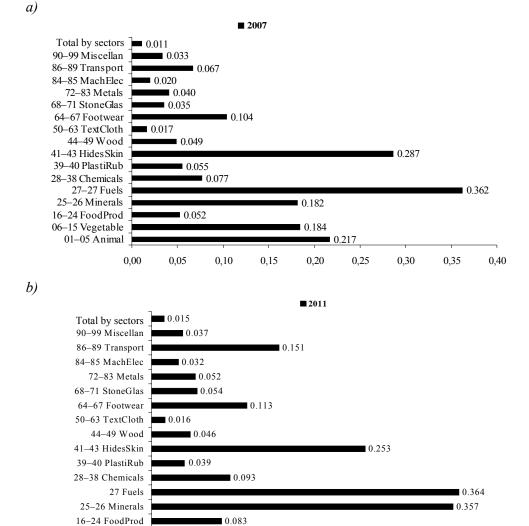
For the purpose of defining the least diversified sectors all the Ukrainian product export (at HS subheadings level) is divided into 16 product code groups and for each of them normalized Herfindahl index is calculated separately. As a checkpoint for comparing 2007 (figure 2a) and 2011 (figure 2b) are used.

Against the background of overall trend to Ukrainian export decreasing observed at macro level, the results of sector calculations at six-digit codes level show contrary trends and are rather informative.

In export sectors normalized Herfindahl concentration index increased from 0.011 in 2007 to 0.015 in 2011. Those product code groups for which

the index analyzed is the highest are clearly observed, such as: fuel, mineral raw materials, leather and animal products.

As can be seen from *figure 2a* and *figure 2b* export concentration in product code groups mentioned (excluding vegetable and leather products) in post-crisis period only increased. The highest national export concentration increasing was observed in the product code group combining mineral raw materials (from 0.182 to 0.357) and in transport (from 0.067 to 0.151). Together with this majority of another product code groups within comparison made also showed small normalized Herfindahl concentration index increasing.



**Figure 2. Normalized Herfindahl concentration indices in export sectors** in 2007 and 2011 (Made by the author by WITS [9] and UN COMTRADE data [10])

0,15

0,20

0,05

0,10

0.231

0,30

0.35

0,40

06-15 Vegetable 01-05 Animal So, the lowest Ukrainian export diversification level can be observed in fuel and mineral raw materials, vegetable and animal products export, light industry and in transport. These are the industries which must be the object of especial attention from the government in national economy export potential stimulating.

For the analysis of the Ukrainian export potential understanding how national export structure differs from the world one is very important. Its indicator is normalized export structure diversification index  $S_j$  (index Finger-Kreinin). Export structure diversification index  $S_j$  signals about the availability of a certain country export structure differences or groups of countries from the world one. Index values varying within  $0 \le S_j \le 1$ , shows export structure discrepancy degree of individual country or groups of countries from the average world one. Index approximating to 1 testifies about a certain country export structure differences increasing from the world one.

$$S_{j} = \frac{\sum_{i} \left| h_{ij} - h_{i} \right|}{2}, \tag{4}$$

where  $h_{ij}$  – is a product share i in the overall country export and groups of countries j;

 $h_i$  – is a product share i in the overall world export [12].

For the purpose of the Ukrainian export structure diversification two main approaches are used: Finger-Kreinin indices calculating on the data detailed at the level of HS two-digit code basis (unlimited data in *table 3*); Finger-Kreinin indices calculating at the data detailed at the level of HS two-digit code basis and voided from the product items effect which export amount doesn't exceed 100 billion USD (limited data in *table 3*).

For providing comparison of the values obtained in *table 3* Finger-Kreinin indices for individual groups of countries of the world including Ukraine are also given.

As the *table 3* data show Ukrainian export structure considerably differs from the world one, as Finger-Kreinin index for all the period analyzed exceeds 0.5. Besides, in the most developed export items segments such difference grew to 2008 (as analyzed index inconsiderably higher values for the limited data in this period show), while after 2008 contrary processes were observed.

International comparisons of export structure diversification indices enable to make a conclusion, that in whole its values for Ukraine are at the level for countries with transitional economy. At the same time EC-27 countries – the main industrial goods exporters have the export structure more similar to the world one by product assortment and value structure. Developing countries show a little greater difference.

Ukrainian export structure diversification and individual countries of the world in indices 2004–2012 \*

Index	2004	2005	2006	2007	2008	2009	2010	2011	2012	
Unlimited data for Ukraine										
Diversification (structure) index Finger-Kreinin (on HS chapters level)	0.506	0.539	0.546	0.542	0.574	0.542	0.553	0.558	0.581	
	Limited data for Ukraine									
Diversification (structure) index Finger-Kreinin (on chapters HS level)	0.505	0.543	0.551	0.545	0.574	0.543	0.548	0.554	0.578	
		Da	ta accord	ing count	ries grou	ps				
Developed countries	0.150	0.159	0.165	0.168	0.173	0.175	0.180	0.181	0.189	
Developing countries	0.260	0.247	0.238	0.238	0.226	0.229	0.212	0.199	0.199	
Transitional economies **	0.568	0.578	0.573	0.559	0.548	0.562	0.568	0.557	0.544	
EC-27	0.182	0.188	0.192	0.199	0.213	0.217	0.220	0.224	0.228	
The main industrial products exporters	0.112	0.125	0.131	0.129	0.143	0.131	0.139	0.149	0.154	
Including the USA	0.260	0.268	0.274	0.269	0.269	0.256	0.254	0.258	0.259	
The main petrol and gas exporters	0.666	0.666	0.664	0.652	0.636	0.632	0.639	0.626	0.623	
Including the Russian Federation	0.662	0.662	0.646	0.637	0.620	0.644	0.654	0.639	0.576	

<sup>\*</sup>Made by the author by WITS and UNCTAD statistic data [13].

According the *table 3* data it can be seen that countries – industrial goods exporters have almost six times more diversified export sectors structure, than the ones exporting hydrocarbons. The latter actually become hostages of such natural resources availability, without applying an effort for economic and export diversification.

Finger-Kreinin indices comparison for the USA and the Russian Federation is also informative. American index three times exceeds an appropriate Russian and two times Ukrainian ones. Taking into consideration a low mutual dependence of the economies of the USA and the Russian Federation, a significant difference between these countries industry structure becomes evident. An analogical conclusion can be made relating to the groups, where they are referred in *table 3*.

**Conclusion.** Ukrainian export diversification testifies that:

- Ukrainian export diversification on extensive basis is rather high and meets the developing countries level. At the same time significant reserves of foreign trade product assortment expending are available;
- Ukrainian export concentration at macro level measured on intensive basis is not as high as it is often announced in official media and non-specialized economic research papers. Herfindahl and Herfindahl Hirschman indices don't exceed 0.3 testifying about high product export diversification level;

<sup>\*\*</sup> According to UNCTAD classification of Ukraine are referred to the countries with transitional economy category.

- individual export sectors characterized by higher export concentration in comparison with others were detected, such as: fuel and mineral resources export, agricultural products, transport, and light industry products;
- against the background of satisfactory national export diversification at intensive and extensive basis Ukrainian export signification deviations from the world one are clearly seen.

Ukrainian export diversification is at the developing countries level. However, the country doesn't export the goods being in demand at world markets. It testifies about significant export potential availability and a necessity in its implementation stimulating both on extensive and intensive basis.

Further research outlook is such Ukrainian export product codes identification, which under the condition of stimulating policy can make a basis for Ukraine's export expansion at world markets.

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Зубрицький А. Диверсифікація українського експорту: аналіз на макрорівні. Постановка проблеми. За умов геополітичних та соціально-економічних викликів, що постали перед Україною, диверсифікація вітчизняного експорту є завданням першочергової важливості в контексті економічної безпеки. Це обумовлює необхідність проведення аналітичного аналізу диверсифікації українського експорту та виділення найбільш проблемних експортних секторів.

Аналіз останніх досліджень і публікацій показав, що, незважаючи на високу зацікавленість проблемою оцінки диверсифікації експорту у вітчизняних академічних колах, відповідні дослідження здійснюються досить безсистемно та не дають змоги чітко ідентифікувати найбільш проблемні експортні сектори.

**Метою** статті  $\epsilon$  аналіз інтенсивної та екстенсивної основи диверсифікації українського експорту на макрорівні та ідентифікація експортних секторів, що мають найвищий потенціал до її поглиблення.

**Матеріали та методи.** В процесі дослідження використано методи порівняння, графічний, табличний, індексний. Основним джерелом інформації є база статистичних даних товарної торгівлі ООН (UN-COMTRADE) та даних стосовно зовнішньої торгівлі Світового банку (WITS).

Результати дослідження. У статті здійснено аналіз диверсифікації українського товарного експорту на екстенсивній та інтенсивній основах протягом 2004—2014 рр. Встановлено, що диверсифікація вітчизняного експорту на екстенсивній основі є досить високою та знаходиться на рівні країн, що розвивається. Результати розрахунку диверсифікації експорту на інтенсивній основі свідчать, що вона відповідно до поширеної думки не є критично низькою. Причина низької ефективності українського експорту криється у суттєвому відхиленні його структури від структури світового експорту, що встановлено на основі розрахунку індексу Фінгера-Крейніна. Також ідентифіковані експортні сектори, в яких концентрація експорту є найвищою, а саме: експорт палива та мінеральної сировини, продукції сільського господарства, транспорту, а також продукції легкої промисловості.

**Висновки.** У статті, на відміну від існуючих вітчизняних публікацій, проведено систематизований комплексний аналіз диверсифікації українського експорту на різних рівнях деталізації. За результатами розрахунків пропонується два основних напрями максимальної реалізації національного експортного потенціалу: стратегічний та тактичний. Стратегічний напрям, що включає приведення структури вітчизняного експорту у відповідність до світової, може бути реалізований у довгостроковому періоді. Тактичний напрям полягає у зниженні концентрації експорту в найбільш проблемних секторах за рахунок активної державної політики (у т. ч. фіскальної).

Основні положення, висвітлені у статті, можуть стати базою для подальших наукових досліджень у напрямі ідентифікації товарних кодів українського експорту, які за умови відповідної стимулюючої політики становитимуть основу реалізації експортного потенціалу України та покращання кількісної й якісної структури національного експорту.

*Ключові слова:* експорт, експортний потенціал, диверсифікація експорту, концентрація експорту, екстенсивна основа диверсифікації експорту, інтенсивна основа диверсифікації експорту, структура експорту.