The University of Bournemouth

Bournemouth Business School

Working Paper Series

PATTERNS OF SPECIALISATION IN THE INTERNATIONAL TRADE OF FORMER SOVIET ECONOMIES

Jenifer Piesse

Allen Webster

Authors and affiliation:

Jenifer Piesse

Bournemouth University Business School

Email: jpiesse@bournemouth.ac.uk

and University of Stellenbosch, South Africa

Allan Webster

Bournemouth University Business School

Email: awebster@bournemouth.ac.uk

Abstract

This paper investigates patterns of comparative advantage and export specialisation in a selection of former Soviet states, some of which have natural resource endowments while others do not. For the former, common patterns of specialisation is found in the export of raw materials, both directly and embodied in the goods that make intensive use of them. The latter group are more limited and there exists only a small range of manufactures for which there are common patterns of advantage, most of which are intensive in skilled labour. Bilateral factor content of trade between each of the countries is also examined and many are found to be competitive outside the sample rather than with each other, which makes the creation of a customs union less advantageous.

JEL classification: F13, F15, F47, P33
Keywords: trade, regional integration, CIS

PATTERNS OF SPECIALISATION IN THE INTERNATIONAL TRADE OF FORMER SOVIET ECONOMIES

1. INTRODUCTION

Regional trade agreements continue to proliferate despite being economically inferior from a global perspective to non-discriminatory trade liberalization on a most-favoured-nation (MFN) basis. However, multilateral liberalisation and regional integration will continue to coexist in the future (IMF, 2005). Thus, this paper examines the pattern of specialisation in international trade for a sample of seven former Soviet countries, Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Russia and Ukraine in the context of both Customs Unions and future membership of the World Trade Organisation. This is important for a number of reasons. Firstly, the extent to which countries are competitive with each other has traditionally been seen as significant in the formation of a Customs Union, and several of these are currently in such a union. Secondly, the pattern of specialisation in trade has implications for countries who have either recently joined the WTO or are planning to do so. And finally, patterns of specialisation of these countries are of interest in their own right. Recently, improved data availability has made this region more accessible and, thus, increasingly the focus of empirical research.

Of the sample countries, three are listed as WTO members: Armenia (2003), Georgia (2000) and the Ukraine (2008), and the rest all have observer status. Media reports suggest that Russia plans to conclude negotiations on membership in the near future. With respect to international trade both economic theory and evidence predict that the liberalisation of trade expands exports of those goods in which countries have a comparative advantage and expands imports for those goods in which they have a comparative disadvantage. The current pattern of specialisation in international trade should provide some guidance as to which goods are likely to be so affected. With respect to the pattern of specialisation in different goods this should give a reasonable basis to identify short to medium term effects. Over a longer period of time WTO membership is also likely to change this pattern of specialisation. Thus, the paper also examines the current pattern of comparative advantage with respect to underlying factors of production.

Russia, Belarus and Kazakhstan formed a Customs Union in July 2010 and other former Soviet countries are also considering membership although there have been attempts to form a Customs Union amongst former Soviet economies in the past. The basic economic theory of Customs Union was proposed by Viner (1950) and remains the foundation of much more recent empirical studies of international economic integration, for example, Clausing (2001). This established theory emphasises the trade creation and trade diversion aspects of Customs Unions. Traditionally, trade creation is thought more likely where member states are competitive with each other (allowing cheaper partner country imports to replace more costly domestic production) and trade diversion more likely where they are not (risking the substitution of higher cost partner country imports for lower cost

imports from third party countries). More modern studies, for example those dealing with the European Union's single market programme such as Allen et al (1998), emphasise the potential gains from increased competition. The relevance of the pattern of export specialisation is that it helps to establish where member states or potential member states might be expected to be competitive with each other and where they are not.

The paper begins by briefly reviewing recent trading arrangements in the CIS, followed by a review of the literature on Customs Unions, particularly in the context of comparative advantage and WTO accession. Section 4 describes the data and discussion two approaches to identifying trade patterns between countries: export similarity and revealed comparative advantage. Patterns of specialisation are examined using factor content analysis based on the Heckscher-Ohlin-Vanek Model proposed by Vanek (1968), in both a single and bi-lateral form, are in Section 5. Then, the validity of these results IS confirmed using a simple gravity model. Section 6 discusses the policy implications and the final section concludes.

2. REGIONAL TRADING ARRANGEMENTS

The CIS countries have committed to several bilateral and regional trade agreements since the breakup of the Soviet Union (see Tumbarello, 2005 for details). However, these were largely driven by a wish to preserve previous trading relationships established during the Soviet era, particularly as preferential trade agreements were viewed as being mutually beneficial until market institutions could be introduced and exchange rate convertibility established and stable. Unfortunately, many of these agreements were not monitored or enforced and were de jure arrangements only. There were also numerous exceptions introduced to protect national sovereignty, for example, Kazakhstan and Russia did not include oil and gas in any trade agreement. However, these somewhat flawed arrangements have not proved fatal and more recently regional trade initiatives have been proposed and some implemented. The Eurasian Economic Community agreement between Belarus, Kazakhstan, the Kyrgyz Republic, the Russian Federation, and Tajikistan was introduced in October 2000 and in May 2003 members focused their attention on improving their customs union in order to gain accession to the WTO. Then, in September 19, 2003 Belarus, Kazakhstan, the Russian Federation, and Ukraine met to form a Common Economic Space within the next 7 years. This has three stages. The first is to harmonise trade regulations, the second is to elimination of trade barriers and create a customs union and the third is the implementation of a common customs boundary with no internal barriers to trade. This final stage also includes a regulatory institution that is common to all.

CIS member countries, with the exception of Belarus, Turkmenistan, and Uzbekistan, are generally open economies, although the degree of openness varies. Kazakhstan and the Russian Federation are more restrictive, while the CIS-5 (Armenia, Georgia, the Kyrgyz Republic, Moldova, and Tajikistan) have the most liberal trading policies, see Table 1. Despite the de jure liberal trade regimes in most of the CIS, unofficial and non-transparent barriers, including corruption, present

obstacles to liberal trade. For example, problems of transit trade include rail, roads, poor infrastructure and air transportation. Transport markets are either absent or incomplete and excepting Kazakhstan, Turkmenistan, and Russia there are few opportunities to benefit from scale economies. There are also cross country dependences, for example, despite its dominant position in gas exports to Europe, Russia still relies on the Ukrainian for a transit route and Kazakhstan needs the Russian Transneft pipeline. Thus, the tariff level is not always an obstacle to trade, rather the lack of transparent custom valuation procedures. Essentially, a policy declaration of openness does not always result in trade openness.

Table 1

3. LITERATURE REVIEW

The literature on patterns of trade and the impact on integration began with traditional customs union theory (Viner, 1950), based largely on comparative advantage. This assumed perfect competition and hence integration was of little importance as any response was a function of the effect of shifts in barriers to trade. Economies of scale were recognised as important but it was not until the notion of imperfect competition in trade that effects of integration were established (see Baldwin and Venables, 1995; Venables, 2003). In this literature, imperfect competition is either the underlying motivation for international trade or necessary to allow for product differentiation and economies of scale. By opening up competitor markets, trade liberalization increases the level of competition and changes the nature of cross border interactions resulting in economic integration. Thus, while in segmented markets prices are set nationally, in an integrated market prices are determined by members of the customs union. These tend to be at more competitive levels as producers face a single market and adopt a unified pricing strategy. However, with both segmented and integrated markets, the competitiveness of customs union member firms may generate trade diversion as non-member producers lose market share to union markets. However, there is also the possibility of the market-access effect, that is, common regulatory systems within the union may make union markets more attractive to non-union producers resulting in external trade creation (see Smith and Venables (1991).

The issue of trade creation or trade diversion and therefore whether world economic welfare may be increased or lowered as the result of a preferential arrangement is conveniently summarised by Wonnacott and Lutz (1989, pp 67-70), suggesting the ratio between these two outcomes depends on whether:

a) The tariffs of outside countries are high and the initial tariffs of member countries are also high. In this case, the formation of a preferential arrangement is not likely to be trade diverting since there would not be a great deal of trade with outside countries. By the same token, the welfare effects of the preferential arrangement would be enhanced if the member-country tariffs on imports from outside countries were subsequently set at low rates.

b) The prospective member countries are already major trading partners and are close geographically.

c) There are important differences in comparative advantage among the member countries.

In addition, the level of development is important, and if this is similar in the member countries, and if the benefits can be distributed without major economic and political disagreement. This is a particularly pertinent issue in this paper given regulatory harmonisation may not overcome the more troublesome conflicts that are a legacy of the region.

This paper focuses on comparative advantage to determine levels of possible trade creation and trade diversion. The CIS customs union is a political and not an economic construct and given the member countries are small, with the exception of Russia, prices of traded goods are set outside the union rather than within (Venables, 2003) and therefore a framework is needed that allows the analysis to include dynamic effects and political economy concerns (Krugman, 1993; Krishna, 1998; Baldwin, 1995). The major interesting feature is that two crucial export goods, oil and gas, can distort the economic important of the union and impact on issues of competition. We follow Venables (2003) by considering two possibilities. Firstly, whether goods have alternative sources of supply or terms of trade effects introduced, so that price changes can take place. Then it is possible to examine if country comparative advantage, relative to other union members and relative to the rest of the world, yields some important insights about the costs and benefits of custom union membership

4. DATA AND INITIAL ANALYSIS

(a) Data

Data on exports by commodity were taken from the United Nations *COMTRADE* database. Export shares were calculated using export data, according to the HS 2002 classification (four digit). Data were obtained for the 4 year period 2006-2009, to minimise the effects of short run temporary fluctuations in export data. For Georgia and a small number of the comparison countries the period 2006-2008 was used due to the absence of data for 2009. It is also important to note that the available data included only commodities. Thus the results are representative of trade in commodities but, since they do not include exports of services, do not provide a complete analysis. As with the export similarity indices export data from the COMTRADE database according to the (four digit) HS 2002 classification were used. This gives something in excess of 1200 categories of commodity. As before, calculations were made using the four year total of exports for 2006-2009 and for 2006-2008 for Georgia (2009 data not available)

In the factor contents analysis section, it was necessary to use trade data for the sample of CIS countries for exports and imports of detailed commodities (4 digit HS 2002 Codes). These were taken for each country from the UN's *COMTRADE* database. They were then aggregated by sector to

correspond to the UK input-output classification of industries. The UK factor requirements matrix was based on the UK input output table for 2008 (taken from the Office of National Statistics website). These data were supplemented by labour data specially commissioned from the (UK) Office of National Statistics, taken from the *Labour Force Survey*, to provide a detailed factor requirements matrix. In a similar fashion data on the exports and imports of each sampled CIS country (4 digit HS 2002) were taken from the UN's *COMTRADE* database and aggregated to the classification used for the US input output table for 2008. Data on US requirements were based on the US input output table for 2008 (US Department of Commerce, Bureau of Economic Analysis). These data were supplemented by labour data for 2008 taken from *Occupational Employment (OES) Statistics* (US Bureau of Labor Statistics), again to provide a detailed factor requirements matrix. For bilateral factor content calculations data on the GDP of each country are also required. These were taken from the World Bank's *World Development Indicators* database.

(b) Export similarity analysis

The export similarity index first proposed by Finger and Kreinin (1979) is an established method for analysing similarities between countries with respect to their pattern of specialisation in different types of goods. This index, denoted $XS_{i,j}$, provides a comparison between any pair of countries, *j* and *k* with respect to their export specialisation and is defined:

$$XS_{i,j} = \sum_{i=1}^{N} \text{minimum } x_{ij}, x_{ik} \qquad (1)$$

where x_{ij} is the share of good *i* in country *j*'s total exports and x_{ik} the share of the same good in country *k*'s total exports. Values of the export similarity index range between 0 to 1 (or 100%).

In this study export similarity indices were constructed for the sample countries, both with each other and with a much larger sample of countries from outside the region. These comprised a pair wise value for each of the CIS included countries with the remaining CIS countries in the sample plus a group of comparison countries. To provide a benchmark the degree of export similarity between each sample country and total world exports was calculated. Thus, *similar* countries are defined to be those with a higher value of the export similarity index with the country concerned than the index of similarity with total world exports.

Given the size of the sample of countries the analysis generated a large number of results and these are presented in Appendix 1, which also serves to provide a list of the 89 countries included in the sample. Table 2 lists the results for all of those countries found to be *similar* according to the definition above. The sample of former Soviet countries is divided into (a) major oil and gas exporters and (b) others. It is immediately clear that former oil and gas exporting Soviet countries have a similar pattern of commodity exports to other oil and gas exporters, no matter how different they are in any other respect. For example, the high degree of similarity between Azerbaijan and Venezuela or between Russia and Oman is almost entirely attributable to oil and related exports. At the same time

the indices for neither Belarus nor the Ukraine exhibit a similar pattern of exports to either Azerbaijan or Russia. In general, the data show that a common specialisation in oil and related exports tends to dominate any other pattern of similarity in the commodity composition of exports. For countries that are not major oil exporters it is worth noting that both Georgia and Armenia are substantially more similar to each other than any other country in the extended sample. However, both exhibit a degree of similarity with a diverse group of countries including, for example, South Africa, and with Bulgaria for Armenia and Canada for Georgia. Ukraine is only shown to be similar to one other country, Romania.

Table 2

Overall the export similarity analysis suggests that both common and distinct export patterns exist within the sample of former Soviet economies. The most distinctive common feature in exports is a found in a group of oil and gas exporters, namely Azerbaijan, Kazakhstan and Russia. Both Georgia and Armenia share much common ground with each other in their export patterns but no real similarity with the other former Soviet countries. The remaining two countries in the sample, Belarus and Ukraine, are neither similar with each other nor similar with any of the other countries in the sample. Finally, the export similarity indices provide a picture of similar countries with respect to the composition of commodity trade, although they do not provide any guidance as to which commodities are in factor exported by these countries. To address this issue indices of revealed comparative advantage are constructed.

(c) Revealed comparative advantage

The principle of revealed comparative advantage, that is, that patterns of comparative advantage by commodity are not directly observable but can be inferred from observed trade data, has been widely used in the international trade literature (Balassa, 1965). It has also generated an on-going methodological literature, see, for example, Yu et al (2009).

There are a variety of different indices of revealed comparative advantage, each with its own strengths and weaknesses. The original index proposed by Balassa (1965) is used here mainly because of its direct comparability with export similarity indices since both are based on export shares. It is defined:

$$B_{ij} = \frac{x_{ij}}{x_{iw}} \qquad (2)$$

where x_{ij} is the share of good *i* in country *j*'s total exports and x_{iw} the share of the same good in total world exports. Values of the index greater than 1 are interpreted as *revealing* a comparative advantage and values less than 1 a comparative disadvantage.

As above, this analysis yielded a huge number of results, which are not presented here.[1] However, Table 3 shows results for those categories of commodity in which three or more of the sample countries exhibited a revealed comparative advantage as defined by the Balassa index. As expected, crude petroleum and related products, including refined petroleum, is one category that is important. However, other broad areas in which three or more of countries exhibit a revealed advantage include:

- Minerals (cement, iron and copper ores, silicates, granite, basalt, mineral fertilisers, clays, construction aggregates)
- Wood (crude and sawn)
- Various iron and steel products
- Chemical products (ammonia, sulphates, hair preparations, explosives)
- Specific agricultural and food products (bran, sunflower seeds, wheat, wheat flour, barley, fruit and nuts, jams, fruit juices, sugar, alcoholic drink)
- Railway machinery and equipment
- Various metal articles (nails, tacks, wire, titanium articles)

Table 3

With the exception of some agricultural and food products, the results suggest that where former Soviet countries have overlapping export specialisations these are typically in groups of producer rather than consumer goods. Consequence some doubt exists as to how far potential gains in the form of greater competition between member states exist for either the present Customs Union or for any l future combination similar trading bloc of former Soviet countries. Certainly, it is unlikely that competition in the majority of consumer goods would be greatly stimulated unless patterns of specialisation change substantially.

5. FACTOR CONTENT ANALYSIS

This section derives the factor content of trade for the sample of CIS countries, using UK and US data as a proxy for reasons of data availability. The results are then used to determine the trade relationship in a regression model.

(a) The Heckscher-Ohlin-Vanek Model

This was initially a theoretical extension of Heckscher-Ohlin trade theory by Vanek (1968) but was subsequently used to extend the applied analysis of Leontief (1953) and has long been used in empirical models of international trade. It can be defined through the following relationship:

$$AT = V - sV_w \tag{3}$$

where there are *k* factors of production and *n* goods and where:

---

[1] A full set of results are available from the authors on request.

- A is a (k x n) matrix of factor requirements
- T is a (n x 1) vector of net exports (exports less imports)
- V is the (k x 1) vector of domestic factor supplies
- s is a scalar representing the ratio of domestic to world GDP
- V_W is the (k x 1) vector of world factor supplies.

The basic model makes a number of key assumptions. These include:

- linearly homogeneous production
- identical homothetic consumer preferences between countries
- balanced trade
- identical techniques of production across countries (that is, the A matrix is common).

Not all of these assumptions are strictly necessary. Helpman (1984) has shown that the model remains valid even if the assumption of identical homothetic preferences is violated. Leamer (1980) has shown that the model remains valid even if aggregate trade is not balanced, provide that the results are reported relative to the factor requirements of consumption and in the form of a ranking. Indeed it is for this reason that the results below are presented as they are in Table 3.

Previously, the terms on the right on equation (3) have been difficult to measure satisfactorily. Factor supplies are notoriously difficult to calibrate for any single country, not to mention for the world as a whole. Data on international trade has often been readily available, at least for goods, and the data necessary to construct a factor requirements matrix occasionally available. Thus, the most common use for the model has been to calculate AT as a measure of the underlying pattern of comparative advantage by factor of production, that is, to *reveal* the underlying pattern of specialisation by trade in embodied factor services in a manner similar to using trade statistics to *reveal* the pattern of advantage in goods.

Another, but less common, application of model has been as a test of the theory. To do this both the factor content of trade, AT, and the actual differences in factor supplies, $V - sV_W$, are calculated. These can then be compared to assess how well the model represents the theoretical relationship. It was studies of this type, most notably Trefler (1995), which led to one source of criticism of the model. Trefler's argument is that firstly, comparisons between actual factor supplies and the factor content of trade suggest that much trade is observable and secondly, that this unobservable trade can be linked to technological differences between countries. Thus, Trefler and others have correctly pointed out that the assumption of identical technology between countries is an important limitation in the model as an accurate measure of true differences between country level factors.

Leamer (2000) also raised objections to the use of the model to gain insights into the effects of international trade on relative wage levels. Leamer's argument is that the theoretical basis for such effects is the Stolper-Samuelson theorem, which links goods' prices to factor prices, not volumes of

trade to factor prices. These objections are not a concern in the current paper. However, the HOV model has recently undergone a partial revival, for example, Krugman (2000) has argued that it may be both valid and useful despite differences between countries in both consumer preferences and technology and thus if the model is re-interpreted as comparing actual trade with a counter-factual of autarky then it remains a valid exercise.

One practical problem in applying the model to many countries is the factor requirements matrix. This typically requires both an input-output table and some supplementary data allowing labour requirements to be divided into a number of different categories. Not all countries produce input-output tables with a sufficient degree of disaggregation and it is even more difficult to find matching labour data. Even if such data could be obtained for some countries it would not be particularly useful. The factor requirements matrix has to cover at least a full range of production activities and preferably all economic activity. For a large, diversified country this can be satisfied but for a small or highly specialised country this will not be so. That is, the absence of certain industries means that a full factor requirements matrix cannot be derived.

One technique for dealing with these difficulties is to proxy factor requirements data by using another suitable country, and this practice is followed here. Factor requirements from the UK are used to derive estimates of the factor content of trade for the sample of CIS countries. However, this may bias the results so to minimise any distortion the analysis is repeated using US factor requirements data to allow for a different technology set. Thus, if both analyses produce comparable results there is some reason to suppose that the results are not excessively sensitive to changes in technical requirements.

i. Results: Factor Contents Using UK Requirements Data

Table 4 reports the results of the factor content analysis for the CIS countries using UK data for factor requirements, presented according to the value of the factor content of net exports for each country relative to the content of the relevant factor in UK consumption and according to their ranking by this measure. As previously discussed, Leamer (1980) shows that ranking of factors according to the factor content of net exports relative to consumption is the appropriate procedure if aggregate trade is imbalanced.

Unsurprisingly, the countries in the sample classed as major oil and gas exporters exhibit a pattern of specialisation based on the use of oil and gas. Clearly, they would directly export oil and gas but the factor content analysis is somewhat different as this provides estimates of the extent that the extraction of oil and gas is a factor input into a wider based set of exports. That is, they are measures of the extent to which the crude fuels are embodied in the exports of other goods and services. For Azerbaijan and Belarus oil and gas is ranked by far the most important source of comparative advantage. For Russia and Kazakhstan it is ranked second.

Table 4

After oil and gas, exports of goods that make intensive use of other natural resources is a common source of specialisation in the net exports of the sample of former Soviet countries. Other minerals are ranked first for Armenia, Georgia and Kazakhstan, second for the Ukraine and third for Russia. Exports of goods intensive in forestry are ranked second for Belarus and Georgia, first for Russia. Fishing is the one exception in the list of natural resources and is highly ranked for Armenia, Belarus and Georgia but ranked low for all other countries. In summary, these results suggest that this sample of former Soviet countries are highly specialised not just in the direct export of natural resources but in those goods that make intensive use of such resources.

Most of the countries in the sample are shown to be specialised in goods that make intensive use of professional and technical workers (at least according to UK production techniques). Professional workers ranked third for Azerbaijan, fifth for Armenia and Kazakhstan and seventh for Russia and Ukraine. Technicians ranked fourth for Armenia, Azerbaijan and Belarus and sixth for Georgia and Russia. Agricultural and fishery workers were ranked highest of all for the Ukraine, third for Kazakhstan and fifth for Georgia but these workers ranked low in the exports of all other countries. Skilled manual workers are not ranked highly in most countries except Georgia (ranked third), Belarus and Ukraine (ranked fifth in each).

Overall, these results suggest that there are important differences between countries in this sample but that some common features can be identified. The most important common pattern of specialisation is the export of natural resources, not just directly but also as embodied inputs into other goods. A secondary common pattern is specialisation in goods that make intensive use of professional and technical workers.

ii. Results: Factor Contents Using US Requirements Data

Table 5 reports the results of the factor content analysis for the CIS countries using US data for factor requirements for 2008. These also suggest oil and gas to be a highly important source of advantage for essentially the same group of countries as in the UK based analysis. Thus, oil and gas are ranked highest for Azerbaijan, Belarus and Russia and ranked second for Kazakhstan. Mining is also shown to be highly ranked for Armenia, Kazakhstan, Russia and Ukraine. However, forestry and fishing is only highly ranked for Russia and Ukraine. Real estate is highly ranked in the pattern of export specialisation of all countries in the sample except Russia. Overall, the results using US production techniques are broadly consistent with those of the UK with respect to natural resources, despite using a different classification of factors of production. That is, the most important common pattern of specialisation is in the exporting of goods intensive in natural resources.

With respect to different categories of labour the results using US factor requirements are again broadly consistent with those using UK production techniques. Professional workers are highly ranked in almost all countries and mid-ranked in two (tenth in the Ukraine and ninth in Belarus). Technicians are highly ranked in all countries except Russia (ranked twelfth). A minor difference with

the UK based results is with respect to service and sales workers, which are typically mid-ranked using UK factor requirements while using US factor requirements this type of labour is ranked more highly – first in Georgia, second in Armenia and third in Belarus.

It is not possible to rule out the fact that the results may have been biased by the use of factor requirements data borrowed from other countries but the consistency between the results using UK data and those using US factor requirements provides some reassurance that the sensitivity of the analysis to different production techniques may not be excessive.

Table 5

(b) The Bilateral Factor Content Model

The bilateral factor content model provides two important contributions to the analysis, one conceptual and the other methodological. From the analysis of Venables (2003) the likely gains to individual countries from the formation of a Customs Union depend on comparative advantage in two ways – in relation to the world and in comparison to partner countries. The standard H-O-V model provides a way to assess the underlying pattern of comparative advantage of each country relative to the world. The bilateral factor content model provides evidence on the second aspect – the comparative advantage of each CIS country relative to each other. For data availability reasons the standard H-O-V model was calculated using factor requirements data from the US and UK, which introduces some risk of error. The bilateral factor content model, as shown below, can also be used to reduce this risk.

The bilateral factor content model is a misleading title as it does not compute the factor content of bilateral trade between two countries; it compares the factor content of each countries net exports to the world. Consider two countries (denoted by subscript 1 and 2) that are sufficiently similar in production techniques for a common factor requirements matrix (A) to be a reasonable supposition. From equation 3 the difference between country 1's and country 2's net exports to the world can be written as:

$$AT_1 - (s_1/s_2),\ AT_2 = V_1 - (s_1/s_2),\ V_2 \qquad (4)$$

The variables for equation 4 are as defined previously for equation 3 save for the introduction of subscripts for countries 1 and 2. Then assume that for this sample of CIS countries a common factor requirements matrix (A) is a reasonable one. However, suppose that the common A matrix for the CIS countries differs from that for a third, country (the UK or the US in this analysis), denoted as A_3. Maskus and Webster (1999) propose two types of representation of technological differences: *Factor Enhancing Industry Neutral* (FEIN) and *Industry Specific Hicks Neutral* (ISHN). Using a FEIN representation would suggest a relationship between A_3 (the factor requirements matrix for the UK or the US) and A (the factor requirements matrix for the CIS countries) such that:

$$A_3 = \Phi A \qquad (5)$$

where Φ is a (k x k) diagonal matrix whose diagonal elements are factor enhancing coefficients, representing the differences in technology between the two A matrices. Thus, for example, if the coefficient for skilled manual workers is 1.2 this would imply that these workers are 20% more

productive in the US than in the CIS countries. Suppose now that a factor requirements matrix from a third country (UK or US) is used in place of an unknown true a matrix for the CIS countries. From equation 4 this would result in the following:

$$\Phi\ AT_1 - (s_1/s_2),\ \Phi\ AT_2 = \Phi\ V_1 - (s_1/s_2),\ \Phi\ V_2 \qquad (6)$$

Note that, by pre-multiplying both sides of equation 6 by the inverse of Φ (Φ^{-1}) it is easy to demonstrate that equation 6 simplifies back to equation 4. That is, two assumptions need to be satisfied - (a) that the CIS countries share a common A matrix and (b) that the differences between this common A matrix and the requirements matrix for a third country (A_3) can be adequately represented by a FEIN transformation such as Φ. If these assumptions can be satisfied it can be shown that the resulting bilateral content using the borrowed requirements matrix A_3 would be the same as using the true but unknown matrix A.

The second representation of difference between A matrices suggested by Webster and Maskus (1999) was an *Industry Specific Hicks Neutral* (ISHN) transformation matrix Ω. Thus, using a third county matrix with this type of transformation gives:

$$A_3 = A\ \Omega \qquad (7)$$

where Ω is a (n x n) diagonal matrix whose diagonal elements represent Hicks neutral differences between the UK or US and the same industry in the CIS countries. Thus, if the coefficient for a particular industry is 1.15 this would suggest that the industry in the US uses all factor of production 15% more productively than in CIS countries. Calculating the bilateral factor content using a third country A matrix in this case results in:

$$A\ \Omega\ T_1 - (s_1/s_2),\ A\ \Omega\ T_2 = V_1 - (s_1/s_2).V_2 + \Gamma \qquad (8)$$

It is possible to simplify equation 8 back to the standard bilateral factor content model (equation 4) but, for reasons of brevity, this is not done here. However, the insight is much the same – differences between the UK or US matrix and a common A matrix for the SIS countries cancel out in the bilateral factor content model where the technological differences can be represented by an ISHN matrix. Where this transformation is valid the bilateral factor content using the US or UK matrix (A_3) is the same as that using the true but unknown common CIS matrix A.

To summarise, the attraction of a bilateral factor content model is twofold. Firstly, it meets the theoretical need, from Venables (2003), to identify patterns of comparative advantage of one CIS country relative to another. Secondly, it provides a better basis for reducing any biases resulting from the use of a borrowed factor requirements matrix from a third country.

i. Results: Bilateral Factor Contents Using UK Requirements Data

Table 6 presents the results of the bilateral factor content analysis using a UK requirements (A) matrix. In interpreting the bilateral factor content results it is important to remember that the results are for factors of production. Bilateral factor contents, for example for oil and gas are for these natural resources embodied within other goods and services and do not reflect exports of the natural resources

themselves. For example, Azerbaijan's heavy emphasis on oil and gas reflects in large part its export of petroleum products.

Bilateral factor contents again reflect the dominance of oil and gas (as a factor of production) in the trade of a number of CIS countries. Armenia, Georgia and the Ukraine all exhibit a propensity to be net importers compared to the other CIS countries of goods embodying oil and gas inputs. Conversely the other countries in our sample tend to be net exporters of goods and services using oil and gas compared to the former group. Belarus and Russia are shown to be specialised in goods making use of forestry, Russia and Ukraine with respect to those intensive in real estate.

Differences in patterns of specialisation also exist within this sample of CIS countries with respect to the varied categories of labour. Russia and, to a lesser extent, Kazakhstan tend to have the strongest pattern of export specialisation in goods making intensive use of various categories of highly educated labour - managers, professionals and technicians. Belarus and the Ukraine tend to be the most specialised of these countries with respect to goods intensive in skilled manual labour (craft and related workers). Azerbaijan is shown to be the most specialised with respect to semi-skilled process workers (plant and machine operators).

Taken overall what do these results suggest about the possibilities for economic gains from a hypothetical Customs Union formed by this sample of countries? Traditional Customs Union theory and more recent models based on the gains from competition all suggest that a common pattern of specialisation is necessary for economic gains to be likely. The results of Venables (2003) – that countries with a pattern of advantage intermediate between that of their partners and the world are most likely to gain from a Customs Union – also suggests that a number of key countries in our sample might not gain from economic integration. For example, Russia tends to have an extreme pattern of advantage on several counts – oil and gas, forestry and educated labour.

Table 6

ii. Results: Bilateral Factor Contents Using US Requirements Data

The results using US requirements data, presented in Table 7 below, are similar to those using UK requirements data. Thus, the bilateral factor content model shows Russia, Azerbaijan, Kazakhstan and Belarus have the strongest pattern of comparative advantage in industries using oil and gas. Oil and gas is also again shown to be the most important factor of production in explaining variations in the factor content of trade within this sample of countries.

Russia again is shown to have the strongest advantage in goods intensive in the use of real estate and one of the strongest patterns of specialisation in goods intensive in the use of highly educated workers. Belarus is less clearly a country specialised in the use of skilled manual labour than with the UK requirements but nonetheless remains one of the countries more heavily specialised in exporting goods using these workers. With the US data Russia and the Ukraine tend to be more specialised in exports intensive in the services of these workers. Azerbaijan is again one of the

countries with the strongest specialisation with respect to semi-skilled process workers (plant and machine operators).

Table 7

Overall, the main purpose in providing an analysis using factor requirements from two different countries is to allow a basis for assessing the robustness of our findings with respect to variation in the factor requirements matrix used. This is admittedly both an informal and a limited check on robustness. Nonetheless, the broad similarity in our findings based on both UK and US requirements does provide some grounds to suppose that the results are not dominated by the choice of factor requirements matrix.

6. ECONOMETRIC ANALYSIS OF A GRAVITY TYPE MODEL OF EXPORT SIMILARITY

In this section the determinants of the degree of export similarity of this sample of CIS countries is examined, both with each other and with a sample of countries from the rest of the world. This serves two main purposes. Firstly, the analysis is intended to identify the key characteristics that determine both common and divergent patterns of comparative advantage between each of the sample countries and other trading partners. Secondly, by including a dummy variable for other CIS countries the analysis is intended to

The findings of Tumbarello (2005) are of particular relevance to this paper. Simulations from this gravity model suggests that the CIS countries do not trade enough relatively to other transition economies. This result reflects specific constraints and obstacles to trade in the CIS: economic structure (some of the CIS countries rely mainly on natural resources); geographic conditions (e.g., Belarus, the Kyrgyz Republic, Tajikistan, Turkmenistan, and Uzbekistan are landlocked); unresolved external and internal conflicts (e.g., between Armenia and Azerbaijan, within Georgia, and within the Russian Federation); the cost of transit trade; the existence of unofficial payments; and excessive regulation. Moreover, the large number of free trade agreements in the region and the plethora of inconsistent rules of origin represent additional barriers, not only because of the increased scope for corruption but also because uncertainty about the rules creates trade disputes, retaliation and a climate of distrust among the CIS members.

This analysis of the determinants of export similarity has much in common with a gravity model. The traditional gravity model relates bilateral trade flows to a series of distance variables. In this respect the approach here intentionally shares much common ground with a gravity model. In particular, an equation is specified in which export similarity indices, a bilateral comparison in two countries export patterns with the world, depends on a series of differences between the two countries in key determinants. In general form the specification is:

$$XSIM_{jk} = \beta X_{jk} + \theta CIS + u_{jk} \qquad (9)$$

where $XSIM_{jk}$ is the export similarity index between CIS country j and country k, X is a matrix of observations of m explanatory variables, measured as the difference ("distance") between country j and country k in each variable, CIS is a dummy variable taking the value of 1 when the comparison country is another CIS country and 0 otherwise and where u_{jk} is an appropriate disturbance term.

For the purposes of estimation the sample is treated as an undated panel comprising one cross section for each of the CIS countries in the sample. Data for the explanatory variables were taken from the World Bank's *World Development Indicators* database. The list of variables is given in Table 8. Due to missing observations for some variables and countries two samples were used. Sample 1 was designed to maximise the number of reporting countries included and omits some variables for which observations were missing. This resulted in a sample comprising all 7 of the CIS countries covered elsewhere in the analysis, each with a cross-section of 83 comparison countries, 581 observations in total. Sample 2 was designed to maximise the number of variables included and, in consequence, resulted in countries with missing observations being excluded. This resulted in a sample of 6 CIS countries (Azerbaijan being excluded), each with a cross-section of 43 comparison countries, 258 observations in total.

Table 8

Estimation was by panel least squares estimators and results are in Table 9 for both samples. In each case the general equation was estimated followed by a restricted model with a number of apparently statistically insignificant variables excluded. Thus, for each sample au unrestricted and restricted model are reported, together with appropriate tests for the exclusion of the relevant variables. Table 9 also reports the (fixed) cross section effects for each of the CIS countries in the sample. Note that the interpretation of the results presented in Table 9 requires some care. The specification states the degree of export similarity between two countries depends on the extent of differences between them in a series of explanatory variables. A positive sign for the relevant coefficient would suggest that the greater the difference between the two countries in the variable concerned, the higher the degree of export similarity between the two countries. Conversely, a negative sign would suggest the lower the difference in the particular variable the greater the similarity.

Two variables were included to capture the effects of technological differences between countries – high technology exports as a percentage of total exports (HITECH) and research and development expenditure as a percentage of GDP (RES). These were intended to reflect underlying Ricardian features, in which comparative advantage depends on differences between countries in technology and, ultimately, labour productivity. These variables could only be included in sample 2 due to missing observations. Differences between countries in R&D expenditure were found to be statistically insignificant but differences in the importance of high technology exports were found to be statistically significant (at 95%) in Sample 2, with a positive sign. Although this is the opposite of the expected sign this variable is of marginal statistical significance in the unrestricted version for

sample 2. Given also the comparatively small value of the coefficient it is reasonable to conclude that our evidence suggests that technological differences are not an important determinant of similarities between CIS countries and others in the pattern of comparative advantage. Differences between countries in per capita GDP were intended to capture Linder effects, representing the degree of dissimilarity in demand. The corresponding coefficients were found to be statistically insignificant in both sample 1 and sample 2.

Table 9

The remaining explanatory variables were intended to capture underlying differences in factor endowments between each of the samples of CIS countries and their comparison countries. For natural resources per capita differences in arable land, forests and energy production were used. Differences in gross fixed capital formation in relation to GDP (INVEST) were used to capture different capital endowments. In sample 1 differences in gross fixed capital formation were found to be statistically significant but of small magnitude and with a positive sign. In sample 2 these effects were statistically insignificant. Differences in endowments of arable land were found to be statistically significant in sample 2 but with a positive sign but statistically insignificant in sample 1. Differences in endowments of forests were of more marginal statistical significance in sample 1 (significant at 90% but not 95% confidence), again with a positive sign. However, the results are dominated by the effect of differences in per capita energy production. The relevant coefficients are statistically significant in both samples 1 and 2 and of a magnitude several times larger than any of the other variables. The signs are negative in all cases; the higher the differences between countries in energy endowments the less the degree of export similarity, as expected. Thus, these results confirm the importance of energy in determining the pattern of export specialisation, supporting the analysis in earlier sections. Indeed the magnitude of the coefficients concerned suggests that these results are dominated by such differences.

Differences in labour endowments and, in particular, those in human capital were addressed by a further group of explanatory variables. To capture educational differences two variables were used – the primary school enrolment ratio (SCHOOL1) and the tertiary school enrolment ratio (SCHOOL2). Differences in the birth rate, life expectancy, urbanisation and in the labour participation rate were also included to capture differences between countries in long run labour supply. These variables proved to be statistically insignificant in either or both sample 1 and 2. An important exception to this was urbanisation, statistically significant at 90% confidence in sample 2 and at 95% confidence in sample 1, in both cases with the expected negative sign. A further exception was the labour participation rate, statistically significant in both sample 1 and 2 but with a positive sign.

The dummy for CIS countries was statistically significant in both sample 1 and 2. This variable differs from the other explanatory variable in that it is not a measure of economic distance (i.e. the difference between two countries). Its expected sign is positive – that common ground between CIS countries would make them more not less similar. In sample 1 it has the expected positive sign but in sample 2 the relevant coefficient is negative.

The final set of explanatory variables capture differences between countries in "trade friction": those institutional, policy and cultural variables likely to distort underlying patterns of comparative advantage. These comprised differences in the indices of the ease of doing business (EASE), of legal rights (LEGAL), taxes on goods and services as a percentage of value added (TAX1), the total tax rate on business (TAX2), and the trade weighted average of applied import tariffs (TARIFF). Of these only differences in import tariffs and in the total tax rate were found to have statistically significant effects in both sample 1 and sample 2. Whether these are positive or negative is unclear in theory. Differences in policy and institutional barriers to trade are clearly capable of affecting patterns of specialisation but there is no particular reason to presume that they would make them more or less similar. Thus, the results suggest that such barriers do indeed play a pattern in shaping the pattern of export specialisation of CIS countries.

7. CONCLUSION

This paper finds some common patterns of comparative advantage and, hence, export specialisation within a sample of countries that includes several former Soviet states. The most significant is a common reliance on oil and gas, in particular, by Azerbaijan, Kazakhstan and Russia. This is both in terms of direct exports and in the export of goods intensive in these natural resources. A further common pattern of specialisation is in the export of other raw materials, especially minerals, both directly and embodied in the exports of goods that make intensive use of them. Otherwise, there exists only a small range of manufactures (certain types of chemicals, some iron and steel products and some food products) for which there are common patterns of advantage. The research suggests that these tend to be in goods that are comparatively intensive in professional and technical labour.

The bilateral factor content of trade between each of the countries in the sample is also examined. The analysis suggests there are important variations in this sample of countries such that it is doubtful that many are directly competitive with each other. Based on the predictions of Venables (2003) it is also likely that Russia, in particular, has an extreme rather than intermediate comparative advantage based on several factors of production and might not gain from a Customs Union.

With respect to WTO membership it is likely that any subsequent expansion of trade would be similarly focused upon natural resources and natural resource intensive products. For the possible economic gains from a Customs Union, such as trade creation and greater competition, these results suggest some scepticism. Superficially, the similarities between countries with respect to the export of natural resources and goods intensive in their use does indeed suggest some overlapping between the countries in this sample. However, this leaves the vast majority of consumer goods and many producer goods for which there currently is little effective competition between member states in export markets. This may limit the potential economic benefits from the Customs Union for both current and potential members. Clearly, the political benefits are an entirely different matter which may be far greater but while recognised are not considered here.

The econometric analysis of export similarity indices further strengthens the conclusion that patterns of comparative advantage in CIS countries are dominated by whether or not the country is an oil and gas producer. The results also suggest that there is a common, unspecified "CIS" influence that results in increased export similarity but this is of far less economic significance than oil and gas. Finally, there is evidence that differences between these countries in variables capturing institutional friction, such as ease of doing business, import tariffs, taxes, etc has had an influence on differences in their patterns of export specialisation.

REFERENCES

Allen, C, Gasoriek, M and A Smith, 1998. The Competition Effects of the Single Market in Europe, *Economic Policy*, 13, 439-486

Balassa, B, 1965. Trade Liberalisation and Revealed Comparative Advantage, *The Manchester School*, 33, 99-123

Baldwin, R.E. and A.J. Venables, 1995. Regional economic integration., in G. Grossman and K. Rogoff (eds.), *Handbook of International Economics*, vol. 3, North-Holland, Amsterdam.

Clausing, KA, 2001, Trade Creation and Trade Diversion in the Canada-United States Free Trade Agreement, *Canadian Journal of Economics*, 34, 677-696.

Donald R. Davis, David E. Weinstein, 2003, Market Access, Economic Geography and Comparative Advantage: an Empirical Test, *Journal of International Economics,* 59, 1–23

Finger, JM, and Kreinin, M, 1979, An Index of Export Similarity and its Possible Uses, *Economic Journal*, 85, 905-912.

Helpman, E., 1981. International trade in the presence of product differentiation, economies of scale and monopolistic competition: a Chamberlin–Heckscher–Ohlin approach, *Journal of International Economics* 11 (3).

Krishna, P., 1998, Regionalism and Multilateralism: A Political Economy Approach, *Quarterly Journal of Economics*, Vol. 113 (No. 1, February).

Krugman, P.R., 1979. Increasing returns, monopolistic competition, and international trade. *Journal of International Economics* 9 (4), 469–479.

Krugman, P.R., 1980. Scale economies, product differentiation, and the pattern of trade. *American Economic Review* 70, 950–959.

Krugman, P, 2000, Technology, Trade and Factor Prices, *Journal of International Economics*, 50, 51-71.

Krugman, P.R., Venables, A.J., 1995. Globalization and the inequality of nations. *Quarterly Journal of Economics* 110 (4), 857–880.

Lancaster, K., 1980. Intra-industry trade under perfect monopolistic competition. *Journal of International Economics* 10 (2), 151–175.

Leamer, EE, 1980, The Leontief Paradox Reconsidered, *Journal of Political Economy*, 8, 495-503.

Leamer, EE, 2000, What's the Use of Factor Contents?, *Journal of International Economics,* 50, 17-49.

Leontief, W, 1953, Domestic Production and Foreign Trade: The American Capital Position Re-examined, *Proceedings of the American Philosophical Society*, 97, 332-349.

Lissovolik, B., and L. Lissovolik, 2004. Russia and the WTO: The Gravity of Outsider Status, IMF Working Paper No. 04/159 (Washington: International Monetary Fund).

Maskus, K E and A Webster, 1999, Estimating the HOV Model with Technology Differences Using Disaggregated Labor Skills for the United States and the United Kingdom, *Review of International Economics,* Vol. 7, 8-19.

Schott, Jeffrey J. 1991. Trading Blocs and the World Trading System, *The World Economy* 14: 1-18.

Trefler, D, 1995. The Case of the Missing Trade and Other Mysteries, *American Economic Review*, 85, 1029-1046.

Tumbarello P, 2005. Regional Trade Integration and WTO Accession: Which Is the Right Sequencing? An Application to the CIS, IMF Working paper WP/05/94

Vanek, J, 1968. The Factor Proportions Theory: the N-Factor Case, *Kyklos*, 21, 749-756.

Venables A, 2003. Winners and Losers from Regional Integration Agreements, *The Economic Journal,* 113, 747-61.

Viner, J, 1950. *The Customs Union Issue*, New York: Carnegie Endowment for International Peace.

Wonnacott, Paul and Mark Lutz. 1989. Is There a Case for Free Trade Areas? and Comments by Isaiah Frank and Martin Wolf, in Jeffrey J. Schott (ed.), *Free Trade Areas and U.S. Trade Policy.* Washington, D. C.: Institute for International Economics.

Yu, R, Cai, J and P Leung, 2009. The Normalized Revealed Comparative Advantage Index, *The Annals of Regional Science*, 43, 267-282.

Table 1. Trade Regime Indicators in the CIS (selected countries) - 2003

	Number of bands	Min tariff (%)	Max tariff (%)	Mean tariff (%)	Custom fees (%)
Armenia	2	0	10	4.0	0.00
Azerbaijan	3	0	15	10.8	0.15
Belarus	8	0	100	11.0	0.15
Georgia	22	0	30	8.2	0.15
Kazakhstan	10	1	100	7.4	0.20
Kyrgyz Republic	5	0	20	4.5	0.15
Moldova	6	0	15	6.9	0.00
Russia	10	0	100	11.1	0.00
Tajikistan	6	10	15	7.6	0.00
Turkmenistan	6	0	100	5.1	0.50
Ukraine	5	0	70	12.7	0.00
Uzbekistan	3	0	30	15.3	0.20

Source: Country authorities and IMF calculations (Tumbarello, 2003)

TABLE 2: EXPORT SIMILARITY INDICES					
A. MAJOR OIL AND GAS EXPORTERS					
Azerbaijan		**Kazakhstan**		**Russia**	
WORLD	**9.6%**	**WORLD**	**21.5%**	**WORLD**	**30.4%**
Venezuela	90.2%	Saudi Arabia	68.0%	Algeria	56.5%
Yemen	90.2%	Iran	67.9%	Oman	56.5%
Nigeria	87.6%	Venezuela	67.5%	Kuwait	53.8%
Sudan	87.4%	Kuwait	67.4%	Qatar	52.9%
Saudi Arabia	86.6%	Oman	66.0%	Venezuela	50.2%
Iran	82.6%	Azerbaijan	65.7%	UAE	49.8%
Kuwait	73.6%	Yemen	65.1%	Saudi Arabia	48.3%
Oman	66.7%	Sudan	64.4%	Kazakhstan	47.4%
Kazakhstan	65.7%	Nigeria	63.3%	Trinidad	47.1%
Algeria	62.5%	Algeria	59.8%	Egypt	46.1%
Qatar	51.5%	Qatar	53.5%	Azerbaijan	44.1%
UAE	46.0%	Russia	47.4%	Syria	42.9%
Russia	44.1%	UAE	41.5%	Yemen	42.8%
Syria	42.6%	Syria	40.6%	Iran	41.6%
Colombia	30.8%	Colombia	33.6%	Canada	39.4%
Cote d Ivoire	25.4%	Canada	28.3%	Colombia	37.6%
Trinidad	23.5%	Vietnam	24.0%	Cote d Ivoire	35.8%
Vietnam	21.2%	Australia	22.9%	Sudan	35.8%
Egypt	20.8%	Trinidad	22.2%	Nigeria	35.6%
Mexico	17.6%				
Canada	17.5%				
Tunisia	17.3%				
B. OTHERS					
Armenia		**Belarus**		**Georgia**	
WORLD	**9.6%**	**WORLD**	**33.0%**	**WORLD**	**23.4%**
Georgia	37.0%	Bahrain	36.7%	Armenia	37.0%
Namibia	26.7%	Senegal	35.7%	South Africa	25.8%
Chile	23.3%	Egypt	35.2%	Canada	25.6%
Israel	22.3%	Kuwait	34.5%	France	24.4%
Dom Rep	19.7%	Bulgaria	33.2%		
India	16.3%			**Ukraine**	
South Africa	16.2%			**WORLD**	**34.2%**
Bulgaria	15.3%			Romania	35.6%
Bhutan	14.0%				
UK	10.5%				
Colombia	10.4%				
Turkey	10.3%				
UAE	10.0%				
Thailand	9.9%				
Hong Kong	9.8%				
USA	9.8%				
Jordan	9.7%				

TABLE 3: BALASSA REVEALED COMPARATIVE ADVANTAGE INDICES (where 3 or more countries reveal an advantage)								
HS Code	Description	BALASSA RCA INDICES						
		Armenia 2006-9	Azerbaijan 2006-9	Belarus 2006-9	Georgia 2006-8	Kazakhstar 2006-9	Russia 2006-9	Ukraine 2008-9
A. PRODUCTS FOR WHICH FIVE COUNTRIES EXHIBIT A REVEALED ADVANTAGE								
1512	Sunflower-seed, safflower or cotton-seed oil and fractions thereof.	1.028	2.591	0.005	2.041	0.728	4.099	83.494
2302	Bran, sharps and other residues,from working of cereals etc.	1.683	5.894	0.003	2.697	2.005	0.474	10.943
2849	Carbides, whether or not chemically defined.	352.390	0.000	0.000	3.698	43.439	19.995	72.569
7202	Ferro-alloys.	100.321	0.000	0.001	66.709	15.378	1.861	10.535
7204	Ferrous waste and scrap; remelting scrap ingots of iron or steel.	2.336	0.002	0.175	24.798	2.051	1.494	1.574
8606	Railway or tramway goods vans and wagons, not self-propelled.	7.678	0.306	1.133	1.827	0.955	1.808	89.068
B. PRODUCTS FOR WHICH FOUR COUNTRIES EXHIBIT A REVEALED ADVANTAGE								
0407	Birds' eggs, in shell, fresh, preserved or cooked.	3.172	0.046	6.293	1.342	0.001	0.235	3.215
1001	Wheat and meslin.	0.000	0.010	0.001	1.787	7.395	2.949	12.495
1101	Wheat or meslin flour.	0.000	0.994	0.167	1.552	33.415	1.120	5.148
2306	Oil-cake and other solid residues from vegetable fats or oils.	0.000	0.364	0.037	16.137	2.473	1.635	26.844
2508	Other clays, andalusite, kyanite and sillimanite, mullite etc.	0.289	1.104	0.003	2.570	1.721	0.060	20.640
2523	Portland cement, aluminous cement, slag cement, etc.	37.642	0.003	1.807	61.123	0.075	0.594	1.607
2619	Slag, dross, scalings and other waste from iron or steel.	0.000	0.008	1.244	59.038	0.011	4.278	3.335
2839	Silicates; commercial alkali metal silicates.	61.746	0.509	140.808	0.000	0.927	11.681	182.149
3102	Mineral or chemical fertilisers, nitrogenous.	0.000	0.007	4.552	44.900	0.332	4.971	19.537
6811	Articles of asbestos-cement, of cellulose fibre-cement or the like.	0.000	0.000	1.675	0.007	1.587	3.275	4.916
7010	Carboys, bottles, flasks, jars, pots, phials etyc. of glass.	15.339	0.004	1.708	6.930	0.035	0.524	2.390
7207	Semi-finished products of iron or non-alloy steel.	0.002	0.184	4.879	0.155	2.811	7.935	47.750
7217	Wire of iron or non-alloy steel.	0.000	0.001	10.389	2.902	0.003	1.011	4.916
8601	Rail locomotives powered by electricity.	1.571	0.004	0.000	205.109	0.688	1.320	4.051
C. PRODUCTS FOR WHICH THREE COUNTRIES EXHIBIT A REVEALED ADVANTAGE								
0507	Ivory, tortoise-shell, whalebone and whalebone hair, horns, etc	0.000	0.018	1.112	0.002	2.269	1.816	0.108
0511	Animal products not elsewhere specified.	0.774	0.009	1.387	0.000	3.109	3.270	0.852
0802	Other nuts, fresh or dried, whether or not shelled or peeled.	0.001	4.254	0.002	74.955	0.001	0.063	3.552
0811	Fruit and nuts, uncooked or cooked	1.036	0.000	5.234	0.193	0.001	0.367	3.782
1003	Barley.	0.000	0.002	0.004	0.559	4.086	2.247	47.593
1204	Linseed, whether or not broken.	0.000	0.000	0.609	0.000	1.532	1.502	3.602
1701	Cane or beet sugar and chemically pure sucrose, in solid form.	0.000	3.454	4.795	10.702	0.246	0.140	0.117
1703	Molasses resulting from the extraction or refining of sugar.	0.000	0.520	1.845	0.000	0.002	1.327	6.909
2001	Vegetables, fruit, nuts etc, prepared or preserved by vinegar etc.	3.605	0.083	1.903	0.193	0.007	0.042	5.151
2007	Jams, fruit jellies, marmalades, fruit or nut purée, fruit or nut pastes.	17.667	0.302	1.026	2.686	0.003	0.108	0.391
2009	Fruit juices (including grape must) and vegetable juices.	1.246	0.956	0.053	6.391	0.128	0.068	1.194
2202	Waters, including mineral waters and aerated waters.	1.542	0.011	0.237	17.107	0.156	0.219	1.461
2208	Undenatured ethyl alcohol, spirits, liqueurs etc.	56.587	0.485	0.529	24.812	0.018	0.234	2.513
2403	"homogenised" or "reconstituted" tobacco; tobacco extracts.	1.688	0.161	0.007	0.000	0.007	1.515	3.630
2501	Salt (including table salt and denatured salt)	2.738	0.029	13.601	0.001	0.042	0.045	9.560
2503	Sulphur of all kinds, other than sublimed sulphur	0.000	0.000	0.003	0.000	15.121	4.949	1.564

TABLE 3: BALASSA REVEALED COMPARATIVE ADVANTAGE INDICES (where 3 or more countries reveal an advantage), continued								
HS Code	Description	BALASSA RCA INDICES						
		Armenia 2006-9	Azerbaijan 2006-9	Belarus 2006-9	Georgia 2006-8	Kazakhstar 2006-9	Russia 2006-9	Ukraine 2008-9
C. PRODUCTS FOR WHICH THREE COUNTRIES EXHIBIT A REVEALED ADVANTAGE (continued)								
2516	Granite, basalt, sandstone and other monumental or building stone	3.866	0.017	0.019	1.878	0.310	0.041	1.914
2517	Pebbles, gravel, broken or crushed stone for concrete aggregates	1.161	0.001	1.916	0.213	0.234	0.119	22.333
2601	Iron ores and concentrates, including roasted iron pyrites.	0.000	0.000	0.000	0.000	5.105	1.009	8.464
2603	Copper ores and concentrates.	51.153	0.000	0.000	33.675	2.632	0.010	0.000
2618	Granulated slag (slag sand) from the manufacture of iron or steel.	3.628	0.000	0.000	1.334	0.030	0.005	17.725
2701	Coal; briquettes, ovoids and solid fuels manufactured from coal.	0.000	0.000	0.000	0.051	2.566	3.809	1.834
2709	Petroleum oils and oils obtained from bituminous minerals, crude.	0.000	11.299	0.377	0.284	8.112	4.342	0.001
2710	Petroleum oils, other than crude.	0.000	1.948	7.263	0.029	0.625	3.420	0.751
2716	Electrical energy.	3.730	0.437	0.273	3.755	0.328	0.794	2.570
2814	Ammonia, anhydrous or in aqueous solution.	0.000	0.000	0.679	1.313	0.014	7.119	19.132
2818	Artificial corundum, aluminium oxide; aluminium hydroxide.	0.364	3.415	0.001	0.010	8.535	0.060	7.247
2833	Sulphates; alums; peroxosulphates (persulphates).	0.000	0.002	0.460	0.219	1.489	1.144	1.295
2841	Salts of oxometallic or peroxometallic acids.	39.492	0.000	0.334	0.000	24.969	7.525	0.107
3105	Mineral or chemical fertilisers.	0.000	0.007	1.661	0.000	0.265	6.132	1.661
3305	Preparations for use on the hair.	0.003	0.001	1.862	4.088	0.108	0.292	1.257
3602	Prepared explosives, other than propellent powders.	0.000	0.000	0.000	4.714	0.040	1.376	1.273
4104	Tanned or crust hides and skins of bovine or equine animals.	0.027	0.556	1.870	0.065	13.753	0.466	7.005
4401	Fuel wood, in logs, in billets, in twigs, in faggots etc.	0.000	0.000	1.464	0.027	0.000	1.046	2.410
4403	Wood in the rough or roughly squared.	0.342	0.000	3.885	0.299	0.000	10.269	2.952
4406	Railway or tramway sleepers (cross-ties) of wood.	0.000	0.260	0.209	3.548	0.000	4.353	3.003
4407	Wood sawn or chipped lengthwise	0.058	0.008	0.990	6.018	0.000	3.034	1.713
6305	Sacks and bags, of a kind used for the packing of goods.	1.114	2.569	0.225	0.002	0.082	0.053	1.334
6809	Articles of plaster or of compositions based on plaster.	0.002	0.000	1.989	0.033	1.073	0.154	1.506
7108	Gold unwrought or in semi-manufactured forms.	3.214	0.000	0.000	10.862	1.828	0.000	0.000
7208	Flat-rolled products of iron or steel, of a width of 600 mm or more	0.006	0.000	0.003	0.011	2.228	1.795	14.146
7209	Flat-rolled products of iron or steel, of a width of 600 mm or more	0.000	0.002	0.008	0.193	4.910	1.832	5.777
7214	Other bars and rods of iron or non-alloy steel	0.086	0.065	10.938	1.514	0.100	0.792	14.400
7224	Other alloy steel in primary forms; semi-finished products.	0.000	0.000	3.675	0.050	0.009	1.426	4.203
7228	Angles, shapes and sections, bars and rods,of other alloy steel	0.000	0.000	1.904	0.001	0.018	1.473	4.727
7305	Other tubes and pipes of iron or steel exceeding 406.4 mm diameter.	0.216	0.113	0.062	0.379	1.204	2.279	14.695
7317	Nails, tacks, corrugated nails, staples etc, of iron or steel.	0.028	0.000	6.945	3.925	0.002	0.337	2.227
7601	Unwrought aluminium.	0.046	1.028	0.005	0.413	0.675	4.691	1.051
7801	Unwrought lead.	0.000	0.079	0.096	3.809	8.882	0.943	1.188
8108	Titanium and articles thereof, including waste and scrap.	0.043	0.000	0.022	0.327	6.186	4.567	4.454
8412	Other engines and motors.	0.000	0.006	1.641	2.392	0.163	0.426	1.679
8607	Parts of railway or tramway locomotives or rolling-stock.	0.131	0.000	0.356	7.058	0.034	1.083	9.792
8608	Signalling, safety or traffic control equipment for railways, roads, etc.	0.012	0.000	3.015	0.365	0.018	1.780	7.869
8904	Tugs and pusher craft.	0.000	2.997	0.023	0.000	0.216	1.773	1.403

TABLE 4: FACTOR CONTENTS OF NET EXPORTS*, using UK production techniques								
Factor of Production	**Armenia**		**Azerbaijan**		**Belarus**		**Georgia**	
	Value	**Rank**	**Value**	**Rank**	**Value**	**Rank**	**Value**	**Rank**
Forestry	-13.469	9	-17.572	10	225.553	2	-7.754	2
Fishing	-4.324	2	-1.747	5	-109.138	18	-12.554	4
Oil and gas	-19.473	17	228.879	1	416.348	1	-33.298	18
Other minerals	6.711	1	-27.643	15	-37.488	11	2.811	1
Machinery (including rental of)	-14.615	14	-13.817	8	-68.425	17	-17.874	12
Office machinery & computers	-11.736	6	-19.267	11	-47.354	12	-19.233	15
Electrical equipment	-15.647	15	-39.484	17	-51.988	14	-25.024	17
Transport equipment	-9.155	3	-24.383	13	34.937	3	-16.097	9
Real estate	-14.140	10	-11.380	7	-26.285	8	-14.159	7
Legislators, senior officials, managers	-14.502	12	-14.239	9	-27.118	9	-18.830	13
Professionals	-10.710	5	22.147	3	-53.410	15	-14.432	8
Technicians, associate professionals	-9.787	4	13.370	4	22.703	4	-13.175	6
Clerks, administrators	-13.404	8	90.477	2	-24.615	7	-17.861	11
Service, shop, sales workers	-11.822	7	-27.191	14	-6.639	6	-16.993	10
Skilled agricultural and fishery workers	-24.721	18	-20.273	12	-59.111	16	-12.637	5
Craft and related workers	-14.162	11	-39.617	18	16.188	5	-11.245	3
Plant & machine operators, assemblers	-14.574	13	-9.314	6	-33.908	10	-19.793	16
Elementary occupations	-16.839	16	-28.639	16	-47.664	13	-19.031	14
Factor of Production	**Kazakhstan**		**Russia**		**Ukraine**			
	Value	**Rank**	**Value**	**Rank**	**Value**	**Rank**		
Forestry	-107.458	16	7489.281	1	202.898	3		
Fishing	-38.326	8	-872.881	16	-128.235	17		
Oil and gas	250.549	2	4961.642	2	-126.267	16		
Other minerals	275.010	1	1358.546	3	242.694	2		
Machinery (including rental of)	-92.659	14	219.196	5	-64.708	13		
Office machinery & computers	-83.409	13	-798.724	15	-19.911	9		
Electrical equipment	-196.556	18	-1538.440	18	-71.092	15		
Transport equipment	-118.408	17	-898.882	17	-141.894	18		
Real estate	-35.292	7	-217.692	10	9.151	6		
Legislators, senior officials, managers	-73.489	12	-64.796	8	-35.961	10		
Professionals	11.845	5	133.487	7	-16.047	7		
Technicians, associate professionals	-46.270	11	168.813	6	-48.553	11		
Clerks, administrators	73.488	4	1138.415	4	-63.659	12		
Service, shop, sales workers	-26.378	6	-501.942	12	-18.370	8		
Skilled agricultural and fishery workers	125.069	3	-698.573	14	278.183	1		
Craft and related workers	-106.588	15	-255.351	11	31.802	5		
Plant & machine operators, assemblers	-40.192	9	-168.242	9	-68.229	14		
Elementary occupations	-44.789	10	-694.720	13	46.186	4		
***Factor contents of each country's net exports, relative to those of UK consumption**								

TABLE 5: FACTOR CONTENTS OF NET EXPORTS*, using US production techniques								
Factor of Production	**Armenia**		**Azerbaijan**		**Belarus**		**Georgia**	
	Value	**Rank**	**Value**	**Rank**	**Value**	**Rank**	**Value**	**Rank**
Forestry & Fishing	-1.377	18	-1.623	14	-1.481	13	-1.191	15
Oil and gas	-1.136	17	14.731	1	22.334	1	-1.908	18
Mining	0.000	1	-2.265	16	-4.378	15	-0.402	9
Real Estate	-0.091	4	0.228	6	-0.310	4	-0.097	3
Machinery	-1.013	16	-1.038	13	-6.785	18	-1.264	17
Computers & Electronic Equipment	-0.674	12	-1.857	15	-1.140	11	-0.976	12
Electrical Equipment	-0.881	15	-3.504	18	-4.196	14	-1.049	14
Transport Equipment	-0.692	13	-2.483	17	2.217	2	-1.232	16
Renting & leasing (other than real estate)	-0.396	11	10.017	2	-6.222	17	-0.407	10
Legislators, senior officials, managers	-0.323	9	0.441	4	-1.063	10	-0.343	6
Professionals	-0.176	6	0.929	3	-0.885	9	-0.210	5
Techncians, associate professionals	-0.081	3	0.262	5	-0.327	5	-0.096	2
Clerks, administrators	-0.143	5	0.119	7	-0.415	6	-0.159	4
Service, shop, sales workers	-0.065	2	-0.059	8	-0.143	3	-0.071	1
Skilled agricultural and fishery workers	-0.221	7	-0.464	11	-5.376	16	-1.020	13
Craft and related workers	-0.349	10	-0.451	10	-0.723	7	-0.402	8
Plant and machine operators, assemblers	-0.699	14	-0.691	12	-1.233	12	-0.854	11
Elementary occupations	-0.269	8	-0.312	9	-0.725	8	-0.372	7
Factor of Production	**Kazakhstan**		**Russia**		**Ukraine**			
	Value	**Rank**	**Value**	**Rank**	**Value**	**Rank**		
Forestry & Fishing	-1.257	12	28.253	5	5.483	2		
Oil and gas	17.595	2	297.872	1	-7.909	17		
Mining	16.751	3	108.005	3	17.904	1		
Real Estate	0.234	6	1.845	11	-0.151	4		
Machinery	-9.923	16	-47.486	15	-6.548	15		
Computers & Electronic Equipment	-6.686	15	-51.876	16	-1.010	11		
Electrical Equipment	-13.629	18	-59.651	17	-1.090	12		
Transport Equipment	-12.297	17	-93.828	18	-8.537	18		
Renting & leasing (other than real estate)	19.049	1	105.088	4	-4.312	14		
Legislators, senior officials, managers	0.532	5	2.797	8	-0.222	6		
Professionals	1.073	4	6.495	7	-0.880	10		
Techncians, associate professionals	0.154	7	1.766	12	-0.329	7		
Clerks, administrators	-0.217	8	2.030	10	-0.417	8		
Service, shop, sales workers	-0.346	9	-0.644	13	-0.151	5		
Skilled agricultural and fishery workers	-0.726	11	110.265	2	-6.960	16		
Craft and related workers	-1.604	13	2.093	9	0.200	3		
Plant and machine operators, assemblers	-2.996	14	-7.491	14	-1.269	13		
Elementary occupations	-0.537	10	10.558	6	-0.429	9		
***Factor contents of each country's net exports, relative to those of US consumption**								

TABLE 6: BILATERAL FACTOR CONTENT OF NET EXPORTS, 2008, using UK factor requirements, US $ 000						
Factor	**Bilateral factor content - Armenia compared to:**					
	Azerbaijan	**Belarus**	**Georgia**	**Kazakhstan**	**Russia**	**Ukraine**
Forestry	-6 120	-39 488	-4 276	-2 651	-45 856	-18 392
Fishing	-4 508	19 873	8 573	-1 049	2 229	4 827
Oil and gas	-3534 522	-4557 016	519 995	-1885 779	-2475 882	-501 550
Other minerals	117 842	119 809	34 871	-152 056	-25 567	-79 441
Machinery (including rental of)	-200 907	-21 737	36 926	-115 222	-294 063	-187 894
Office machinery & computers	-33 697	-12 184	30 735	-21 331	-29 982	-51 847
Electrical equipment	-63 932	-63 651	89 419	22 248	-54 284	-127 847
Transport equipment	-70 007	-389 970	142 209	34 576	-66 486	5 373
Real estate	-47 413	-38 008	-4 031	-46 482	-53 231	-62 372
Legislators, senior officials, managers	-511 450	-433 558	143 273	-374 813	-662 747	-572 448
Professionals	-189 744	-2 723	31 572	-136 023	-134 826	-111 541
Technicians, associate professionals	-131 969	-142 024	24 767	-56 406	-109 653	-65 621
Clerks, administrators	-200 887	-46 930	17 681	-109 257	-117 878	-50 329
Service, shop, sales workers	-16 920	-36 949	14 064	-33 249	-28 920	-37 259
Skilled agricultural and fishery workers	-39 377	-26 513	-26 156	-72 480	-39 839	-87 043
Craft and related workers	-95 234	-417 312	-88 790	-111 774	-296 954	-391 474
Plant and machine operators etc.	-326 057	-212 224	103 373	-294 190	-358 103	-269 582
Elementary occupations	-95 666	-75 750	8 956	-129 823	-120 049	-201 122
Factor		**Bilateral factor content - Azerbaijan compared to:**				
		Belarus	**Georgia**	**Kazakhstan**	**Russia**	**Ukraine**
Forestry		-129 531	7 157	13 466	-154 249	-47 638
Fishing		94 644	50 779	13 427	26 152	36 238
Oil and gas		-3969 154	15738 971	6400 153	4109 470	11773 502
Other minerals		7 634	-322 080	-1047 700	-556 690	-765 821
Machinery (including rental of)		695 509	923 227	332 616	-361 616	50 512
Office machinery & computers		83 509	250 114	48 004	14 420	-70 455
Electrical equipment		1 094	595 284	334 537	37 453	-248 107
Transport equipment		-1242 042	823 788	405 975	13 669	292 613
Real estate		36 510	168 402	3 615	-22 583	-58 066
Legislators, senior officials, managers		302 364	2541 527	530 403	-587 312	-236 783
Professionals		725 983	859 111	208 537	213 181	303 572
Technicians, associate professionals		-39 030	608 424	293 325	86 628	257 554
Clerks, administrators		597 637	848 445	355 694	322 226	584 440
Service, shop, sales workers		-77 750	120 274	-63 385	-46 579	-78 952
Skilled agricultural and fishery workers		49 937	51 322	-128 499	-1 792	-185 032
Craft and related workers		-1250 256	25 013	-64 206	-783 044	-1149 956
Plant and machine operators, assemblers		441 879	1666 976	123 699	-124 397	219 225
Elementary occupations		77 314	406 129	-132 589	-94 648	-409 360

TABLE 6 (CONTINUED): Bilateral Factor Contents 2008, using UK requirements, US $ 000						
Factor	**Belarus compared with :**				**Russia with :**	
	Georgia	**Kazakhstan**	**Russia**	**Ukraine**	**Ukraine**	
Forestry	179 551	187 838	-32 468	107 573	3841 803	
Fishing	-57 620	-106 685	-89 969	-76 721	363 445	
Oil and gas	25888 070	13620 846	10611 865	20679 134	276179 709	
Other minerals	-433 103	-1386 258	-741 280	-1015 989	-7536 210	
Machinery (including rental of)	299 124	-476 687	-1388 612	-847 251	14851 389	
Office machinery & computers	218 849	-46 638	-90 753	-202 243	-3058 549	
Electrical equipment	780 512	438 002	47 760	-327 344	-10290 400	
Transport equipment	2713 620	2164 792	1649 469	2015 882	10051 974	
Real estate	173 251	-43 209	-77 623	-124 232	-1278 650	
Legislators, senior officials, managers	2941 305	299 546	-1168 654	-708 210	12631 575	
Professionals	174 873	-679 704	-673 603	-554 868	3257 313	
Technicians, associate professionals	850 478	436 572	165 061	389 585	6159 468	
Clerks, administrators	329 454	-317 810	-361 772	-17 335	9449 108	
Service, shop, sales workers	260 119	18 868	40 945	-1 580	-1166 600	
Skilled agricultural and fishery workers	1 820	-234 388	-67 949	-308 649	-6603 217	
Craft and related workers	1675 159	1557 964	613 717	131 751	-13221 974	
Plant and machine operators etc.	1609 254	-417 953	-743 846	-292 473	12382 711	
Elementary occupations	431 923	-275 723	-225 884	-639 282	-11340 902	
Factor	**Georgia with:**				**Kazakhstan with:**	
	Kazakhstan	**Russia**	**Ukraine**		**Russia**	**Ukraine**
Forestry	1 745	-44 645	-15 156		-483 810	-176 269
Fishing	-10 332	-6 812	-4 022		36 710	65 804
Oil and gas	-2583 125	-3216 730	-1096 852		-6607 967	15500 577
Other minerals	-200 707	-64 893	-122 739		1416 425	813 142
Machinery (including rental of)	-163 364	-355 389	-241 394		-2002 662	-813 789
Office machinery & computers	-55 904	-65 193	-88 670		-96 879	-341 720
Electrical equipment	-72 123	-154 297	-233 283		-857 002	-1680 762
Transport equipment	-115 567	-224 080	-146 924		-1131 691	-327 017
Real estate	-45 580	-52 827	-62 641		-75 575	-177 933
Legislators, senior officials, managers	-556 279	-865 440	-768 483		-3224 289	-2213 115
Professionals	-179 949	-178 665	-153 662		13 399	274 151
Technicians, associate professionals	-87 157	-144 329	-97 051		-596 260	-103 187
Clerks, administrators	-136 295	-145 552	-73 024		-96 544	659 869
Service, shop, sales workers	-50 800	-46 152	-55 106		48 482	-44 906
Skilled agricultural and fishery workers	-49 739	-14 692	-65 376		365 512	-163 084
Craft and related workers	-24 678	-223 509	-324 997		-2073 643	-3132 079
Plant and machine operators etc.	-426 872	-495 495	-400 449		-715 687	275 565
Elementary occupations	-149 010	-138 515	-225 565		109 449	-798 404

TABLE 7: BILATERAL FACTOR CONTENT OF NET EXPORTS, 2008, using US factor requirements, US $ 000						
Factor	**Bilateral factor content - Armenia compared to:**					
	Azerbaijan	**Belarus**	**Georgia**	**Kazakhstan**	**Russia**	**Ukraine**
Forestry & Fishing	-59 793	-67 755	-16 701	-78 874	-98 479	-108 479
Oil and gas	-3628 964	-2962 281	471 895	-1992 546	-2403 294	-451 626
Mining	49 092	37 370	31 519	-125 902	-64 988	-99 564
Real Estate	-107 325	-97 244	- 577	-80 071	-74 557	-57 939
Machinery	-113 781	-123 521	25 099	-19 310	-102 763	-88 534
Computers & Electronic Equipment	-48 588	-76 924	58 210	-19 151	-75 279	-150 727
Electrical Equipment	2 036	-17 829	8 908	31 008	-41 869	-74 536
Transport Equipment	-15 839	-62 341	138 665	123 791	-6 365	-38 864
Renting & leasing (not real estate)	-701 849	-556 574	-3 975	-494 444	-270 446	-26 102
Legislators, senior officials, managers	-363 129	-340 568	-2 701	-308 167	-285 273	-256 418
Professionals	-623 775	-538 058	29 276	-408 539	-334 387	-177 412
Technicians, associate professionals	-116 078	-103 528	5 957	-74 220	-73 346	-46 557
Clerks, administrators	-156 222	-149 667	3 846	-111 393	-141 800	-103 989
Service, shop, sales workers	-60 472	-64 874	1 452	-41 401	-73 334	-66 810
Skilled agricultural, fishery workers	- 727	- 932	5 228	-1 119	-7 234	1 713
Craft and related workers	-159 642	-178 630	17 118	-141 032	-249 433	-248 226
Plant and machine operators etc	-339 739	-367 469	62 969	-281 403	-420 969	-401 209
Elementary occupations	-40 881	-45 045	16 836	-47 915	-74 704	-52 177
Factor		**Bilateral factor content - Azerbaijan compared to:**				
		Belarus	**Georgia**	**Kazakhstan**	**Russia**	**Ukraine**
Forestry & Fishing		-30 906	167 275	-74 069	-150 174	-188 989
Oil and gas		-1671 612	15918 864	6352 307	4757 850	12333 907
Mining		89 846	-68 216	-679 298	-442 842	-577 059
Real Estate		333 277	414 379	105 796	127 200	191 709
Machinery		630 159	539 109	366 719	42 768	98 001
Computers & Electronic Equipment		-245 488	414 571	114 272	-103 611	-396 485
Electrical Equipment		-28 559	26 678	112 467	-170 431	-297 240
Transport Equipment		-1270 149	599 760	542 022	36 777	-89 377
Renting & leasing (not real estate)		3479 410	2709 035	805 115	1674 637	2623 141
Legislators, senior officials, managers		1041 059	1399 124	213 355	302 223	414 235
Professionals		2405 387	2535 038	835 512	1123 360	1732 710
Technicians, associate professionals		398 424	473 722	162 486	165 879	269 868
Clerks, administrators		390 465	621 359	174 019	55 984	202 757
Service, shop, sales workers		59 986	240 377	74 031	-49 927	-24 603
Skilled agricultural and fishery workers		26 013	23 117	-1 521	-25 260	9 471
Craft and related workers		68 126	686 157	72 242	-348 551	-343 866
Plant and machine operators, assemblers		161 207	1563 245	226 449	-315 322	-238 617
Elementary occupations		52 000	224 047	-27 304	-131 296	-43 850

TABLE 7 (CONTINUED): Bilateral Factor Contents 2008, using US requirements, US $ 000						
Factor	**Belarus compared with :**				**Russia with :**	
	Georgia	**Kazakhstan**	**Russia**	**Ukraine**	**Ukraine**	
Forestry & Fishing	260 326	-56 698	-156 667	-207 653	-1398723	
Oil and gas	23106 382	10540 007	8445 571	18397 278	273009461	
Mining	-207 627	-1010 327	-699 725	-876 029	-4836612	
Real Estate	106 534	-298 812	-270 697	-185 959	2324635	
Machinery	-119 600	-346 047	-771 581	-699 028	1990362	
Computers & Electronic Equipment	867 036	472 571	186 366	-198 346	-10553962	
Electrical Equipment	72 557	185 248	-186 360	-352 932	-4569660	
Transport Equipment	2456 263	2380 420	1716 743	1551 031	-4546056	
Renting & leasing (not real estate)	-1011 944	-3512 883	-2370 702	-1124 772	34180133	
Legislators, senior officials, managers	470 345	-1087 250	-970 514	-823 379	4036433	
Professionals	170 306	-2062 147	-1684 037	-883 611	21958424	
Technicians, associate professionals	98 909	-309 921	-305 465	-168 867	3747354	
Clerks, administrators	303 295	-284 319	-439 366	-246 568	5289105	
Service, shop, sales workers	236 958	18 450	-144 379	-111 113	912587	
Skilled agricultural, fishery workers	-3 804	-36 168	-67 351	-21 729	1251563	
Craft and related workers	811 828	5 407	-547 337	-541 183	168837	
Plant and machine operators etc	1841 680	85 700	-625 955	-525 198	2764126	
Elementary occupations	225 996	-104 172	-240 773	-125 906	3151178	
Factor	**Georgia with:**				**Kazakhstan with:**	
	Kazakhstan	**Russia**	**Ukraine**		**Russia**	**Ukraine**
Forestry & Fishing	-66 756	-87 807	-98 543		-219 541	-331 510
Oil and gas	-2646 118	-3087 146	-991 602		-4599 553	17255 208
Mining	-169 026	-103 622	-140 746		682 107	294 930
Real Estate	-85 354	-79 434	-61 591		61 744	247 834
Machinery	-47 683	-137 288	-122 011		-934 507	-775 176
Computers & Electronic Equipment	-83 063	-143 330	-224 339		-628 529	-1473 388
Electrical Equipment	23 729	-54 521	-89 596		-816 080	-1181 887
Transport Equipment	-15 970	-155 722	-190 616		-1457 488	-1821 406
Renting & leasing (not real estate)	-526 626	-286 115	-23 758		2508 323	5244 487
Legislators, senior officials, managers	-327 985	-303 404	-272 421		256 360	579 482
Professionals	-470 090	-390 471	-221 925		830 360	2588 160
Technicians, associate professionals	-86 088	-85 150	-56 386		9 785	309 766
Clerks, administrators	-123 735	-156 383	-115 785		-340 497	82 903
Service, shop, sales workers	-46 011	-80 299	-73 294		-357 585	-284 532
Skilled agricultural, fishery workers	-6 815	-13 381	-3 774		-68 481	31 708
Craft and related workers	-169 809	-286 201	-284 905		-1213 870	-1200 354
Plant and machine operators etc	-369 759	-519 613	-498 397		-1562 854	-1341 582
Elementary occupations	-69 524	-98 288	-74 101		-299 987	-47 731

TABLE 8: LIST OF VARIABLES IN REGRESSION ANALYSIS		
Variable	**Description**	**Year**
XSIM	export similraity index (calculated from trade data)	2008
ARABLE	Arable land (hectares per person)	2007
FOREST	Forest area (sq. Km per capita)	2007
ENERGY	Energy production per capita (kt of oil equivalent)	2007
RES	Research and development expenditure (% of GDP)	2007
HITECH	High-technology exports (% of total exports of goods & services)	2008
TAX1	Taxes on goods and services (% value added of industry and services)	2008
EASE	Ease of doing business index (1=most business-friendly regulations)	2009
LEGAL	Strength of legal rights index (0=weak to 10=strong)	2008
TAX2	Total tax rate (% of profit)	2008
INVEST	Gross fixed capital formation (% of GDP)	2008
GDP	GDP per capita (current US$)	2008
SCHOOL1	Primary completion rate, total (% of relevant age group)	2008
SCHOOL2	School enrollment, tertiary (% gross)	2007
PARTIC	Labor participation rate, total (% of total population ages 15+)	2008
BIRTH	Birth rate, crude (per 1,000 people)	2008
LIFEX	Life expectancy at birth, total (years)	2008
URBAN	Urban population (% of total)	2005
TARIFF	Tariff rate, applied, weighted mean, all products (%)	2008
CIS	CIS Dummy	

TABLE 9: REGRESSION ANALYSIS (PANEL LEAST SQUARES) - DEPENDENT VARIABLE - EXPORT SIMILARITY INDICE

	SAMPLE 2 258 Observations, 6 CIS countries			SAMPLE 2 Restricted equation			SAMPLE 1 581 Observations, 7 CIS countries			SAMPLE 1 Restricted equation		
Variable	Coeff.	Std. Error	t-Stat.	Coeff.	Std. Error	t-Stat.	Coeff.	Std. Error	t-Stat.	Coeff.	Std. Error	t-Stat.
C	0.2485	0.0198	12.5679	0.2415	0.0178	13.5957	0.1589	0.0156	10.1754	0.1480	0.0081	18.2382
ARABLE	0.0818	0.0308	2.6568	0.0837	0.0284	2.9515	-0.0247	0.0257	-0.9593			
BIRTH	0.0059	0.0020	2.9800	0.0046	0.0015	2.9627	-0.0015	0.0012	-1.2984	-0.0014	0.0010	-1.4631
CIS	-0.0734	0.0258	-2.8523	-0.0665	0.0242	-2.7491	0.0362	0.0258	1.4028	0.0477	0.0222	2.1491
EASE	0.0001	0.0002	0.6291				0.0000	0.0002	-0.2071			
ENERGY	-20.2489	4.8941	-4.1374	-23.2816	4.2971	-5.4180	-3.8590	0.7447	-5.1817	-4.0115	0.5648	-7.1020
FOREST	0.6882	0.5403	1.2737	0.8729	0.4755	1.8356	0.1209	0.4764	0.2538			
GDP	0.0000	0.0000	-1.6596				0.0000	0.0000	-0.3058			
HITECH	0.0026	0.0014	1.8737	0.0033	0.0012	2.7576	n/a	n/a	n/a			
INVEST	-0.0006	0.0014	-0.4061				0.0019	0.0010	1.8936	0.0019	0.0010	1.9678
LEGAL	-0.0001	0.0034	-0.0388				-0.0005	0.0031	-0.1569			
LIFEX	0.0130	0.0030	4.2814	0.0071	0.0018	3.8703	0.0006	0.0012	0.5446			
PARTIC	0.0021	0.0010	2.1461	0.0014	0.0009	1.6085	0.0033	0.0008	4.3081	0.0032	0.0006	4.8822
RES	0.0228	0.0237	0.9645				n/a	n/a	n/a			
SCHOOL1	-0.0006	0.0009	-0.6148				-0.0006	0.0006	-0.9939			
SCHOOL2	0.0005	0.0005	0.8280				n/a	n/a	n/a			
TARIFF	0.0059	0.0028	2.1336	0.0047	0.0022	2.1540	-0.0026	0.0018	-1.4113	-0.0026	0.0016	-1.6147
TAX1	0.0025	0.0016	1.5426				n/a	n/a	n/a			
TAX2	-0.0008	0.0004	-1.9623	-0.0009	0.0003	-2.7571	-0.0007	0.0004	-1.6431	-0.0008	0.0003	-2.3567
URBAN	-0.0011	0.0007	-1.6664				-0.0005	0.0004	-1.4023	-0.0007	0.0003	-2.1801
Diagnostics :												
R-squared	0.3541			0.3354			0.2164			0.2131		
Adjusted R-squared	0.2876			0.2943			0.1869			0.1936		
S.E. of regression	0.0904			0.0900			0.1331			0.1326		
Sum squared resids.	1.9033			1.9583			9.9094			9.9508		
Log likelihood	267.2255			263.5451			358.2997			357.0894		
F-statistic	5.3233			8.1436			7.3490			10.9471		
Mean dependent var	0.1676			0.1676			0.1658			0.1658		
S.D. dependent var	0.1071			0.1071			0.1477			0.1477		
Akaike info criterion	-1.8777			-1.9190			-1.1577			-1.1776		
Schwarz criterion	-1.5334			-1.6986			-0.9924			-1.0649		
Hannan-Quinn criter.	-1.7393			-1.8304			-1.0932			-1.1337		

Cross-section effects (fixed) :		**Redundant variables tests:**			**Cross-section effects (fixed) :**	**Redundant variables tests:**		
			Value	df			Value	df
Armenia	-0.1461				-0.1614			
Azerbaijan	n/a	F-statistic	0.74923	(9, 233)	0.0284	F-statistic	0.3334	(7, 559)
Belarus	0.0469	Likelihood ratio	7.3607	9	0.0523	Likelihood ratio	2.4206	7.0000
Georgia	-0.0473				-0.0764			
Kazakhstan	0.0181				0.0340			
Russian Federation	0.1059				0.0825			
Ukraine	0.0223				0.0406			

APPENDIX 1: EXPORT SIMILARITY INDICES							
Comparison Country	**Former Soviet Country:**						
	Armenia	**Azerbaijan**	**Belarus**	**Georgia**	**Kazakhstan**	**Russia**	**Ukraine**
WORLD	**9.6%**	**16.4%**	**33.0%**	**23.4%**	**21.5%**	**30.4%**	**34.2%**
Algeria	0.6%	62.5%	13.2%	3.0%	59.8%	56.5%	4.9%
Argentina	8.3%	12.0%	25.5%	22.1%	17.7%	20.9%	28.1%
Armenia	N/A	0.9%	3.5%	37.0%	7.1%	4.1%	9.1%
Australia	9.2%	8.6%	15.4%	22.3%	22.9%	22.8%	22.5%
Austria	7.3%	3.9%	27.7%	20.7%	8.1%	14.1%	29.9%
Azerbaijan	0.9%	N/A	14.5%	5.0%	65.7%	44.1%	7.1%
Bahrain	1.3%	10.1%	36.7%	5.2%	5.5%	20.1%	11.1%
Bangladesh	2.4%	2.4%	6.3%	4.6%	3.7%	4.1%	7.3%
Belarus	3.5%	14.5%	N/A	10.4%	9.5%	29.0%	24.7%
Bhutan	14.0%	0.8%	4.3%	15.1%	5.1%	3.4%	7.8%
Bolivia	5.3%	7.2%	8.1%	9.4%	11.9%	22.0%	7.0%
Brazil	6.7%	12.2%	25.7%	19.4%	20.1%	23.4%	30.3%
Bulgaria	15.3%	12.0%	33.2%	17.4%	15.4%	25.0%	33.4%
Canada	8.7%	17.5%	28.2%	25.6%	28.3%	39.4%	30.0%
Chile	23.3%	3.3%	8.7%	18.9%	12.2%	9.6%	11.4%
China	5.7%	3.7%	21.4%	9.9%	6.5%	12.2%	24.6%
Colombia	10.4%	30.8%	23.7%	19.4%	33.6%	37.6%	22.4%
Costa Rica	6.7%	2.3%	14.0%	9.3%	3.5%	6.0%	14.1%
Cote d Ivoire	2.9%	25.4%	29.4%	10.7%	21.1%	35.8%	11.5%
Cyprus	6.7%	10.4%	28.4%	18.4%	7.0%	21.9%	16.5%
Czech Republic	7.2%	3.2%	24.8%	19.5%	6.5%	13.2%	30.5%
Dom Rep	19.7%	3.3%	12.2%	20.5%	7.6%	6.4%	16.9%
Egypt	4.3%	20.8%	35.2%	11.1%	18.8%	46.1%	22.6%
France	8.7%	6.2%	28.3%	24.4%	10.8%	16.6%	32.6%
Georgia	37.0%	5.0%	10.4%	N/A	11.3%	10.3%	18.5%
Germany	7.3%	4.7%	26.2%	21.1%	7.6%	14.4%	29.3%
Ghana	4.6%	2.0%	5.3%	11.4%	3.6%	5.4%	5.9%
Greece	9.6%	13.4%	30.3%	15.1%	9.6%	22.0%	28.6%
Hong Kong	9.8%	1.7%	12.0%	8.6%	4.2%	6.7%	14.5%
Hungary	6.3%	4.2%	21.8%	17.0%	6.2%	11.6%	26.0%
India	16.3%	13.1%	32.4%	12.6%	13.4%	27.8%	28.1%
Iran	3.0%	82.6%	9.2%	7.8%	67.9%	41.6%	8.3%
Ireland	4.9%	2.1%	12.0%	8.4%	3.3%	6.0%	13.1%
Israel	22.3%	2.3%	10.6%	7.8%	2.5%	7.2%	12.2%
Italy	8.5%	6.7%	29.3%	16.8%	8.2%	14.3%	31.4%
Jamaica	6.6%	10.9%	20.1%	11.6%	5.9%	19.1%	10.7%
Japan	5.4%	3.1%	18.1%	14.4%	7.8%	12.9%	21.9%
Jordan	9.7%	3.1%	24.2%	19.8%	4.5%	9.0%	20.3%
Kazakhstan	7.1%	65.7%	9.5%	11.3%	N/A	47.4%	18.3%
Kenya	8.0%	7.6%	17.3%	14.0%	7.7%	12.1%	18.8%
Kuwait	0.9%	73.6%	34.5%	5.0%	67.4%	53.8%	6.7%
Malawi	1.7%	1.7%	4.9%	6.2%	1.5%	2.8%	7.3%
Malaysia	5.5%	12.2%	22.4%	9.8%	14.9%	24.6%	20.7%
Mauritius	6.6%	1.6%	8.1%	8.3%	2.7%	4.5%	8.3%
Mexico	7.5%	17.6%	25.2%	19.0%	21.2%	24.1%	23.8%

APPENDIX 1: EXPORT SIMILARITY INDICES (CONTINUED)							
Comparison Countr	**Former Soviet Country:**						
	Armenia	**Azerbaijan**	**Belarus**	**Georgia**	**Kazakhstan**	**Russia**	**Ukraine**
WORLD	**9.6%**	**16.4%**	**33.0%**	**23.4%**	**21.5%**	**30.4%**	**34.2%**
Morocco	5.7%	3.8%	12.1%	8.7%	7.1%	8.2%	13.9%
Namibia	26.7%	1.9%	8.4%	8.2%	6.7%	5.5%	8.6%
Nepal	2.5%	1.4%	6.7%	6.0%	4.3%	3.1%	10.0%
Netherlands	7.7%	12.6%	29.8%	13.8%	9.3%	21.2%	27.8%
New Zealand	7.0%	6.8%	21.0%	17.2%	10.4%	15.7%	18.3%
Nigeria	0.5%	87.6%	6.0%	3.2%	63.3%	35.6%	3.1%
Oman	2.2%	66.7%	15.7%	7.3%	66.0%	56.5%	12.0%
Pakistan	6.0%	7.3%	12.8%	8.3%	6.5%	9.0%	12.1%
Panama	6.0%	1.8%	7.3%	11.4%	3.6%	3.6%	7.7%
Paraguay	3.0%	1.8%	7.2%	7.0%	4.6%	4.8%	13.8%
Philippines	5.3%	4.0%	12.9%	7.8%	8.7%	9.0%	15.2%
Poland	7.6%	4.7%	30.6%	19.6%	9.5%	15.7%	32.1%
Portugal	9.2%	8.0%	28.9%	20.4%	7.8%	14.4%	27.2%
Qatar	0.5%	51.5%	9.5%	4.9%	53.5%	52.9%	7.1%
Romania	7.1%	10.3%	29.5%	19.5%	10.2%	20.9%	35.6%
Russia	4.1%	44.1%	29.0%	10.3%	47.4%	N/A	22.4%
South Korea	4.8%	9.8%	24.0%	13.5%	9.6%	17.7%	22.5%
Saudi Arabia	1.8%	86.6%	16.3%	6.0%	68.0%	48.3%	9.0%
Senegal	9.4%	11.6%	35.7%	19.2%	9.6%	23.9%	17.2%
Seychelles	0.6%	0.3%	1.4%	1.2%	0.4%	0.7%	1.1%
Singapore	5.9%	11.4%	26.9%	9.4%	6.9%	23.2%	18.9%
Slovakia	6.6%	7.5%	27.6%	17.7%	10.5%	17.4%	31.6%
Spain	7.4%	8.4%	31.1%	21.8%	8.7%	16.8%	30.8%
Sri Lanka	7.6%	1.5%	9.1%	5.4%	2.5%	4.2%	8.6%
South Africa	16.2%	6.6%	18.4%	25.8%	17.2%	20.0%	28.3%
Sudan	0.9%	87.4%	6.0%	3.3%	64.4%	35.8%	3.6%
Sweden	6.6%	7.8%	27.3%	18.8%	9.2%	18.0%	30.1%
Switzerland	9.3%	1.7%	15.3%	11.6%	3.5%	8.8%	19.7%
Syria	3.5%	42.6%	19.9%	8.8%	40.6%	42.9%	15.2%
Taiwan	4.9%	7.7%	20.0%	6.3%	8.3%	15.0%	20.1%
Tanzania	6.2%	3.2%	8.9%	15.2%	6.3%	8.5%	12.9%
Thailand	9.9%	7.9%	28.2%	15.1%	8.6%	14.0%	23.3%
Trinidad and Tobago	2.4%	23.5%	31.9%	8.2%	22.2%	47.1%	14.8%
Tunisia	5.3%	17.3%	19.2%	10.6%	18.0%	21.6%	18.7%
Turkey	10.3%	7.7%	31.6%	20.9%	10.3%	15.1%	31.7%
UAE	10.0%	46.0%	23.5%	16.0%	41.5%	49.8%	14.9%
Uganda	8.4%	5.5%	12.0%	19.4%	7.1%	8.3%	15.7%
Ukraine	9.1%	7.1%	24.7%	18.5%	18.3%	22.4%	N/A
UK	10.5%	12.8%	27.6%	21.9%	14.7%	23.0%	27.1%
Uruguay	5.3%	4.1%	17.4%	9.4%	8.3%	9.7%	16.9%
USA	9.8%	6.6%	24.7%	20.2%	11.7%	17.2%	29.3%
Venezuela	1.3%	90.2%	16.6%	4.8%	67.5%	50.2%	9.0%
Vietnam	4.8%	21.2%	18.0%	8.8%	24.0%	27.5%	16.9%
Yemen	2.0%	90.2%	13.6%	6.4%	65.1%	42.8%	8.1%