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Technological Exports and the Dynamics of Ukraine's Economic Growth*

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ABSTRACT. This article examines the promotion of technological exports in the context of making products competitive on the world market at the expense of quantified but not qualified factors. The author describes the destructive consequences of primary export growth. Relying on a designed structural model, she analyzes factors pertaining to technological exports and industrial production, and also evaluates the effectiveness of promoting exports for economic growth. She demonstrates the negative effect of the devaluation of the hryvnia on industrial production growth and the currency's neutrality as a factor in the promotion of technological exports. The article establishes that technological exports determine to a considerable extent the dynamics of Ukraine's economic growth, while the exports of raw materials worsen these indicators. The author shows that the export of metal products stands in the way of increasing technological export, and offers her recommendations to improve the dynamics of economic growth.

KEY WORDS. Technological export, export of raw materials, economic growth, competitiveness, industrial production, price and non-price factors of export promotion, strengthening of monetary unit, devaluation, budget balance, energy-intensive export sectors, critical import, structural model of technological export, error correction model, vector-error correction.

Introduction

The predominance of the export of raw materials (primary export) makes Ukraine's national economy dependent both on the world market situation and on the supply of energy sources, given the energy-intensity of Ukraine's principal exports — metal and chemical products. Moreover, exporters depend considerably on the

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import of materials, equipment and their complete set-ups. In many respects, the competitiveness of Ukrainian goods on the world market is achieved at the expense of environmental expenditures, overuse of fixed assets, and low labor costs, which threaten significant losses in the long run.

With the help of the error correction model (ECM) and vector-error correction (VEC), this articles examines the principal relationship between the export volumes of metal products (raw materials component), the export-import products of mechanical engineering (technological component), and industrial production in Ukraine. Its immediate aim is to describe the impact of technological exports on the dynamics of industrial production and the dependence of both indicators on a number of external and internal factors, such as Ukraine's currency exchange rate and the budget balance. The article innovatively designs a structural model of technological exports (with allowance for short- and long-term trends) and provides empirical verification of the dependence of the selected endogenous variable on a broad spectrum of factors (exchange rate, budget balance, aggregated GDP of the countries-trading partners, world prices of metal, and the like).

The structure of the article reflects its set of stated objectives. It begins with an analytical overview of the literature on the dependence of economic growth on the structure of exports. It then analyzes the structural changes in Ukraine's foreign trade and provides an empirical study of the functional interdependence. In its conclusions it outlines practical areas for the stimulation of technological exports.

1. Overview of Literature

The numerous advantages of exports are traditionally associated with higher productivity, greater independence from price trends, stimulated investment and application of innovation, dissemination of knowledge and technologies, higher quality of products[1], increased demand and skilled labor[2]. Lately, researchers are concentrating less on volumes of export and more on its structure. D. Hummels and P. Klenow showed that industrial countries export more goods at higher prices and quality than less developed countries. The impact of exports on economic growth depends on its technological component; in this respect the export of raw materials

[1] *Awarez R., López R.* Exporting and Performance: Evidence from Chilean Plants // Canadian Journal of Economics. — 2005. — Vol. 38. — No. 4. — P. 1384—1400.

[2] *Yeaple S.* A Simple Model of Firm Heterogeneity, International Trade and Wages // Journal of International Economics. — 2005. —Vol. 65. —pp. 1—20.

might be a negative factor, since it does not require the concentrated application of scientific and technological achievements and is also sensitive to the price factor[4]. In their analysis of indicators from 45 countries, J. Cuaresma and J. Wurz showed the stimulating nature of exports for developing countries, above all within the competitive environment of an open economy, but also stressed the importance of constantly raising the quality of goods and the efficiency of production[5]. On the basis of an analysis of indicators from China's 28 provinces[6] from 1978 to 2000, it was demonstrated that exports were facilitated by the liberalization of foreign trade, the attraction of foreign direct investment, and industrial restructuring, which foresaw the specialization of exports where comparative advantages were effectively used. W. Naude and T. Gries[7] proved that the application of know-how is one of the most important factors of export growth for African countries.

In Singapore, the development of technological sectors yielded tangible results over a comparatively short time owing to a policy of higher wages and higher difference of tariff rates between high- and low-skilled workers, which encouraged advancement in the qualification of personnel[8]. For enterprises in export processing zones, tax holidays were provided as well as subsidies and exemptions from customs duties of goods for re-export. A study of the long-term (1960—2001) relationship between export and economic growth in Chile[4] demonstrated the negative impact of raw-materials-oriented export on GDP, since it showed how an increase in the technological component facilitates the attraction of investment and higher productivity of foreign trade and ensures long-term economic growth.

An important factor in the increase of technological exports (in the general understanding of non-raw materials) can be the import of technologies, machines, equipment and raw materials. B. Hoekman and S. Djankov[9] argue that imports of technologies and equipment are strongly associated with the structure and volumes of

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[4] *Herzer D., Novak-Lehmann F., Siliverstovs B.* Export-Led Growth in Chile: Assessing the Role of Export Composition in Productivity Growth // Discussion Papers. — 2004, November. — No. 103. — 28 p.

[5] *Cuaresma J., and Wörz J.* On Export Composition and Growth // Review of World Economics. — 2005. — Vol. 141— No.1. — P. 33—49.

[6] *Shujie Yao.* On Economic Growth, FDI and Exports in China // Applied Economics. — 2006, February. — No. 3 (38). — P. 339—351.

[7] *Naude W., Gries T.* The Economic Geography and Determinants of Manufacturing Exports from South Africa // The Conference on Growth, Poverty Reduction and Human Development in Africa, Centre for the Study of African Economies, University of Oxford. — 2004, March 21-22. — 27 p.

[8] *Chao-Wei Lan.* Singapore's Export Promotion Strategy and Economic Growth // Working Paper. — 2001, March. — No. 116. — 18 p.

[9] Determinants of the Export Structure of Countries in Central and Eastern Europe // The World Bank Economic Review. — 1997. —Vol. 11. — No. 3. — P. 471—487.

exports to the EU countries from the countries of Central and Eastern Europe (Bulgaria, Czech Republic, Hungary, Poland and Romania). The well-known «Dutch sickness» demonstrates that even in industrial countries with a diversified industrial sector, technological exports of industrial products can be «squeezed out» by primary exports (the de-industrialization of export) because of a strengthened currency and higher prices, with a simultaneous growth in the internal trade in goods [10]. Japan's experience is useful in that from the outset the government set its sight on manufacturing competitive technological products for export[11].

Many Ukrainian economists and politicians have been stressing the importance of increasing exports in general and promoting technological exports in particular as a way to grow the economy [12] and to raise not only the economic, but also the political, strength of the country[13]. For all its technological, scientific and resource potential, Ukraine's volumes of exports per capita are twice as low as Bulgaria's and Russia's, three times as low as Poland's, four times as low as Croatia's, ten times as low as Hungary's, and twelve times as low than that of the Czech Republic[14]. The increase in the competitiveness of Ukrainian exports entails purposeful renewal of fixed assets, technologies and products[15] and the use of revenue from exports for retooling, primarily in the mechanical engineering sector[16]. But what remains disputable is the dependence on its exchange rate of Ukrainian exports generally and the technological component in

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[10] *Шевчук В.О.* Міжнародна економіка: теорія і практика. — Львів: Каменяр, 2003, — С. 589—607. *V. Shevchuk*. (*Mizhnarodna ekonomika: teoria i praktyka* [International Economy and Practice]. Lviv, Kameniar Publishers, 2003, pp. 589—607)

[11] *Hibbert P.* Evaluating Government Export Promotion — Some Conceptual and Empirical Approaches // The International Trade Journal. —1998. — Vol. XII. — No. 4. — P. 24—41.

[12] *Пирець Н. М.* Шляхи стимулювання експортного потенціалу України // Проблемы развития внешнеэкономических связей и привлечения иностранных инвестиций: региональный аспект. — Донецк: ДонНУ, — 2004. — С. 271—273 N.Pyrets. (*Shliakhy stymuliuvannia eksportnoho potentsialy Ukrainy. Problemy razvitiya vneshneekonomicheskikh sviasey i privlecheniya inostrannykh investitsiy: regionalny aspekt* Ways of Promoting Ukraine's Export Potential: Regional Aspect]. Donetsk, Donetsk National University, 2004, pp. 271—273)

[13] *Юхименко В. В.* Експортний потенціал України // Політика і час. — 2001. — № 12. — С. 35—41.V.Yukhymenko. (*Eksportny potentsial Ukrainy* [Ukraine's Export Potential]). *Politics and our Time* magazine, No. 12, pp. 35—410.

[14] Сальник О.М. Шляхи підвищення експортного потенціалу України // Формування ринкових відносин в Україні. — 2004. — №1. — С. 127—129. O.Salnyk (*Shliaky pidvyshchennia eksportnoho potentsialu Ukrainy. Formuvannia rynkovykh vidnosyn v Ukraini* [Ways of Raising Ukraine's Export Potential. *Formation of Market Relations in Ukraine*]). 2004, No.1, pp.127-129.

[15] *Сухоруков А. І.* Проблеми та шляхи забезпечення конкурентної спроможності економіки України // Стратегічна панорама. — 2002. — № 2. — С. 25—31. A.Sukhorukov (*Problemy ta shliakhy zabezpechennia konkurentnoi spromozhnosti ekonomiky Ukrainy. Stratehichna panorama* [Problems and Ways of Enduring the Competitiveness of Ukraine's Economy. *Strategic Panorama*]. 2002, No.2, pp. 25-31)

[16] *Алимов О., Ємченко В.* Промисловий потенціал України: напрями ефективного розвитку // Економічний часопис — XXI. — 2003. — №6. — С. 28—32. O.Alymov, V.Yemchenko. (*Promyslovy potentsial Ukrainy: napriamy efedktyvnoho rozvytku. Ekonomichny chasopys* [Ukraine's Industrial Potential: Areas of Efficient Development. *Economic Journal*]). 2003, No.6, pp. 28—32.

particular[17]. In the opinion of many Ukrainian scholars, the undervalued exchange rate of the hryvnia has become a factor for increased output and an improved balance of trade[18]. But there is no lack of contrary opinions as to the expedience of devaluing the currency in the Ukrainian economy: dependence of production on critical imports, weakening fiscal indicators[19], and low incentives for efficient use of labor and energy resources[20]. As well, there is no certainty about the dependence of technological exports on the budget balance. Generally, there is a need to define such fundamental functional characteristics of the Ukrainian economy as the impact of technological and primary exports on the dynamics of industrial production or the dependence of both indicators on individual groups of imports. Finally, what arouses interest is a comparison of long- and short-term trends as well as an evaluation of the speed of adaptation of the short-term dynamics to the equally important long-term trends.

2. Dynamics of Technological Exports

An increase in technological exports appears to be a immediate objective for Ukraine for a number of reasons. First, because of the justified fear of the economy becoming more dependent on the export of raw materials. Second, a better structure of exports will create conditions for stable economic growth. Non-primary exports will raise demand, which is less threatening than the growing dependence on the price situation in the world[21], and more so since this should be expected from technological exports. In many

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[17] *Береславська О.* Ревальвація, девальвація чи лібералізація? // Вісник НБУ. — 2001. —№ 9. — С. 40—43. O. Bereslavska. (*Revalvatsia, devalvatsia chy liberalizatsia? Visnyk NBU* [Revalution, Devaluation or Liberalization? *NBU Herald*). 2001, No.4, pp. 5—6.

[18] *Геск'єр А.* Загальний огляд макроекономічної ситуації в Україні//Вісник НБУ. — 2001. — № 4. — С. 5—6. A. Geskier. (*Zahalny ohliad makroekonomichnoi sytuatsii v Ukraini. Visnyk NBU* [General Overview of the Macroeconomic Situation in Ukraine. *NBU Herald*]). 2001, No.4, pp. 5—6.

[19] *Шевчук В. О.* Платіжний баланс і макроекономічна рівновага в трансформаційних економіках: досвід України. — Львів: Каменяр, 2001. — С. 340—358. V.Shevchuk. (*Platizhny balans i makroekonomichna rivnovaha v transformatsiynyk ekonomikas: dosvid Ukrainy.* [Balance of Payments and the Macroeconomic Equilibrium in Transformational Economies; Ukraine's Experience]). Lviv. Kameniar Publishers, 2001, pp. 340—358).

[20] *Крючкова І.* Макроекономічні наслідки зміцнення гривні // Вісник НБУ. — 2005. — № 5. — С. 14—18. I.Kriuchkova. (*Makroekonomichni naslidky zmitsnennia hryvni. Visnyk NBU* [The Macroeconomic Implications of a Strengthened Hryvnia. *NBU Herald*]). 2005, No.5, pp.14-18.

[21] *Вахненко Т.* Нееквівалентність зовнішньої торгівлі — фундаментальна проблема економічного розвитку країн, що розвиваються // Економіка України. — 2005. — № 2. — С. 65—73. T.Vakhnenko. (*Neekvivalentnist zovnishnyoi torhivli — fundamentalna problema economichnoho rozvytky krain shcho rozvyvayiutsia. Economika Ukrainy.* [Nonequivalent Foreign Trade — the Fundamental Problem of Economic Development of the Developing Countries. *Economy of Ukraine*]). 2005, No.2, pp.65-73.

countries where exports of raw materials predominated, the trajectory of stable economic growth was upset by an «unexpected» deterioration of the balance of payments because of a sudden drop in prices for raw materials, and in Ukraine's case — world prices for metal. Third, impulses are intensifying for implementing the model of innovational-technological growth, which would raise qualitative competitiveness and move away from a raw materials-oriented economy. The link between the two indicators can be mutual when the reorientation from primary exports to non-primary exports (e.g. by strengthening the currency) strengthens the innovational component of exports in particular and of production in general.

The commodity pattern of Ukraine's foreign trade is clear enough: export increases predominantly account for the raw materials sectors (see Table 1). At the end of 2005, products of metallurgy (about 40 %) and the chemical industry (10 %) dominated exports, while machines and equipment accounted for some 13 %. Energy sources remain Ukraine's main imports, although the share of products of mechanical engineering and the chemical sector is growing. The export-import structure retains a narrow specialization, with three-four commodity lines accounting for 70—75 % of foreign trade turnover.

In 2005, the share of products of ferrous and nonferrous metallurgy in Ukrainian exports went up to 40.9 % from 37.9 % in 2004 (see table 1), which inspires misgivings about the decline of efficiency (the physical growth of exports volumes occurred against the background of a stabilization in world prices for metal and a decline in profitability[22]), a negative impact on the environment, and insufficient funds for modernizing production[23]. A comparison with the countries of Central and Eastern Europe only bolsters this observation. National exports of raw materials and goods with a low share of added value exceeds by 4—10 times a similar indicator for the Czech Republic, Hungary and Poland. At the same time the export of products from Ukrainian mechanical engineering is 2—5 times below similar indicators in the countries of Central Europe[24]. A raw

[22] *Дем'янченко А.* Анализ внешнеэкономической деятельности Украины в 1998-2003 годах: от спада к экономическому росту // Економіст. — 2004. — № 9. — С. 42—45. A.Demianchenko. (*Analiz vneshneekonomicheskoi deiatelnosti Ukrainy f 1998-2003 godakh: ot spada k ekonomichesmo-myu rostu.* [Analysis of Ukraine's Foreign Economic Activity in 1998-2003: from Decline to Economic Growth. *Economist* magazine. 2004, No.9, pp.42-45])

[23] *Непомняща Т.* Стимулювання експортної діяльності підприємств малого та середнього бізнесу // Актуальні проблеми економіки. — 2004. № 2(32). — С. 146—155. T.Nepomniashcha (*Stymuliubannia eksportnoi diyalnosti pidpryyemstv maloho ta serednioho bizness. Aktualni problem ekonomiky.* {Promotion of Export activity of Small and Medium-Sized Business. *Topical Problems of the Economy*. 2004, No.2(32), pp.146-155]).

materials structure that is extremely unprofitable in the strategic sense is gradually gaining a strong foothold in Ukraine; not to be dismissed is the limited revenues from exports due to the ongoing decline in world prices.

Table 1. Ukraine's most important exports and imports
(% of overall volume)

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Exports											
Metal products	36,2	32,3	41,5	34,0	39,1	41,9	39,3	38,2	36,6	37,9	40,9
Mechanical engineering products	11,8	9,8	9,6	12,0	11,1	12,0	13,7	14,1	13,5	18,5	13,1
Chemical products	9,7	11,7	10,6	10,5	11,1	12,4	10,9	9,7	10,1	9,8	10,4
Agricultural and food products	8,5	8,7	4,8	8,5	11,4	9,0	10,7	12,8	13,1	12,8	12,6
Imports											
Energy resources	55,4	51,7	47,6	42,0	42,1	42,9	39,0	38,6	38,1	36,4	32,1
Mechanical engineering products	14,9	13,5	15,2	21,0	17,4	17,6	20,0	21,1	22,3	25,2	26,5
Chemical products	5,4	5,6	7,3	10,0	11,3	11,1	11,6	12,4	12,3	12,4	13,9

Source: State Statistics Committee of Ukraine

A higher than usual intensity of energy in the export sector creates additional difficulties. For each dollar of GDP, Ukraine expends 5.5 times more energy sources compared with the countries of Central and Eastern Europe, and 12 times more than countries of the Organization for Economic Cooperation and Development, and as years pass the situation does not improve. From 1990 to 2000, the energy intensity of Ukraine's GDP went up from 1.39 kg of conventional fuel per one hryvnia of products to 1.96 kg[25], which increases dependence on the import of crude oil and natural gas.

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[24] *Вірван Л.* Проблеми і перспективи у міжнародній торгівлі // Фінанси України. — 2003. — № 5. — С. 78—88. L. Virvan. (*Problemy i perspektyvy u mizhnarodniy torhivli. Finansy Ukrainy.* [Problems and Prospects in International Trade. *Finances of Ukraine*. 2003, No.5, pp.78—88]).

[25] *Лазебник Л.* Зовнішньоторговельні чинники розвитку України // Актуальні проблеми економіки. — 2003. — № 6(24). — С. 59—64. L. Lazebnyk. (*Zovnishniotorhovelnik chynnyky rozvytku Ukrainy. Aktualni problemy eknomiky.* [Foreign Trade Factors of Ukrine's Development. *Topical Problems of the Economy*. 2003, No.6924), pp. 59—64]).

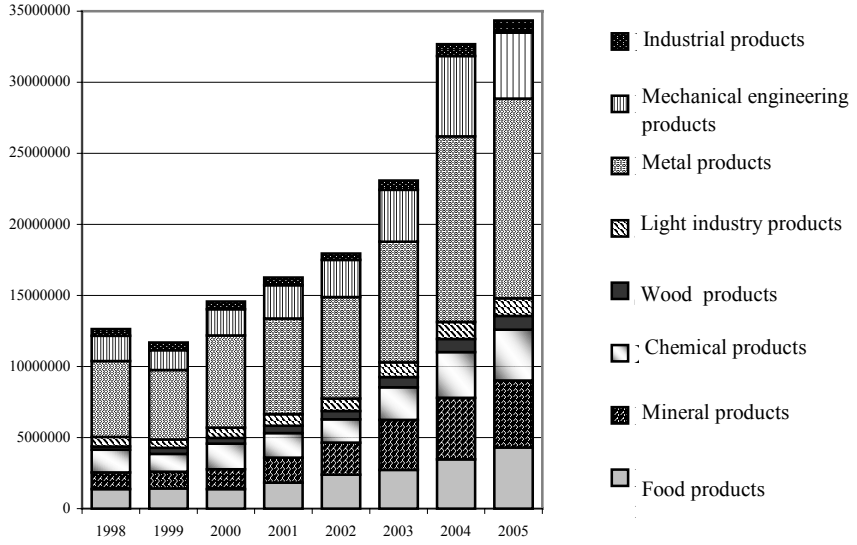

Fig.1. Commodity patterns of Ukrainian exports (US $million), 1998—2005

Source: State Statistics Committee of Ukraine

Although recognizing the competitiveness of national products on the world market as an aggregate of technical (product quality, eco-mindedness, design, safety, conditions of presale and aftersale support, etc.), economic (prestige of products, production costs, profitability, price, leasing, terms of payment and delivery, efficiency of innovational and investment processes, selection of markets and technologies of marketing promotion of products, customs tariffs) and other factors[26], Ukraine has retained the «devaluation syndrome» inherited from the inflationary 1990s[27]. In this respect, an undervalued hryvnia is believed to be one of the

[26] *Соловьев В., Войтович А., Покровский С.* Пути повышения эффективности инновационного партнерства Украины со странами Европейского сообщества // Проблемы науки. — 2002. — № 3. — С. 16—21. V. Solovyov, A. Voitovich, S. Pokrovsky. (*Puti povysheniya effecktivnosti innovatsionnogo partnerstva Ukrainy so stranamy Evopeiskogo soobshchestva. Problemy nauki* (Ways of Increasing the Efficiency of Ukraine's Innovational Partnership with the Countries of the European Community. *Problems of Science.* 2002, No. 3, pp. 16—21).

[27] *Кияк А.* Реальний ефективний обмінний курс гривні як показник конкурентоспроможності національної економіки (1998—2000 рр.) // Тенденції української економіки. — 2001. — № 3. — С. 60—68. A.Kyiak. (*Realny efektyvny obminny kurs hryvni yak pokaznyk konkurentospromozhnosti natsionalnoi economiky (1998—2000). Tendentsii ukrainskoi ekonomiky.* (The Really Effective Exchange Rate of the Hryvnia as an Indicator of the National Economy's Competitiveness (1998—2000). *Trends in the National Economy*. 2001, No. 3, pp. 60—68).

most important competitive advantages[28]. On the other hand, an excessive output of the metallurgical, chemical, power and fuel industries resulted precisely from the repeated devaluation of the currency[29], which is mistakenly viewed as a method for quickly improving the price competitiveness of exports. But the advocates of a «weak» hryvnia do not take into account the dependence of exports on the price reduction of critical imports, primarily of machines and equipment, which is important for the technological retooling of production.

3. Empirical study of the functional dependencies of technological export

The functional dependence of technological exports was evaluated with the assistance of a structural regression model that takes into account the effect of substitution between primary exports and technological exports, the dependence of both indicators on technological imports, as well as the mutual dependence between export-import and industrial production. The results were studied for stability with the assistance of a corresponding autoregression model.

The indicator of technological exports $EXPORT^{16\text{-}18}{}_t$ is determined as a summary value of groups XVI, XVII and XVIII of Ukraine's customs statistics that takes into account the export of mechanical equipment, machines and mechanisms, motor vehicles and road-building equipment (see Table 2).

Exports of mechanical engineering products exceeded by far the balanced value of 2004, while in 2005 the contrast correction of this indicator was not less (see Fig.2). The international exchange of mechanical engineering products stands out for its rather quick renewal and the appearance of new generations of more science-intensive machines. Among the promising areas of world trade in mechanical engineering products is aerospace equipment, new types of power equipment, devices and in-

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[28] *Кораблин С.* Боргова стабільність гривні // Дзеркало тижня. — 2001. — № 46(328). — 24 листопада. — С. 1, 8. S.Korablyn. (*Borhova stabilnist hryvni. Dzerkalo tyzhnia.*(Debt Stability of the Hryvnia. *Mirror of the Week* newspaper. No.46 [328], November 24, pp. 1,8.)

[29] *Шевчук В.* Чинники українського експорту-імпорту в 1994—2000 рр. // Вісник Львівської комерційної академії. — Вип. 10. Збірник наукових праць за матеріалами другої Міжн. економ. конф. «Економетричні методи і моделі в економіці: теорія і практика». — Львів: Коопосвіта, 2001. — С. 50—59. V.Shevchuk. (*Chynnyky ukrainskoho eksporty-importy v 1994—2000 r. Visnyk Lvivskoi comertsiynoi akademii. Vyp.10. Zbirnyk naukovykh prats za materialamydruhoi Mizhn. eknom. konf. «Ekonometrychni methody I modeli v ekonomitsi: teoria I praktyka.* (Factors of Ukrainian Export-Import in 1994-2000. *Lviv Commercial Academy Herald.* Issue 10. Collection of scientific papers of the international economic conference Econometric Methods and Models in Economics; Theory and Practice. Lviv. Kooposvita Publishers, 2001, pp. 50—59).

struments, and cars, ships, special-purpose machines of higher quality achieved by the application of electronic devices[30].

Table 2. Product lines of Ukraine's foreign trade nomenclature (XVI—XVIII)

Number	Name
XVI.	Mechanical equipment; machines and mechanisms, electric equipment and parts; devices for recording or representing images or sound:
84	boilers, machines, apparatuses and mechanical devices
85	electric machines and equipment
XVII.	Motor vehicles and road-building equipment:
86	railroad or streetcar engines, road-building equipment
87	overland vehicles, except for railroad vehicles
88	air navigation or space apparatuses
89	sea or river craft
XVIII.	Optical devices and apparatuses for photographing or filming; medical and surgical apparatuses; watches:
90	instruments and apparatuses
91	watches

Source: State Statistics Committee of Ukraine

Primary exports $EXPORT^{15}_{t}$, represented by group XV of customs statistics, embrace ferrous and nonferrous metals (see Fig.2). For two years in a row Ukraine holds third place in the export of ferrous metals in the world[31]. The further development of metallurgy might seem to be a «locomotive» of Ukraine's economy and a way of increasing foreign currency earnings[32], but

[30] *Лелека В. В.* Порівняльне статистичне дослідження науково-технічного, виробничого та торговельного потенціалів енергетичного машинобудування України // Статистика України. — 2003. — № 2. — С. 46—51. V.Leleka. *Porivnialne statystychne doslidzhennia naukovo-tekhnichnoho, vyrobnychoho ta torhivelnoho potentialiv enerheteychnoho mashynobuduvannia Ukrainy. Statistka Ukrainy.* (Comaprative Statistical Study of the Scientific, Technical Production and Trade Potentials of Ukraine's Power Mechanical Engineering. *Statistics of Ukraine*), 2003, No.2, pp. 46—51).

[31] *Макогон Ю.* Гірничо-металургійний комплекс України: міфи та реальність // Дзеркало тижня. — 2005. — № 34(562). Y. Makhohon (*Hirnychno-metalurhiyny kompleks Ukrainy: mify ta realnist. Dzerkalo tyzhnia.* (Ukraine's Mining and Metallurgical Industries: Myths and Reality. *Mirror of the Week* newspaper. 2005, No.34 [562]).

[32] *Рубан А.* Про деякі питання та тенденції сучасної зовнішньої торгівлі України // Економіка України. — 2003. — № 7. — С. 66—69. *A. Ruban* (*Pro deiaki pytannia ta tendentsii suchasnoi zovnishnioi torhibli ukrainy. Ekonomika Ukrainy* [On Some Issues and Trends of Ukraine's Current Foreign Trade. *Economy of Ukraine.*] 2003, No.7, pp. 66—69).

its importance should not be overestimated. Ukraine exports mostly metal products with a low added value, while the existing production capacities require radical modernization to increase the share of products of high quality and higher added value. What is worse, the growing exports of Ukrainian metals depend on the critical import of energy sources.

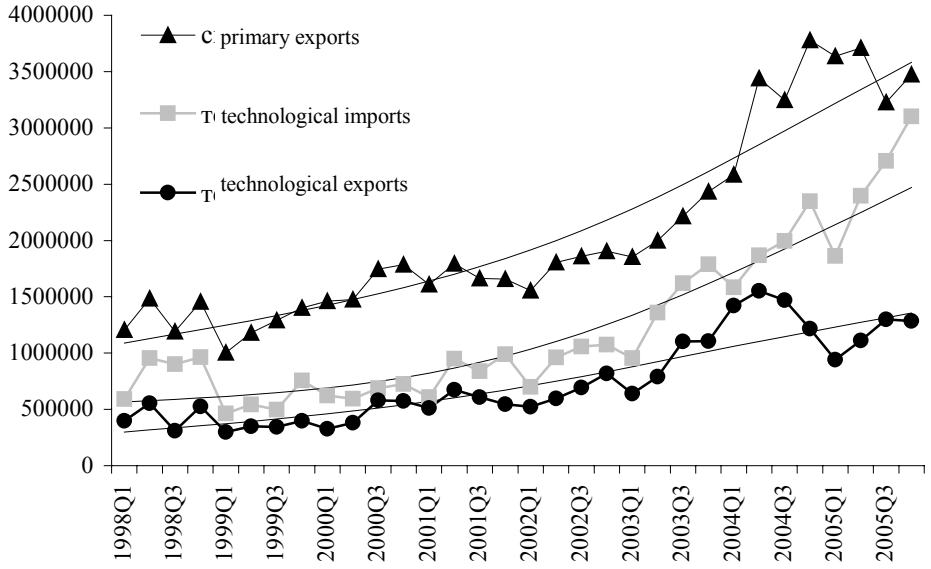

Fig.2. Volumes of technological exports, technological imports (group XVI-XVIII), and exports of metal products (group XV), US $million, 1998—2005

Source: State Statistics Committee of Ukraine

The misgivings about growing imports are leveled if we take into account their probable innovational nature ($IMPORT^{16\text{-}18}_t$). For industrial production the increase in the imports of mechanical equipment, machines and mechanisms (see Fig. 2) can be a favorable circumstance in reviving the innovational process on a technological basis. Equally favorable for economic growth can be the increase in imports of vehicles and road-building equipment, but it should not be ignored that in the case of Ukraine the imports are passenger cars, which mostly serve the purposes of consumers.

Apart from the export-import structure indicators, we used in the empirical analysis the following quarterly indicators for the period from 1998 to 2005: IND_t and $INDWORLD_t$ — industrial production in Ukraine and the countries-trading partners (index, 1994 =

= 100[33]), BD_t — budget balance (% of GDP), E_t — nominal exchange rate (hryvnia to the US dollar)), $METAL_t$ — index of world prices for metal (index, 1994 = 100) (See Annex A).

Table 3. Johansen test for BD_t, E_t, $METAL_t$, $INDWORLD_t$

Number of equations	Lags			Critical values	
	1	2	3	5 %	1 %
1	55.90474**	98.79828**	122.6452**	47.21	54.46
2	15.35514	38.74943**	60.99518**	29.68	35.65
3	6.211692	18.62723*	24.49442**	15.41	20.04
4	1.630494	2.633146	9.775410**	3.76	6.65

Note*:* tentative assumptions of linear trends, (**–1 %, *–5 %,)

Since the Johansen test revealed a stable long-term link between the dependent variables, a regression model with error correction was used for empirical evaluation:

$$Y_t = a_0 + \sum_{j=1}^{m} A_j Y_{t-j} + \sum_{i=0}^{k} B_i X_{t-i} + z_t$$

$$\Delta Y_t = b_0 + \sum_{j=1}^{m} a_j \Delta Y_{t-j} + \sum_{i=0}^{k} b_i \Delta X_{t-i} + c_i z_{t_{-1}} + \upsilon_t ,$$

where Y_t — vector of dependent variables (technological exports, imports, exports of metal products, industrial production), X_t — vector of independent variables, υ_t — model error.

To allow for crisis developments, the dummy variable $CRISIS_t$ was used with «1» standing for 1998:Q1 — 2001:Q1 and 2004Q3 — 2005:Q2. In equation (1), the levels of corresponding indicators were used, while in equation (2), their first differences ($\Delta X = \log(X_t) - \log(X_{t-1})$). Coefficients $A_j - B_i$ reflect long-term, while $a_j - b_i$ short-term dependence. The stochastic residuals z_{t-1} with long-term regressive equations for levels were used to adjust the evaluation of the short-term dynamics. Although the variables in equation (1) may not correspond to the requirements of stationarity (presence of a trend), the inclusion of residuals z_{t-1} in equation (2) makes it possible to obtain a more precise evaluation of the regressive coefficients.

[33] This index takes into account GDP data (or industrial production) of Russia, the United Kingdom, Spain, Italy, The Netherlands, Germany, US, Turkey, and most of the countries of Eastern Europe (in all 15 countries accounting for two-thirds of Ukrainian exports-imports). Standard weighing coefficients were calculated on the basis of the share of a corresponding country in the volumes of Ukrainian exports-imports.

The indicators of export-import, industrial production and budget balance were cleared of seasonality with the assistance of the Census X-11 method. Before being used in the empirical evaluation, the logs of all indicators (except for the budget balance) were taken.

Table 4 presents the evaluations of the long-term dependencies of technological exports, exports of metal products, technological imports, and industrial production. In all regression equations the corrected value of the coefficient of determination (adj. R^2) is sufficiently high. The Durbin-Watson statistics (DW) is within admissible limits, without revealing autocorrelated residuals. To confirm the stationarity of residuals, the ADF (an Augmented Dickey-Fuller) test was used.

Table 4. Factors of individual groups of exports, imports and industrial production (long-term coefficients)

Independent variables	Dependent variables			
	$EXPORT^{16\text{-}18}_{t}$	$EXPORT^{15}_{t}$	$IMPORT^{16\text{-}18}_{t}$	IND_t
Const				4,202 (10,955***)
$EXPORT^{16\text{-}18}_{t+2}$			0,332 (3,204**)	
$EXPORT^{16\text{-}18}_{t-1}$	0,270 (1,713*)	0,248 (7,774***)		0,068 (2,642**)
$EXPORT^{15}_{t}$				0,116 (2,636*)
$EXPORT^{15}_{t-1}$	−0,458 (−1,539*)	0,334 (6,121***)		
BD_{t-1}	0,038 (1,937*)	−0,467 (−5,577***)		
$IMPORT^{16\text{-}18}_{t-1}$	0,774 (5,104***)	—	0,511 (4,697***)	0,041 (1,528*)
E_t		0,258 (4,074***)		−0,093 (−2,286*)
IND_{t-1}			0,653 (1,961*)	
$METAL_t$		0,229 (4,013***)		
$INDWORLD_t$	1,166 (1,774*)			0,969 (4,912***)
$INDWORLD_{t-1}$		1,021 (7,898***)	—	
$CRISIS_t$			1,131 (2,241*)	
adj. R^2	0,90	0,98	0,92	0,98
DW	1,81	2,14	2,05	2,17
ADF	−3,867***	−4,114***	−5,109***	−3,384**
PP	−5,476***	−4,015***	−6,512***	−5,793***

Note: In brackets opposite the dependent variables are indicated the Student t-criteria with indication of statistical significance (***−1 %, **−5 %, *−10 %).

The exports of technological products is characterized by an autoregressive dependence with a lag of one quarter, which can mean that export growth creates conditions for its further buildup. The depreciated currency now impacts on the export of technological products, which proves the neutrality of the price factor as a method for promoting export. Ukrainian technological exports are characterized by a high positive dependence on imports of similar products and on the budget balance (with a lag of one quarter). Therefore, improvement in fiscal discipline becomes a factor for promoting technological exports. However, in the Ukrainian economy, the administrative redistribution of resources in favor of technological export sectors is proceeding unevenly[34]. State policy is subordinate to the interests of influential exporters of raw materials. As a result, metallurgy is becoming a superprofit sector that in no way can be considered as a long-term comparable advantage of the Ukrainian economy.

The negative coefficient during $EXPORT'^{5}_{t-1,}$ in the equation for technological exports shows that primary exports are gaining the upper hand (and yet, their statistical significance does not exceed 10 %). The result can mean that metallurgy is «taking away» resources from more technological sectors. Such a mechanism can be achieved, for instance, by redistributing resources or using state budget funds.

Exports of the metallurgical sector depend in a positive way on industrial production and the level of world prices for metals. It is completely predictable that growing industrial production in countries-trading partners (Russia accounting for the lion's share) promotes the exports of mechanical engineering products and metallurgy. This is confirmed by the Ukrainian economy's high dependence on the situation in the world markets. Growing prices for metal in 2005 contributed to the retention of positive dynamics in the export of ferrous metals. But at the same time its physical volumes went down, which can be partly explained by the depression of demand and the increased competition on the part of Asian producers[35].

Exports of metal products are also of an autoregressive nature with a lag of one quarter. Unlike technological exports, the devaluation of the currency promotes the growth of exports of metal

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[34] *Стельмах В., Петрик О.* Обмінний курс, інфляція та конкурентоспроможність. // Вісник НБУ. — 2001. — № 9. — С. 3—6. V. Stelmakh, O. Petryk. (*Obminny kurs, infliatsia ta konkurentnospromozhnist. Visnyk NBU* [Exchange Rate, Inflation and Competitiveness. *NBU Herald*]. 2001, No. 9, pp. 3—6).

[35] *Литвицький В.* У заручниках зовнішньої кон'юнктури // Вісник НБУ. — 2006. — № 5. — С. 23—27. V.Lytvytsky. (*U zaruchenikakh zovnishnioi koniuktury. Visny NBU* (Held in Hostage by External Market Performance. *NBU Herald*. 2006, No.5, pp. 23—27).

products. For this reason the devaluation of the hryvnia appears to promote primary exports, which, on the other hand, also reduces the volumes of technological exports. Although no direct impact of the exchange rate on technological exports has been revealed, its limitations owing to the strengthened currency are enforced indirectly — through the increase in the exports of metal products.

Notably, technological export growth is beneficial for exports of metal products. The results can be interpreted as follows: earnings from exports are committed to the expansion of production, thereby increasing exports in general and of the metallurgical sector in particular.

A shrinking budget deficit impacts markedly on the export volumes of metal products. Restrictions on privileges for the metallurgical sector improve the budget balance and are a factor for substitution in favor of technological exports.

Volumes of technological exports equally depend on their own lag values that characterize most of the indicators of Ukraine's foreign trade. There is nothing strange in the revival of industrial production becoming a tangible factor for growth of imports of mechanical engineering products. Exports of technological products promote the imports of this commodity group with a leading lag: expectations of export growth result in import growth. With the assistance of the *CRISIS* dummy variable we traced the effect of the crisis developments in Ukraine's economy on the volumes of imports of mechanical engineering products.

The strengthened currency negatively affects the dynamics of industrial production in the country. An increase in the volumes of technological exports as well as the imports of technological products promotes industrial production growth in Ukraine. The positive impact of exports of metal products can be explained by the increase in domestic demand and, in consequence, we have the effect of retrenchment derived from dimension of output. As well, the increase in industrial production of countries-trading partners positively impacts on Ukrainian industrial production.

Table 5 evaluates the short-term dynamics factors for individual commodity groups of exports, imports and industrial production. When compared with the long-term coefficients (see Table 4), the dependence of export on its own lag value disappears. This means that the opportunities for export growth reflect the long-term characteristics of Ukraine's economy rather than its short-term trends. The impact of the budget deficit for the exports of technological products is not traceable. But the prompt adjustment of long-term trends is obvious; for instance, within a quarter, the deviations of current values from long-term trends are corrected by 70 %. The un-

favorable effect of primary exports of metal products on technological exports is also confirmed in the short-term. Neither is the impact of the nominal exchange rate on technological exports obvious in the short-term. Therefore, the devaluation of the hryvnia in April 2005 could not have hindered technological export growth. The study confirms the positive link between exports and the industrial production of countries-trading partners.

Table 5. Factors of individual groups of exports, imports and industrial production (short-term coefficients)

Independent variables	Dependent variables			
	$\Delta EXPORT^{16\text{-}18}_{t}$	$\Delta EXPORT^{15}_{t}$	$\Delta IMPORT^{16\text{-}18}_{t}$	ΔIND_t
$\Delta EXPORT^{16\text{-}18}_{t}$		0,314 (5,130***)		
$\Delta EXPORT^{16\text{-}18}_{t-1}$	—		−0,221 (−2,291*)	0,040 (1,917*)
$\Delta EXPORT^{15}_{t-1}$	−5,253 (−1,126*)			
ΔBD_{t-1}	—	−0,044 (−3,956***)		
$\Delta IMPORT^{16\text{-}18}_{t-1}$	0,529 (2,874**)		0,588 (2,867**)	0,049 (1,517*)
ΔE_{t-1}				−0,134 (−2,110*)
ΔIND_{t-2}			1,404 (2,279*)	
$\Delta METAL_{t-1}$		0,266 (1,781*)		
$\Delta INDWORLD_t$	2,354 (1,672*)	1,712 (2,857**)		1,297 (4,014***)
Z_{t-1}	−0,702 (−3,771***)	−1,460 (−5,000***)	−0,936 (−3,410***)	−0,989 (−4,683***)
adj. R^2	0,51	0,75	0,53	0,55
DW	1,72	1,94	2,32	1,93

Note: In brackets opposite the dependent variables are indicated the Student *t*-criteria with indication of statistical significance (***−1 %, **−5 %,*−10 %).

The evaluation of the short-term dependencies of exports of metal products confirms the long-term coefficients presented above. In particular, there is a conspicuous positive impact of technological exports on the improvement of the budget balance. In addition, the growing world

prices for metal promote absolutely expected larger exports of metal products. The impact of the exchange rate on exports of raw materials wanes in the short-term. Compared with the long-term coefficients for technological imports, the dependence on industrial production and autoregressive dependence are retained. There is a negligible negative impact of technological exports with a lag of one quarter. This is explained by the substitution of export earnings for technological imports. The dependencies of industrial productions are also retained in the short-term outlook, and only the impact of exports of metal products disappears.

Technological export growth by 10 % adds 0.7 % to the short-term dynamics of industrial production, while for technological import growth it is 0.4 %

In order to check the results for durability, the mutual dependencies of technological exports and imports, exports of metal products and industrial production were also evaluated with the assistance of the VEC model:

$$\Delta y_{i,t} = \Gamma_1 \Delta y_{i,t-1} + \ldots + \Gamma_k \Delta y_{i,t-k+1} + \Pi \tilde{y}_{i,t-1} + \Psi X_t + \varepsilon_t,$$

where Δy_t — first differences of the dependent variable; $\tilde{y}_t$ — long-term values (in levels); X_t — vector of independent variables; ε_t — stochastic factor.

The evaluations of vector autoregression (VAR) provide a more complete description of the functional relations as regards causality, change in time and degree of impact from among several interrelated factors. Therefore, VEC models present a description of the short-term dynamics of the dependent variable (first differences) with allowance for lag values — its own and of other dependent variables, corresponding long-term (or cointegrational) linkages and independent variables.

The nature of the cointegrational linkage was identified with the assistance of the Johansen test (see Table 6). Corresponding results of the VEC model are presented in figures 5—8.

Table 6. Johansen test for EXPORT16-18t, EXPORT15t, IMPORT16-18t, INDWORLDt

Number of equations	Lags			Critical values	
	1	2	3	5 %	1 %
1	69.54278**	88.76226**	90.95198**	47.21	54.46
2	33.43106*	36.67634**	48.39793**	29.68	35.65
3	11.35709	18.76087*	17.31606*	15.41	20.04
4	3.215646	3.961032*	0.067916	3.76	6.65

Note: tentative assumptions of linear trends(3), (**–1 %, *–5 %,)

Technological import growth positively impacts on the dynamics of industrial production, while in the decomposition of residuals its share goes up to 60 % (see Fig.5). There is no doubt that the animation in industrial production is the result of technological export growth (the impact is substantial throughout three quarters, and then it declines), which completely accords with the ECM evaluations. At the same time we observe a negative impact of exports of metal products on the dynamics of industrial production, which differs from the ECM evaluations.

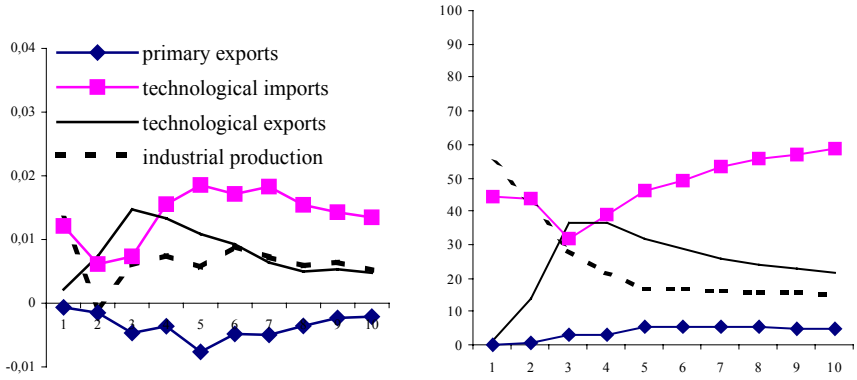

Fig. 5. Factors of Ukraine's industrial production (VEC evaluations)[36]

The most prominent factors in Ukraine's economic growth are technological imports (determining about 60 % of changes in industrial production) and technological exports (20 % of changes in industrial production). However, the share of exports of metal products in the change of the dynamics of industrial production remains insignificant — less than 5 %. The results convincingly reveal the error in the assumption that the development of metallurgy is a motive force of Ukraine's industrial production.

The volumes of technological exports decrease owing to the growth of exports of metal products (see Fig.6). Industrial production growth positively impacts on exports throughout three quarters, after which the impact declines. Imports of mechanical engineering products explicitly promote technological exports, their share in the decomposition of residuals increases rapidly throughout the year and then reaches the 55 % mark. Export growth is determined primarily by its own dynamics and technological imports. The share of exports

[36] For each dependent variable are given impulse functions describing the dependence on other dependent variables (on the left), as well as the decomposition of residuals describing the share of each factor in the changes of the dependent variable (on the right). The VEC model with two lags was used.

of metals and industrial production in the decomposition of residuals is almost the same and fluctuates at a rate of 10 %.

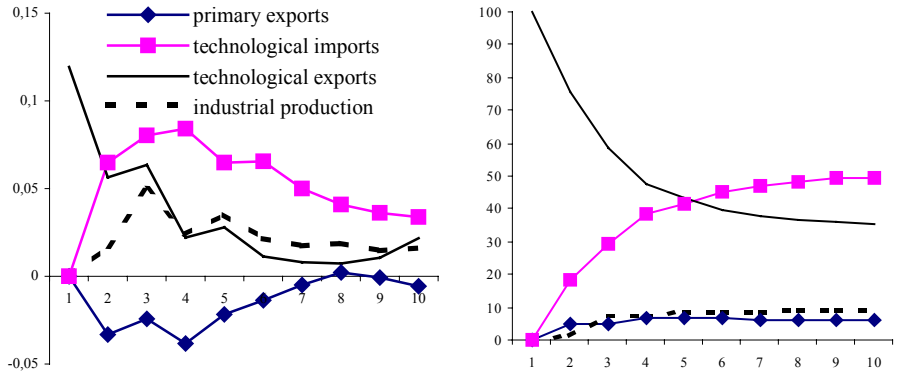

Fig. 6. Factors of Ukraine's technological exports (VEC evaluations)

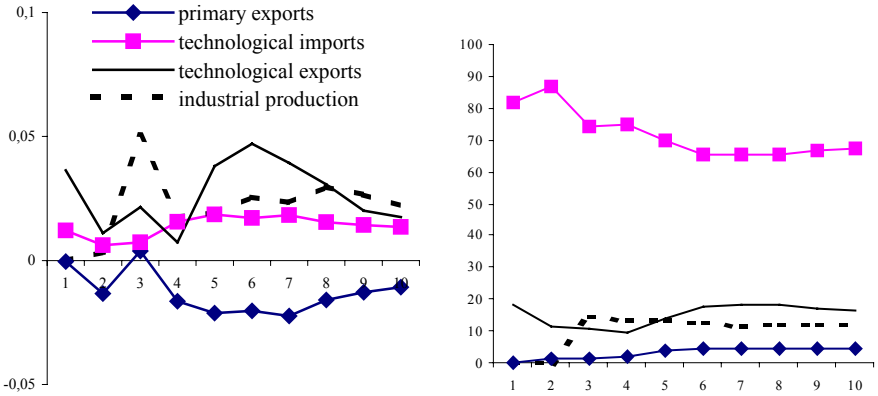

Fig. 7. Factors of technological imports (VEC evaluations)

The increase in the exports of mechanical engineering products and industrial production promote at first technological imports, but then they remain neutral (see Fig.7). The export growth of metal products hinders the buildup of technological imports, which reinforces the dependence of primary exports on technological imports. But the share of this factor in the decomposition of residuals is the lowest (rising to 8 %). Technological exports determined the dynamics of technological imports at 20 %, while industrial production at 15 %. Technological imports are characterized by a substantial autoregressive dependence and to a considerable extent depend on their own trends.

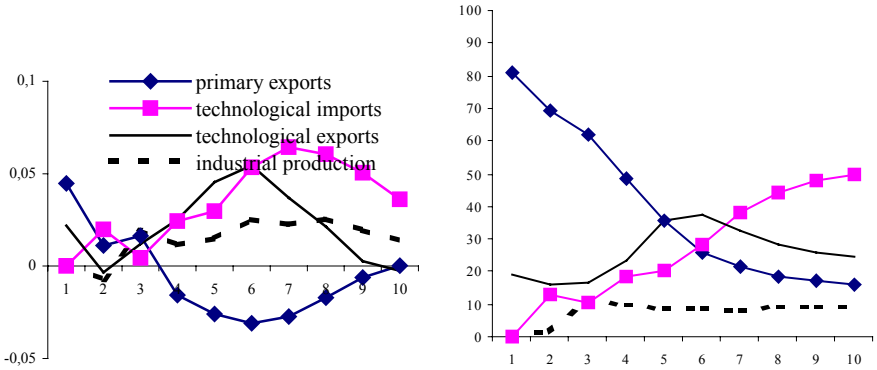

Fig.8. Factors in exports of metal products (VEC evaluations)

The exports of the metallurgical sector grew (see Fig.8) owing to the buildup of technological imports (over two years) and the exports of mechanical engineering products (over a year and a half). The considerable impact of the given factors is confirmed by their share in the decomposition of residuals (50 % and 30 % respectively). The development of technological sectors does not reduce the exports of metal products, and therefore technological exports supplement the exports of metal. There is a positive impact of industrial production, which in the decomposition of residuals determines the changes in primary exports by 10 %. Exports of metal products show their autoregressive dependence over three quarters, after which the impulse becomes weak and correction of the indicator occurs.

Conclusions

First, we established the ineffectiveness of strengthening the currency as a method for promoting exports of finished products (of mechanical engineering) and technological imports. The reverse link between a devaluation of the currency and the dynamics of industrial production was instead proved again.

Second, technological exports are a considerable motive force behind the economic growth in Ukraine, unlike primary exports. But at the same time technological exports depend very much on imports of machines and equipment, which can be explained by modernization and higher efficiency of production.

Third, primary exports restrict technological exports. Devaluation of the currency creates an initial incentive for the exports of metal products, which increase demand in imports (output of metals depends on the import of Russian energy sources). Then, imports determine the

volumes of exports, while the commitment of resources to metallurgy deprives sources of financing the technological sectors. The perceptible increase in exporters' profitability creates a peculiar «greenhouse effect» which blunts incentives to reduce production costs and arrests the introduction of innovations. A strengthened currency supported by a budget surplus could reorient investments toward high-tech sectors and hinder the shrinkage of the scientific and technological sectors. One of the implications of a «strong hryvnia» will be the end of an unproductive redistribution of resources in favor of the raw materials sectors.

An improved budget balance facilitates the development of the technological exports sector and restricts the opportunities of the exporters of raw materials. In contrast to creating preferential conditions for the metallurgical industry, it is necessary to concentrate attention on financing research in the metallurgical sector.

The powerful export-oriented sectors create new jobs and have the opportunity to use the effect of scales. Moreover, they are sources of new technologies, examples of rational organization of business, and effective marketing strategy, which through the mechanism of foreign markets produces a positive impact on the entire economy. Also, given low domestic demand, exports are perhaps the most important stimulants for economic development. Therefore, the export potential and sale of commodities, primarily with a high degree of working, are prospective sources of economic growth that the new independent countries are so much interested in as they are «catching up» in their development. An increase in the share of technological exports with substantial added value is also important to reduce the dependence on the import of energy sources and to improve its efficient use.

The following areas for continued research can be identified:

1. Detailed analysis of the mechanisms for restricting technological exports by exports of metal products, which allows for the monetary factor (offer of money supply in general and the dynamics of interest rate in particular).

2. Study of the trends of technological exports at the stage of reorienting Ukrainian foreign trade toward the markets of industrially developed countries.

3. The index of industrial production of countries-trading partners is rather disparate, since the largest share in Ukraine's foreign trade is held by Russia. It is worthwhile dividing this index into two parts: industrial production in Russia and in the other countries-trading partners of Ukraine.

4. It should not be ignored that Russia's industrial production is of an endogenous nature for Ukraine. The basis for such a belief is as follows: the operation of Russia's oil and gas industries as well as related industrial sectors depend on Ukrainian exports of mechanical engineering products.

References

1. *Awarez R,. Lypez R*. Exporting and Performance: Evidence from Chilean Plants // Canadian Journal of Economics. — 2005. — Vol. 38. — No. 4. — P. 1384—1400.

2. *Chao-Wei Lan*. Singapore's Export Promotion Strategy and Economic Growth // Working Paper. — 2001, March. — No. 116. — 18 p.

3. Cuaresma J., and Wцrz J. On Export Composition and Growth // Review of World Economics. — 2005. — Vol. 141— No.1. — P. 33-49.

4. *Herzer D., Novak-Lehmann F., Siliverstovs B*. Export-Led Growth in Chile: Assessing the Role of Export Composition in Productivity Growth // Discussion Papers. — 2004, November. — No. 103. — 28 p.

5. *Hibbert P*. Evaluating Government Export Promotion — Some Conceptual and Empirical Approaches // The International Trade Journal. — 1998. — Vol. XII. — No. 4. — P. 24—41.

6. *Hoekman B., Djankov S.* Determinants of the Export Structure of Countries in Central and Eastern Europe // The World Bank Economic Review. — 1997. —Vol. 11. — No. 3. — P. 471—487.

7. *Hummels D., Klenow P.* The Variety and Quality of a Nation's Exports // The American Economic Review. — 2005, June. — Vol. 95. — No. 5. — P. 704—719.

8. *Naude W., Gries T*. The Economic Geography and Determinants of Manufacturing Exports from South Africa // The Conference on Growth, Poverty Reduction and Human Development in Africa, University of Oxford. — 2004, March 21-22. — 27 p.

9. *Shujie Yao*, On Economic Growth, FDI and Exports in China // Applied Economics. — 2006, February. — No. 3 (38). — P. 339—351.

10. *Yeaple S.* A Simple Model of Firm Heterogeneity, International Trade and Wages // Journal of International Economics. — 2005. —Vol. 65. —P. 1—20.

11. *Алимов О., Ємченко В. П*ромисловий потенціал України: напрями ефективного розвитку // Економічний часопис — XXI. — 2003. — №6. — С. 28—32. O.Alymov, V.Yemchenko. (*Promyslovy potentsial Ukrainy: napriamy efedktyvnoho rozvytku. Ekonomichny chasopys* [Ukraine's Industrial Potential: Areas of Efficient Development. *Economic Journal*]). 2003, No.6, pp. 28—32).

12. *Береславська О*. Ревальвація, девальвація чи лібералізація? // Вісник НБУ. — 2001. —№ 9. — С. 40—43. O.Bereslavska. (*Revalvatsia, devalvatsia chy liberalizatsia? Visnyk NBU* [Revalution, Devaluation or Liberalization? *NBU Herald*). 2001, No.4, pp.5-6).

13. *Вахненко Т*. Нееквівалентність зовнішньої торгівлі — фундаментальна проблема економічного розвитку країн, що розвиваються // Економіка України. — 2005. — № 2. — С. 65—73. T.Vakhnenko. (*Neekvivalentnist zovnishnyoi torhivli — fundamentalna problema economichnoho rozvytky krain shcho rozvyvayiutsia. Economika Ukrainy.* [Nonequivalent Foreign Trade — the Fundamental Problem of Economic Development of the Developing Countries. *Economy of Ukraine*]. 2005, No.2, pp. 65—73).

14. *Вірван Л.* Проблеми і перспективи у міжнародній торгівлі // Фінанси України. — 2003. — № 5. — С. 78—88. L.Virvan. (*Problemy i perspektyvy u mizhnarodniy torhivli. Finansy Ukrainy.* [Problems and Prospects in International Trade. *Finances of Ukraine*. 2003, No.5, pp. 78-88]).

15. *Геск'єр А.* Загальний огляд макроекономічної ситуації в Україні // Вісник НБУ. — 2001. — № 4. — С. 5—6. A.Geskier. (*Zahalny ohliad makroekonomichnoi sytuatsii v Ukraini. Visnyk NBU* [General Overview of the Macroeconomic Situation in Ukraine. *NBU Herald*]). 2001, No.4, pp.5-6.

16. *Дем'янченко А.* Анализ внешнеэкономической деятельности Украины в 1998-2003 годах: от спада к экономическому росту // Економіст. — 2004. — № 9. — С. 42—45. A.Demianchenko. (*Analiz vneshneekonomicheskoi deiatelnosti Ukrainy f 1998—2003 godakh: ot spada k ekonomichesmomyu rostu.* [Analysis of Ukraine's Foreign Economic Activity in 1998-2003: from Decline to Economic Growth. *Economist*magazine. 2004, No.9, pp. 42—454])

17. *Кияк А.* Реальний ефективний обмінний курс гривні як показник конкурентоспроможності національної економіки (1998—2000 рр.) // Тенденції української економіки. — 2001. — № 3. — С. 60—68. A. Kyiak. *Realny efektyvny obminny kurs hryvni yak pokaznyk konkurentospromozhnosti natsionalnoi economiky (1998—2000). Tendentsii ukrainskoi ekonomiky.* (The Really Effective Exchange Rate of the Hryvnia as an Indicator of the National Economy's Competitiveness [1998—2000]. *Trends in the National Economy*. 2001, No. 3, pp. 60—68).

18. *Кораблин С.* Боргова стабільність гривні // Дзеркало тижня. — 2001. — № 46(328). — 24 листопада. — С. 1, 8. S.Korablyn. (*Borhova stabilnist hryvni. Dzerkalo tyzhnia.* [Debt Stability of the Hryvnia]. *Mirror of the Week* newspaper. No.46 [328], November 24, pp. 1, 8.).

19. *Крючкова І.* Макроекономічні наслідки зміцнення гривні // Вісник НБУ. — 2005. — № 5. — С. 14—18. I.Kriuchkova. (*Makroekonomichni naslidky zmitsnennia hryvni. Visnyk NBU* [The Macroeconomic Implications of a Strengthened Hryvnia]. *NBU Herald*). 2005, No. 5, pp. 14—18).

20. *Лазебник Л.* Зовнішньоторговельні чинники розвитку України // Актуальні проблеми економіки. — 2003. — №6 (24). — С. 59-64.L.Lazebnyk. (*Zovnishniotorhovelnik chynnyky rozvytku Ukrainy. Aktualni problemy eknomiky.* [Foreign Trade Factors of Ukraine's Development. *Topical Problems of the Economy*]. 2003, No.6924), pp.59-64).

21. *Лелека В. В.* Порівняльне статистичне дослідження науково-технічного, виробничого та торговельного потенціалів енергетичного машинобудування України // Статистика України. — 2003. — №2. — С. 46—51. V.Leleka. (*Porivnialne statystychne doslidzhennia naukovotekhnichnoho, vyrobnychoho ta torhivelnoho potentialiv enerheteychnoho mashynobuduvannia Ukrainy. Statistka Ukrainy.* [Comparative Statistical Study of the Scientific, Technical Production and Trade Potentials of Ukraine's Power Mechanical Engineering. *Statistics of Ukraine*]. 2003, No. 2, pp. 46—51).

22. *Литвицький В.* У заручниках зовнішньої кон'юнктури // Вісник НБУ. — 2006. — № 5. — С. 23—27. V. Lytvytsky. (*U zaruchenikakh zovnishnioi koniuktury. Visny NBU* [Held in Hostage by External Market Performance. *NBU Herald*]. 2006, No.5, pp. 23—27).

23. *Макогон Ю.* Гірничо-металургійний комплекс України: міфи та реальність // Дзеркало тижня. — 2005. —. № 34 (562). Y. Makhohon (*Hirnychno-metalurhiyny kompleks Ukrainy: mify ta realnist. Dzerkalo tyzhnia.* (Ukraine's Mining and Metallurgical Industries: Myths and Reality. *Mirror of the Week* newspaper. 2005, No.34 [562]).

24. *Непомняща Т.* Стимулювання експортної діяльності підприємств малого та середнього бізнесу // Актуальні проблеми економіки. — 2004. № 2(32). — С. 146—155. T.Nepomniashcha (*Stymuliubannia eksportnoi diyalnosti pidpryyemstv maloho ta serednioho bizness. Aktualni problem ekonomiky.* {Promotion of Export activity of Small and Medium-Sized Business. *Topical Problems of the Economy*. 2004, No.2(32), pp. 146-155]).

25. *Пирець Н. М.* Шляхи стимулювання експортного потенціалу України // Проблемы развития внешнеэкономических связей и привлечения иностранных инвестиций: региональный аспект. — Донецк: ДонНУ, — 2004. — С. 271—273 N. Pyrets. (*Shliakhy stymuliuvannia eksportnoho potentsialy Ukrainy. Problemy razvitiya vneshneekonomicheskikh sviasey i privlecheniya inostrannykh investitsiy: regionalny aspekt* [Ways of Promoting Ukraine's Export Potential: Regional Aspect]. Donetsk, Donetsk National University, 2004, pp.271-273).

26. *Рубан А.* Про деякі питання та тенденції сучасної зовнішньої торгівлі України // Економіка України. — 2003. — № 7. — С. 66—69. A. Ruban (*Pro deiaki pytannia ta tendentsii suchasnoi zovnishnioi torhibli ukrainy. Ekonomika Ukrainy* [On Some Issues and Trends of Ukraine's Current Foreign Trade. *Economy of Ukraine.*] 2003, No.7, pp. 66—69).

27. *Сальник О. М.* Шляхи підвищення експортного потенціалу України // Формування ринкових відносин в Україні. — 2004. — № 1. — С. 127—129. O. Salnyk (*Shliaky pidvyshchennia eksportnoho potentsialu Ukrainy. Formuvannia rynkovykh vidnosyn v Ukraini* [Ways of Raising Ukraine's Export Potential. *Formation of Market Relations in Ukraine*]. 2004, No. 1, pp. 127—129).

28. *Соловьев В., Войтович А., Покровский С.* Пути повышения эффективности инновационного партнерства Украины со странами Европейского сообщества // Проблемы науки. — 2002. — № 3. — С. 16—21.V.Solovyov, A.Voitovich, S.Pokrovsky. (*Puti povysheniya effecktivnosti innovatsionnogo partnerstva Ukrainy so stranamy Evopeiskogo soobshchestva. Problemy nauki* [Ways of Increasing the Efficiency of Ukraine's Innovational Partnership with the Countries of the European Community. *Problems of Science*]. 2002, No.3, pp.16-21).

29. *Стельмах В., Петрик О.* Обмінний курс, інфляція та конкурентоспроможність. // Вісник НБУ. — 2001. — № 9. — С. 3—6. V. Stelmakh, O. Petryk. (*Obminny kurs, infliatsia ta konkurentnospromozhnist. Visnyk NBU* [Exchange Rate, Inflation and Competitiveness. *NBU Herald*]. 2001, No. 9, pp. 3—6.

30. *Сухоруков А. І.* Проблеми та шляхи забезпечення конкурентної спроможності економіки України // Стратегічна панорама. — 2002. — № 2. — С. 25—31. A.Sukhorukov (*Problemy ta shliakhy zabezpechennia konkurentnoi spromozhnosti ekonomiky Ukrainy. Stratehichna panorama* [Problems and Ways of Enduring the Competitiveness of Ukraine's Economy. *Strategic Panorama*. 2002, No.2, pp. 25—31).

31. *Шевчук В.* Чинники українського експорту-імпорту в 1994—2000 рр. // Вісник Львівської комерційної академії. Львів: Коопосвіта, 2001. — С. 50—59. V.Shevchuk. (*Chynnyky ukrainskoho eksporty-importy v 1994-2000 r. Visnyk Lvivskoi comertsiynoi akademii.* [Factors of Ukrainian Export-Import in 1994—2000. *Lviv Commercial Academy Herald.* Lviv. Kooposvita Publishers, 2001, pp. 50—59]).

32. *Шевчук В. О.* Міжнародна економіка: теорія і практика. — Львів: Каменяр, 2003, — С. 589—607. V. Shevchuk. (*Mizhnarodna ekonomika: teoria i praktyka* [International Economy and Practice]. Lviv. Kameniar Publishers, 2003, pp. 589—607)

33. *Шевчук В.* Платіжний баланс і макроекономічна рівновага в трансформаційних економіках: досвід України. — Львів: Каменяр, 2001. — С. 340—358. V. Shevchuk. (*Platizhny balans i makroekonomichna rivnovaha v transformatsiynyk ekonomikas: dosvid Ukrainy.* [Balance of Payments and the Macroeconomic Equilibrium in Transformational Economies; Ukraine's Experience]). Lviv. Kameniar Publishers, 2001, pp. 340—358).

34. Юхименко В.В. Експортний потенціал України // Політика і час. — 2001. — № 12. — С. 35—41. V. Yukhymenko. (*Eksportny potentsial Ukrainy* [Ukraine's Export Potential]). *Politics and Our Time* magazine, No. 12, pp. 35—410.

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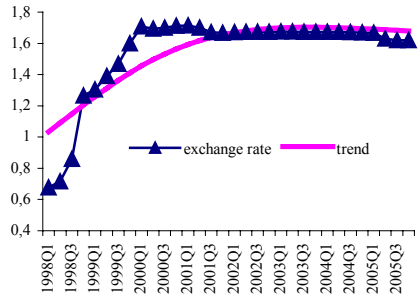
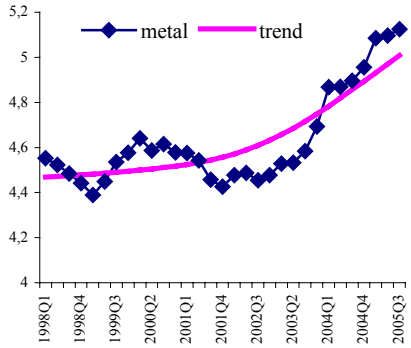
ANNEX A

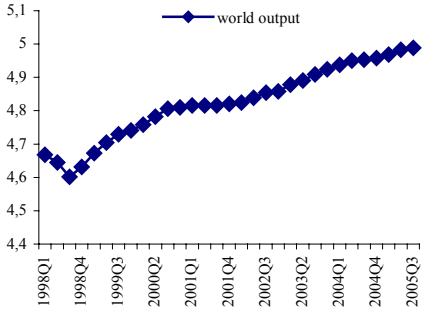
Input data for empirical evaluation of foreign trade factors



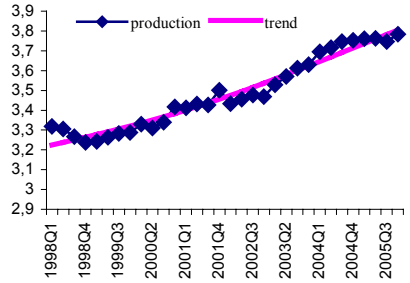
a) nominal exchange rate



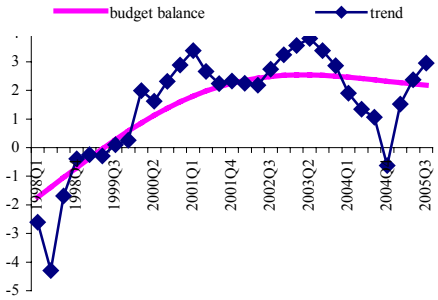
b) index of world prices for metal



c) index of industrial production of countries-trading partners



d) index of industrial production in Ukraine



e) budget balance