

Norwegian-Polish Bilateral Trade Developments since 1990

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Abstract. Since 1990 there has been a significant growth in Norwegian-Polish bilateral trade. Of key interest to this work is to identify the main industries driving bilateral trade and to what extent this trade is in similar or different goods, suggesting either industrial convergence or specialization, respectively. When measured in nominal terms, up until 2014, Norway's exports to Poland have increased by a factor of 16, while Norway's imports from Poland have increased by a factor of 32 during the same period. Over the period 2005-2014 Norwegian imports and exports have both increased by an approximate 200%. This can be strongly attributed to Poland's membership in the European Union since 2004 and the fact that Norway has a free trade agreement with the EU. Therefore, taking into account not only the significant expansion in bilateral trade between these two countries but also the differences in their respective structures of industry, this work seeks to analyse the main factors behind the development of this trade.

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INTRODUCTION

From a theoretical point of view international trade and industrial comparative advantage can be explained by the Hecksher-Ohlin model, which discusses trade in different goods. This is also referred to as inter-industry trade. However a substantial part of international trade conducted in the world today is in similar goods and known as intra-industry trade. This cannot be explained by the above mention model, but by product differentiation, economics of scale and imperfect competition. This type of trade can be measured using the Grubel-Lloyd index. It is this latter model that can reveal that proportion of a country's trade conducted in similar goods (intra-industry) reflecting industrial convergence and that the share of trade which is in different goods (inter-industry). In terms of the former, Poland, whose main trading partner is Germany, has been integrated into the EU supply and production networks since the early 1990's and its bilateral trade is dominantly made up of goods supplied by similar industries. Norway on the other hand is resource rich and trades in different goods. For this reason the theoretical application of the Grubel-Lloyd

index, followed by an empirical analysis of the results generated by the model is intended to reveal the direction, structure and types of goods traded between both countries.

The research follows the United Nations (UN), Standard International Trade Classification (SITC) structure in which goods traded are categorized according to ten main industrial categorizations. Each of these is disaggregated into digits ranging from one onwards, where one represents the UN commodity groups, two represents the broad industrial sector, three represents the industry and four represents those parts, materials and accessories that are used in the production and/or assembly of a given product. This system of disaggregation extends well beyond the four-digit group, expanding the numbers of items used in the production of a given good into the thousands. This work analyses Norwegian-Polish bilateral trade using the two-digit level of disaggregation and the Norwegian Kroner (NOK) as the main currency. The data used in this research was obtained from the Central Bureau of Statistics in Norway. Of recent works in this topic is Clowes & Choros-Mrozowska (2013) studying Chinese–EU bilateral trade in the selected sub-sectors of SITC 7. The results show that products with low and low-to-medium levels of technology are more integrated (SITC 74-Industrial machinery and SITC 77-Electrical machinery) than SITC 75 (Office machines) and SITC 76 (Telecommunications equipment) that are more sophisticated technology and requires more skilled workforce.

From the list below, which shows UN commodity groups at the single-digit level this work will focus on the four most important sectors of trade between the two countries; i.e. SITC 0, SITC 6, SITC 7 and SITC 8 for the years 2005 and 2014. The application of the Grubel Lloyd index will enable us to determine whether the exchange of trade across these four categories is of inter-industry or intra-industry character. The main results of this study is that most of the trade between Norway and Poland both in 2005 and 2014 are in different goods (inter-industry character). The main reason for that is probably that Norway is a small resource rich country.

United Nations Commodity Groups (single digit):¹

SITC 0 - Food and live animals

SITC 1 - Beverages and tobacco

SITC 2 - Crude materials, inedible, except fuels

SITC 3 - Mineral fuels, lubricants and related materials

SITC 4 - Animals and vegetable oils, fats and waxes

SITC 5 - Chemicals and related products

SITC 6 - Manufactured goods classified chiefly by material

SITC 7 - Machinery and transport equipment

SITC 8 - Miscellaneous manufactured articles

SITC 9 - Commodities and transactions not classified in the listed SITC

Part one of this research presents data regarding the development of bilateral trade between these two countries. The main finding is that Norway's exports to Poland have increased by a factor of 16 while Norway's imports from Poland have increased by a factor of 32 since the introduction of market economy in Poland in 1990. Part two presents the Grubel-Lloyd index which is applied to study if this trade is of intra-industry character, i.e. trade in same goods or in different goods suggesting trade based on compara-

¹ For orientational purposes the system of disaggregation can be explained using the above list of UN commodity groups as follows:
SITC 6: Manufactured goods classified chiefly by material;
SITC 66: Non-metallic mineral manufactures, n.e.s.;
SITC 666: Pottery

tive advantages. Then follows an empirical part discussing the developments of the Grubel-Lloyd index in SITC 0, SITC 6, SITC 7 and SITC 8. These sectors are chosen since they are most important measured in Norwegian Kroner when it comes to trade between these two countries.

EMPIRICAL BACKGROUND

The following graph depicts Norway’s trade with Poland for the years 2005 and 2014. The first observation concerns not only the scale of change over time, but the actual growth rates in Norway’s bilateral trade with Poland. For example, over the period 2005 to 2014 the average rate of Norwegian export growth was 12.9 percent, while its imports grew by an average of 12.7 percent. The volume of trade was almost similar (appendix one) leaving a small Norwegian trade deficit. The second observation concerns the actual balance of trade over time. From 1990 to 1999 Norway recorded positive trade surpluses throughout the whole period. This can be attributed to the fact that the Polish economy was implementing economic reforms during those earlier years and was privatizing, restructuring and modernizing its industrial structure. Thus, the types of goods that Poland could export were largely in low demand in Norway. In respect of Norwegian exports to Poland during this period the volume when measured in millions of NOK was gradual increasing from 977 million NOK in 1990 to 3.0 billion NOK in 1999 (see appendix one). Observation of appendix one further reveals that there were significant parallel increases in trade, especially from 2004 onwards, which was when Poland together with a further nine countries became members of the European Union (EU). During the 21st century, with the exception of 2001, 2008, 2010 and 2011, Norway was running a trade deficit with Poland reaching its deepest point at 3.1 billion NOK in 2009. However, the very fact that Norway has a positive surplus in its total trade internationally, due to its vast natural energy resources, suggests that its deficit with Poland is insignificant at a macro level. This work will therefore now turn to the theoretical modeling technique that will be applied in this work.

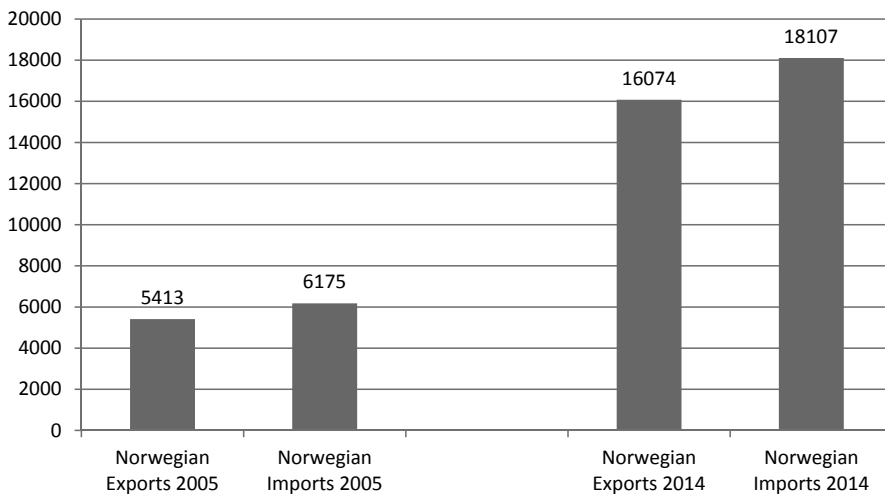


Figure 1. Norwegian-Polish Bilateral Trade in 2005 & 2014 (millions NOK)

Source: www.ssb.no.

THEORETICAL FRAMEWORK

The modeling technique that will be applied in this work is known as the Grubel-Lloyd index (Grubel & Lloyd, 1975). The model generates an index out of one hundred and reveals to what extent a country's trade is more intra-industry driven, suggesting industrial convergence and what proportion of that trade is due to the exchange of different goods. In terms of the latter, this may indicate industrial specialization and possibly comparative advantage. The Grubel-Lloyd index calculates intra-industry trade using the following index and is written as:

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

where x_i represents exports from industry i and m_i represents imports from industry i .

IIT is the level of intra-industry trade and is measured out of one hundred. Observation of the given model reveals that the value for IIT can be calculated by subtracting the balance of trade for a given industry from the sum of total trade. The obtained value is then divided by the sum of total trade. The end value is multiplied by one hundred to provide an index.

In terms of analysis, a value closer to one hundred (>50) suggests industrial convergence in bilateral trade. This could be in, for example, trade in manufactured goods, machinery etc. The value of trade in monetary terms may vary depending on a country's industrial capacity and scale of technology. Oppositely, a value closer to zero (<50) suggests that the degree of industrial convergence is lower and is referred to as inter-industry trade. In such lower convergence coupled with higher export volumes in monetary terms could imply industrial specialization and possibly comparative advantage.

ANALYSIS OF RESULTS

SITC 0 – Food and live animals.

Tables one and two provide the results calculated for Norwegian-Polish bilateral trade for SITC 0. A closer look at the figures shows that by the far most important sector when it comes to exports to Poland is the Norwegian fishing industry (SITC 0), which accounted for almost 40 percent of Norway's exports to Poland in 2014 compared to around 27 percent in 2005; see appendix two. Almost all exports from this category come from SITC 03, and are made up of sea food. During this period exports from this sector increased by 338 per cent, while Norwegian total exports to Poland increased by 197 percent. This is a result of the strong economic growth and therefore also strong growth in private consumption in Poland over the years. Furthermore, fish imported into Poland is also for processing purposes prior to exporting into the European Union.

Table 1

Norway's trade with Poland (1000 NOK) & Intra-industry trade (2005)

Industry	m_i	%	x_i	%	$x_i - m_i$	ITT_i
SITC 00	229	0.1	17	-	-212	13.8
SITC 01	19 993	7.9	0	0.0	-19 993	0.0
SITC 02	0	0.0	2	-	2	0.0
SITC 03	16 702	6.6	1 454 312	98.9	1 437 610	2.3
SITC 04	12 748	5.0	411	0.03	-12 337	6.2
SITC 05	114 300	45.0	967	0.07	-113 333	1.7
SITC 06	3 166	1.2	124	0.01	-3 042	7.5
SITC 07	12 375	4.9	486	0.03	-11 889	7.6
SITC 08	20 518	8.1	13 132	0.9	-7 386	78.1
SITC 09	54 061	21.3	584	0.04	-53 477	2.1
Total	254 093	100	1 470 035	100	1 215 942	

Source: www.ssb.no.

It is clear that this trade has to do with Norway's comparative advantage in this industry. Tables one and two confirm this finding via the low value for the ITT.

Table 2

Norway's trade with Poland (1000 NOK) & Intra-industry trade (2014)

Industry	m_i	%	x_i	%	$x_i - m_i$	ITT_i
SITC 00	563	0.07	0	0.0	-563	0.0
SITC 01	2 137	0.3	843	0.01	-1 294	56.6
SITC 02	16 201	1.9	0	0.0	-16 201	0.0
SITC 03	79 859	9.4	6 375 051	99.4	6 295 192	2.5
SITC 04	86 034	10.1	93	-	-85 941	0.2
SITC 05	344 122	40.5	679	0.01	-343 443	0.4
SITC 06	18 549	2.2	0	0.0	-18 549	0.0
SITC 07	100 371	11.8	8 087	0.1	-92 284	14.9
SITC 08	83 288	9.8	452	0.01	-82 836	1.1
SITC 09	118 281	13.9	28 848	0.4	-89 433	39.2
Total	849 405	100	6 414 052	100	5 564 647	

Source: www.ssb.no.

List of SITC 0 products

- 0 – Food and live animals
- 00 – Live animals other than animals of division 03
- 01 – Meat and meat preparations
- 02 – Dairy products and birds' eggs
- 03 – Fish (not marine mammals), crustaceans, molluscs and aquatic invertebrates, and preparations thereof
- 04 – Cereals and cereal preparations
- 05 – Vegetables and fruit
- 06 – Sugars, sugar preparations and honey
- 07 – Coffee, tea, cocoa, spices, and manufactures thereof
- 08 – Feeding stuff for animals (not including unmilled cereals)
- 09 – Miscellaneous edible products and preparations

SITC 6 – Manufactured goods classified chiefly by material.

Like Norwegian exports of goods from SITC 0 the dominant exports of goods from SITC 6 can be explained by the Heckscher-Ohlin theory of international trade. From this category “Non-ferrous metals” (SITC 68) accounted for one third of the exports in 2005. Almost a decade later these exports accounted for half of the sector (see tables three and four). Norway’s comparative advantages in the production and supply of non-ferrous metals, is due to the availability of electricity supplied at low costs. Producers in this sector benefit from electricity prices below the market average level.

Table 3

Norway’s trade with Poland (1000 NOK) & Intra-industry trade (2005)

Industry	m_i	%	x_i	%	$x_i - m_i$	IIT _i
SITC 60						
SITC 61	2 647	0.2	418	0.03	-2 229	27.3
SITC 62	17 448	1.1	2 610	0.2	-14 838	26.0
SITC 63	266 053	16.5	6 454	0.5	-259 599	4.7
SITC 64	68 170	4.2	70 039	5.4	1 869	98.6
SITC 65	64 265	4.0	125 608	9.7	61 343	67.7
SITC 66	174 051	10.8	9 084	0.7	-164 967	9.9
SITC 67	290 651	18.0	479 691	37.1	189 040	75.5
SITC 68	14 875	0.9	441 362	34.2	426 487	6.5
SITC 69	718 628	44.4	156 962	12.1	-561 666	35.9
Total	1 616 786	100	1 292 227	100	-324 559	

Source: www.ssb.no.

The export of iron and steel to Poland (SITC 67) accounted for 37.1 percent in 2005, but its share had fallen to 25.8 percent in 2014. Bilateral trade in this sector reflects a high degree of convergence (see tables three and four). Norway has been a traditional producer of iron and steel and this is due to its vast resources of medium grade iron ores (IBRD 1948).

Table 4

Norway's trade with Poland (1000 NOK) & Intra-industry trade (2014)

Industry	m_i	%	x_i	%	$x_i - m_i$	IIT _i
SITC 60						
SITC 61	11 517	0.2	308	0.01	-11 209	5.2
SITC 62	98 959	2.1	35 507	1.1	-63 452	52.8
SITC 63	727 769	15.1	8 787	0.3	-718 982	2.4
SITC 64	249 054	5.2	302 406	9.4	53 552	90.3
SITC 65	124 735	2.6	21 740	0.7	-102 995	29.7
SITC 66	686 685	14.3	7 033	0.2	-679 652	2.0
SITC 67	479 496	10.0	829 725	25.8	350 229	73.2
SITC 68	85 710	1.8	1 696 278	52.7	1 610 568	9.6
SITC 69	2 351 201	48.8	314 078	9.8	-2 037 123	23.6
Total	4 815 126	100	3 215 862	100	-1 599 264	

Source: www.ssb.no.

Manufactured metal products (SITC 69) are Norway's single largest import from Poland. Between 2005 and 2014 Polish exports of these products increased by 227 percent, from more than 718 million to 2.3 billion NOK. This represents an average yearly increase of 9.5 percent.

List of SITC 6 products

6 – Manufactured goods classified chiefly by material 61 – Leather, leather manufactures n.e.s., and dressed furskins 62 – Rubber manufactures, n.e.s. 63 - Cork and wood manufactures (excluding furniture) 64 – Paper, paperboard and articles of paper pulp, of paper or of paperboard 65 – Textile yarn, fabrics, made-up articles, n.e.s., and related products 66 – Non-metallic mineral manufactures, n.e.s. 67 – Iron and steel 68 – Non-ferrous metals 69 – Manufactures of metals, n.e.s.

SITC 7 – Machinery and transport equipment.

Tables five and six provide the results calculated for Norwegian-Polish bilateral trade in the exchange of machinery and transport equipment for 2005 and 2014. Like the other sectors, sector 7 can be sub-divided into ten core industrial trade sectors at a two digit level.

Table 5

Norway's trade with Poland (1000 NOK) & Intra-industry trade (2005)

Industry	m_i	%	x_i	%	$x_i - m_i$	IIT _i
1	2	3	4	5	6	7
SITC 70						
SITC 71	44 651	2.3	67 315	9.6	22 664	79.8
SITC 72	86 756	4.5	162 463	23.2	75 707	69.6
SITC 73	11 230	0.6	3 824	0.5	-7 414	50.8

1	2	3	4	5	6	7
SITC 74	144 128	7.5	214 214	30.6	70 086	80.4
SITC 75	3 081	0.2	7 473	1.1	4 392	58.4
SITC 76	204 657	10.7	40 012	5.7	-164 645	32.7
SITC 77	385 044	20.2	170 043	24.3	-215 001	61.3
SITC 78	370 489	19.4	29 617	4.2	-340 872	14.8
SITC 79	659 964	34.6	5 245	0.7	-654 719	1.6
Total	1 910 001	100	699 664	100	-1 210 337	

Source: www.ssb.no.

The most important sub-sector when it comes to Norwegian exports is SITC 74 (General industrial machinery and equipment). The level of intra-industry trade fell by more than seven index points over the entire period, though industrial exchange and convergence is high. However as seen from tables five and six the Grubel-Lloyd index is well below 50 in 6 out of 9 sectors in 2014 (see far-right column), while the same number was only 3 nine years earlier. This indicates significant differences in industrial production and is primary due to Norwegian outsourcing of production to Poland and abroad. This explains Norway's trade deficit across these industries and rising inter-industry trade (Evensen, 2015).

Table 6

Norway's trade with Poland (1000 NOK) & Intra-industry trade (2014)

Industry	m_i	%	x_i	%	$x_i - m_i$	IIT _i
SITC 70						
SITC 71	50 651	0.7	424 823	19.6	374 172	21.3
SITC 72	473 318	6.4	475 525	22.0	2 207	99.8
SITC 73	50 355	0.7	4 646	0.2	-45 709	17.3
SITC 74	1 227 756	16.6	705 255	32.6	-522 501	73.0
SITC 75	455 894	6.2	22 356	1.0	-433 538	9.4
SITC 76	551 960	7.5	50 311	2.3	-501 649	66.7
SITC 77	1 330 533	18.0	286 345	13.2	-1 044 188	35.4
SITC 78	1 746 084	23.6	165 653	7.6	-1 580 431	17.3
SITC 79	1 502 518	20.3	31 310	1.4	-1 471 208	4.1
Total	7 389 068	100	2 166 223	100	-5 222 845	

Source: www.ssb.no.

List of SITC 7 products

7 - Machinery and transport equipment 71 - Power-generating machinery and equipment 72 - Machinery specialized for particular industries 73- Metalworking machinery 74 - General industrial machinery and equipment, n.e.s., and machine parts, n.e.s. 75 - Office machines and automatic data-processing machines 76 - Telecommunications and sound-recording and reproducing apparatus and equipment 77 - Electrical machinery, apparatus and appliances, n.e.s., and electrical parts thereof (including non-electrical counterparts, n.e.s., of electrical household-type equipment) 78 - Road vehicles (including air-cushion vehicles) 79 - Other transport equipment

SITC 8 – Miscellaneous articles.

The figures for the last sector in these analyses; i.e. SITC 8 are presented in the next two tables.

Table 7

Norway's trade with Poland (1000 NOK) & Intra-industry trade (2005)

Industry	m_i	%	x_i	%	$x_i - m_i$	II $_i$
SITC 80						
SITC 81	62 564	4.5	9 779	5.9	-52 785	27.0
SITC 82	594 394	42.8	16 661	10.0	-577 733	5.5
SITC 83	896	0.1	36	0.02	-860	7.7
SITC 84	423 588	30.5	8 133	4.9	-415 455	3.8
SITC 85	13 971	1.0	70	0.04	-13 901	1.0
SITC 86	-	-	-	-	-	-
SITC 87	16 657	1.2	62 320	37.3	45 663	42.2
SITC 88	6 695	0.5	1 111	0.7	-5 584	28.5
SITC 89	271 385	19.5	68 899	41.3	-202 486	40.5
Total	1 390 150	100	167 010	100	-1 223 140	

Source: www.ssb.no.

Table 8

Norway's trade with Poland (1000 NOK) & Intra-industry trade (2014)

Industry	m_i	%	x_i	%	$x_i - m_i$	II $_i$
SITC 80						
SITC 81	351 944	10.6	27 486	4.9	-324 458	14.5
SITC 82	1 500 661	45.0	23 466	4.2	-1 477 195	3.1
SITC 83	8 683	0.3	602	0.1	-8 081	13.0
SITC 84	286 928	8.6	7 703	1.4	-279 225	5.2
SITC 85	14 722	0.4	858	0.2	-13 864	11.0
SITC 86	-	-	-	-	-	-
SITC 87	194 288	5.8	161 829	28.9	-32 459	90.9
SITC 88	25 309	0.8	1 329	0.2	-23 980	10.0
SITC 89	949 595	28.5	336 061	60.1	-613 534	52.3
Total	3 332 130	100	559 334	100	-2 772 796	

Source: www.ssb.no.

List of SITC 8 products

8 - Miscellaneous manufactured articles 81 – Prefabricated buildings; sanitary, plumbing, heating and lighting fixtures and fittings, n.e.s. 82 – Furniture and parts thereof; bedding, mattresses, mattress support, cushions and similar stuffed furnishings 83 - Travel goods, handbags and similar containers 84 – Articles of apparel and clothing accessories 85 – Footwear 87 – Professional, scientific and controlling instruments and apparatus, n.e.s. 88 – Photographic apparatus, equipment and supplies and optical goods, n.e.s.; watches and clocks 89 – Miscellaneous manufactured articles, n.e.s.

From the Grubel-Lloyd index we see that most trade in 2005 was in different goods, since all indexes were below 50. The situation was almost the same one decade later except products classified as SITC 87 and SITC 89. In terms of the former these products are used in veterinary, dental and medical practices. The Norwegian deficit in trade in this sector suggests that Poland has benefited from foreign direct investment and developed products embodied with higher levels of technological sophistication.

CONCLUSION

Since the implementation of market reforms in Poland twenty-five years ago the country has been integrated into European Union supply and production networks. On the basis of this one may expect that bilateral trade between Norway and Poland would be to a great extent of an intra-industry character. This belief is strengthened by the fact that Poland has been one of the countries with the highest level of foreign direct investment in Europe since 1995. However the fact that Norway is a small resource rich country ultimately gives rise to trade in different goods which is revealed in this research to be of an inter-industry character. The exchange of goods between these two countries will therefore be driven by industries with strong comparative advantages in production for the years to come. This is due to the fact that predominantly Norwegian exports of seafood – especially salmon – have increased by 338 percent over a period of nine years, representing a yearly increase of 14.5 percent. In contrast the Polish exports of iron and steel to Norway has increased by 227 percent over the time period measured, equating to an average 9.5 percent per year. This is consistent with increased investment into building and construction in Norway in recent years.

When Norway becomes less dependent of natural resources like oil and gas due to lower oil price and the development of a greener economy, it could be subject for research how it will affect Norwegian future trade in general and trade with Poland special.

Already in 1975 did research by Grubel & Lloyd show that more than half of world trade were in similar goods. The results from this research, which shows that the main part of trade between Norway and Poland are based on comparative advantages and not are of intra-industry character, are therefore not in line with the typical development of international trade pattern.

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Appendix 1

Trade in goods between Norway and Poland in million NOK.

Year	Export million NOK	Import million NOK	Trade balance million NOK
1990	977	558	419
1991	1 812	605	1 206
1992	1 950	731	1 219
1993	2 249	804	1 445
1994	2 343	948	1 395
1995	2 285	1 095	1 191
1996	2 212	1 273	939
1997	2 501	1 729	772
1998	2 582	1 972	610
1999	3 041	2 547	494
2000	3 146	3 363	-217
2001	3 344	3 156	187
2002	3 067	3 677	-610
2003	3 085	3 785	-700
2004	4 116	5 222	-1 105
2005	5 413	6 175	-762
2006	6 960	8 136	-1 176
2007	9 417	9 752	-334
2008	13 198	12 204	993
2009	8 643	11 747	-3 103
2010	12 884	11 727	1 157
2011	15 695	13 140	2 555
2012	14 142	15 382	-1 239
2013	16 191	17 082	-892
2014	16 074	18 107	-2 032

Source: www.ssb.no.

Appendix 2

Norwegian Exports to Poland as Percent of Total Exports

SITC/Year	2005	2014
0	27.2	39.9
6	23.9	20.0
7	12.9	13.5
8	3.1	3.5

Source: www.ssb.no.

Appendix 3

Norwegian Imports from Poland as Percent of Total Imports

SITC/Year	2005	2014
0	4.1	4.7
6	26.2	26.6
7	30.9	40.8
8	22.5	18.4

Source: www.ssb.no.