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POLISH-UKRAINIAN BILATERAL TRADE RELATIONS (2006–2011): GROWTH IN THE EXCHANGE OF GOODS ENDOWED WITH HIGHER LEVELS OF TECHNOLOGY

This research investigates the development in Polish-Ukrainian bilateral trade in machinery & transport goods over the 5-year period. This is carried out with a view to ascertaining whether Poland's membership in the European Union since 2004 has benefitted both partners in terms of their expansion of goods endowed with greater shares of technology and convergence between sectors. The work finds that expansion and convergence are evident, but are limited to 2 industrial sectors, suggesting the need for greater research and cooperation between both countries as well as deeper communication in entrepreneurial and governmental spheres of interaction.
Keywords: *bilateral trade, sectoral convergence, machinery, transport, EU, Poland, Ukraine.*

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ПОЛЬСЬКО-УКРАЇНСЬКІ ДВОСТОРОННІ ТОРГОВЕЛЬНІ ВІДНОСИНИ (2006–2011): РІСТ ТОРГІВЛІ ТОВАРАМИ, ОБУМОВЛЕНИЙ РОЗВИТКОМ ТЕХНОЛОГІЙ

У статті досліджено розвиток польсько-українських двосторонніх торговельних зв'язків із акцентом на галузі машинобудування та транспорту за 5 років. З'ясовано, як членство Польщі в Європейському Союзі з 2004 р. вплинуло на обох партнерів з точки зору товарообміну, технологічних інновацій та конвергенції між секторами. Розвиток торгівлі і конвергенція між секторами очевидні, але обмежені двома галузями промисловості, що свідчить про необхідність подальших досліджень і розвитку співробітництва між двома країнами, а також більш глибокої взаємодії у підприємницькій і державній сферах.
Ключові слова: *двосторонні торговельні зв'язки, конвергенція між секторами, машинобудування, транспорт, ЄС, Польща, Україна.*
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ПОЛЬСКО-УКРАИНСКИЕ ДВУСТОРОННИЕ ТОРГОВЫЕ ОТНОШЕНИЯ (2006–2011): РОСТ ТОРГОВЛИ ТОВАРАМИ, ОБУСЛОВЛЕННЫЙ РАЗВИТИЕМ ТЕХНОЛОГИЙ

В статье исследовано развитие польско-украинских двусторонних торговых связей с акцентом на отрасли машиностроения и транспорта за 5 лет. Выяснено, как членство Польши в Европейском Союзе с 2004 г. повлияло на обоих партнеров с точки зрения товарообмена, технологических инноваций и конвергенции между секторами. Развитие торговли и конвергенция между секторами очевидны, но ограничены двумя отраслями промышленности, что говорит о необходимости дальнейших исследований и развития сотрудничества между двумя странами, а также более глубокого взаимодействия в предпринимательской и государственной сферах.
Ключевые слова: *двусторонние торговые связи, конвергенция между секторами, машиностроение, транспорт, ЕС, Польша, Украина.*

Introduction. The European Union (EU) Association Agreement with Ukraine was initialed in Brussels in March 2012, while that area of the agreement governing free trade was initialed in July of the same year. This is some 20 years after the Interim

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Agreement on foreign trade had been signed between the EU and Poland. At the end of 2011, the EU was Ukraine's second most important trade partner, after Russia, accounting for 31% of the country's exports while at the same time supplying 27% of its imports. The country has a geographically diversified group of partners with sizeable markets in the upper spectrum of the table and, addition to the above, include Belarus, China, India, Turkey and the United States. These countries, however, together account for less than 15% of Ukrainian total trade. In this regard, a great deal can be drawn from neoclassical and modern schools of thought on trade, which highlight the strategic advantage of location in so far that countries within close geographical proximity tend to trade more intensively. The European Union is thus instrumental in contributing to the expansion and future development of Ukrainian trade flows. Poland, a country which has benefitted substantially from its integration into the EU supply and production networks, is playing a growing role in these exchanges. This is confirmed by the European Commission sources, which recorded an increase in Ukrainian exports to Poland by 56% in 2010. During the same year, Polish exports to Ukraine surged by more than 14%. However, while increased trade volume signals growth in output, the very structure of that output and the share of goods endowed with higher shares of technology have important implications for the growth in GDP and distribution of welfare.

Poland commenced economic reforms at the start of the 1990s as chiefly a supplier of labour and resource-intensive goods. The gradual liberalisation of its trade regime with the European Union resulted in the privatisation of state-owned enterprises, increased foreign investment and the subsequent restructuring of the country's industry (Hindley, 1993). Poland is now integrated into the wider EU supply and production network. As a growing influential partner in Ukraine's trade expansion with the EU, the research conducts analyses of the increasing volume of trade, but more specifically questions the extent of convergence in the exchange of goods endowed with higher shares of technology over the period 2006–2011.

The Grubel-Lloyd Index & Intra-industry Trade. Intra-industry trade is the exchange of goods between countries from broadly the same industries, whereas inter-industry trade represents the exchange of different goods (Grubel & Lloyd, 1975). Therefore, the measurement of trade flows between 2 countries reveals both the nature of trade conducted between them (inter/intra) and to what extent countries are similar in their factor endowments. For example, if trade is revealed to be more inter-industry in nature (index value < 50), this would suggest a difference between 2 countries' endowments and could imply that a country may have a comparative advantage in the production of a certain good. This would be consistent with the Ricardian and neo-classical schools of thought. In contrast, intra-industry trade (index value > 50), which occurs as a result of 2 countries being similar in their factor endowments, is more characteristic of the exchange of goods that takes place in the world today, and especially between industrialised countries where it has become the dominant form of trade (Hoekman & Djankov, 1997). Production plants have become endowed with similar, but different levels of technology over time. This in turn determines capital-labour ratios and hence income (Aturupane et al., 1999). The necessity of investment in raising productivity and output therefore emphasises the role of income as one of the key determinants of intra-industry trade (Balassa, 1986).

Measurement. The Grubel-Lloyd index (GL-1) was proposed by Mikic (1998). This particular version of the index contains a weight of 0.5 to adjust for the eventuality of trade imbalances (surplus/deficit) and does so by upwardly or downwardly adjusting the end value according to the degree of imbalance. In the absence of this weight in (1), it could occur that the performance of a particular industry could well be over- or underestimated. The model, as applied in the excel calculations of this work, can also be rewritten as shown in (2).

$$IIT = \left\{1 - 0.5\left[\sum\left|\left(\frac{x_i}{x}\right) - \left(\frac{m_i}{m}\right)\right|\right]\right\} \times 100. \quad (1)$$

$$IIT = \left[\frac{\Sigma(x_i + m_i) - \Sigma\left(|x_i - m_i|\right)}{\Sigma(x_i + m_i)}\right] \times 100. \quad (2)$$

In compiling the statistical information for this analysis, 2 years have been chosen to measure Polish-Ukrainian trade flows: 2005 and 2011, thus allowing convergence as well as any significant change in industrial output and likewise exports to be measured over a longer period of time. The data used in this analysis is the 3-digit SITC (standard international trade classification) by Eurostat. This research focuses on SITC 7.

United Nations & Eurostat Commodity Groups:

SITC 0 = Food & live animals.

SITC 1 = Beverages & tobacco.

SITC 2 = Crude materials, inedible, except fuels.

SITC 3 = Mineral fuels, lubricants & related materials.

SITC 4 = Animal & vegetable oils, fats & waxes.

SITC 5 = Chemicals & related products.

SITC 6 = Manufactured goods classified chiefly by material.

SITC 7 = Machinery & transport equipment.

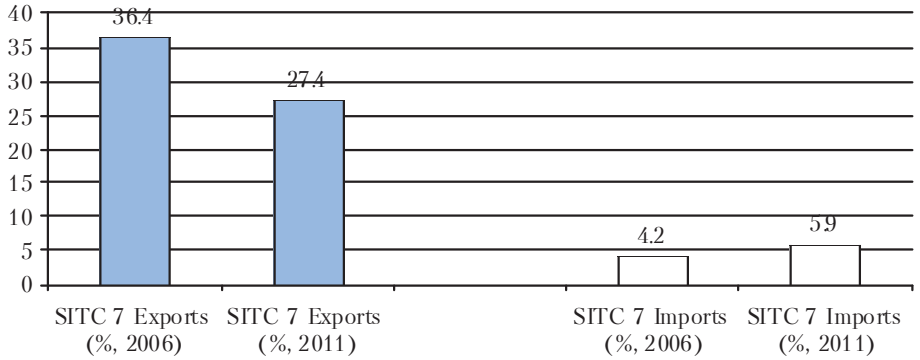
SITC 8 = Miscellaneous articles.

SITC 9 = Commodities & transactions not classified in the listed SITC groups.

In 2006, Poland's exports of machinery and transport equipment (SITC 7) stood at 1.159 bln. euro and accounted for 36.4% of its total exports to Ukraine. By 2011, the share of machinery and transported goods had fallen by 9% (Figure 1), while total exports had increased by 5.2%. The onset of the recession is a possible cause for the fall in exports in this sector, while a process of both changing patterns of convergence and specialisation between 2 countries are also evident during the measured period of industrial exchange.

Poland's imports from Ukraine increased by 1.7% over the same period. Since Poland joined the EU in 2004 it has been much easier for Ukraine to export to Europe. Russia remains the most important trade partner for Ukraine, though there has been a shift towards Europe, resulting in an expansion of trade with Poland (Misala, 1992). The overall trade structure initially consisted of resource-based goods from Ukraine, such as steel, fuels and ores, while Poland supplied merchandise goods such as vehicles and electronics (USAID, 2005). The latter types of goods belong to SITC 7, which is the category of interest in this work. Table 1 summarises the inflows

and outflows of Polish goods to Ukraine as well as the IIT value for the level of convergence in 2006.



Source: Eurostat, Commodity Data, 2005 & 2011.

Figure 1. **Trade in SITC 7 commodities in 2006 & 2011**

Grubel-Lloyd Results (2006). The first column lists 9 SITC 7 commodity categories. These categories have been labelled and expanded into their respective 3-digit commodities, which total 50 in number. For orientation, these are presented in Annex 1 of this work.

Table 1. **Polish-Ukrainian trade volumes (mln. euro) & Intra-industry trade (2006)**

Industry	x_i	%	m_i	%	$x_i - m_i$	IIT_i
SITC 71	68990762	8.18	3569540	5.95	65421222	9.84
SITC 72	124477124	4.36	1901915	10.74	122575209	3.00
SITC 73	12857620	17.87	7797151	1.11	5060469	75.50
SITC 74	143251022	11.18	4877446	12.36	138373576	6.59
SITC 75	11942709	0,19	84272	1.03	11858437	1.40
SITC 76	53596321	1.96	853940	4.62	52742381	3.14
SITC 77	151893931	38.14	16645003	13.11	135248928	19.75
SITC 78	576281354	8.73	3809981	49.72	572471373	1.31
SI79	15747088	9.40	4100161	1.36	11646927	41.31
Total	1159037931	100	43639409	100	1115398522	

Source: Own calculations based on Eurostat, 3-digit data, 2006.

Poland's exports to Ukraine (column 2) totalled 1.159 bln. euro in 2006. More than 38% of these commodities (column 3) were made up of the goods supplied by industries categorised under SITC 77, which (Annex 1) supply electrical machinery and apparatus. Ukrainian exports of these commodities (Polish imports, column 4) totalled 16.6 mln. euro and represented 13.1% of its total SITC 7 outflows to Poland. Application of the Grubel-Lloyd index (IIT, column 7) reflects Poland's dominance in the exchange of these items and indicates a low level of convergence (19.75) between both countries' industries (Grubel & Lloyd, 1975).

In terms of actual convergence, 1 out of 9 given categories falls in line (> 50) with Grubel-Lloyd criteria. This is SITC 73, which for 2006 registered an IIT value of 75.5, which reflects the exchange of goods produced by similar industries, confirmed by a comparatively lower trade deficit. The exchange of commodities from this cate-

gory comprises machine tools and metal working machinery, but features low in Poland's imports 1.1% (column 5) while constituting 17.8% of Poland's exports (column 3).

Grubel-Lloyd Results (2011). Table 2 provides the results for trade volume and convergence between the countries 5 years later.

Table 2. **Polish-Ukrainian trade volumes (mln. euro) & Intra-industry trade (2011)**

Industry	x_i	%	m_i	%	$x_i - m_i$	IIT_i
SITC 71	40906511	4.20	4854686	4.46	36051825	21.22
SITC 72	114448229	3.77	4354504	12.48	110093725	7.33
SITC 73	10704424	5.69	6566333	1.17	4138091	76.04
SITC 74	124683992	10.37	11976296	13.59	112707696	17.53
SITC 75	13033966	0.15	175679	1.42	12858287	2.66
SITC 76	96602080	0.25	284921	10.53	96317159	0.59
SITC 77	23001381	67.86	78351400	25.62	156649981	50.01
SITC 78	209592392	2.36	2728453	22.85	206863939	2.57
SITC 79	72384824	5.4	6167089	7.89	66217735	15.70
Total	917357799	100	115459361	100	801898438	

Source: Own calculations based on Eurostat, 3-digit data, 2011.

At the outset, it should be noted that Poland's "total" exports to Ukraine had increased in volume from a value of 3.178 bln. euro in 2006 to 3.346 bln. euro in 2011. This represents the average growth of 1.05%. Total imports from Ukraine meanwhile grew by an average of 17.6% from 1.039 bln. euro to 1.956 bln. euro, suggesting that the 5-year period, on average, has benefitted Ukrainian exporters substantially more in growth terms.

The contribution of machinery and transport goods as a share of total trade also revealed significant change over time (Figure 1). However, the aforementioned 2 SITC 7 categories discussed on Table 1 reveal change worthy to mention. First and foremost, while the level of intra-industry trade in SITC 73 products has decreased slightly to 76.04%, the actual Polish export volume of these products has actually fallen from 17.87% of total SITC 7 (2006) exports to 5.69% in 2011. One can observe that, while Polish imports of these products have remained relatively stable, a reduction in the trade deficit is observable.

The second category discussed in Table 1 does provide some important pointers as to the future and this concerns namely those products traded under the heading of SITC 77 (electrical machinery and apparatus). The first noticeable result on Table 2 is the degree of convergence as measure by the Grubel-Lloyd index. In 2006, the value stood at 19.75, while in 2011 had increased to 50.01, suggesting a far integrated level of exchange between the 2 industries of these countries. This is confirmed by the actual share of Polish imports and exports as a percentage of the total SITC 7 group. Polish exports, for example, had increased from 38.1% (2006) to 67.8% in 2011, while imports from Ukraine in these products had increased from 13.1% to 25.6%, indicating areas of industrial specialisation mutually beneficial for both partners.

The fleshed out interpretation of these industrial commodities signifies greater investment in industry in order to expand capacity. This is more applicable in the case of Ukraine, whose expansion of such industrial products to Poland as well as its total

trade exchanges with the European Union has benefitted the country's industrial sector, not to mention greater potential stability at the labour market.

Conclusion. The research shows that countries with higher shares of industrial products in their total output and its capability to both expand and export them has beneficial effects in terms of their integration into regional trade blocs as well as the global economy as a whole. The results of this research focused on 2 countries Poland and Ukraine. The former of the 2 commenced economic reform in the 1990's with substantially deeper economic problems and the highest level of foreign debt, but benefitted from Western financial assistance as well as integration into European supply and production networks. This was of greater advantage for Ukraine after Poland joined the European Union in 2004, which facilitated greater access as well as the integration of its own industries into similar production networks.

Bilateral trade between the 2 countries has increased considerably over time and the exchange of industrial products discussed in this work reveals that over the 5-year period analysed, expansion and convergence have taken place in the exchange of products endowed with medium levels of technology. This is particularly relevant in the case of electrical machinery and apparatus, an area of industrial specialisation in which both countries have deepened their cooperation.

It should be outlined that the table given in Annex 1 lists these products under UN headings as SITC 771 and 772 defined as goods traded in "electrical power machinery" (771) and "Electrical apparatus for switching or protecting electrical circuits or for making connections to or in electrical circuits" (772). These products can be used for domestic or industrial purposes and can likewise be produced via the utilization of medium- and low-skilled labour, respectively.

The salience of the subject illustrates the need for greater research in this area with a view to tracking trade at a more detailed and disaggregated level, so that entrepreneurs in both countries as well as policy makers were more aware of the future potential across all industrial sectors.

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Annex 1.

SITC 7 COMMODITIES (2011)	Exports to Ukraine	Imports from Ukraine	IIT
711 Steam or other vapour-generating boilers	800796	15167	3,717570527
712 Steam turbines and other vapour turbines	1277231	0	0
713 Internal combustion piston engines	57283435	716638	2,471162407
714 Engines and motors, non-electric	336568	2076614	27,89412485
716 Rotating electric plant	6989943	328530	8,978102399
718 Power-generating machinery	2302789	432591	31,62931658
721 Agricultural machinery (excluding tractors)	33736772	337859	1,983053023
722 Tractors	2395930	32398	2,66833805
723 Civil engineering and contractors' plant & equipment	11865223	795494	12,56633412
724 Textile and leather machinery	3591495	99304	5,381165433
725 Paper mill and pulp mill machinery	8237399	10819	0,262335452
726 Printing and bookbinding machinery	5239577	2545	0,097098084
727 Food-processing machines	10077014	65689	1,295295741
728 Other machinery	49333714	557807	2,236079353
731 Machine tools	1971525	394574	33,35228154
733 Machine tools for working metal	4830946	132467	5,337738367
735 Parts, n.e.s., and accessories	970220	814862	91,2968704
737 Metalworking machinery	5084929	6455248	88,1256674
741 Heating and cooling equipment	33140665	165870	0,996020751
742 Pumps for liquids	17519697	731348	8,014313701
743 Pumps for air or other gas compressors	30337195	874751	5,605232048
744 Mechanical handling equipment	19654104	373478	3,729636458
745 Non-electrical machinery	13475518	170625	2,50070661
746 Ball/roller bearings	5225586	1725525	49,64745923
747 Taps, cocks, valves and similar appliances	13997580	214026	3,011988934
748 Transmission shafts	4638358	407692	16,15885693
749 Non-electric parts and accessories of machinery	5262319	214131	7,820065919
751 Office machines	312104	57	0,036519616
752 Automatic data-processing machines	7242239	39966	1,097634576
759 Parts and accessories	4388366	44249	1,996518985
761 Television receivers	19848932	47667	0,479147215
762 Radio-broadcast receivers	147536	170378	92,81503803
763 Sound recorders	370045	100	0,054032879
764 Telecommunications equipment	33229808	635795	3,754812811
771 Electric power machinery	6394254	123520	3,790251089
772 Electrical apparatus	18784723	814188	8,308502447
773 Equipment for distributing electricty	25620761	11879092	63,35540569
774 Electro-diagnostic apparatus for medical purposes	172843	52955	46,90475558
775 Household electrical equipment	57289092	1279469	4,369132443
776 Thermionic, cold cathode or photo tubes	3932224	156741	7,666536642
778 Electrical machinery	39700034	2339038	11,12792404
781 Motor cars & road vehicles	258732798	345107	0,266411757
782 Motor vehicles for the transport of goods	53960815	1319069	4,772329117
783 Road motor vehicles	33384782	44704	0,267452512
784 Parts & accessories for 722, 781m 782 & 783	203638456	1781890	1,734871968
785 Motorcycles	1508537	246494	28,08998815
786 Trailers & semitrailers	25055966	72717	0,578756953
791 Railway vehicles	14670273	3399748	37,62860043
792 Aircraft & associated equipment	142135	513900	43,33152957
793 Ships, boats & floating structures	934680	186513	33,27045388

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