BOFIT
Discussion Papers
2004 ▪ No. 19

Bernadina Algieri

Trade specialisation patterns: The case of Russia

Bank of Finland
BOFIT – Institute for Economies in Transition

BOFIT personnel 2004

Economists

Mr Pekka Sutela, head
Russian economy and economic policy
Russia's international economic relations
China in the world economy
Pekka.Sutela@bof.fi

Mr Gang Ji, economist
Chinese economy and economic policy
Gang.Ji@bof.fi

Ms Tuuli Koivu, economist
Chinese economy and economic policy
Editor-in-Chief of BOFIT China Review
Tuuli.Koivu@bof.fi

Mr Tuomas Komulainen, economist
Russian financial system
Currency crises
Editor-in-Chief of BOFIT Online

Mr Iikka Korhonen, research supervisor
Exchange rate policies in transition economies
Monetary policy in transition economies
Editor-in-Chief of BOFIT Discussion Papers
Iikka.Korhonen@bof.fi

Mr Vesa Korhonen, economist
Russia's international economic relations
Russia's banking system
Vesa.Korhonen@bof.fi

Ms Seija Lainela, economist
Russian economy and economic policy
Editor-in-Chief of BOFIT Russia Review
Seija.Lainela@bof.fi

Mr Jouko Rautava, economist
Russian economy and economic policy
Jouko.Rautava@bof.fi

Ms Laura Solanko, economist
Russian regional issues
Public economics
Laura.Solanko@bof.fi

Ms Merja Tekoniemi, economist
Russian economy and economic policy
Merja.Tekoniemi@bof.fi

Information Services

Mr Timo Harell, editor
Press monitoring
Editor-in-Chief of BOFIT Weekly
Timo.Harell@bof.fi

Ms Liisa Mannila, department secretary
Department coordinator
Publications traffic
Liisa.Mannila@bof.fi

Ms Päivi Määttä, information specialist
Institute's library
Information services
Paivi.Maatta@bof.fi

Ms Tiina Saajasto, information specialist
Statistical analysis
Statistical data bases
Internet sites
Tiina.Saajasto@bof.fi

Ms Liisa Sipola, information specialist
Information retrieval
Institute's library and publications
Liisa.Sipola@bof.fi

Contact us

Bank of Finland
BOFIT – Institute for Economies inTransition
PO Box 160
FIN-00101 Helsinki

Phone: +358 9 183 2268
Fax: +358 9 183 2294
E-mail: bofit@bof.fi
Internet: www.bof.fi/bofit

Bernadina Algieri

Trade specialisation patterns: The case of Russia

BOFIT Discussion Papers
Editor-in-Chief Iikka Korhonen

BOFIT Discussion Papers 19/2004
30.12.2004

Bernadina Algieri

Trade specialisation patterns: The case of Russia

ISBN 951-686-980-7 (print)
ISSN 1456-4564 (print)

ISBN 051-686-981-5 (online)
ISSN 1456-5889 (online)

Multiprint Oy
Helsinki 2004

Contents

All opinions expressed are those of the authors and do not necessarily reflect the views of the Bank of Finland.

Bernadina Algieri*

Trade specialisation patterns: The case of Russia

Abstract

This paper considers trade specialisation in Russia, examining changes in trade patterns at the sectoral level over the transition period. Trade based on inter-industry specialisation and intra-industry trade (IIT) are empirically distinguished using the Aquino and Grubel-Lloyd indices. The Aquino index is applied to measure the degree of inter-industry specialisation by sector, while the Grubel-Lloyd index is used to establish the level of IIT between industries. The empirical results support recent trade theory, which predicts an increasing level of intra-industry trade with liberalisation processes. They also suggest how inter- and intra-industry trade coexist. The final econometric estimation of the factor content of Russia's exports (specialisation in resource-intensive products) supports the index analysis.

Ph.D. Student at University of Naples, Federico II, Italy and the Center for Development Research (ZEF,) University of Bonn, Germany e-mail: b.algieri@unical.it

Bernadina Algieri

Trade specialisation patterns: The case of Russia

Tiivistelmä

Tutkimukessa käsitellään Venäjä ulkomaankaupan erikoistumista ja muutoksia taloudellisen siirtymäkauden aikana. Teollisuuden aloje sisäinen ja niiden välinen kauppa pystytään erottelemaan käyttämällä Aquino-ja Grubel-Lloyd-indeksejä. Teollisuudenalojen välistä-erikoistumista mitataan Aquino-indeksillä. Teollisuudenaloje sisäistä kauppaa mitataan taas Grubel-Lloyd-indeksillä. Empiiriset tulokset tukevat modernin kansainvälisen kaupan teorioita. Teollisuudenaloje sisäinen kauppa lisääntyy kaupan vapauttamisen myötä. On myös selvää, että Venäjä on erikoustunut raaka-aineisiin perustuviin tuotteisiin.

1 Introduction

During the 1990s, Central and Eastern European countries liberalised and reformed their economies. Differences in liberalisation processes, manufacturing bases, administrative reforms and political frameworks manifested themselves as differences in trade structure and comparative advantage.

The body of studies assessing evolution of trade patterns in transition economies includes a number of papers dealing with the newest EU members (Aturupane et al., 1997); Fidrmuc et al., 1999; Kaitila, 1999; Kaitila and Widgren, 2001; Traistaru et al., 2002). They also highlight the glaring absence of similar empirical research on the Russian economy. In the following discussion, therefore, we attempt to give a modest examination of the evolution of Russian specialisation over time and identify signature characteristics of Russia's export structure.

The paper is organised as follows: Section 2 discusses the theoretical framework of trade specialisation. Section 3 reviews various ways of measuring inter- and intra-industry trade and explicates the indices used in the empirical analysis. Section 4 presents the empirical evidence on the patterns of trade specialisation in Russia. Section 5 displays the econometric findings for the factor content of the Russian exports. Section 6 concludes.

2 Theoretical framework

Trade specialisation evolves over time, bringing with it economic development patterns that vary from country to country and from region to region within countries. We consider trade specialisation in light of neoclassical trade theory, new trade theory or new economic geography theory.

Neoclassical trade theory explains patterns of regional specialisation in terms of comparative advantages from either differences in production technology (Ricardo, 1817) or differences in natural endowments between countries and regions (Heckscher, 1919; Ohlin, 1933). Neoclassical trade models assume perfect competition, constant return-to-scale and homogeneous goods. With factors of production and consumers scattered across regions, neoclassical theory also envisages a geographically dispersed structure of indus-

trial production with individual regions specialising in production of goods they where hold a comparative advantage. As a result, inter-industry specialisation is stimulated.[1]

During the 1980s, new trade theory models were developed to explain high levels of intra-industry trade (IIT), i.e. two-way trade, and the large proportion of world trade between similar countries (Amiti, 1998). IIT is defined as the simultaneous export and import of products that belong to the same sector (Vollrath, 1991). IIT is prevalent in regions and industries where increasing return-to-scale in production, monopolistic competition and product differentiation play important roles (Erkkilä, 1996). The new trade models postulate that increasing returns to scale and trade costs will induce activities to locate in regions with good market access ("the core") and away from remote areas ("the periphery"), which translates into inter-industry specialisation between core regions. Scale economies, in turn, promote intra-industry trade across companies with each company focusing on producing a unique differentiated product. The process continues until all increasing-returns activities are concentrated near the core of the market and intra-industry trade between the core and the periphery vanishes (Brülhart, 1998). Although geographic advantage plays a role in new trade theory, it is considered exogenous (i.e. determined by physical, not economic, characteristics).

The new economic geography model, in contrast, starts with the proposition that geographical advantage is endogenous. Regional specialisation is the result of the spatial pattern of agglomeration of economic activities (Krugman, 1991). Firms locate in an economic centre because other firms have already located there, which then fuels a cumulative causation process whereby the arrival of new firms to a location further increases the attractiveness of the site for other firms. This cumulative causation process is based on technological externalities (e.g. learning by doing and knowledge spillovers) and pecuniary externalities between firms. As long as these externalities are localised, production remains geographically concentrated. The logic of increasing returns to scale implies that once a pattern of industrialisation has been established, it persists over time.

[1] Inter-industry trade refers to the simultaneous exchange of different goods.

3 Inter-industry specialisation indices

Researchers have used a number of measures of trade specialisation in studying the structure and determinants of international trade and identifying the origins of comparative advantages. Empirically quantifying comparative advantages is a non-trivial task: the rigor of economic theory imposes severe restrictions and country and commodity aggregations necessarily entail conceptual compromise.

The literature identifies seven techniques for measuring the inter-industry specialisation: the Balassa index, the Normalised Balance and the Neven index, the Donges and Riedel index, the Hine and Greenway method, the Sapir method, the Gini index and the Aquino index.

3.1 Measuring inter-industry specialisation with trade flows

Balassa index

In exploring the theoretical explanations of international trade in determining patterns of comparative advantage, Bela Balassa (1965) observed:

"Comparative advantages appear to be the outcome of a number of factors, some measurable, other not, some easily pinned down, others less so. One wonders, therefore, whether more could not be gained if, instead of enunciating general principles and trying to apply these to explain actual trade flows, one took the observed patterns of trade as a point of departure..."

Balassa suggests considering comparative advantages as *revealed* by international trade, arguing that actual exchange "reflects relative cost as well as differences in non-price factors." He proposes the specialisation indicator now known as the Balassa index:

$$B_{yi} = 100 \cdot \frac{x_{yi}}{\sum_{y=1}^{N} x_{yi}} \Bigg/ \frac{\sum_{i=1}^{M} x_{yi}}{\sum_{y=1}^{N}\sum_{i=1}^{M} x_{yi}},$$

where x_{yi} stands for country i's exports of commodity y. The Balassa index has a lower bound of zero and no upper bound. A country that is more specialised in some industry than the average of all countries taken together has an index value greater than 100 for that

industry, and, conversely, a value below 100 reveals a lack of specialisation (despecialisation) compared to the average for all countries. Thus, values above 100 indicate the presence of comparative advantages. The standard deviation of this index across products can be used as measure of the comparative importance of inter-industry specialisation and intra-industry trade. The greater the degree of inter-industry specialisation, the greater the standard deviation of the Balassa index.

Researchers have applied the Balassa index to determine a country's weak and strong sectors. Michael Porter, for instance, uses Balassa index values above 100 (and, in certain cases, values exceeding 200) to identify national productive sectors. Other notable empirical analyses include Ariovich (1979), Aquino (1981), Reza (1983), Yeats (1985), Peterson (1988), Crafts (1989), Amiti (1999), Hinloopen and van Marrewijk (2000) and Kaitila (2001).

Normalised Balance and Neven index

The Normalised Balance is given by the ratio between the value of trade balance and the value of total trade. This index, which takes into account both imports (m) and exports (x), indicates the economic performance of a country i. It is defined as

$$NB_{ji} = \left(\frac{x_{ji} - m_{ji}}{x_{ji} + m_{ji}} \right).$$

Thus, the ratio ranges between –1 and 1. A Normalised Balance of 1 means the country or region is completely specialised in the production of commodity j. A Normalised Balance of –1 implies despecialisation. When the index is zero, imports and exports are even. The Normalised Balance is limited to the extent it focuses only on a single commodity j and ignores the contrasting dimension inherent in the principle of comparative advantage.

Neven (1995) has provided an extended Normalised Balance formula to overcome the aforementioned shortcoming, such that

$$NEV_{ji} = (x_{ji}/X_i - m_{ji}/M_i) / (x_{ji}/X_i + m_{ji}/M_i),$$

where X and M are the total exports and imports of country i. The Neven index, however, still fails to account for world imports and exports.

Donges and Riedel index

The Donges and Riedel index (1977) considers both country and world trade performances. Formally, it is expressed as

$$\text{D-R}_{ki} = \left[\left(\frac{(x_{ki}-m_{ki})/(x_{ki}+m_{ki})}{(x_{kw}-m_{kw})/(x_{kw}+m_{kw})}\right)-1\right]*\left[sign\left(x_{kw}-m_{kw}\right)\right],$$

where x_{ki} refers to the exports of commodity k in country i, m_{ki} to the imports of commodity k in country i and x_{kw} and m_{kw} to total world exports and imports of commodity k.

Aquino index

Aquino (1999) suggests

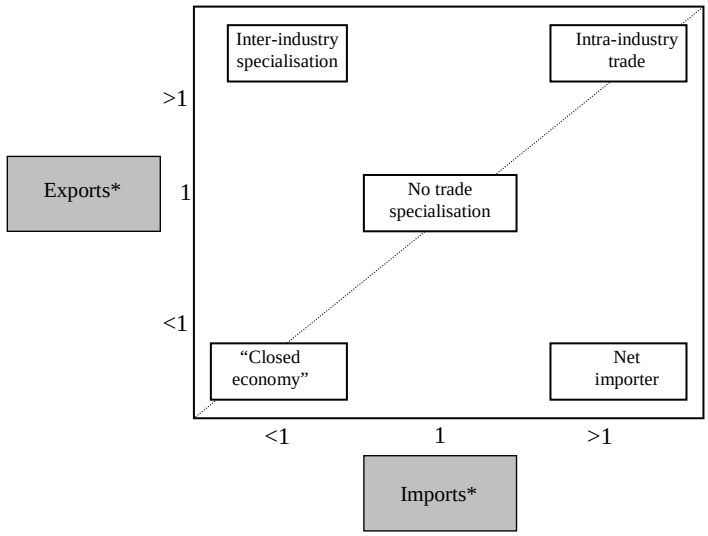
$$A_{ki} = 100*\left(\frac{x_{ki}\Big/\sum_{k=1}^{M}x_{ki}}{\sum_{i=1}^{N}x_{ki}\Big/\sum_{i=1}^{N}\sum_{k=1}^{M}x_{ki}}\right)\Bigg/\left(\frac{m_{ki}\Big/\sum_{k=1}^{M}m_{ki}}{\sum_{i=1}^{N}m_{ki}\Big/\sum_{i=1}^{N}\sum_{k=1}^{M}m_{ki}}\right),$$

where x_{ki} refers to the exports of commodity k by country i and m_{ki} to the imports of commodity k by country i. This index is the ratio between the Balassa index calculated for exports and the Balassa index for imports. The numerator represents the share of commodity k in the exports of country i relative to the share of commodity k in world exports. The denominator represents the same relative share for imports. By considering the normalised quotas of exports and imports, this indicator ostensibly provides an unbiased measure of specialisation, as well as an unbiased predictor of the intensity of comparative advantage. It also overcomes the Balassa index's sole consideration of exports. We use the standard deviation of the Aquino index (Algieri et al., 2001) as the measure of inter-industry specialisation for a country.

The Aquino index only measures relative values of the Balassa index for imports and exports. Thus, when $A_{ki} = 1$, the index cannot distinguish whether this is due to high relative exports and imports of commodity k (i.e. the Balassa index for imports and the Balassa index for exports of an industry are equal and both greater than one), or due to low relative exports and imports of commodity k (i.e. the Balassa index for imports and the Balassa index for exports are equal and both smaller than one), or whether the trade profile of commodity k does not differ from the one of the country (i.e. the Balassa index for imports and the Balassa index for exports are both equal to one). To determine what is actually going on, we must look separately at the numerator and denominator of the Aquino index for each industry, i.e. the Balassa index for imports and the Balassa index for exports. It then becomes possible to determine not only sectors of specialisation but also to

define areas of trade structure. Plotting the Balassa index for exports on the vertical axis against the Balassa index for imports on the horizontal axis, we get the inter- vs. intra-industry trade matrix (Fig. 1). The matrix displays five regions of specialisation patterns and clearly distinguishes between inter-industry specialisation and intra-industry trade.

Figure 1. Inter- vs. intra-industry trade matrix, regional specialisation patterns relative to country specialisation



* Balassa index

3.2 Measuring inter-industry specialisation without trade flows

The economic literature also identifies three techniques for measuring inter-industry specialisation without the use of import and export flows: the Hine and Greenaway method, the Sapir method, and the Gini index.

Hine and Greenaway method

Hine (1990) and Greenaway and Hine (1991) use the Finger-Kreinin statistic (F-K) applied to production and export data of 28 manufacturing industries to compute specialisation in Europe over the period 1980-1985. They demonstrate an increase in inter-industry specialisation in the European Community as well as EC-EFTA areas. They first calculate for individual countries the share of each industry in total production. These shares are then compared between countries to obtain a measure of industrial similarity.

The Finger-Kreinin statistic is defined as

$$(\text{F-K})_{ij} = \sum_{m=1}^{N} \min (x_{mi}, x_{mj}),$$

where x_{mi} refers to industry m's share in total production of country i and x_{mj} to industry m's share in total production of country j. This index ranges between zero and one. It gives a unit value if countries have identical production patterns (intra-industry trade) and a zero value for disparate patterns (inter-industry trade). Finger-Kreinin is a relative index that compares the industrial share in total exports of one country with respect to another.[2]

Unfortunately, the mean of the F-K index can be an unsatisfactory summary measure of specialisation if the bilateral comparisons of a country j with other countries in the sample move in different directions. Large variations in production shares of small countries easily drive the value of the index (Amiti, 1999). Thus, the index can be misleading by failing to account for the size and the characteristics of countries.

Sapir method

Sapir (1996) adopts the Herfindhal index to measure manufacturing specialisation in Europe using data for 100 manufacturing sectors. He finds that specialisation remained constant in Italy, Germany and Great Britain between 1977 and 1992, and increased in France after 1986. The index is formalised as

$$H_i = \sum_i (s_i)^2 \qquad 0.01 \leq H_i \leq 1,$$

where s_i is the share of sector i in the total exports of the country. A value of H=0.01 unity implies no specialisation, while a value equal to 1 implies complete specialisation in a particular sector.

Gini index

The Gini index also measures the intensity of specialisation. It involves constructing a Lorenz curve by ranking the Balassa index in descending order and then representing the cumulative of the denominator on the horizontal axis and the cumulative of the numerator on the vertical axis. The area between the 45° line and the Lorenz curve multiplied by two gives the Gini index. This index can take values between 0 and 1. If the index is zero, there is no specialisation. The higher the Gini index, the more specialised the country.The Gini

[2] It is possible to consider more than two countries. In such case, however, we should calculate the indices for one country with respect to each of the other countries and then take the arithmetic mean of these indices.

index is based on comparisons of geographic patterns of employment for one industry against the aggregate. Inter-industry comparisons with the Gini index appear to be highly sensitive to industry characteristics and results are highly dependent on the concentration of production within the industry (Maurel and Sédillot, 1999). Which is to say it is a measure of production specialisation rather than trade specialisation. The Gini index also places greater relative value on changes in the middle parts of the distribution, because the transfer from a big industry to a small one has a much greater effect on the value of the index if the two industries are near to the central part of the distribution rather than at either end (Amiti, 1999). [3]

3.3. Intra-industry trade indices

In the traditional approach to IIT, models of monopolistic competition with increasing returns to scale and homogeneous consumer preferences in partner countries are used explain the existence and significance of IIT.[4] IIT theory predicts a negative relationship between comparative advantage and IIT trade. The more similar the factor endowments of countries, the greater the extent of intra-industry trade and the lower the degree of inter-industry specialisation.

The share of IIT is typically high between industrialised countries and low between countries at different levels of economic development. IIT earlier was much lower in trade between Eastern European transition countries and the EU than in intra-EU trade. As countries of Central and Eastern Europe narrowed their differences in economic structures and income levels, their share of IIT in total trade increased (Kaitila, 2001).

European integration and the transition processes of Eastern European countries and Russia have caused an upsurge in international trade flows of goods and factors of production. Liberalisation has helped boost IIT relationships among countries that have reduced or eliminated trade barriers (Fontagné and Freudenberg, 1997; Brülhart and Hine, 1999; Lovely and Nelson, 2002).

Intra-industry trade can take two forms: *horizontal* (HIIT) and *vertical* (VIIT). The latter considers the exchange of similar goods of different quality, while the former com-

[3] For example, the horizontal axis indicates region j's production of industry i as a proportion of total country production of industry i, while the vertical axis indicates region j's share of manufacturing in the total manufacturing of the country.
[4] See Kol and Tharakan (1989) for references.

prises exchange of similar commodities differentiated by characteristics instead of quality. Abd-el-Rahman (1991) and Greenaway (1995) argue that making such a distinction is important as the determinants of each type of IIT differ: vertical IIT is more likely to be driven by differences in endowments, while horizontal IIT is more likely to be driven by scale economies and imperfect competition. Several applied economists have demonstrated that most IIT is vertical (Aturupane et al. 1997; Kaitila, 1999; Blanes and Martín, 2000). As a result, it is usually assumed that the level of quality is positively associated with the intensity of capital used in production.

The existence of vertical IIT challenges the view that there is a negative relationship between comparative advantage and IIT. In the theoretical models for IIT proposed by Falvey (1981), Falvey and Kierzkowsky (1987) and Shaked and Sutton (1984), the distinguishing feature on the supply side is the capital-to-labour ratio (K/L) used in production, i.e. high-quality products require more K-intensive production techniques and cost more. On the demand side, goods are distinguished by perceived quality. Although all consumers have the similar preferences, individual incomes determine that each consumer can only demand a single type of differentiated product. Given that aggregate income is unequally distributed, there is an aggregate demand for varieties of differentiated products. If the country is relatively labour-abundant, it will tend to export lower-quality or more labour-intensive varieties of the differentiated product (demanded abroad by low-income consumers) and import higher-quality, more capital-intensive varieties (demanded by domestic high-income consumers). In this respect, it is an application of the Heckscher-Ohlin paradigm to IIT.[5]

Greenaway and Milner (1994) note the importance of human capital in producing high-quality varieties of differentiated goods.

Flam and Helpman (1987) emphasise technological and income differences between countries as determinants of intra-industry flows. They argues that source of this North-South divide is not the quantity of capital used in producing goods, as in Falvey and Kierzkowski (1987) model, but the technology used. Labour input per unit output of quality-differentiated commodities varies across countries, with the North holding a comparative advantage in high-quality products. Thus, the North exports products of high quality and imports goods of lower quality from the South. Given an overlap of income distribution, IIT materialises.

In all these studies, intra-industry trade is determined by comparative advantages derived from differences in physical and human capital and technology, with IIT increasing as the differences in factor endowments between countries increase.

3.4 Measures of IIT

Intra-industry trade is conventionally measured by the Grubel-Lloyd index (1975) defined as

$$GL=1-\frac{\sum_{i=1}^{N}\left|x_{ij}-m_{ij}\right|}{\sum_{i=1}^{N}\left(x_{ij}+m_{ij}\right)},$$

where x_{ij} and m_{ij} are exports and imports of commodity j and country i. GL index values can range between zero and one. A zero value implies a complete inter-industry trade of country i in commodity j, and the unit value stands for complete intra-industry trade. A series of low GL values of one region or country reflect a centripetal process of industrial agglomeration and high specialisation, while a series of high GL values reflect a centrifugal process of industrial dispersion.

This index is unbiased if, and only if, total trade of country i is balanced. Otherwise, the index is a downward-biased summary measure of intra-industry trade for each commodity.[6] The methodology to measure the nature of IIT was proposed first by Abd-el-Rahaman (1991), and developed by Greenaway et al. (1994) and Blanes and Martín (2000).

Horizontal IIT is defined to exist for trade in product i in industry j in country k that satisfies the criterion

$$1-\alpha \le \frac{exp\ UV_{ijk}}{impoUV_{ijk}} \le 1+\alpha \ .$$

[5] Also known as neo-Heckscher-Ohlin models.
[6] One way of correcting such downward bias towards intra-industry trade is to estimate the values of exports and imports if trade was balanced and calculate the index with these new values. A weighted average of the values of the new index gives the corrected summary measure of the proportion of intra-industry trade in i's total trade (Aquino, 1981).

Vertical IIT comprises trade, where

$$\frac{\exp UV_{ijk}}{impoUV_{ijk}} \prec 1-\alpha \qquad \text{or} \qquad \frac{\exp UV_{ijk}}{impoUV_{ijk}} \succ 1+\alpha .$$

Relative unit values (UV) of exports and imports are used to disentangle horizontal IIT from vertical IIT. Unit value indexes are taken as a proxy for prices on the assumption that prices properly reflect quality differences. Vertical IIT is thus defined as two-way trade of an item where the per kilogram unit value of exports (measured f.o.b.) relative to its per kilogram unit value of imports (measured c.i.f.) falls outside a specific range of ±α. Trade in products with relative unit values within the range ±α is defined as horizontal IIT. Abd-el-Rahman (1991), Greenaway et al. (1995), Aturupane et al. (1999) and Blanes et al. (2000) use a unit value dispersion of 15% (i.e. α = 0.15). Since vertical IIT indicates specialisation in varieties of different quality, VIIT is assumed to have two components – high- and low-quality vertical IIT. When the relative unit value index of a product is below the limit of 0.85 (1-α), it is considered a low-quality, low-price export, VIIT (LQ). Conversely, when the unit value index exceeds 1.15 (1+α), we have high-quality exports, VIIT (HQ). Formally, we express this as

$$IIT = HIIT + VIIT = HIIT + (VIIT^{LQ} + VIIT^{HQ})$$

with

$$\text{HIIT} \Rightarrow \qquad 0.85 \prec \frac{exp\ UV_{ijk}}{impoUV_{ijk}} \prec 1.15$$

$$\text{VIIT} \Rightarrow \qquad \frac{expUV_{ijk}}{impoUV_{ijk}} \prec 0.85 \quad \text{for VIIT}^{\text{LQ}} \qquad \text{and}$$

$$\frac{expUV_{ijk}}{impoUV_{ijk}} \succ 1.15 \quad \text{for VIIT}^{\text{HQ}}$$

4 The extent and nature of trade specialisation in Russia

To assess the trade structure and the factor intensity of Russia, the Aquino index and the Grubel-Lloyd index have been employed. The empirical literature often uses the Balassa index to compute inter-industry specialisation (Ariovich, 1979; Reza, 1983; Yeats, 1985; Peterson, 1988; Crafts, 1989; Aturupane et al., 1997; Amiti, 1999; Kaitila, 1999; Hinloopen and van Marrewijk, 2000; Kaitila, 2001). We prefer the Aquino index, however, because it overcomes a drawback of the Balassa technique, the Balassa index's failure to represent fully the trade performance of one country by only considering exports. In certain instances, the Balassa index gives implausible information. For example, if a country has strong comparative advantage in the production of a certain good, say, personal computers, but at the same time that country registers a higher value of imports for that good than the value of exports. The Aquino index (1999), given as the ratio between the Balassa index for exports and the Balassa index for imports, reveals comparative advantages of Russia without losing any information regarding import flows (Table 2). Moreover, the construction of an inter- vs. intra-industry matrix clearly exposes areas of trade specialisation, while distinguishing between inter- and intra-industry trade and identifying the sectors that drive the Russian trade flows.

Disaggregated Russian and worldwide trade data have been collected from the International Trade Centre. We use 3-digit level data classed according to the Standard International Trade Classification (SITC) and include 82 commodities. Before computing the indices, we make a preliminary analysis of the degree of openness and stability of the Russian export structure.

4.1 Preliminary analysis

Russia is a large, open, trade-dependent economy. Its openness ratio, i.e. the ratio of exports and imports to GDP, was 42.40% in 1994 and 50.09% in 2001. Throughout the 1990s, Russia registered surpluses in its current account (Table 1). Russia's total foreign trade turnover grew consistently during 1992-1997, and fell between 1998-1999 in the wake of a major financial crisis. Growth resumed in 2000 and continues to the present (Table 1). The constraints of autarky attempted under communism and the disruption of payment arrangements with other former Soviet republics (along with their ability to pay)

made integration with the world economy a priority for Russia's reformers. Although collapsing domestic demand led to a sharp fall in imports in 1992-1993, exports boomed and produced large trade surpluses. The main drivers of export growth were weak domestic demand for raw materials and semi-finished goods, an undervalued rouble and "the profit to be gained from diverting previously subsidized intra-Soviet exports to hard-currency markets where world prices could be charged" (The Economist, IU, 2003). Imports subsequently picked up as a result of real rouble appreciation, and exports declined for the first time in 1997. In part, this reflected a recovery in domestic demand, which both constrained exports and drew in increased imports. After the rouble's collapse in August 1998, imports fell sharply and exports received a boost (Table 1). The sharp devaluation made Russian goods more competitive on world markets. International prices of Russia's main export items (oil, gas and metals) also rose in 1999-2000, leading to 40% export growth in US dollar terms in these two years. Meanwhile, imports slumped by more than 20% (and by 38% compared to 1997), [7] evidencing the sharp fall in real incomes that followed the rouble crisis and the competitiveness gains of domestic producers who vigorously expanded their local market shares. In 2001, 2002 and 2003 exports continued to record good performances, while imports increased in line with real exchange-rate appreciation (and despite a slowdown in the Russian economy).

Table 1. Russian foreign trade, US$ billion

Exports (fob)	42.1	44.3	67.8	82.9	90.6	89	74.9	75.7	105.5	101.6	107.2	134.4
Imports (fob)	36.9	32.8	50.5	62.6	68	72	58	39.5	44.9	53.7	61	74.8
External trade turnover	79	77.1	118.3	145.5	158.6	161	132.9	115.2	150.4	155.3	168.2	209.2

Source: Russian Central Bank, data according to IMF standards.

To gauge the stability of Russia's export structure, we calculate the linear correlation coefficient of Russia's exports (Table 2). A linear correlation coefficient equal or close to 1 reflects stability in trade patterns. Conversely, a linear correlation coefficient equal or close to zero shows instability in trade flows, i.e. consistent changes in the export mix. Russia's

[7] Calculated according to the classical formula $[(x_t-x_{t-1})/x_t-1]*100$.

export merchandise mix is stable over the considered time frame. Indeed, the linear correlation coefficient stays above 0.9 from 1993 on.[8]

Table 2. Correlation coefficient

	1993	1994	1995	1996	1997	1998	1999	2000	2001
1993	1								
1994	0,99	1							
1995	0,98	0,99	1						
1996	0,90	0,94	0,96	1					
1997	0,91	0,95	0,97	1,00	1				
1998	0,936	0,945	0,966	0,970	0,9828	1			
1999	0,991	0,989	0,993	0,992	0,9908	0,96899	1		
2000	0,990	0,988	0,987	0,985	0,9804	0,93634	0,99111	1	
2001	0,991	0,987	0,985	0,983	0,9778	0,93732	0,99049	0,99756	1

Source: Own calculations on ITC data, 2002

4.2 Aquino index analysis

The Aquino index indicates that the basic exported commodities are raw materials and primary processed products. Russia plays the role of "raw-material adjunct" for the world's industrially developed countries. The raw-materials-producing sector is the backbone of Russia's economy, and although it employs only 1.5% of the country's workers, it accounts for 6% of the Russian GDP and over 59% of exports. Moreover, the sector absorbs more than 20% of the total of investments in the national economy and more than 60% of investments in the country's industries (The Economist, IU 2003). A sizable propensity toward the raw-materials-producing sector makes Russian development strongly dependent on world market prices for raw materials.

Our Aquino index analysis finds that in 2002 Russia specialised in 27 products, including wood rough-squared, primary products-iron steel, manufactured fertilizers, natural gas, nickel, oil, refined copper, and zinc (Table 4). The complete time series of the Aquino index appears in the appendix (Table 9). Very high values of the Aquino index indicate that the country exports a certain product in high quantities but imports the same product only in minor quantities or not at all. Thus, Russia's top eight traded goods are mainly exported and not imported.

[8] The coefficient of correlation is a measure of the degree of association between two variables. It is computed here as $r = (\Sigma x_i * y_i) / \sqrt{(\Sigma x_i^2) * (\Sigma y_i^2)}$ with $x_i = (X_i - X_{mean})$ and $y_i = (Y_i - Y_{mean})$.

At the time of the Soviet Union's collapse, engineering and metal products were Russia's main exported commodities, together accounting for around 30% of the total-compared with only 13% for electricity and fuels. However, the extent of Russia's dependence on primary commodity exports was concealed by their artificially low prices to countries belonging to the Council for Mutual Economic Assistance. The substantial realignment of prices since the end of communist rule has turned fuels into the largest visible export (The Economist, IU 2003). In 2002, the Aquino index value for natural gas was about 9,125.08, for heavy oil and crude oil it was 5,386.85 and 4,825.18, respectively (Table 4). In absolute terms, oil is the product with the highest exported value (Table 3).

Table 3. Leading export products in absolute value, 2002

Exports, Russia Product Group	*Value 2002 US$ (thousand)*
333 - PETROL./BITUM. OIL,CRUDE	27,445,344
343 - NATURAL GAS	15,358,771
334 - HEAVY PETROL/BITUM OILS	11,139,610
684 - ALUMINIUM	3,495,656
673 - FLAT ROLLED IRON/ NON ALLOY STEEL	2,051,248
672 - PRIMARY FORM OF IRON OR STEEL /PRODS IRON/STEEL	1,969,409
683 - NICKEL	1,753,144
247 - WOOD IN THE ROUGH/ROUGHLY SQUARED	1,647,834
562 - MANUFACTURED FERTILIZERS	1,643,993
321 - COAL NON- AGGLOMERATED	1,150,702
682 - COPPER	938,481
248 - WOOD SIMPLY WORKED	886,921
641 - PAPER/PAPERBOARD	847,559
671 - PIG IRON/ FERRO ALLOY	682,549
676 - IRON/STEEL BARS/RODS/ETC	659,290
714 - ENGINES NON-ELECTRIC	571,133
282 - FERROUS WASTE	494,214
782 - GOODS/SERVICE VEHICLES	465,253
522 - INORGANIC CHEMICAL ELEMENTS/OXIDES/HALOGEN SALT	449,025
793 - SHIPS/BOATS/ETC	442,430

Source: International Trade Centre

Russia's inter-industry specialisation essentially consists of raw materials and natural resources. Manufactured and processed goods are nearly absent in Russia's export flows. Manufactured fertilizers (with an Aquino index value of 19,285.5 in 2002), steam and vapour turbines (857), optical instruments (164.17), non-electric engines (111.86) and steam generating boilers (106.18) (Table 4) are exceptions to the mainly natural-resource-led specialisations. While Russia is specialised in the production and export of optical instrument (particularly manufactured lasers), it notably imports optical fibres. The import bill is correspondingly biased towards intermediate and downstream industrial products. Russia's imports consist almost of medical, electric, heating and cooling machinery and equipment, foodstuffs, high-tech products and textile articles (Table 4).

Import markets for imports consist mainly of *champion markets, emerging markets, declining markets* and *traditional markets.* Champion markets are markets for imported goods, such as tobacco and aluminium oxides, for which Russia's demand in per capita terms is substantial and growing. Emerging markets cover imported products such as automatic data processing machines, for which per capita imports are lower than those of similar countries, while national import demand has been growing at high rates reflecting a catch-up effect or development of new industries in the country. Declining markets consist of stagnating or declining imports. Mainly, the declining markets for Russia are those of crude petroleum oils and machinery plants. Finally, traditional markets comprise traditional imported goods such as meat, cane and sugar.

Table 4. Aquino index, 2002

Aquino Index	*2002*		*2002*
Inter-industry specialisation		*Despecialisation*	
247 - WOOD IN THE ROUGH/ROUGHLY SQUARED	25,391.86	782 – GOODS/SERVICE VEHICLES	91,60
672 – PRIMARY FORM OF IRON OR STEEL /PRODS IRON/STEEL	23,363.73	792 - AIRCRAFT/SPACECRAFT/ETC	84,59
562 - MANUFACTURED FERTILIZERS	19,285.53	034 - FISH,LIVE/ FRESH/CHILLED/FROZEN	81.73
343 - NATURAL GAS	9,125.08	641 - PAPER/PAPERBOARD	79.93
683 - NICKEL	8,623.62	654 - WOVEN TEXTILE FABRIC	76.11
282 – FERROUS WASTE/SCRAP	7,211.14	281 - IRON ORE/CONCENTRATES	58.42
248 - WOOD SIMPLY WORKED	6,336.96	716 - ROTATING ELECTR PLANT	48.27
334 - HEAVY PETROL/BITUM OILS	5,386.85	722 - TRACTORS	47.07
333 - PETROL./BITUM. OIL,CRUDE	4,825.18	613 - FURSKINS TANNED/DRESSED	46.90
325 - COKE/SEMI-COKE/RETORT CARBON	2,805.95	773 - ELECTRICAL DISTRIB EQUIPMENT	45.13
673 - FLAT ROLLED IRON/STEEL PRODUCTS	1,152.98	635 - WOOD MANUFACTURES	44.89
682 - COPPER	1,150.91	793 - SHIPS/BOATS/ETC	34.53
686 - ZINC	1,061.38	612 - LEATHER MANUFACTURES	34.02
684 - ALUMINIUM	956.94	621 - MATERIALS OF RUBBER	30.62
712 - STEAM/VAPOUR TURBINES	857.00	842 - WOMEN/GIRL CLOTHING	29.63
232 - SYNTHETIC RUBBER /WASTE/ETC	842.58	322 - BRIQUETTES/LIGNITE/PEAT	29.53
512 - ALCOHOLS/PHENOLS/DERIVS	613.44	884 - OPTICAL FIBRES	28.28
321 - COAL NON-AGGLOMERATED	496.79	841 - MENS/BOYS CLOTHING	22.11
211 - HIDE/SKIN (EX FUR) RAW	403.75	122 – TOBACCO, MANUFACTURED	21.59
611 – LEATHER	374.93	657 - SPECIAL YARNS/FABRICS	20.27
671 - PIG IRON ETC FERRO ALLOY	329.98	724 - TEXTILE/LEATHER MACHINERY	19.03
522 - INORGANIC CHEMICAL ELEMENTS/OXIDES/HALOGEN SALT	262.19	737 - METALWORKING MACHINE	17.23
676 - IRON/STEEL BARS/RODS/ETC	260.19	658 - MADE-UP TEXTILE ARTICLES	16.69
678 - IRON/STEEL WIRE	254.94	721 - AGRIC MACHINE EX TRACTORS	15.99
871 - OPTICAL INSTRUMENTS	164.17	723 - CIVIL ENGINEERING PLANT	15.42
714 – ENGINES NON-ELECTRIC	111.86	781 - PASSENGER CARS, ETC	15.11
711 - STEAM GENERATING BOILERS	106.18	666 - POTTERY	14.43
		541 - PHARMACEUT EXC MEDICAMENT	14.39
		783 - ROAD MOTOR VEHICLES	14.32
		751 - OFFICE MACHINES	13.53
		848 - HEADGEAR/NON-TEXT CLOTHING	13.04
		741 - INDUST HEAT/COOL EQUIPMENT	13.00
		881 - PHOTOGRAPHIC EQUIPMENT	11.79
		744 - MECHANICAL HANDLING EQUIPMENT	9.95
		001 - LIVE ANIMALS EXCEPT FISH	9.65
		752 - COMPUTER EQUIPMENT	8.88
		112 - ALCOHOLIC BEVERAGES	8.67
		764 - TELECOMMS EQUIPMENT	8.22
		812 - SANITARY/PLUMB/HEAT FIXT	8.09
		759 - OFFICE EQUIP PARTS/ACCS.	6.88
		851 - FOOTWEAR	6.28
		653 - FABRICS OF MAN-MADE TEXTILE PROD	6.00
		553 - PERFUME/TOILET/COSMETICS	5.31
		872 - MEDICAL/ETC INSTRUMENTS	4.32
		725 - PAPER INDUSTRY MACHINERY	3.69
		726 - PRINTING INDUSTRY MACHINERY	3.32
		583 - MONOFILAMENT RODS/STICKS	2.72
		846 - CLOTHING ACCESSORIES	2.08
		882 - PHOTOGRAPHIC SUPPLIES	2.03
		774 - MEDICAL ETC EL DIAG EQUI	1.82
		763 - SOUND/TV RECORDERS ETC	1.55
		727 - FOOD PROCESSING MACHINES	1.34
		762 - RADIO BROADCAST RECEIVER	0.72
		761 - TELEVISION RECEIVERS	0.53
		012 - MEAT,FRESH/CHILLED/FROZEN	0.09
		011 - BEEF, FRESH/CHILLED/FROZEN	0.00

Source: Own calculations using UN data.

Aquino index values around 80-120 should reveal a tendency to intra-industry trade (Table 4). We note vehicles, aircraft, fish, paper, steam generating boilers and engines are imported and exported approximately in the same amount. By comparing the Aquino index values for 2002 with the Aquino index values for 2001 (Table 4, Table 5), we attempt to clarify intra-industry trade. We find exports of aircraft, fish and paper a bit higher than imports in 2001, and a bit lower in 2002. It seems sensible that where exports and imports are

fairly even, it is possible that in one year the country is a net exporter and in the following a net importer.

To gain a broader representation of the Aquino indicator, we compare it with the Balassa index calculated for 2002. According to the Balassa index (Table 2, appendix), Russia is specialised in more sectors than indicated by the Aquino index. Moreover, the intensity of specialisation varies between the two indices due to the import correction made by the Aquino indicator. This comparison shows the limitation of the Balassa index in that by considering the exports quota only, it overlooks an important aspect of trade flows. For example, according the Balassa index Russia is specialised in tobacco (Table 2). The computation of the Balassa for imports, instead, demonstrates that imports are more relevant than exports (Table 2). The Aquino index, which accounts for both the Balassa ratios, is an unbiased measure and put tobacco into the despecialisation area (Table 4).

Summing up, Russia is abundant in natural resources, but it does not export manufactured goods made of the same raw materials. One reason for such a tendency can be explained through a brilliant intuition of an Italian economist, Antonio Serra. According to him the fortune and wealth of a nation are more linked to “the beautiful minds and good governance within the country” than to the abundance in natural resources. A second and most important reason arises from the Dutch Disease literature, which postulates that abundance in natural resources can be a mixing blessing for a country. In the short run, in fact, natural resource abundance triggers exports and economic growth. Conversely, in the long run, it leads to consistent losses in national production and finishes to crowd out the manufacturing sector in the long run.

Table 5. Aquino index, 2001

Aquino Index	*2001*		*2001*
		Despecialisation	
562 - MANUFACTURED FERTILIZERS	29,714.37	842 - WOMEN/GIRL CLOTHING	92.48
247 - WOOD IN THE ROUGH/ROUGHLY SQUARED	28,405.21	722 - TRACTORS	74.00
343 - NATURAL GAS	27,886.98	281 - IRON ORE/CONCENTRATES	71.12
672 - –PRIMARY FORM OF IRON OR STEEL /PRODS IRON/STEEL	13,855.58	716 - ROTATING ELECTR PLANT	67.21
248 - WOOD SIMPLY WORKED	6,466.06	654 - WOVEN TEXTILE FABRIC	62.22
282 - FERROUS WASTE/SCRAP	5,318.30	773 - ELECTRICAL DISTRIB EQUIPMENT	58.84
683 - NICKEL	4,691.22	782 - GOODS/SERVICE VEHICLES	47.92
334 - HEAVY PETROL/BITUM OILS	4,608.78	841 - MENS/BOYS CLOTHING	39.77
333 - PETROL./BITUM. OIL.CRUDE	3,892.17	884 - OPTICAL FIBRES	39.54
682 - COPPER	1,103.32	635 - WOOD MANUFACTURES	36.66
684 - ALUMINIUM	957.96	793 - SHIPS/BOATS/ETC	29.76
325 - COKE/SEMI-COKE/RETORT CARBON	849.81	621 - MATERIALS OF RUBBER	28.77
211 - HIDE/SKIN (EX FUR) RAW	782.13	322 - BRIQUETTES/LIGNITE/PEAT	25.06
686 - ZINC	739.24	723 - CIVIL ENGINEERING PLANT	21.72
232 - SYNTHETIC RUBBER /WASTE/ETC	615.03	658 - MADE-UP TEXTILE ARTICLES	20.46
512 - ALCOHOLS/PHENOLS/DERIVS	573.67	741 - INDUST HEAT/COOL EQUIPMENT	19.75
673 - FLAT ROLLED IRON/STEEL PROD	532.75	848 - HEADGEAR/NON-TEXTILE CLOTHING	18.12
321 - COAL NON-AGGLOMERATED	382.68	781 - PASSENGER CARS ETC	16.94
522 – INORGANIC CHEMCAL ELEMENTS/OXIDES/HALOGEN SALT	339.62	881 - PHOTOGRAPHIC EQUIPMENT	16.92
678 - IRON/STEEL WIRE	256.05	666 - POTTERY	16.68
711 - STEAM GENERATING BOILERS	230.45	721 - AGRIC MACHINE EX TRACTOR	16.67
671 - PIG IRON ETC FERRO ALLOY	227.90	724 - TEXTILE/LEATHER MACHINERY	16.17
676 - IRON/STEEL BARS/RODS/ETC	176.03	612 - LEATHER MANUFACTURES	14.25
871 - OPTICAL INSTRUMENTS	159.80	783 - ROAD MOTOR VEHICLES	13.65
712 - STEAM/VAPOUR TURBINES	158.08	122 - TOBACCO. MANUFACTURED	13.19
714 - ENGINES NON-ELECTRIC	154.47	744 - MECHANICAL HANDLING EQUIP	10.81
611 - LEATHER	132.77	657 - SPECIAL YARNS/FABRICS	10.48
792 - AIRCRAFT/SPACECRAFT/ETC	123.93	541 - PHARMACEUT EXC MEDICAMENT	9.70
034 - FISH, LIVE/FRESH/CHILLED/FROZEN	120.56	001 - LIVE ANIMALS EXCEPT FISH	8.89
641 - PAPER/PAPERBOARD	111.60	764 - TELECOMMS EQUIPMENT	8.67
		737 – METALWORKING MACHINE	8.45
		653 - FABRICS OF MAN-MADE TEXTILE PROD	8.17
		812 - SANITARY/PLUMB/HEAT FIXT	7.60
		851 - FOOTWEAR	7.30
		751 - OFFICE MACHINES	6.64
		553 - PERFUME/TOILET/COSMETICS	6.00
		112 - ALCOHOLIC BEVERAGES	5.96
		613 - FURSKINS TANNED/DRESSED	5.58
		761 - TELEVISION RECEIVERS	4,63
		725 - PAPER INDUSTRY MACHINERY	4.59
		752 - COMPUTER EQUIPMENT	4.16
		759 - OFFICE EQUIP PARTS/ACCS.	3.68
		583 – MONOFILAMENT RODS/STICKS	3.40
		872 - MEDICAL/ETC INSTRUMENTS	3.17
		726 - PRINTING INDUSTRY MACHINERY	3.02
		727 - FOOD PROCESSING MACHINES	2.50
		846 - CLOTHING ACCESSORIES	2.45
		763 - SOUND/TV RECORDERS ETC	2.26
		882 - PHOTOGRAPHIC SUPPLIES	2.26
		774 - MEDICAL ETC EL DIAG EQUI	1.40
		762 - RADIO BROADCAST RECEIVER	1.14
		012 - MEAT NES, FRESH/CHILLED/FROZEN	0.16
		011 - BEEF, FRESH/CHILLED/FROZEN	0.01

Source: Own calculations on ITC data.

4.3. Top export companies

According to the Expert Rating Agency, the top 100 enterprises in 2001 (Table 14, appendix) accounted for over 60% of the country's total exports. The best performers were large quasi-monopolies. Broken down by industry, the structure of the top 100 enterprises' exports seems to correlate with the country's overall structure of exports, i.e. leading positions belong to Russia's traditional exporting sectors. Thus, the oil and gas industry is well

represented in the top 100 exporters, accounting for 72.1% of all foreign trade sales made by the top 100 companies. Moreover, note that the leader of the sector and the ranking, Gazprom, had 2001 exports equalling $16.4 billion. These accounted for 26.2% of exports by the top 100 enterprises and more than 15% of the country's total exports in the 2001. Gazprom, the world's largest gas company, exports natural gas to 27 countries, mostly in Eastern and Western Europe.

The metallurgical industry is the country's number-two source of export earning. It consists mostly of jumbo conglomerates – industrial groups spanning full production stream from the mining of ores and coal to the manufacture of final products. Against a background of a general decline in metals exports due to falls in prices and production, the biggest metallurgical holdings on the list of the country's top 100 exporters in 2001 represented a 17.7% share of the revenues of the top 100 exporters. The metal companies and holdings among the top 100 represent are probably just the tip of the iceberg of Russian metal exports. The iceberg base, less conspicuous and off the rating list, is comprised primarily of trading companies. These companies account for the difference between the proportions of metals in the exports of the top 100 and the national overall total; otherwise, metals industries would be much closer to oil and gas in export earnings. The share of small traders in metal exports varies in a wide range: from 1% for rolled steel to over 80% for rails. Small traders have almost no involvement in oil and gas exports.

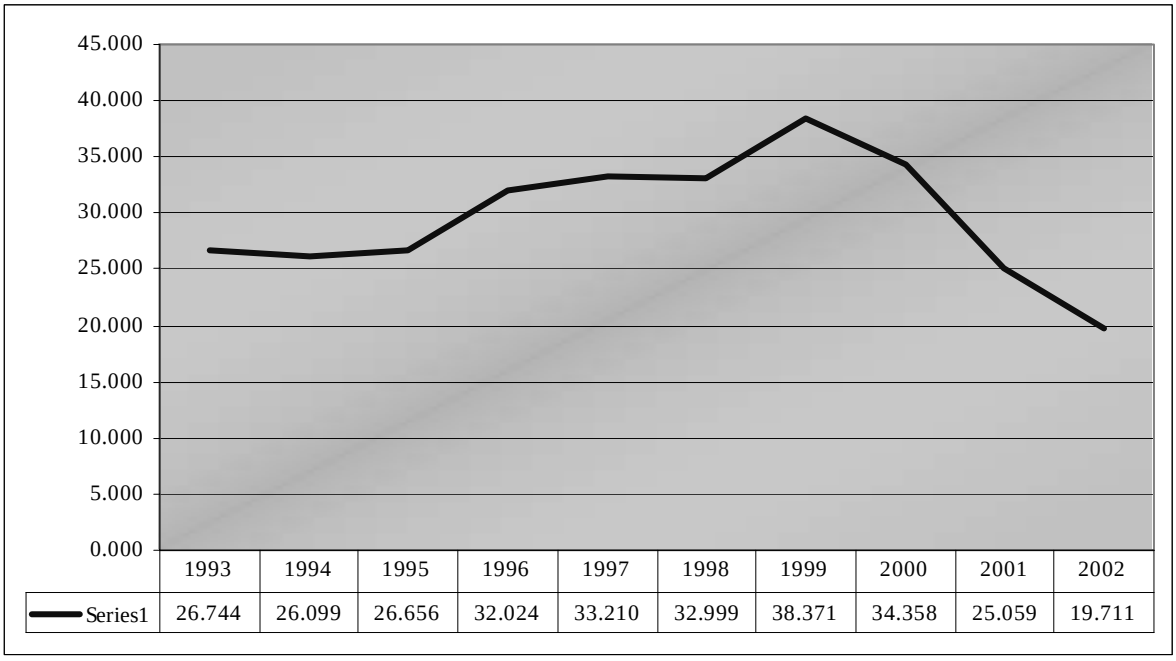
Export volumes of the 48 enterprises representing seven other industries in the top 100 list are minor. Their combined volume is only a little higher than 10% of the total volume of exports of the top 100. This does not mean Russia is hopelessly doomed as a raw-materials supplier. Russia's high-tech products are highly valued internationally and often without foreign rivals. These include developments in the spheres of military technologies and equipment, aviation, aerospace and the nuclear power industry.

4.4. Russian intra-industry trade

We start with the traditional Grubel-Lloyd indicator (1975) in computing the degree of intra-industry trade. Next, following the method adopted by Abd-el-Rahman (1991), Greenaway et al. (1995), Fontagnè and Freudenberg (1997), we distinguish horizontally differentiated goods from vertically differentiated goods. Data are extracted from the UN Comtrade database. The results for Russia (Figure 2.) show that IIT increased from 26.74%

in 1993 to 38.37% in 1999 and decreased during the following years. The reason for the increase in the Russian IIT reflects higher trade flows between Russia and the EU. In line with the literature, the higher the degree of integration among countries and the reduction in trade barriers, the higher its associated IIT index (Fontagnè, 1997; Brülhart and Hine, 1999; Lovely and Nelson, 2002; Brülhart and Elliott, 2002; Diaz-Mora, 2002).

Figure 2. Traditional Gruber-Lloyd index for Russia



	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Series1	26.744	26.099	26.656	32.024	33.210	32.999	38.371	34.358	25.059	19.711

Source: Own calculations using Comtrade data for 152 sectors.

The Grubel-Lloyd values remain low, indicating inter-industry specialisation dominates intra-industry trade. These results are in accordance with those calculated with our Aquino index findings. We also compare Russia and countries with the similar GDP per capita, i.e. Brazil, Mexico and Poland, and find that the former Soviet Union has the lowest intra-industry trade value in 2002.

Table 6. Traditional GL index for four countries, 2002

2002	Brazil	Mexico	Poland	Russia
GL	41.024	60.22	55.846	19.71

Source: Own calculations using Comtrade data

The Grubel-Lloyd index calculated for each Russian product is reported in the Appendix (Table). The products for which the index is greater than 0.5 are highlighted. Note the similarities between intra-industry sectors identified by the Aquino index and using the GL index, which includes several additional sectors.

The second stage of the analysis involved breaking down Russian IIT into vertical and horizontal components.

Russia's vertical and horizontal intra-industry trade indices have been identified by unit values. We have used the range of ± 25% to allow for the greater distance of Russia from the main international markets.[9] In this way, horizontal IIT (HIIT) includes trade, where

$$0.75 \prec \frac{expUV_{ijk}}{impoUV_{ijk}} \prec 1.25$$

and vertical IIT (VIIT) satisfies the criterion

$$\text{VIIT} => \quad \frac{expUV_{ijk}}{impoUV_{ijk}} \prec 0.75 \qquad \text{for VIIT}^{\text{LQ}} \text{ and}$$

$$\frac{expUV_{ijk}}{impoUV_{ijk}} \succ 1.25 \qquad \text{for VIIT}^{\text{HQ}}.$$

Vertical IIT dominates horizontal IIT in Russia over the considered period (Table 6, appendix). In particular, 56.5% is VIIT of low quality products, 39.13% is VIIT of high quality and 4.35% is the HIIT. These results are similar to those of other analyses carried out for emerging Central and Eastern European markets. Aturupane et al. (1999) and Kaitila and Widgren (1999) show that most of IIT is vertical in character for Poland, Hungary, Czech Republic and other accession countries. The low-quality component is the most important one in the Russian intra-industry trade. Moreover, these outcomes follow the findings for Aquino index with traditional GL indicator; the large extension of VIIT indicates that trade responds mainly to factor endowment.

[9] Greenaway et al. (1994) chose a range of ± 15% for the UK. We increase this range to ±25% because Russia is a so vast. We expect greater transport costs account for much of the variation in export and import unit values.

5 Factor content of trade flows

The theoretical foundations for empirical studies of the determinants of export performance lie in the conventional trade theory based on the Heckscher-Ohlin framework, new trade theories and endogenous growth theories.

In line with the empirical literature, the following model for Russia is estimated

AQ= f(R, LI, RD, HK, CI),

where the dependent variable AQ is the Aquino index of 25 Russian exporting sectors.[10] Note that the selected 25 sectors represent both the primary sector and the secondary sector. R is the intensity of resource index, measured as the ratio of the resource costs to the gross output value of the considered sectors. LI is the labour intensity variable, which is constructed as the ratio of the number of employees to the value of production. RD is the research and development variable measured as expenditure in R&D on output in each sector. HK is the human capital variable calculated as the ratio between the skilled and unskilled workers in the sector. CI is capital intensity as the ratio between investments and number of employees. Data come from the 2000 figures of Comtrade, OECD sources, Russian Economic Trend, and the IMF and ILO data sets. The lack of a broader availability of data unfortunately reduces the number of observations. The analysis is performed using the OLS technique. The estimated factor content equation is

*AQ = 6.878*R + 0.0573*LI + 0.027*RD + 0.978*HK - 1.115*CI*
t-stat: (12.79541) (2.093496) (2.975249) (1.940670) (-2.176125)

p-value: (0.0000) (0.0500) (0.0078) (0.0673) (0.0424)

Rsq.: 0.96

We then check for heteroskedasticity in the data. The White test (the null hypothesis of no heteroskedasticity against heteroskedasticity) gives evidence of heteroskerasticity.

[10] Specifically, the electrical power industry, fuel industry, oil extracting, oil refining, natural gas, coal, ferrous metallurgy, non-ferrous metallurgy, chemical and petrochemical industry, machine building, building materials industry, pulp and paper industry, light industry, and the food industry.

White heteroskedasticity test			
F-statistic	2.498474	Probability	0.057404
Obs*R-squared	16.02213	Probability	0.099001

In the presence of heteroskedasticity, ordinary least squares estimates are still consistent, while the conventional computed standard errors are no longer valid. Hence, we choose the robust standard errors option to correct the standard errors. In particular, we adopt the heteroskedasticity-consistent covariance matrix estimator (HAC), which provides correct estimates of coefficient co-variances in the presence of heteroskedasticity. Note that using HAC-consistent covariance estimates does not change the point estimates of the parameters, only the estimated standard errors.

*AQ = 6.878*R + 0.0573*LI + 0.027*RD + 0.978*HK - 1.115*CI*

Std. error (0.907706) (016709) (0.008908) (0.383784) (0.289024)

t-stat: (7.577306) (3.431108) (3.029625) (2.547499) (-3.858002)

p-value: (0.0000) (0.0028) (0.0069) (0.0197) (0.0011)

Rsq.: 0.96

Estimates for the year 2000 confirm the findings obtained from the trade specialisation indices. The results suggest that natural resources are the most important factor in determining Russia's export performance. Other factors being constant, a 1% increase in the natural resource intensity raises Russia's exports by 6.9%. The economic risk linked to natural-resource-led exports (in terms of periodic growth collapses) derives from the relatively high volatility of primary good prices compared to manufactured goods. Moreover, even though Russia is a resource-abundant country, the Dutch Disease literature postulates that significant short-term economic improvements resulting from a substantial upsurge in revenues from raw material exports are threatened in the long run without, in the words of Kaldor (1981), "cultural, technical and intellectual development which only a strong, healthy manufacturing industry...can provide". Hence, the long-term effect may be to erode the country's competitive position in manufacturing from which it may be difficult to recover.

Our estimation indicates that Russian exports have both a slight labour intensity and a low research and development intensity. The coefficient of human capital is positive and statis-

tically significant, showing that the human-capital intensive products play a strategic role in promoting exports. The capital intensity variable carries the negative sign and is statistically significant, demonstrating that Russian trade flows are not physical capital. Thus, Russia's policy of encouraging export-oriented FDI should be fostered to generate positive results.

6 Conclusions

As the process of economic change and liberalisation in Central and Eastern Europe continues, specialisation patterns can be expected to change. In this paper, we examined the developments in the trade specialisation patterns at the national level in post-Soviet Russia. To distinguish between inter-industry specialisation and intra-industry trade, the empirical work was carried out using the Aquino and indices the Grubel-Lloyd . The Aquino index highlights the degree of inter-industry specialisation by sector, while the Grubel-Lloyd index considers the level of IIT between industries. The IIT index was split into horizontal and vertical components.

The empirical results confirm both new trade theory, which predicts an increasing level of intra-industry trade as a consequence of the liberalisation process, and the new strand of trade theory, which, by distinguishing between horizontal and vertical IIT, suggests how inter- and intra-industry trade coexist. Overall, Russia exhibits mainly specialised intra-industry trade, a tendency that appears to have increased over time. Oil and gas are Russia's most important items in the structure of exports. The econometric estimation of the factor content of Russia's exports highlights that exports are biased toward natural resources and at the same time the traded goods show a slight labour intensity and R&D intensity.

Policymakers should be aware of the potential effects of resource-led exports on the Russian economy, particularly long-term damage from Dutch Disease.

References

Abd-el-Rahman, K. (1991), "Firms' Competitive and National Comparative Advantages as Joint Determinants of Trade Composition," *Weltwirtschaftliches Archiv* (Review of World Economics), Vol. 127, No. 1, Kiel.

Algieri, B., Ankkuriniemi, S. and Zampieri, L. (2001), "Inter-industry Specialisation versus Intra-industry Trade: A Regional Approach," *International Economics*, Vol. LIV, No.3, August, pp. 299-324.

Amiti, M. (1998), "New Trade Theories and Industrial Location in the EU: A Survey of Evidence," *Oxford Review of Economic Policy*, Vol. 14, No 2.

--- (1999), "Specialization Patterns in Europe," *Weltwirtschaftliches Archiv*, Vol. 135.

Aquino, A. (1981), "Intra-Industry Trade and Inter-industry Specialization as Concurrent Sources of International Trade in Manufactures," *Weltwirtschaftliches Archiv*, Vol. 114.

--- (1999), "Aspetti Empirici Essenziali del Processo di Globalizzazione," in Acocella, N., *Globalizzazione e Stato Sociale*, (ed.) Il Mulino.

Ariovich, G. (1979), "The comparative advantage of South Africa as revealed by export shares," *South African Journal of Economics* 47, 2: pp. 188-197.

Aturupane, C., Djankov, S. and Hoekman, B. (1997), "Determinants of Intra-Industry Trade between East and West Europe," CEPR Discussion Paper 1721.

Aturupane, C., Djankov, S. and Hoekman, B. (1999), "Horizontal and Vertical Intra-Industry Trade between Eastern Europe and the European Union," *Weltwirtschaftliches Archiv*, Vol. 135, No. 1.

Balassa, B. (1965), "Trade Liberalisation and Revealed Comparative Advantage," The Manchester School of Economics and Social Sciences, 33.

Blanes, J.V. and Martín, C. (2000), "The Nature and Causes of Intra-Industry Trade: Back to the Comparative Advantage Explanation? The Case of Spain," *Weltwirtschaftliches Archiv*, Vol. 136, No. 3.

Brülhart, M. (1998), "Economic Geography, Industry Location and Trade: The Evidence," *The World Economy*, Vol. 21.

Brülhart, M. and Hine, R.C. (1999), "Vertical and horizontal intra-industry trade: an analysis of country- and industry-specific determinants," Macmillan Press, London.

Brülhart, M. and Elliott, R. J. R. (2002), "Labor-Market Effects of Intra-Industry Trade: Evidence for the United Kingdom," *Weltwirtschaftliches Archiv*, Vol. 138, No. 2, pp. 207-228.

Crafts, N.F.R. (1989), "Revealed comparative advantage in manufacturing, 1899-1950', *Journal of European Economic History 18*, 1: 127-37.

Diaz-Mora, C. (2002), 'The Role of Comparative Advantage in Trade within Industries: A Panel Data Approach for the European Union', *Weltwirtschaft Archiv*, Vol. 138, No. 2, pp. 291-316.

Donges, J.B. and Riedel, J. (1977), "The Expansion of Manufactured Exports in Developing Countries: An Empirical Assessment of Supply and Demand Issues," *Weltwirtschaftliches Archiv*, Vol. 113. .

Erkkilä, M. (1996), "Finnish Participation in the Internal Market," in Alho, K. et al. (eds.), *The Economics and Policies of Integration – A Finnish Perspective*, ETLA series A22

Falvey, R. (1981), "Commercial Policy and Intra-Industry Trade," *Journal of International Economics*, 11 (4).

Falvey, R. and Kierzkowski, H. (1987), "Product Quality, Intra-Industry Trade and (Im)perfect Competition," in Kierzkowski (ed.) *Protection and Competition in International Trade*, Oxford: Basil Blackwell.

Fidrmuc, J.D, Helmenstein, G. and Wörgötter, A. (1999), "East-West Intra-Industry Trade Dynamics," *Weltwirtschaftliches Archiv*, Vol. 135, No. 2.

Flam, H. and Helpman, E. (1987), "Industrial Policy Under Monopolistic Competition," *Journal of International Economics*, 22.

Fontagné, L. and Freudenberg, M. (1997), "Intra-Industry Trade: Methodological Issues," Document de travail CEPII, #97-01.

Greenaway, D. (1995), "Vertical and Horizontal Intra-Industry Trade: A Cross-Industry Analysis for the United Kingdom," *Economic Journal* 105 (3).

Greenaway, D. and Hine, R.C. (1991), "Intra-industry Specialization, Trade Expansion and Adjustment in the European Economic Space," *Journal of Common Market Studies*, 29 (6), December.

Greenaway, D., Hine, R., and Milner, C. (1994), "Country-Specific Factors and the Pattern of Horizontal and Vertical Intra-Industry Trade in the UK," *Weltwirtschaftliches Archiv*, Vol. 130, No. 1.

Grubel, H.G. and Lloyd, P.J. (1975), *Intra-industry Trade*, The Macmillian Press.

Heckscher, E. (1919), "The Effect of Foreign Trade on the Distribution of Income," *Ekonomisk Tidskrift*, pp. 497-512.

Hine, R.C. (1990), "Economic Integration and Inter-industry Specialisation," CREDIT Research Paper 89/6, University of Nottingham.

Hinloopen, J., and van Marrewijk, C. (2000), "On the Empirical Distribution of the Balassa Index," W. P. Erasmus University, Rotterdam.

Kaitila, V. and Widgren, M. (2001), "Revealed Comparative Advantage in Trade between the European Union and the Baltic Countries," European University Institute, Working Paper RSC 2.

Kaitila, V. (1999), "Trade and Revealed Comparative Advantage: Hungary, the Czech Republic, and the European Union," BOFIT Discussion Papers, 8.

Kaitila, V. (2001), "Accession Countries' Comparative Advantage in the Internal Market: A Trade and Factor Analysis," BOFIT Discussion Papers, 3.

Kaldor, N. (1981), "The Energy Issues," in Barker, T. and Braiilovsky V., *Oil or Industry*, London.

Krugman, P. (1991), "Increasing Returns and Economic Geography," *Journal of Political Economy*, Vol. 99.

Lovely, M. E. and Nelson, D. R. (2002), "Intra-Industry Trade as an Indicator of Labor Market Adjustment," *Weltwirtschaft Archiv,* Vol. 138, No. 2, pp. 179-206.

Maurel, F. and Sédillot, B. (1999), "A Measure of the Geographic Concentration in French Manufacturing Industries," *Regional Science & Urban Economics*.

Neven, D. (1995), "Trade Liberalization with Eastern Nations: How Sensitive?" in R. Faini and R. Portes (eds.), *European Union Trade with Eastern Europe: Adjustment and Opportunities*, CEPR.

Ohlin, B. (1933), *Interregional and International Trade*, Cambridge, MA: Harvard University Press.

Peterson, J. (1988), "Export shares and revealed comparative advantage, a study of international travel," *Applied Economics* 20, 3: 351-65.

Reza, S. (1983), "Revealed comparative advantage in the South Asian manufacturing sector: Some estimates," *Indian Economic Journal* 31, 2: 96-106.

Ricardo, D. (1817), "Principles of Political Economy and Taxation," Prometheus Books, 59 John Glenn Drive, Amherst, New York, 1996, www.econlib.org/library/Ricardo/ricPtoc.html

Sapir, A. (1996), "The Effects of Europe's Internal Market Programme on Production and Trade: A First Assessment," *Weltwirtschaftliches Archiv*.

Shaked A. and Sutton, J. (1984), "Natural Oligopolies and International Trade," in Kierzkowski (ed.) *Protection and Competition in International Trade*, Oxford: Basil Blackwell.

The Economist (2003), various issues.

Traistaru I., Nijkamp, P. and Longhi, S. (2002), "Regional Specialization and Location of Industrial Activities in Accession Countries," Working paper, 42nd ERSA Congress.

Vollrath, T.L. (1991), "A Theoretical Evaluation of Alternative Trade Intensity Measures of Revealed Comparative Advantage," *Weltwirtschaftliches Archiv*, Vol. 130, No. 2, pp. 265-279.

Yeats, A. J. (1985), "On the appropriate interpretation of the revealed comparative advantage index: implications of a methodology based on industry sector analysis," *Weltwirtschaftliches Archiv*, Vol. 121, No. 1, pp. 61-73.

Appendix

Table1. Aquino index

Aquino index	*1993*	*1994*	*1995*	*1996*	*1997*	*1998*	*1999*	*2000*	*2001*	*2002*
001 - live animals, except fish	19.05	16.42	19.00	26.37	6.35	17.82	11.41	16.56	8.89	9.65
011 - beef, fresh/chilled/frozen	0.18	0.19	0.16	0.32	2.27	0.55	0.00	0.02	0.01	0.00
012 – meat, fresh/chilled/frozen	0.90	0.36	0.28	1.75	1.24	0.65	0.13	0.28	0.16	0.09
034 - fish, live/fresh/chilled/frozen	121.59	106.52	103.85	102.92	112.05	168.87	129.06	121.32	120.56	81.73
112 - alcoholic beverages	5.99	13.87	13.44	15.51	7.29	3.32	5.33	5.14	5.96	8.67
122 - tobacco, manufactured	0.95	0.76	0.78	1.24	0.67	0.22	0.40	3.50	13.19	21.59
211 - hides/skin (ex fur) raw	326.50	560.15	545.07	9,607.65	4,981.55	3,726.88	1,623.50	938.91	782.13	403.75
232 – synthetic rubber /waste/etc.	1,113.81	1,044.34	1,286.18	1,414.79	815.35	1,140.53	695.70	512.99	615.03	842.58
247 – wood in the rough/roughly squared	39,821.69	29,536.57	32,107.04	9,902.28	31,545.48	19,418.20	22,739.41	13,745.46	28,405.21	25,391.86
248 - wood, simply worked	3,071.48	2,743.48	3,169.35	3,139.76	3,293.08	2,814.06	6,370.11	6,165.97	6,466.06	6,336.96
281 - iron ore/concentrates	279.31	248.20	256.58	293.36	157.70	149.76	196.01	74.18	71.12	58.42
282 - ferrous waste/scrap	3,038.29	2,800.12	2,737.03	3,156.25	7,341.45	10,530.36	3,564.65	2,106.80	5,318.30	7,211.14
321 - coal non-agglomerated	207.04	319.62	277.63	306.28	340.00	275.06	258.32	472.15	382.68	496.79
322 - briquettes/lignite/peat	619.92	624.79	547.92	191.87	89.90	111.14	272.74	124.05	25.06	29.53
325 - coke/semi-coke/retort carbon	117.91	136.92	238.87	178.41	537.67	377.53	245.02	94.01	849.81	2,805.95
333 - petrol./bitum. oils. crude	2,956.32	3,278.63	2,336.99	3,523.70	3,873.63	2,344.97	2,773.97	1,976.23	3,892.17	4,825.18
334 - heavy petrol/bitum. oils	1,061.26	892.01	982.96	1,307.35	708.73	633.35	2,146.60	5,350.60	4,608.78	5,386.85
343 - natural gas	6,763.71	6,991.69	6,923.07	8,973.96	11,458.87	14,313.63	7,800.49	1,192.29	27,886.98	9,125.08
512 - alcohols/phenols/derivs	112.06	250.37	332.12	247.41	795.81	420.79	447.21	550.87	573.67	613.44
522 – inorganic chemical elements/oxides/halogen salt	577.83	464.93	478.61	477.32	478.41	435.46	281.62	258.51	339.62	262.19
541 - pharmaceuticals. excl. medicaments	80.46	64.91	71.18	56.70	37.28	36.12	25.28	10.47	9.70	14.39
553 - perfume/toilet/cosmetics	3.39	2.35	2.22	2.23	1.95	3.13	8.70	9.74	6.00	5.31
562 - manufactured fertilizers	3,518.06	3,557.13	4,672.55	7,224.56	14,328.94	13,063.69	31,363.80	30,407.17	29,714.37	19,285.53
583 - monofilament rods/sticks	12.17	14.66	15.51	8.75	4.81	3.81	2.66	3.68	3.40	2.72
611 - leather	118.58	108.95	126.29	120.82	102.81	238.73	91.06	163.47	132.77	374.93
612 - leather manufactures	55.76	56.31	54.50	54.51	51.16	53.93	31.97	13.15	14.25	34.02
613 - furskins tanned/dressed	1.87	4.92	4.89	22.27	5.50	9.92	5.50	11.80	5.58	46.90
621 - materials of rubber	92.64	94.49	96.64	90.77	97.68	53.67	31.20	24.32	28.77	30.62
635 - wood manufactures	31.83	41.57	42.23	12.34	14.85	19.85	24.03	33.75	36.66	44.89
641 - paper/paperboard	771.28	1,127.68	1,441.33	167.34	145.03	209.52	153.01	130.10	111.60	79.93
653 - fabrics of man-made textile products	8.02	8.10	8.13	27.21	25.57	22.08	9.05	8.48	8.17	6.00
654 - woven textile fabric.	27.63	61.98	42.73	54.46	59.96	77.40	79.85	67.23	62.22	76.11
657 - special yarns/fabrics	76.00	57.51	67.22	23.85	16.82	18.12	9.38	10.52	10.48	20.27
658 - made-up textile articles	26.04	16.56	15.25	21.05	22.19	27.64	20.49	15.46	20.46	16.69
666 - pottery	22.33	22.11	29.50	28.91	21.69	24.41	108.50	17.68	16.68	14.43
671 - pig iron etc ferroalloy	194.95	128.79	154.51	128.94	293.38	350.52	196.10	154.65	227.90	329.98
672 - primary form of iron or steel/prods iron/steel	3,415.27	4,465.70	3,935.49	2,252.70	15,217.95	9,826.28	8,778.71	8,887.45	13,855.58	23,363.73
673 - flat rolled iron/steel prods	1,189.46	1,081.15	1,150.15	665.38	1,011.47	1,190.70	922.60	823.43	532.75	1,152.98
676 - iron/steel bars/rods/etc	669.51	580.14	862.03	299.79	377.96	243.10	229.67	124.59	176.03	260.19
678 - iron/steel wire	298.97	146.46	137.06	152.52	122.46	229.56	166.25	191.74	256.05	254.94
682 - copper	779.58	791.16	1,077.97	805.19	829.08	889.71	922.18	873.09	1,103.32	1,150.91
683 - nickel	28,313.34	29,985.25	54,632.20	27,786.18	39,012.19	13,207.33	38,486.24	12,549.50	4,691.22	8,623.62
684 - aluminium	3,306.10	3,753.12	3,058.50	2,754.39	2,588.33	2,569.95	1,095.32	634.82	957.96	956.94
686 - zinc	149.53	166.71	176.03	160.71	186.67	257.63	1,008.24	502.63	739.24	1,061.38
711 - steam generating boilers	17.43	24.00	22.79	35.19	70.93	171.04	142.35	129.32	230.45	106.18
712 - steam/vapour turbines	157.40	109.20	112.51	118.97	229.16	412.98	324.93	291.30	158.08	857.00
714 - engines non-electric.	137.61	110.71	66.82	95.32	58.58	122.85	108.92	101.12	154.47	111.86
716 - rotating electric plant	35.95	33.30	32.79	56.13	70.97	57.46	64.19	57.22	67.21	48.27
721 - agriculture machines. excl. tractors	36.72	27.13	25.46	28.82	9.38	4.45	4.15	7.41	16.67	15.99
722 - tractors	137.52	133.36	112.30	51.71	29.35	78.92	68.14	36.41	74.00	47.07
723 - civil engineering plant	7.43	7.81	8.69	15.37	15.28	16.37	31.45	13.62	21.72	15.42
724 - textile/leather machinery	24.68	30.78	38.47	43.25	30.73	28.84	40.14	29.88	16.17	19.03
725 - paper industry machinery	1.18	2.01	2.70	9.70	8.91	7.86	4.99	4.05	4.59	3.69
726 - printing industry machinery	0.98	1.56	1.76	4.81	2.49	1.83	3.70	4.13	3.02	3.32
727 - food processing machines	3.72	3.73	3.63	5.77	2.82	2.22	6.35	4.09	2.50	1.34
737 - metalworking machine	59.01	27.61	29.05	17.29	20.88	18.02	20.10	37.77	8.45	17.23
741 - industrial heat/cool equipment	6.47	15.17	23.04	12.93	5.88	6.86	11.01	15.56	19.75	13.00
744 - mechanical handling equipment	15.65	14.63	13.80	12.02	10.54	9.92	13.64	14.64	10.81	9.95
751 - office machines	17.85	21.97	22.77	15.97	16.01	14.53	12.54	7.54	6.64	13.53
752 - computer equipment	21.77	48.76	57.75	22.61	14.06	23.17	22.59	9.84	4.16	8.88
759 - office equip. parts/accs	1.95	4.57	6.03	14.21	10.27	10.52	8.87	11.18	3.68	6.88
761 - television receivers	13.33	18.99	17.19	19.69	71.10	33.05	11.84	3.72	4.63	0.53
762 - radio broadcast receiver	16.77	16.22	14.12	8.29	129.81	39.81	26.59	4.98	1.14	0.72
763 – sound/tv recorders. etc.	26.69	37.78	36.07	21.00	108.56	42.05	11.26	5.96	2.26	1.55
764 – telecom equipment.	34.01	45.89	56.62	23.66	19.20	12.46	16.98	7.54	8.67	8.22
773 - electrical distribution equip	25.35	42.63	62.17	49.10	40.19	40.63	43.71	44.60	58.84	45.13
774 - medical, etc. el diag equip	1.99	2.79	2.53	1.11	1.00	0.92	0.83	6.66	1.40	1.82
781 - passenger cars, etc.	59.33	74.22	67.72	91.11	33.48	29.97	35.98	34.28	16.94	15.11
782 – goods/service vehicles	42.41	40.14	35.15	55.30	39.86	52.60	55.81	37.89	47.92	91.60
783 - road motor vehicles.	2.80	2.80	3.09	4.83	4.72	8.12	14.17	10.44	13.65	14.32
792 – aircraft/spacecraft/etc.	2.45	2.28	2.77	25.58	44.91	39.95	354.59	359.99	123.93	84.59
793 - ships/boats/etc.	74.32	77.86	78.57	78.43	49.08	48.88	37.37	85.53	29.76	34.53
812 - sanitary/plumb/heat fixtures	4.84	4.29	3.97	3.77	3.63	7.10	6.57	7.91	7.60	8.09
841 - mens/boys clothing	70.64	61.17	79.52	80.89	91.11	138.49	170.32	47.90	39.77	22.11
842 – women/girl clothing	220.94	258.35	308.33	140.53	178.83	226.82	275.17	166.99	92.48	29.63
846 - clothing accessories	2.89	1.97	2.57	4.58	3.39	4.47	7.97	3.92	2.45	2.08
848 - headgear/non-text clothing	7.84	8.09	9.56	9.20	8.68	7.02	45.78	30.54	18.12	13.04
851 – footwear	5.33	9.30	10.45	8.31	27.43	43.48	41.27	13.63	7.30	6.28
871 - optical instruments	120.98	100.36	107.00	119.14	349.82	210.21	125.10	200.11	159.80	164.17
872 - medical/etc. instruments	5.06	3.42	4.17	4.06	3.36	2.81	4.24	3.45	3.17	4.32
881 - photographic equipment	20.41	9.08	8.78	11.67	33.58	36.23	55.04	14.39	16.92	11.79
882 - photographic supplies	1.50	2.49	2.52	2.52	4.51	4.51	3.33	1.92	2.26	2.03
884 - optical fibres	1.45	5.90	4.87	13.11	26.02	30.61	78.77	48.55	39.54	28.28

Source: Own calculations based on UN data. international trade statistics

Table 2. Balassa index, 2002

Balassa index for exports	*2002*	*Balassa index for exports*	*2002*
343 - NATURAL GAS	19489.44	848 - HEADGEAR/NON-TEXT CLOTHG	94.47
683 - NICKEL	18321.52	884 - OPTICAL FIBRES	90.38
247 - WOOD IN THE ROUGH/ ROUGHLY SQUARED	18050.48	727 - FOOD PROCESSING MACHINES	88.60
672 - PRIMARY FORM OF IRON OR STEEL /PRODS IRON/STEEL	11579.00	764 - TELECOMMS EQUIPMENT	80.60
562 - MANUFACTURED FERTILIZERS	9648.61	781 - PASSENGER CARS ETC	73.04
333 - PETROL./BITUM. OIL. CRUDE	8220.95	725 - PAPER INDUSTRY MACHINERY	68.95
334 - HEAVY PETROL/BITUM. OILS	6363.46	751 - OFFICE MACHINES	62.37
671 - PIG IRON ETC FERRO ALLOY	6154.03	726 - PRINTING INDUSTRY MACHINERY	54.46
673 – FLAT ROLLED IRON/STEEL PRODUCTS	5784.93	872 - MEDICAL/ETC INSTRUMENTS	53.06
684 - ALUMINIUM	5536.71	774 - MEDICAL. ETC. EL DIAG EQUIP	50.25
325 – COKE/SEMI-COKE/RETORT CARBON	4972.91	653 - FABRICS OF MAN-MADE TEXTILE PROD	42.71
232 - SYNTHETIC RUBBER /WASTE/ETC	4341.68	322 - BRIQUETTES/LIGNITE/PEAT	38.54
282 - FERROUS WASTE/SCRAP	4190.32	851 - FOOTWEAR	35.82
321 – COAL NON-AGGLOMERATED	4033.09	001 - LIVE ANIMALS. EXCL. FISH	34.65
712 - STEAM/VAPOUR TURBINES	3230.08	752 - COMPUTER EQUIPMENT	30.69
682 - COPPER	2582.81	881 - PHOTOGRAPHIC EQUIPMENT	28.89
248 - WOOD SIMPLY WORKED	2578.07	882 - PHOTOGRAPHIC SUPPLIES	15.54
676 – IRON/STEEL BARS/RODS/ETC	2066.64	846 - CLOTHING ACCESSORIES	11.79
522 - INORG. CHEMICAL ELEMENTS/OXIDES/HALOGEN SALT	2058.76	012 - MEAT. NES. FRESH/CHILLED/FROZEN	7.65
686 - ZINC	1746.86	759 - OFFICE EQUIP PARTS/ACCS.	7.46
512 - ALCOHOLS/PHENOLS/DERIVS	1728.66	762 - RADIO BROADCAST RECEIVER	5.92
281 - IRON ORE/CONCENTRATES	1461.93	763 - SOUND/TV RECORDERS. ETC	4.09
711 - STEAM GENERATING BOILERS	1203.70	761 - TELEVISION RECEIVERS	3.37
034 - FISH. LIVE/FRESH/CHILLED/FROZEN	1095.25	011 - BEEF. FRESH/CHILLED/FROZEN	0.03
678 – IRON/STEEL WIRE	1087.49		
641 - PAPER/PAPERBOARD	856.48		
714 - ENGINES NON-ELECTRIC	800.98		
654 - WOVEN TEXTILE FABRIC	730.94		
793 – SHIPS/BOATS/ETC	696.92		
211 - HIDE/SKIN (EXCL. FUR). RAW	636.23		
782 - GOODS/SERVICE VEHICLES	565.41		
721 - AGRICULTURE MACHINES. EXCL TRACTORS	443.84		
611 - LEATHER	437.65		
737 - METALWORKING MACHINE	425.76		
871 - OPTICAL INSTRUMENTS	370.80		
783 – ROAD MOTOR VEHICLES	347.49		
122 - TOBACCO. MANUFACTURED	335.80		
716 - ROTATING ELECTRIC PLANT	317.81		
723 – CIVIL ENGINEERING PLANT	313.00		
741 - INDUST HEAT/COOL EQUIPMENT	276.40		
635 - WOOD MANUFACTURES	251.80		
792 - AIRCRAFT/SPACECRAFT/ETC	236.78		
722 – TRACTORS	232.36		
657 - SPECIAL YARNS/FABRICS	229.81		
613 - FURSKINS TANNED/DRESSED	228.51		
621 - MATERIALS OF RUBBER	225.05		
773 - ELECTRICAL DISTRIB EQUIPMENT	221.13		
112 - ALCOHOLIC BEVERAGES	198.26		
744 - MECHANICAL HANDLING EQUIPMENT	180.34		
666 - POTTERY	167.59		
658 - MADE-UP TEXTILE ARTICLES	159.28		
612 - LEATHER MANUFACTURES	158.68		
812 - SANITARY/PLUMB/HEAT FIXTURES	148.75		
553 - PERFUME/TOILET/COSMETICS	145.15		
842 - WOMEN/GIRL CLOTHING	126.19		
724 - TEXTILE/LEATHER MACHINERY	117.41		
541 - PHARMACEUTICALS. EXCL. MEDICAMENTS	113.04		
841 – MENS/BOYS CLOTHING	104.39		
583 - MONOFILAMENT RODS/STICKS	101.45		

Source: Own calculations using UN data, international trade statistics

Table 3. Balassa indices for exports and imports, 2002

Balassa indices for exports and imports	*2002 Exports (Y)*	*2002 Imports (X)*		*2002 Exports (Y)*	*2002 Imports (X)*
001 - LIVE ANIMALS EXCEPT FISH	34.7	359.1	684 - ALUMINIUM	5536.7	578.6
011 - BEEF, FRESH/CHILLED/FROZEN	0.0	5462.8	686 - ZINC	1746.9	164.6
012 - MEAT FRESH/CHILLED/FROZEN	7.7	8276.1	711 - STEAM GENERATING BOILERS	1203.7	1133.7
034 - FISH.LIVE/FRESH/CHILLED/FROZEN	1095.2	1340.1	712 - STEAM/VAPOUR TURBINES	3230.1	376.9
112 - ALCOHOLIC BEVERAGES	198.3	2287.4	714 - ENGINES NON-ELECTRIC	801.0	716.0
122 - TOBACCO. MANUFACTURED	335.8	1555.3	716 - ROTATING ELECTR PLANT	317.8	658.4
211 - HIDE/SKIN (EX FUR) RAW	636.2	157.6	721 - AGRIC MACHINE EX TRACTOR	443.8	2775.5
232 - RUBBER SYNTH/WASTE/ETC	4341.7	515.3	722 - TRACTORS	232.4	493.6
247 - WOOD IN ROUGH/SQUARED	18050.5	71.1	723 - CIVIL ENGINEERING PLANT	313.0	2029.9
248 - WOOD SIMPLY WORKED	2578.1	40.7	724 - TEXTILE/LEATHER MACHINERY	117.4	616.9
281 - IRON ORE/CONCENTRATES	1461.9	2502.7	725 - PAPER INDUSTRY MACHINERY	69.0	1866.7
282 - FERROUS WASTE/SCRAP	4190.3	58.1	726 - PRINTING INDUSTRY MACHINE	54.5	1640.0
321 - COAL NON-AGGLOMERATED	4033.1	811.8	727 - FOOD PROCESSING MACHINES	88.6	6624.7
322 - BRIQUETTES/LIGNITE/PEAT	38.5	130.5	737 - METALWORKING MACHINE	425.8	2471.3
325 - COKE/SEMI-COKE/RETORT C	4972.9	177.2	741 - INDUST HEAT/COOL EQUIPMT	276.4	2126.8
333 - PETROL./BITUM. OIL.CRUDE	8220.9	170.4	744 - MECHANICAL HANDLING EQUI	180.3	1813.0
334 - HEAVY PETROL/BITUM OILS	6363.5	118.1	751 - OFFICE MACHINES	62.4	461.0
343 - NATURAL GAS	19489.4	213.6	752 - COMPUTER EQUIPMENT	30.7	345.7
512 - ALCOHOLS/PHENOLS/DERIVS	1728.7	281.8	759 - OFFICE EQUIP PARTS/ACCS.	7.5	108.4
522 – INORG CHEMIC ELEMENTS/OXIDES/ SALT	2058.8	785.2	761 - TELEVISION RECEIVERS	3.4	637.2
541 - PHARMACEUT EXC MEDICAMNT	113.0	785.8	762 - RADIO BROADCAST RECEIVER	5.9	827.5
553 - PERFUME/TOILET/COSMETICS	145.1	2732.2	763 - SOUND/TV RECORDERS ETC	4.1	263.2
562 - MANUFACTURED FERTILIZERS	9648.6	50.0	764 - TELECOMMS EQUIPMENT	80.6	981.0
583 - MONOFILAMENT RODS/STICKS	101.4	3729.4	773 - ELECTRICAL DISTRIB EQUIPM	221.1	490.0
611 - LEATHER	437.6	116.7	774 - MEDICAL ETC EL DIAG EQUIPM	50.2	2762.4
612 - LEATHER MANUFACTURES	158.7	466.4	781 - PASSENGER CARS ETC	73.0	483.3
613 - FURSKINS TANNED/DRESSED	228.5	487.2	782 - GOODS/SERVICE VEHICLES	565.4	617.2
621 - MATERIALS OF RUBBER	225.0	735.0	783 - ROAD MOTOR VEHICLES NES	347.5	2426.0
635 - WOOD MANUFACTURES N.E.S.	251.8	560.9	792 - AIRCRAFT/SPACECRAFT/ETC	236.8	279.9
641 - PAPER/PAPERBOARD	856.5	1071.6	793 - SHIPS/BOATS/ETC	696.9	2018.0
653 - FABRICS OF MAN-MADE TEXT-PRODUCT	42.7	712.1	812 - SANITARY/PLUMB/HEAT FIXT	148.8	1839.2
654 - WOVEN TEXTILE FABRIC	730.9	960.4	841 - MENS/BOYS CLOTHING	104.4	472.2
657 - SPECIAL YARNS/FABRICS	229.8	1133.6	842 - WOMEN/GIRL CLOTHING	126.2	425.9
658 - MADE-UP TEXTILE ARTICLES	159.3	954.1	846 - CLOTHING ACCESSORIES	11.8	567.9
666 - POTTERY	167.6	1161.2	848 - HEADGEAR/NON-TEXT CLOTH	94.5	724.3
671 - PIG IRON ETC FERRO ALLOY	6154.0	1864.9	851 - FOOTWEAR	35.8	570.1
672 - PRIMARY/PRODS IRON/STEEL	11579.0	49.6	871 - OPTICAL INSTRUMENTS	370.8	225.9
673 - FLAT ROLLED IRON/ST PROD	5784.9	501.7	872 - MEDICAL/ETC INSTRUMENTS	53.1	1228.5
676 - IRON/STEEL BARS/RODS/ETC	2066.6	794.3	881 - PHOTOGRAPHIC EQUIPMENT	28.9	245.1
678 - IRON/STEEL WIRE	1087.5	426.6	882 - PHOTOGRAPHIC SUPPLIES	15.5	764.3
682 - COPPER	2582.8	224.4	884 - OPTICAL FIBRES	90.4	319.6
683 - NICKEL	18321.5	212.5			

Source: Own calculations on UN data, International trade statistics

Table 4. Grubel-Lloyd index per product, time series

Grubel Lloyd	*Value 1993*	*Value 1994*	*Value 1995*	*Value 1996*	*Value 1997*	*Value 1998*	*Value 1999*	*Value 2000*	*Value 2001*	*Value 2002*
001 - LIVE ANIMALS EXCEPT FISH	0.39	0.37	0.44	0.49	0.16	0.36	0.34	0.54	0.29	0.31
011 - BEEF. FRESH/CHILLED/FROZEN	0.00	0.00	0.00	0.00	0.02	0.01	0.00	0.00	0.00	0.00
012 - MEAT FRESH/CHILLED/FROZEN	0.06	0.02	0.02	0.06	0.02	0.02	0.00	0.01	0.01	0.00
034 - FISH.LIVE/FRESH/CHILLED/FROZEN	0.68	0.69	0.68	0.75	0.84	0.76	0.69	0.63	0.71	0.93
112 - ALCOHOLIC BEVERAGES	0.15	0.31	0.31	0.35	0.18	0.08	0.20	0.23	0.21	0.27
122 - TOBACCO. MANUFACTURED	0.06	0.05	0.05	0.07	0.02	0.01	0.02	0.17	0.44	0.57
211 - HIDE/SKIN (EX FUR) RAW	0.37	0.23	0.24	0.05	0.03	0.04	0.06	0.09	0.13	0.25
232 - RUBBER SYNTH/WASTE/ETC	0.14	0.13	0.13	0.12	0.18	0.17	0.19	0.20	0.20	0.15
247 - WOOD IN THE ROUGH/SQUARED	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.01
248 - WOOD SIMPLY WORKED	0.05	0.06	0.05	0.05	0.07	0.06	0.02	0.02	0.02	0.02
281 - IRON ORE/CONCENTRATES	0.53	0.61	0.62	0.56	0.83	0.81	0.53	0.89	0.95	0.88
282 - FERROUS WASTE	0.06	0.06	0.07	0.06	0.03	0.02	0.03	0.05	0.02	0.02
321 - COAL NON-AGGLOMERATED	0.60	0.51	0.51	0.47	0.47	0.46	0.34	0.18	0.26	0.23
322 - BRIQUETTES/LIGNITE/PEAT	0.04	0.04	0.04	0.19	0.25	0.19	0.04	0.07	0.40	0.34
325 - COKE/SEMI-COKE/RETORT CARBON	0.33	0.34	0.32	0.32	0.16	0.15	0.23	0.33	0.09	0.04
333 - PETROL./BITUM. OIL.CRUDE	0.08	0.07	0.09	0.08	0.07	0.09	0.04	0.05	0.04	0.03
334 - HEAVY PETROL/BITUM OILS	0.11	0.13	0.14	0.11	0.23	0.23	0.05	0.01	0.02	0.02
343 - NATURAL GAS	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.06	0.00	0.02
512 - ALCOHOLS/PHENOLS/DERIVS	0.84	0.60	0.60	0.54	0.22	0.34	0.23	0.17	0.20	0.19
522 - INORG CHEMIC ELEMENTS/OXIDES/ SALT	0.32	0.34	0.35	0.30	0.33	0.34	0.35	0.32	0.31	0.38
541 - PHARMACEUT EXC MEDICAMNT	0.94	0.95	0.94	0.82	0.58	0.60	0.63	0.37	0.29	0.39
553 - PERFUME/TOILET/COSMETICS	0.10	0.06	0.05	0.06	0.05	0.08	0.29	0.38	0.21	0.18
562 - MANUFACTURED FERTILIZERS	0.04	0.04	0.04	0.04	0.01	0.01	0.00	0.00	0.00	0.01
583 - MONOFILAMENT RODS/STICKS	0.23	0.29	0.36	0.17	0.12	0.09	0.10	0.16	0.12	0.11
611 - LEATHER	0.90	0.88	0.77	0.80	0.94	0.54	0.78	0.44	0.63	0.29
612 - LEATHER MANUFACTURES	0.95	0.97	0.98	0.97	0.81	0.89	0.87	0.57	0.44	0.83
613 - FURSKINS TANNED/DRESSED	0.09	0.20	0.19	0.45	0.13	0.22	0.17	0.36	0.16	0.82
621 - MATERIALS OF RUBBER	0.64	0.60	0.63	0.93	0.95	0.81	0.74	0.71	0.69	0.67
635 - WOOD MANUFACTURES	0.61	0.72	0.72	0.30	0.30	0.39	0.62	0.87	0.81	0.87
641 - PAPER/PAPERBOARD	0.19	0.10	0.11	0.64	0.75	0.57	0.53	0.50	0.66	0.83
653 - FABRICS OF MAN-MADE TEXTILE PROD	0.21	0.21	0.20	0.51	0.46	0.42	0.27	0.32	0.24	0.20
654 - WOVEN TEXTILE FABRIC	0.84	0.83	0.96	0.89	0.86	1.00	0.78	0.77	0.93	0.83
657 - SPECIAL YARNS/FABRICS	0.86	0.99	0.98	0.48	0.33	0.38	0.31	0.40	0.33	0.53
658 - MADE-UP TEXTILE ARTICLES	0.49	0.32	0.28	0.43	0.42	0.50	0.54	0.51	0.54	0.44
666 - POTTERY	0.43	0.44	0.54	0.53	0.37	0.42	0.73	0.51	0.40	0.35
671 - PIG IRON ETC FERRO ALLOY	0.59	0.63	0.64	0.86	0.57	0.50	0.48	0.49	0.44	0.36
672 – PRIMARY FORM IRON/PRODS IRON/STEEL	0.04	0.03	0.03	0.05	0.01	0.02	0.01	0.01	0.01	0.00
673 - FLAT ROLLED IRON/STEEL PROD	0.18	0.19	0.20	0.21	0.16	0.14	0.12	0.11	0.20	0.10
676 - IRON/STEEL BARS/RODS/ETC	0.22	0.25	0.22	0.42	0.36	0.50	0.39	0.53	0.46	0.34
678 - IRON/STEEL WIRE	0.40	0.45	0.74	0.80	0.84	0.54	0.52	0.41	0.39	0.39
682 - COPPER	0.14	0.16	0.12	0.14	0.18	0.16	0.11	0.10	0.10	0.10
683 - NICKEL	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.01	0.02	0.01
684 - ALUMINIUM	0.04	0.04	0.05	0.06	0.07	0.06	0.10	0.13	0.11	0.12
686 - ZINC	0.65	0.66	0.66	0.67	0.66	0.51	0.10	0.17	0.15	0.11
711 - STEAM GENERATING BOILERS	0.41	0.52	0.46	0.66	0.98	0.65	0.56	0.52	0.39	0.72
712 - STEAM/VAPOUR TURBINES	0.76	0.73	0.88	0.78	0.57	0.34	0.31	0.27	0.52	0.12
714 - ENGINES NON-ELECTRIC	0.81	0.91	0.96	0.89	0.81	0.78	0.64	0.58	0.48	0.63
716 - ROTATING ELECTR PLANT	0.61	0.62	0.61	0.82	0.87	0.78	0.96	0.91	0.94	0.85
721 - AGRIC MACHINE EX TRACTR	0.66	0.51	0.51	0.50	0.20	0.11	0.14	0.30	0.48	0.46
722 - TRACTORS	0.71	0.72	0.73	0.83	0.53	0.99	0.84	0.93	0.83	0.92
723 - CIVIL ENGINEERING PLANT	0.22	0.21	0.20	0.35	0.34	0.38	0.78	0.52	0.65	0.48
724 - TEXTILE/LEATHER MACHINERY	0.54	0.63	0.70	0.73	0.52	0.51	0.85	0.79	0.45	0.48
725 - PAPER INDUSTRY MACHINERY	0.04	0.06	0.06	0.25	0.19	0.17	0.17	0.18	0.16	0.13
726 - PRINTING INDUSTRY MACHINERY	0.05	0.07	0.07	0.12	0.06	0.05	0.13	0.18	0.11	0.11
727 - FOOD PROCESSING MACHINES	0.09	0.09	0.11	0.11	0.07	0.06	0.22	0.18	0.10	0.05
737 - METALWORKING MACHINE	0.60	0.32	0.32	0.37	0.38	0.35	0.53	0.93	0.27	0.47
741 - INDUST HEAT/COOL EQUIPMENT	0.28	0.52	0.51	0.30	0.13	0.16	0.34	0.54	0.55	0.38
744 - MECHANICAL HANDLING EQUIPMENT	0.31	0.27	0.27	0.26	0.23	0.22	0.42	0.52	0.35	0.32
751 - OFFICE MACHINES	0.36	0.43	0.42	0.32	0.28	0.27	0.35	0.28	0.21	0.32
752 - COMPUTER EQUIPMENT	0.53	0.84	0.83	0.41	0.26	0.40	0.52	0.32	0.12	0.23
759 - OFFICE EQUIP PARTS/ACCS.	0.08	0.16	0.15	0.28	0.19	0.20	0.25	0.38	0.11	0.19
761 - TELEVISION RECEIVERS	0.46	0.59	0.58	0.31	0.97	0.59	0.37	0.17	0.16	0.02
762 - RADIO BROADCAST RECEIVER	0.15	0.15	0.15	0.14	0.94	0.52	0.52	0.15	0.03	0.02
763 - SOUND/TV RECORDERS ETC	0.52	0.70	0.69	0.36	0.96	0.63	0.32	0.21	0.07	0.04
764 - TELECOMMS EQUIPMENT	0.86	0.87	0.83	0.46	0.36	0.26	0.46	0.28	0.26	0.25
773 - ELECTRICAL DISTRIB EQUIPMENT	0.45	0.65	0.73	0.76	0.60	0.62	0.85	0.98	1.00	0.84
774 - MEDICAL ETC EL DIAG EQUIPMENT	0.03	0.07	0.07	0.03	0.03	0.02	0.03	0.28	0.05	0.06
781 - PASSENGER CARS ETC	0.97	0.86	0.79	0.66	0.58	0.55	0.81	0.88	0.48	0.43
782 - GOODS/SERVICE VEHICLES	0.74	0.73	0.67	0.87	0.66	0.80	0.99	0.93	0.94	0.77
783 - ROAD MOTOR VEHICLES	0.15	0.14	0.14	0.24	0.12	0.21	0.45	0.42	0.45	0.47
792 - AIRCRAFT/SPACECRAFT/ETC	0.09	0.08	0.10	0.65	0.80	0.79	0.22	0.18	0.53	0.71
793 - SHIPS/BOATS/ETC	0.69	0.64	0.65	0.47	0.91	0.79	0.76	0.37	0.85	0.81
812 - SANITARY/PLUMB/HEAT FIXT	0.12	0.11	0.10	0.11	0.09	0.17	0.23	0.33	0.25	0.25
841 - MENS/BOYS CLOTHING	0.95	0.87	1.00	0.99	1.00	0.76	0.52	0.99	0.82	0.50
842 - WOMEN/GIRL CLOTHING	0.45	0.42	0.35	0.64	0.72	0.59	0.37	0.48	0.86	0.60
846 - CLOTHING ACCESSORIES	0.12	0.08	0.12	0.16	0.08	0.11	0.26	0.17	0.08	0.07
848 - HEADGEAR/NON-TEXT CLOTHING	0.16	0.16	0.18	0.21	0.16	0.14	0.83	0.72	0.42	0.32
851 - FOOTWEAR	0.14	0.22	0.22	0.26	0.39	0.59	0.74	0.38	0.18	0.15
871 - OPTICAL INSTRUMENTS	0.77	0.82	0.85	0.76	0.35	0.47	0.52	0.37	0.58	0.65
872 - MEDICAL/ETC INSTRUMENTS	0.16	0.10	0.10	0.11	0.08	0.07	0.14	0.14	0.11	0.14
881 - PHOTOGRAPHIC EQUIPMENT	0.55	0.27	0.26	0.30	0.53	0.57	0.96	0.49	0.46	0.32
882 - PHOTOGRAPHIC SUPPLIES	0.04	0.06	0.06	0.07	0.10	0.10	0.11	0.08	0.08	0.07
884 - OPTICAL FIBRES	0.06	0.15	0.14	0.30	0.47	0.55	0.82	0.93	0.85	0.67

The products for which the index is greater than 0.5 are highlighted

Source: Own calculations on UN data. international trade statistics

Table 5. Russia's horizontal and vertical intra-industry trade

VIIT (low-quality products) in Russia	*1993*	*1994*	*1995*	*1996*	*1997*	*1998*
001 - live animals except fish	…	…	…	0,42	0,09	0,22
011 - beef, fresh/chilled/frozen	…	…	…	0,01	0,00	0,0
012 meat fresh, chilled, frozen	0	0	0	0,02	0,01	…
034 fish, fresh, frozen	0,51	0,53	0,52	0,61	0,72	1,6
112 alcoholic beverages	0,08	0,19	0,18	0,21	0,10	0,04
121 tobacco	0,03	0,03	0,03	0,00	0,00	0,00
541 medicinal, pharm products	0,11	0,09	0,09	0,1	0,07	0,07
553 parfumery, cosmetics	0	0	0	0,03	0,03	0,04
584 cellulose derivatives	0,07	0,1	0,1	0,12	0,05	0,06
613 fur skins tanned, dressed	1,3	0,26	0,25	0,29	0,07	0,12
635 woods manifactures	9,02	6,33	6,43	0,18	0,22	0,24
653 fabrics of man-made textile products	0,2	0,3	0,3	0,35	0,3	0,26
657 special txtl fabrc, products	0,46	0,27	0,27	0,31	0,2	0,23
658 texile articles	0,2	0,29	0,24	0,28	0,26	0,34
666 pottery	0,14	0,31	0,31	0,36	0,23	0,26
678 iron, steel tubes, pipes	0,33	0,28	3,64	0,32	0,21	0,25
716 rotating electric plant	0,88	0,61	0,6	0,7	0,76	0,64
721 agric machines	0,26	0,29	0,29	0,33	0,11	0,06
722 tractors non road	1,23	0,62	0,61	0,71	0,36	1,02
723 civil engneer equip.	0,1	0,15	0,15	0,17	0,16	0,18
725 paper etc mill machinery	0,21	0,12	0,12	0,14	0,11	0,1
726 printing machines	0,02	0,06	0,06	0,07	0,03	0,02
727 food machines non domestic	0,08	0,05	0,05	0,06	0,03	0,03
736 metalworking mach-tools	0,22	0,34	0,34	0,39	0,42	0,45
741 heating, cooling equip.	0,18	0,15	0,15	0,18	0,07	0,09
744 mechanical handling equip.	0,16	0,17	0,17	0,2	0,18	0,19
751 office machines	0,07	0,17	0,16	0,19	0,16	0,16
752 computer equipment	0,11	0,22	0,22	0,26	0,15	0,25
759 office equip. parts/ accs.	0,1	0,14	0,14	0,16	0,11	0,11
761 television receivers	0,17	0,16	0,16	0,19	0,94	0,42
762 radio broadcast	0,04	0,07	0,07	0,08	1,12	0,35
763 sound / TV recorders	0,12	0,19	0,19	0,22	1,09	0,46
764 telecomms equipment	0,31	0,26	0,25	0,3	0,22	0,15
773 elettric distributing equip.	0,26	0,61	0,6	0,7	0,55	0,45
774 elettro medical equip.	0,02	0,01	0,01	0,02	0,01	0,01
781 - passenger cars	…	…	…	2,04	0,41	0,38
812 plumbing, heating, lighting equip.	0,12	0,1	0,1	0,11	0,07	…
84 clothing and accessories	…	…	…	0,69	0,58	…
851 footwear	0,07	0,13	0,12	0,15	0,25	0,42
872 medical instruments	0,09	0,05	0,05	0,06	0,04	0,03
881 photo apparat	0,38	0,16	0,15	0,18	0,36	0,39
882 photo, cinema supplies	0,02	0,03	0,03	0,04	0,05	0,05
884 optical goods	0,03	0,08	0,08	0,09	0,15	0,38

Source: Own calculations on UN data

VIIT (high-quality products) in Russia	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**
212 furskins, raw	4,44	7,61	7,49	8,72	6,51	5,02
233 synthetic rubber	2,48	1,42	1,39	1,62	1,32	1,86
247 other wood, rough squared	3,89	2,82	3,02	1,49	1,45	1,6
248 wood shaped, sleepers	3,78	3,19	3,73	3,73	2,74	3,2
281 iron ore, concentrates	2,77	2,25	2,22	2,59	1,41	1,46
282 iron and steel scrap	3,48	2,98	2,92	3,42	5,68	1,39
322 coal lignite and peat	2,34	2,94	2,9	3,38	3,31	3,4
323 briquets, coke, semi-coke	4,57	4,55	4,49	5,21	5,75	2,17
325 coke/semi-coke/retort carbon	…	…	…	5,18	11,87	12,16
333 crude petroleum	…	0	0	2,54	2,56	2,15
334 petroleum products	1,64	1,40	1,37	1,60	1,96	1,79
341 gas, natural and manuf.	1,84	1,88	1,87	2,01	1,35	1,78
512 organic chemicals: alcohols	1,39	2,35	2,32	2,7	8,19	4,83
522 inorganic chemicals, oxides	5,31	4,85	4,78	5,56	5,08	4,8
562 fertilizers	4,79	4,88	5,45	5,3	6,39	7,47
641 paper, paperbord	1,16	1,83	1,8	2,1	1,62	2,53
671 pig iron	…	1,16	1,14	1,33	2,52	3,02
672 iron, steel, primary form	1,42	2,23	2,20	2,56	2,58	…
673 iron, steel shaped	…	3,24	3,19	3,72	4,61	2,95
676 railway rails etc iron, steel	1,11	1,1	1,09	1,26	2,6	4,1
682 copper exc cement copper	11,2	11,94	11,76	13,69	10	11,17
683 nickel	5,87	4,83	6,039	3,813	4,89	1,63
684 aluminium	…	…	1,49	3,31	2,92	3,05
711 steam boilers & aux plnt	0,68	0,42	0,42	0,49	0,96	2,08
712 steam engines, turbines	1,66	1,36	0,75	1,56	2,51	4,88
714 engines and motors	1,08	1,09	1,07	1,25	0,69	1,56
793 ships and boats	2,17	2,84	2,81	3,48	1,52	1,53
871 optical instruments	1,58	1,18	1,16	1,35	2,66	3,25

HIIT in Russia	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**
621 materials of rubber	1,05	0,99	0,98	1,14	1,09	0,67

Table 6. Leading Russian exporting companies, 2001

2001	*2000*	*Position*	*Companies*	*Branch*	*Region*	*Volume of exports $ million 2001*	*Volume of exports $ million 2000*	*Relative export growth (%)*	*Number of supplies in 2001*	*Importer countries in 2001*
1	1	1	Gazprom*	Oil and gas industry		16.400	13.900	17.99	1.932	27
2	2	2	OC LUKoil*	Oil and gas industry		6.624.5	6.218.1	6.54	4.272	32
3	3	4	OC YUKOS*	Oil and gas industry		5.682.2	5.247.5	8.28	4.851	40
4	4	7	Tyumen Oil Company*	Oil and gas industry		5.597.3	3.477.5	60.96	2.020	40
5	8	5	Surgutneftegas*	Oil and gas industry		2.356	1.700.5	38.55	2.044	13
6	7		Russian Aluminium*	Non-ferrous metallurgy		2.231.2	2.161.6	3.22	10.332	52
7	5	8	Tatneft*	Oil and gas industry	Tatarstan	2.136	2.629.5	-18.77	2.572	43
8	12	10	OGC Slavneft*	Oil and gas industry		1.762.7	1.261.6	39.72	1.522	25
9	6	6	MMC Norilsk Nickel*	Non-ferrous metallurgy		1.754.5	2.246.9	-21.91	996	23
10	9	11	OC Sibneft*	Oil and gas industry		1.650.7	1.699.9	-2.9	2.158	29
11	10	9	OC Rosneft*	Oil and gas industry		1.346.7	1.298.5	3.71	996	no data
12	13	14	SC Alrosa	Non-ferrous metallurgy	Yakutia	1.173.5	883.8	32.78	109	8
13	15	18	OSC Bashneft*	Oil and gas industry	Bashkiria	871.7	858.7	1.52	253	21
14	16	15	Magnitogorsk Iron and Steel Works	Ferrous metallurgy	Chelyabinsk region	827.4	849.2	-2.57	6.216	72
15	14	16	Novolipetsky Metallurgical Combine	Ferrous metallurgy	Lipetsk region	697	857	-18.67	16.524	86
16	36	19	SC Sibur*	Chemical and petrochemical industry		690.4	179.3	285.07	10.018	66
17	11	13	Severstal*	Ferrous metallurgy	Vologda region	667.7	1.066.7	-37.41	13.554	98
18	22	23	SUAL-Holding*	Non-ferrous metallurgy		575.3	506.4	13.61	6.112	40
19	20	21	TVEL*	Machine-building industry		538	458	17.47	237	23
20	23		Eurasholding*	Ferrous metallurgy		505.5	470.8	7.36	8.450	42
21	19		ITERA Holding*	Oil and gas industry		435.1	641.9	-32.22	143	6
22		42	HC Kuzbassrazrezugol*	Coal industry	Kemerovo region	375.7	205.6	82.73	3.170	24
23	26	24	Nizhnekamsk Oil Refinery	Chemical and petrochemical industry	Tatarstan	355.4	415.8	-14.53	6.918	44
24	25		Ural Mining and Smelting Company*	Non-ferrous metallurgy		352.7	424.3	-16.87	3.441	36
25	30	31	MHC Metalloinvest*	Ferrous metallurgy		328.8	257.6	27.66	2.924	47

Source: Expert RA, 2003

Only the top 25 companies are reported above. Other exporting enterprises can be found at www.raexpert.ru
* Companies' holdings, consolidated data for all holding companies.

2003

No 4 Byung-Yeon Kim and Jukka Pirttilä: The political economy of reforms: Empirical evidence from post-communist transition in the 1990s

No 5 Tuomas Komulainen and Johanna Lukkarila: What drives financial crises in emerging markets? *Published in:Emerging Markets Review vol 4, no 3 (2003) pp. 248-272, ISSN 1566-0141.*

No 6 Jarko Fidrmuc and Iikka Korhonen: The Euro goes East: Implications of the 2000-2002 economic slowdown for synchronisation of business cycles between the euro area and CEEs. *Published in: Comparative Economic Studies vol. 46 no 1 (2004) pp. 45-62, ISSN 0888-7233.*

No 7 Derek C. Jones, Panu Kalmi and Niels Mygind: Choice of ownership structure and firm performance: Evidence from Estonia

No 8 Michael Funke and Ralf Ruhwedel: Export variety and economic growth in East European transition economies

No 9 Laura Solanko: An empirical note on growth and convergence across Russian regions

No 10 Michael Funke and Holger Strulik: Taxation, growth and welfare: Dynamic effects of Estonia's 2000 income tax act

No 11 Jörg Rahn: Bilateral equilibrium exchange rates of EU accession countries against the euro

No 12 Toni Riipinen: Energy market liberalisation in the FSU–simulations with the GTAP model

No 13 Natalia Smirnova: Job search behavior of unemployed in Russia

No 14 Jesús Crespo-Cuaresma, Jarko Fidrmuc and Ronald MacDonald: The monetary approach to exchange rates in the CEECs. *Published in: Economics of Transition, ISSN 0967-0750 (forthcoming)*

No 15 Julius Horvath: Optimum currency area theory: A selective review

No 16 Pertti Haaparanta, Tuuli Juurikkala, Olga Lazareva, Jukka Pirttilä, Laura Solanko and Ekaterina Zhuravskaya: Firms and public service provision in Russia

No 17 Michael Funke and Ralf Ruhwedel: Trade, product variety and welfare: A quantitative assessment for the transition economies in Central and Eastern Europe.

2004

No 1 Balázs Égert: Assessing equilirium exchange rates in CEE acceding countries: Can we have DEER with BEER without FEER? A critical survey of the literature

No 2 Leena Kerkelä: Distortion costs and effects of price liberalisation in Russian energy markets: A CGE analysis

No 3 Julius Horvath and Stanislav Vidovic: Price variability and the speed of adjustment to the law of one price: Evidence from Slovakia

No 4 Pertti Haaparanta and Mikko Puhakka: Endogenous time preference, investment and development traps

No 5 Iikka Korhonen and Paul Wachtel: Observations on disinflation in transition economies

No 6 Eugene Nivorozhkin: Financing choices of firms in EU accession countries

No 7 John P. Bonin, Iftekhar Hasan, Paul Wachtel: Bank performance, efficiency and ownership in transition Countries

No 8 John P. Bonin, Iftekhar Hasan, Paul Wachtel: Privatization matters: Bank efficiency in transition countries

No 9 Balázs Égert and Kirsten Lommatzsch: Equilibrium exchange rates in the transition: The tradable price-based real appreciation and estimation uncertainty

No 10 Yuko Kinoshita and Nauro F. Campos: Estimating the determinants of foreign direct investment inflows: How important are sampling and omitted variable biases?

No 11 Akram Esanov, Christian Merkl, Lúcio Vinhas de Souza: Monetary policy rules for Russia

No 12 Greetje M.M. Everaert: The political economy of restructuring and subsidisation: An international perspective

No 13 Igor Vetlov: The Lithuanian block of the ECSB multi-country model

No 14 Michael Funke and Jörgen Rahn: Just how undervalued is the Chinese renminbi. *Published in: World Economy (forthcoming)*

No 15 Steven Rosefielde: An abnormal country

No 16 Juha-Pekka Koskinen, Tuuli Koivu and Abdur Chowdhury: Selecting inflation indicators under an inflation targeting regime: Evidence from the MCL method

No 17 Anna Dorbec: Liquidity provision in transition economy: the lessons from Russia

No 18 Iikka Korhonen: Does democracy cure a resource curse?

No 19 Bernadina Algieri: Trade specialisation patterns:The case of Russia

Bank of Finland
BOFIT – Institute for Economies in Transition
PO Box 160
FIN-00101 Helsinki

Phone: +358 9 183 2268
Fax: +358 9 183 2294
Email: bofit@bof.fi

www.bof.fi/bofit