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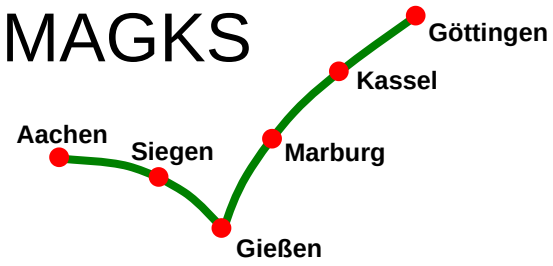

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Forecasting Russian Foreign Trade Comparative Advantages in the Context of a Potential WTO Accession *

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Abstract

This paper proposes a new approach of forecasting "prospective" comparative advantages based on relative prices differences between countries in the context of economic liberalization. An empirical analysis based on the example of Central and East European countries that have already passed the transition period from specialization mainly in natural resource- and labor-intensive goods to "high-tech" goods confirms a significant influence of our "prospective" advantages on comparative advantages dynamics. Using this method we identify a set of industries in Russia that seem to be most promising for formation of comparative advantages in the context of its economic liberalization and joining the WTO agreements. These industries include high and medium technological industries like machinery building, pharmaceutical products, railway transport, electronic and medical equipment.

Keywords: comparative advantage, competitive advantage, economy in transition, Balassa index, Lafay index.

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1 Introduction

The modernization of the economy using newest technologies is the core to Russia's long term economic strategy. To obtain this goal the government needs to stimulate innovative activities of enterprizes and diversify Russian export structure by gaining comparative advantages (CAs) in industries with high value added goods. Apparently, the existing instruments of the comparative advantages theory assess dimensions of advantages at a particular moment in the past or at present, whereas CA is a dynamic characteristic, i.e. it changes in the course of time according to economic development of countries (Grossman and Helpman 1991). Therefore, an instrument that could tackle the problem of forecasting CAs is required to provide an estimation on industries, which have prospects for stimulation of innovations. For the Russian economy this issue is even more important due to the transition period in the economy and the necessity to set development priorities.

At the moment this area of research is seldom explored and contains only a few scientific publications. Thus, Belousov (2006) based on the macroeconomic trends suggests that the future CAs of Russia could be energy, scientific-research (generating innovative technologies and products), transport (international logistic services) and agriculture sectors. Rogov (2004) argues that the diversification of Russian foreign trade is possible in high technology industries by the use of public corporations as the most effective management instrument without providing any concrete suggestions for industries where CAs will take place. Therefore, so far as we know research in this area relies on intuitive approaches rather than theoretical analysis and quantitative assessments, and our research is intended to close this gap.

This paper is organized as follows. Section 2 provides an analysis of the comparative advantages theory and different approaches on measuring CAs. We present a new method of forecasting CAs dynamics in the form of a "prospective" comparative advantage index and describe main features of this index. In Section 3 the present state of the Russian foreign trade specialization is explored and the index of prospective comparative advantages is empirically tested on the example of new EU member states. Based on these results we identify industries with apparently higher potential for stimulation of CAs in Russia. Section 4 concludes.

2 The concepts of Revealed and Prospective Comparative Advantages

2.1 Revealed Comparative Advantages

To analyze the Russian foreign trade structure we will use the comparative advantages theory that was originally introduced by David Ricardo (Feenstra 2004). It asserts that countries are specializing in goods they can produce with less opportunity costs than other countries. This principle is by no means trivial as it asserts that even if a country has an absolute cost disadvantage in all goods, it will still benefit from international trade through specialization in goods where it has CAs. In the simplest case of two goods and two countries it means that country A has a CA for the product that this country can produce most-best in comparison to country B, even if this product is produced less productively than in country B. This implies that the country is relatively more efficient in producing goods with CAs so that under free trade its welfare will be improved by reallocating more resources to producing the goods with CAs and exporting them in exchange for more import goods (Leung and Cai 2005). Thus, a CA is established by cost comparison under autarky and under trade (Siggel 2006).

Possible reasons for this cost advantage include: differences in countries endowments of factors of production, technologies, taxation, and consumers' preferences. The most popular theory of comparative advantages is the Heckscher-Ohlin theory (Feenstra 2004). This theory describes differences in factor proportions among countries as a main reason of CAs. For further details on the comparative advantage theory see Dixit and Norman (1989).

The principle of comparative advantage is straightforward as long as only two products are involved. The extension to a continuum of goods demonstrated by Dornbusch *et al.* (1977) confirms the principle as valid for a "continuum of goods" and determines a "borderline", according to which a country has a CA in goods, that it can produce with less production costs than other country. Further, Dornbusch *et al.* (1977) extend the analysis by requiring the usage of equilibrium prices to measure cost differences across countries as non-equilibrium prices contain various distortions like trade barriers and exchange rate misalignments. Thus, cost comparison based on market prices can not be the sole basis of a measure of CA. When costs are measured in terms of distorted prices we deal with competitive advantage, which is not the same as CA; having a CA implies that production costs in terms of equilibrium factor prices are lower than those of an international competitor.

In order to measure the current trade specialization of a country and

its potential in the context of trade liberalization, we consider CAs indices. According to the principle of comparative advantages, trade patterns and export specialization are determined by CAs (Feenstra 2004) that are difficult to assess empirically, since the principle is based upon autarkic prices which we can not assess under free trade (Balance *et al.* 1987). There exist numerous alternatives to measure comparative advantages (Bruno (1965), Krugman and Hatsopoulos (1987), Porter (1990)). Balassa (1965) suggested calculating the Revealed Comparative Advantage (RCA) index as follows:

$$\mathrm{RCA}_{ij}^{B} = (x_{ij}/X_{wj})/(x_i/X_w), \tag{1}$$

where

x_{ij}	export of good j by country i
X_{wj}	world export of good j
x_i	export of all goods by country i
X_w	world export of all goods

If the Balassa index is greater (smaller) than 1 the country i exhibits a revealed comparative advantage (disadvantage) in good j. With other words, Balassa argued that country i exhibits a comparative advantage in good j, if its export of the good j, relative to world export of the good j, is larger than the country's market share in total exports.

Balance *et al.* (1987) classified different approaches to measure revealed CAs and tested their consistency. The authors highlighted two main classes of indices, namely those using data on trade, domestic production and consumption; and those using only trade data. The consistency tests based on the comparison of correlation coefficients for alternative pairs of RCA indices, rankings of countries provided by the RCA indices and the extents to which the indices agree in distinguishing between countries that enjoy CAs, showed that the index based on the "net export" approach (that uses only trade data) is the most reliable among all tested indices. Taking this into account, a more appropriate index of CAs would be as follows:

$$\mathrm{RCA}_{ij}^{N} = 100(x_{ij} - m_{ij})/(x_{ij} + m_{ij}), \tag{2}$$

where x_{ij} and m_{ij} denote the export and import of good j by country i, respectively. The denominator in formula (2) represents the total trade volume of good j of country i (Balance *et al.* 1987). This index is ranging between -100 and 100. In practice the absolute value of the index is rarely larger than 10. The larger the index is, the higher is the foreign trade specialization in industry j.

Another approach for CA assessment was proposed by Lafay (1992) and takes intra-industry trade more closely into consideration. This is particularly important in the context of the globalization of the world economy, the growth of semi-finished goods trade flows and multinational companies (MNC) that distribute the production process among their subsidiaries around the world. The Lafay index (LFI) also has an advantage in comparison to formula (2) as it is robust to macroeconomic distortions, since it takes the difference between each item normalized trade balance and the overall normalized trade balance into account (Zaghini 2005).

The Lafay index can be calculated for a given country i and for a given good j as follows:

$$\mathrm{LFI}_{ij} = 100 \left(\frac{x_{ij} - m_{ij}}{x_{ij} + m_{ij}} - \frac{\sum_{j=1}^{N}(x_{ij} - m_{ij})}{\sum_{j=1}^{N}(x_{ij} + m_{ij})} \right) \frac{x_{ij} + m_{ij}}{\sum_{j=1}^{N}(x_{ij} + m_{ij})}, \qquad (3)$$

where N is the overall number of traded goods. So the Lafay index measures the contribution of each good to the overall normalized trade balance. Therefore, the sum of LFI indices for all goods equals zero. Positive values of the Lafay index indicate the existence of comparative advantages and vice versa.

In general we can conclude that the indices of revealed comparative advantages assess advantages that exist and are realized in practice, but give no information in regard to their future dynamics.

2.2 Prospective Comparative Advantages

It is both for the private and public sector in any particular economy crucial to know, what industries may exhibit CAs, which for some reasons are not realized. This can efficiently help all current and potential actors to improve their economic strategy. Since CA tends to change over time due to changes in technologies or factor endowments, a forecasting instrument of CAs dynamics is required. Looking for an appropriate instrument we have ascertained that the existing approaches are mainly based on the investigation of reasons for cost advantages and normally do not provide any detailed estimation of industries with a potential of CA.

The widely cited work of Grossman and Helpman (1991) noted that dynamic comparative advantages arise "due to incipient cost advantage in R&D". The authors devote their attention mostly to knowledge spillovers and its accumulation, as well as to the relative shares of R&D expenditures

in GDP, which are, in fact, instruments for stimulating comparative advantages, which is beyond the scope of this paper. We would rather aim to identify the industries, where these instruments may be most advantageous.

As for empirical based analysis, the existing research (Marconi and Rolli (2008), Landesmann and Stehrer (2001), Montobbio (2003)) provides estimates of the potential impact of explanatory variables based on CA dynamics in the past, but do not enable to forecast CA dynamics in the future, mainly due to high variance across country specific characteristics and great difference of CA determinants across industries depending on their level of technology.

Here it is reasonable to note that we will use the classification of high, medium and low technology industries defined by *Technological Performance and Industrial Competitiveness* (1986). Therefore, industries with a share of R&D in output larger than 4% are characterized as high technological industries (e.g., pharmaceuticals, microelectronics, aircraft), industries with a share of 1-4% are considered as medium technological industries (chemicals, motor vehicles, non-electronical machinery) and all other are categorized as low technological industries (mining industries, textile, food).

Marconi and Rolli (2008) examined 16 emerging countries over the period of 1985-2000 and showed that higher unit labor costs have a negative effect on CAs, whereas intensive physical capital accumulation and imports of capital goods have a positive effect only on medium and high technological industries. Similarly, Montobbio (2003) showed that R&D per employee positively affects export market shares, whereas industries are affected by R&D with different time lags, e.g. high technological industries are affected by R&D with a time lag of three years and medium technological industries are affected with a time lag of one or two years.

Stehrer and Woerz (2003) have determined and distinguished three types of "catching-up" processes in productivity levels of less developed countries: first, the "continuous-convergence approach" with an equal speed of convergence across all industries; second, the "climbing-up-the-ladder approach" where the lagging country closes the gap in the low technological industries before it can start to catch up with high technological industries and, third, the "jumping-up approach" where the lagging country catches up in the high technological industries from the very beginning. The authors have empirically tested these "catching-up" patterns and concluded that these patterns differ substantially across countries in terms of industries, time and rate of growth of the "catching-up" process.

To forecast the dynamics of CAs, we will consider relative prices of products in different countries. Practically, we turn back to the initial idea of the comparative advantages theory: when two countries have different prices

of goods in autarky, and trade is allowed to be opened up, these countries gain CAs in goods, which are less expansive than in another country. The difficulty in this case is that, as mentioned above, we cannot measure autarky prices simply because we can not observe them (Balance *et al.* 1987). An important assumption that we make here is that we will consider commodity prices in countries under numerous trade barriers as approximations to autarky prices that will converge to international prices after economic liberalization. Therefore, this forecasting instrument is suitable only for countries that exhibit rigid protectionist policies. In addition, these countries are assumed to be in the period of transition and are expected to liberalize their economy in terms of joining multinational free trade zones, e.g. WTO, EU. Here we should take into account that the Russian Federation is the only large economy outside the WTO agreements and from this point of view may rather be considered, at present, as a closed economy.

Let us now turn back to the meaning of the differences in commodity prices across countries. When a country has a CA in a particular good, it can produce an additional unit of this good while refusing to produce less units of other goods than an other country or the world economy in general. Therefore, the relative price of this good is also lower in this country than elsewhere (Dixit and Norman 1989). In the case of an open economy, the country will export this good according to the Ricardo principle of CAs. This good then becomes scarcer on the domestic market and, therefore, more expensive until it will be as expensive as on the foreign market. This is exactly the comparative advantage principle that is described in classical and neo-classical trade theory (Siggel 2006).

But when trade barriers exist, this process is limited and domestic prices do not reach the level of international prices and some natural CAs are not realized because of distorted prices. Therefore, based on relative price differences we can conclude whether there is a prospective, but unrealized CA or not.

As we have just argued, it is difficult to measure CAs based on market prices due to various distortions presented by these prices (Siggel 2006). To minimize these distortions we use relative producer price indices. This has several reasons, which we will now discuss in detail.

First, since we compare advanced countries and countries in transition with a different structure of industrial output as compared to OECD countries, we use price indices rather than absolute prices. This will eliminate the need to translate the prices in one currency and will better suit our model of heterogenous goods and levels of economic development. Moreover, compiled at different levels of aggregation, the indices are intended to be free of some of the defects of existing measures and more suitable for the calculation of

changes in quantities traded and for the analysis of the relations between prices and quantities (for further details see Diewert (1993)).

Second, the usage of relative prices to construct an indicator of an industry's competitiveness was realized long ago. Indicators of competitiveness calculated by the OECD's Economics and Statistics Department are based on the industry consumer price indices (Durand and Giorno 1987). Practically, they use a relative industry price (relative to foreign competitors), with the exchange rate translating it into US dollars.

Third, in contrast to Durand and Giorno (1987), we consider manufacturer prices rather than consumer prices to measure industry competitiveness, because they are less distorted by the state of competition on a particular market and by possible misalignment of the exchange rate. In fact, producer prices are actual transaction prices of domestic production taking account of discounts and rebates, excluding VAT and all taxes and duties on the goods as well as trade margin. As it was shown by Nakamura and Steinsson (2008) trade margin is stochastic and not fixed as a percentage from a producer price and accounts for roughly 50% of consumer price instability. So we consider that manufacturer prices reflect changes in technologies in companies to a larger extent than consumer prices that are not well suited to measure competitiveness indices (Siggel 2006).

Durand and Giorno (1987) argue that the producer price indices vary in quality across countries due to their lack of homogeneity in terms of weighting and coverage. They argue that the main problem of using manufacturer prices is the difference in data collection across countries, in general, and a possible omission of some products from countries price indices, in particular. It is true, that the problem of economic data aggregation, in particular data aggregation on prices (Balk 1983), is very complicated. But we must keep in mind that, in first instance, we suggest using producer prices with a fine level of commodity detail (classification of goods of 3- and 4-digits) rather than on the high level of aggregation, at which the criticism is primarily directed and, in second instance, we propose to use (if possible) a unified database, e.g. Eurostat, for all countries in the scope as a source of industrial output prices to minimize the risk of omitted goods.

Thus, we use an indicator of competitiveness, or in other words "competitive advantage", as a forecasting instrument for CAs in the context of economic liberalization. Here we need to admit that it is very unlikely to eliminate all artificial distortions that take place in the real economy, e.g., exchange rate misalignments. But it is beyond the scope of this paper to approximate "true natural" CAs. We rather try to forecast CAs that take place in the real economy with a minimum of trade barriers and can be measured by indices of revealed CAs like the Balassa index based on the trade

statistics (see Leung and Cai (2005), Siggel (2006)).

We call the index that forecasts CAs based on relative price differences the Prospective Comparative Advantage (PCA) index. Thus, prospective advantage takes place when a country has a CA, but it is not exploited (e.g. because of trade barriers). The PCA index is defined as follows:

$$\mathrm{PCA}_{ij} = \frac{p^h_{it}}{p^h_{jt}} \Big/ \frac{p^f_{it}}{p^f_{jt}}, \tag{4}$$

where

p^h_{it}	price index of good i on the domestic market in period t
p^h_{jt}	price index of good j on the domestic market in period t
p^f_{it}	price index of good i on the foreign market in period t
p^f_{jt}	price index of good j on the foreign market in period t

We denote a base good as j. In our case it is an overall producer price index (including good i). Prospective comparative advantage takes place when the relative price on the domestic market is lower than on the foreign market. An index value less than 1 reflects a prospective comparative advantage in this industry. The lower the index is, the higher is the prospective comparative advantage.

The PCA index may be seen as an extension of the Domestic Resource Cost (DRC) criterion proposed by Bruno (1965). This criterion is known as an alternative measure of revealed comparative advantages. The main difference is that instead of measuring the relation of total domestic costs per unit of a product to free-trade price of comparable output in absolute values, we measure producer price indices of goods in relation to the base good among two countries. Measuring competitiveness among countries under trade barriers and presuming economic liberalization in the nearest future, the PCA index provides a forecast of industries in which CAs are likely to arise rather than assessing CAs that are already realized.

Calculating the PCA for Russia we can consider Germany, the biggest trade partner of Russia, or the European Union as a whole as the foreign economy, which can be considered as liberalized economies and with price indices structures close to the world economy. The choice of the EU as the foreign economy is also supported by the fact that the EU has the highest degree of product coverage in its trade pattern with Russia (Brenton *et al.* 1997). It is also important to note that the more similar the industrial structure of the foreign economy is, the more exact is the PCA index due to

the comparability of overall producer price indices. For Russia and the EU it is not exactly the case due to a significant prevalence of mining industries in the Russian economy as we will see in Section 3 of this paper.

2.3 Implications of the Prospective Comparative Advantages index

If the PCA is lower than 1, we may conclude that industry i is undervalued in comparison to the overall industrial output, i.e. prices in a particular industry grow slower than the overall price index in comparison to a foreign country, and when the PCA is higher than 1, industry i is overvalued in comparison with the overall output, i.e. prices in this industry rise faster than the overall price index as compared to the foreign economy. After economic liberalization an inefficient use of resources will hardly be maintained, prices in undervalued industries will most likely rise and the optimal strategy would be to arrange conditions under which resources from overvalued industries could freely float into undervalued industries.

To make it easier to understand, let us take a concrete calculation example: consider Russia for h and Germany for f. We will consider medical and surgical equipment for i, an overall industrial price index for j and will calculate the PCA index in 2007 (t). We use chain indices, so that price indices of 2006 are all assumed to be equal 100. Thus, p^h_{it}= 102,1 (which means that the producer price for medical and surgical equipment has changed slightly in Russia in 2007 in comparison with 2006), p^h_{jt}= 125,1 (the manufacturer prices in Russia have risen dramatically in 2007), p^f_{it}=100,1 and p^f_{jt}=100,4 (the prices in Germany of an overall industrial output as well as of medical and surgical equipment in particular have not risen much, at least in comparison with Russia). Then, according to formula (4) the PCA equals 0,823 and gives a signal that this Russian sub-industry is undervalued, prices in this industry are likely to rise after economic liberalization and, therefore, this industry is prospective for investments.

Measuring the PCA indices has several obstacles. First, the PCA is a dynamic characteristic. Therefore it may be distorted, e.g. by price bounces. Second, the PCA is dependent on initial conditions. For example, if the price of a good initially equaled 1 and has risen to 3, then the growth rate is 300%, but if the price initially equaled 2, then the growth rate is only 50%. So as we see, a change of 50% in initial conditions has led to a more significant change in the PCA. It may therefore become problematic to make conclusions based on a quantitative comparison of PCA indices. Third, this index is effective when the share of traded goods (international trade) is

small relative to GNP, i.e. the closer is an economy to autarky, the better we can measure autarky prices and the more informative is the PCA index. Finally, the PCA is also influenced by the exchange rate. When a currency is undervalued, it stimulates net exports and reduces the share of international trade in GNP. Imported goods become more expensive (in terms of p_{it}^h in formula 4) on the domestic market than on the foreign market and this will artificially reduce prospective comparative advantages, e.g., industries may be estimated as overvalued, when in fact they are not. Therefore, in cases where exchange rate distortions are present, the actual PCA value need to be assumed higher than the value of the index. It is not to oversee that an undervalued exchange rate also affects revealed comparative advantages (RCA) but in the opposite direction: it stimulates export of goods, which are not characterized as advantageous for a particular country.

Thus, we need to admit that the measurement of the PCA index as of any other index of competitive advantage is in a large measure a matter of trade-off with available data. In addition, some technical considerations, e.g., collecting and matching the price indices with different classifications of goods, arise in the calculation of the prospective advantages index.

The PCA index should not be considered isolated from other economic indicators, in particular from the indices of revealed comparative advantages, e.g., the Lafay index. This is because of various factors that may lead to over- and undervaluation of prices in a particular industry. After all, we consider not autarky economies, but economies with high trade barriers that are still able to trade. Thus, undervaluation can be explained not only by lower production costs in a given country, but also by intensive competition on the market. Overvaluation in turn can result from favorable international prices. For a summary see Table 1.

Therefore, to explore whether a prospective CA is presented in a particular industry or not we need to consider the PCA index in conjunction with other instruments like RCA index.

3 Empirical application

3.1 Data description

To compute the Revealed Comparative Advantage index for new EU member states and the Russian Federation we use data from the COMTRADE Database of the United Nations Statistics Division (UNSD) at the Harmonized System (HS), 2-digit, and for some particular industries at the 4-digit level covering the period of 2002-2006. These data are available in US dollars.

Table 1: Revealed and Prospective comparative advantages

	Revealed Comparative Advantage	Revealed Comparative Disadvantage
Prospective Comparative Advantage	A country has an advantage in this good, but its export potential is not used in full. Trade barriers may discriminate semifinal inputs from abroad as well as prohibit to realize the full potential of CAs exhibited by our country. Therefore, a growth of relative prices in this industry is expected, and this industry is attractive for further investments.	The undervaluation is temporary due to e.g. intensive price competition on the market between domestic and foreign players. The country may have a CA in this good, but this is an infant industry and foreign goods are still dominant on the market that explains the revealed disadvantage. Otherwise, foreign producers have CA, but because of government support, domestic production is present on the market. But in the course of economic liberalization resources from this industry will eventually flow to other more prospective industries.
PCA =1	The export potential is fulfilled.	There is a stable comparative disadvantage in this good.
Prospective Comparative Disadvantage	The overvaluation can be assumed as temporary because of high international prices in this good (e.g. oil). When international prices will go down (stabilize), the overvaluation will decrease as well. In this case a country may have an advantage in this good or not. If the effects of undervalued exchange rate and import barriers prevail, export is artificially induced and there is no advantage in this good. But if there is a real cost advantage in producing a particular good, then the country has an advantage in this good.	The country has no advantage in this good and the import share in this good is likely to rise in the future.

The data on the LFI indices for new EU countries in the period of 1993-2001 that we use in our empirical estimation were kindly provided by Andrea Zaghini (Center for Financial Studies, Frankfurt).

One of the problems in calculating the Prospective Comparative Advantage index of a country group including CEE countries and Russia is, first, to obtain data for the producer price indices with a detailed classification of industries and sub-industries for a period from the beginning of the 1990s.

Unfortunately, it turned out to be impossible to find detailed price indices of these countries for the period 1993-1996. Therefore, we will calculate and compare PCA indices for the period 1997-2004. Moreover, for the Czech Republic, Hungary and Slovenia we can calculate the PCA index only since 2001-2002 due to data limitations. Nevertheless, we need to keep in mind that the EU enlargement took place only in 2004 and the Central European Free Trade Area (CEFTA) and the Baltic Free Trade Area (BFTA) formed by these countries at the beginning of the 1990s have abolished duties on most of the industrial goods with the European Union only in 1997 (Adam *et al.* 2003). Therefore, we presume that by 1997 the relative prices were not fully adjusted yet and calculation of the PCA index for the period 1997-2004 will provide us with meaningful estimates.

Due to data limitations for producer price indices for new EU countries we use the harmonized indices of consumer prices (HICP) to calculate the PCA indices. As a consequence we are able to compare relative prices mostly on consumer products and not on the semi-finished goods. The data covers the period of 1997-2007, but with substantial differences in availability across countries and industries.

For the EU countries we use data from the Statistical Office of the European Communities (Eurostat) Database. For the Russian Federation we use data for the consumer and producer price indices from the Russian Federal State Statistics Service (Rosstat). Calculating the PCA index for Russia based on consumer prices we are forced to match two different classifications of goods and services, one is COICOP provided by Eurostat and another one of the Russian Rosstat. Calculating the PCA index based on the producer prices we have the same problem by matching the NACE classification for the EU countries and the classification of Rosstat. All three datasets have a detailed classification of goods, at the 2-, 3- and 4-digits. We consider that these classifications of goods are similar and conclude that the matching will not seriously affect our results.

3.2 The example of the new EU Member States

To test the mechanism of Prospective Comparative Advantages we use an example of the new EU member states, in particular Poland, the Czech Republic, Hungary, Slovenia, Slovak Republic, Cyprus, Malta, Lithuania, Latvia and Estonia. These countries may be easily split in two groups. The first group is formed by Poland, the Czech Republic, Hungary, Slovenia, Slovak Republic and the Baltic states that were members of the former socialist bloc. So the structural organization of their economies at the beginning of the 1990s may be considered as close to the system that Russia had at that period of time. The remaining countries, Malta and Cyprus, were taken to complete our analysis with a different type of economies that have never been planned economies. We have chosen these countries because they have recently passed transition periods of their economies. In addition, most of these CEE countries as well as Russia have a larger share of skilled-labor force in comparison to other developing countries (Bardhan and Kroll (2006), Zaghini (2005)). So we can draw a parallel between initial conditions that these countries had at the beginning of the 1990s and conditions in which Russia is situated at the moment.

According to Zaghini (2005) most of these countries had excessive natural, labor and land resources in comparison to other EU countries, so it is not surprising that in the period of 1993-1994 they mainly specialized in sectors where these resources are used more intensively, namely products of steel and glass, simply worked wood, vegetables and fruits. Zaghini (2005) showed that these countries managed to gain CAs during a period of ten years in which they were weak at the beginning of the liberalization process, notably in some medium and high technological industries, e.g., transport and machinery building, electronics. The author explains this success by the "advantage of backwardness" (Gerschenkron 1962) together with significant investments both from the side of governments and from EU countries and by substantial technological transfer as a part of the FDI inflows that was successfully adopted thanks to the endowment of a skilled labor force.

The realization of this scenario could be a reasonable policy in purposing the Russian Government objectives until 2020. Understanding what was the general characteristic of these industries in CEE countries will help us to reveal prospective industries for investments and stimulating CAs in Russia. Our idea is that these "successful" industries were undervalued (had prospective advantages) and thanks to the inflow of new technologies and investments became realized.

Zaghini (2005) used the Lafay index (LFI) and the world export share (WES) to assess CAs at the beginning of the liberalization period (1993-

1994) and after 7 years of reforms (2000-2001). For example, the Czech Republic specialized in simple products of glass, iron and wood with a minor specialization in passenger motor cars in the period of 1993-1994. But by 2001 it has trebled its world export share in motor vehicles and significantly enlarged its revealed advantages not only in this industry, but also in related industries like parts and accessories of motor vehicles, and also in electrical machinery.

Our idea is to calculate the PCA index described in the first part of this paper for industries, in which these countries have gained substantial CAs and to evaluate whether our index has "forecasted" future success of these industries. We calculate the PCA index based on consumer price indices for new ten EU member countries using the EU as a foreign economy. Thus, we expect to find that the "successful" industries were undervalued in terms of relative prices in 1997 and these prices have converged to the international free-trade level (the level of the EU) by 2004.

As we found out, based on the PCA index Estonia, Lithuania, Latvia, Slovak Republic, Poland and Malta had prospective advantages in telecommunication, furniture, clothing, electrical equipment, transport and petroleum industries in 1997. These industries got revealed CAs in the trade structure of these countries by 2004 according to the LFI index.

We also need to note that these undervaluations which reveal prospective advantages are minor in absolute values and normally range between 0.9 and 1 in terms of the PCA index. These minor undervaluations can be explained by measuring the indices for 1997 instead of 1993. During the period of 1993-1997 the economic liberalization of these countries was in progress and we may assume that the process of price convergence has already started as well. By 2004 the relative prices generally achieved the EU level, which corresponds to the value of 1 of the PCA index. The obtained results on the PCA index for the CEE countries are presented in Figure 1 and Table 2.

Table 2: An example of the PCA index for Poland.

COICOP classification		1997	2004
cp0511	Furniture and furnishings	0,92	0,99
cp03	Clothing and footwear	0,94	1,01
cp031	Clothing	0,95	1,01
cp0311	Clothing materials	0,93	1,00
cp0911	Equipment for the reception, recording and reproduction of sound and pictures	0,95	1,02
cp0914	Recording media	0,93	0,99

Due to limited data availability we can calculate the PCA indices for

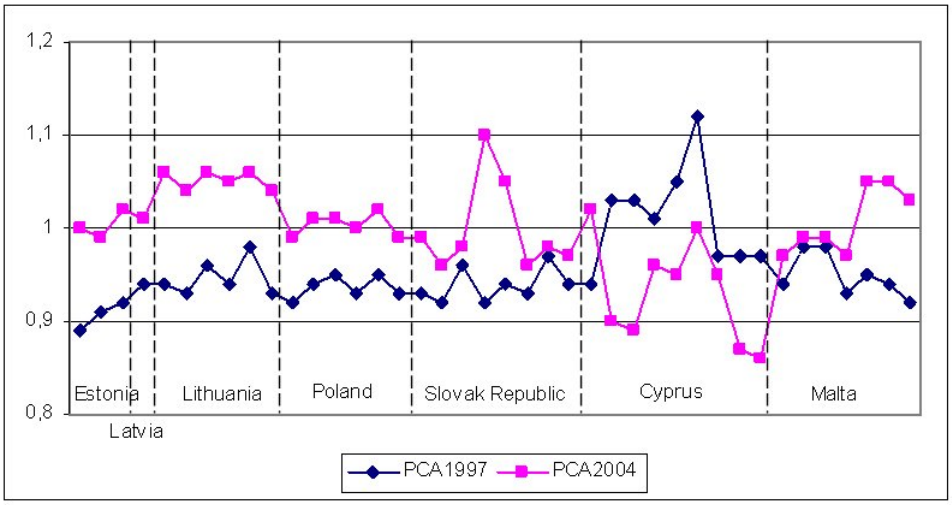

Figure 1: PCA indices for 1997 and 2004 for seven CEE countries.

Slovenia, the Czech Republic and Hungary only since 2001-2002. Thus, for example, in Hungary there were no prospective advantages to be observed in telecommunication or automatic data processing industries by 2002. We can assume that these industries are flexible in relation to price changes and adjustments. In contrast, production of meat and the motor car sector were undervalued even in 2002. We have calculated that in these two industries the indices of LFI and the world export share have generally increased by 2006 up to 1.01 and 0.7 respectively in passenger motor cars - and up to 0.28 and 0.95 in production of meat. It means that the prospective advantages that Hungary still had by 2002 were realized by 2006. Thus, we can draw a parallel with the "catching-up" process observed by Stehrer and Woerz (2003): the speed of convergence in price levels between developed and developing countries that leads to changes in trade specialization patterns differs across industries, where this convergence process takes place.

A different example is shown by Cyprus. In this country the relative prices have significantly dropped after joining the EU, below the European relative price level. As an example, the relative prices of fruits and vegetables have decreased in terms of the PCA index from 1.05 and 1.12 to 0.95 and 1.00, respectively. This overvaluation can also be observed on Figure 1. As a result, the LFI and the world export share for fruits as well as for vegetables have decreased. This may indicate that overvaluation by the end of the 1990s was caused by high import duties in Cyprus before joining the EU. In fact, in comparison to other European countries before their acces-

sion to the EU Cyprus had high import tariffs (average tariff 37.6 percent) especially on agricultural products (with average rates above 60%) together with substantial export subsidies. It also should be noted that Cyprus is a fairly small economy, a net importer of manufacture goods, with 70 percent of GDP and foreign exchange receipts generated in services (*Cyprus: June 1997* (1997)).

Having only very fragmented data on producer price indices we have calculated the PCA index that supports the results we have obtained on the consumer prices. Thus, the Czech Republic had prospective advantages in transport equipment and Lithuania had prospective advantages in production of outer garments and electrical machinery and equipment in terms of manufacturer prices as well. Since the data on producer price indices is very fragmented for CEE countries, we can not provide more detailed results.

The fact that we have got consistent results of PCA index for the CEE countries based both on producer and consumer price indices can be explained by changes in exchange rate regimes among these countries in 1997. In this period the exchange rate regimes of these countries, which differed considerably at the beginning of the 1990s, became oriented towards the Euro (Backe 1999). Therefore, possible distortions of the PCA index due to exchange rate misalignments have not significantly affected the results.

To assess the forecasting power of the PCA index we tested it using the following equation:

$$\mathrm{LFI}_{ij}^{diff} = \alpha + \beta \mathrm{PCA}_{ij}^{1997} + \varepsilon, \tag{5}$$

In this equation, LFI^{diff} stands for the absolute change (increase or decrease) of the Lafay index in the period from 1997 to 2001. This was done to measure the assumed effect of the PCA and to minimize the country character specialization in particular industries. Thus, Slovak Republic in 2001 has a Lafay index in passenger motor cars of more than 6, but the real improvement of the index during the period of 1997-2001 was about 4. PCA^{1997} is the calculated PCA index for 1997. We test the equation (5) on industries with a 3-digit level on 7 countries: Poland, Slovak Republic, Latvia, Lithuania, Estonia, Cyprus and Malta (for which price indices are available since 1997). These industries were chosen independently from the fact whether a change in the LFI index is to observe in the period or not, according to only one criterion, namely data availability.

The results are presented in Table 3. Firstly, we have estimated our equations on goods from low, medium and high technological industries (total sample). Then, we have estimated the equations only on medium and high technological goods (subsample 1). Finally, we have also tested equation

Table 3: Regression results.

	Total sample	Subsample 1	Subsample 2
β	-9.98	-15.79	-11.04
Std. Error	0.74	1.78	1.29
P-value	0.000	0.000	0.000
R^2	0.48	0.49	0.49
N	200	81	74

(5) only on industries, where a change of the LFI index was larger than 0.5 in absolute value (subsample 2). The subsample 2 was constructed to test, whether a significant difference in estimates compared to the total sample exists or not.

We have also tested a modification of equation (5) using logarithm of the PCA index and obtained almost the same results as for absolute values of the PCA index. This is due to the type of the PCA values, i.e. around 1, normally in the range from 0.8 to 1.2.

In addition, we have tested equation (5) controlling for possible country-specific effects using dummy-variables. As a result, no significant country-specific effects have been obtained.

Looking at Table 3 we see that the explanatory power of the index remains almost the same for all three samples (which is approximately 49% and quite well for a cross-section analysis with only one explanatory variable). The value of β - which is in all cases significantly different from zero - differs across the subsamples. β is substantially higher for the industries with a significant change in the LFI value, and even higher for the subsample of medium and high technological products. It means that in the case of medium and high technological products a negative/positive change in the PCA index of 0.1 (10% higher under- or overvaluation of prices) leads to an increase/decrease in the value of the Lafay index of roughly 1.6, i.e. industries that were undervalued in 1997 experienced a growth in CAs. This negative correlation of the change in the LFI value and the value of the PCA index can be observed on Figure 2 in the appendix, where LFI and PCI indices are grouped by country.

To conclude, we observe a robust significant influence of the PCA index on the CAs dynamics.

3.3 Russian revealed and prospective comparative advantages

3.3.1 Revealed comparative advantages

Let us now turn back to the comparative advantages theory and consider dynamics of CAs indices of Russia during the last years. The RCA indices analyze the current structure of international trade. Table 4 in the appendix presents a short review of obtained revealed comparative advantages of Russia in the form of LFI indices, starting from industries with the highest advantages and presenting the most disadvantageous industries in the end of the table.

Thus, we see that Russia's main CAs are linked to hydrocarbons (oil, gas, coal) and some other resources (woodworking industry, non-ferrous metals and fertilizers). Medium and high technology industries are characterized mainly as disadvantageous in Russian exports.

Moreover, in contrast to most of the developing countries whose trade structures have become more diversified in the last decade (Woerz (2005), Marconi and Rolli (2008)) the structure of Russian foreign trade has become even more concentrated in the period from 2002 to 2006. For example, in pharmaceutical products and motor cars the revealed disadvantages have significantly increased. The only exceptions among medium and high technology industries are nuclear reactors and turbo-jets, which are characterized as advantages, but very specific ones.

3.3.2 Prospective comparative advantages

As it was already pointed out in Section 2, the PCA index based on manufacturer prices is less distorted. Nevertheless, analyzing the prospective CAs of Russia we consider the PCA index based both on consumer and producer prices to compare the results and to try to explain possible deviations.

Calculating the prospective advantages for Russia, we need to remember that according to the existing Exchange Rate Deviation Index (ERDI) the Russian rouble is still clearly undervalued (Tiusanen 2007). This index of undervaluation was extreme after the economic crisis in Russia in 1998 (roughly by factor 3) and has gradually decreased during the last ten years to about 1.8. This leads to a competitive advantage of Russian companies in terms of absolute prices. That points out that Russian companies have a competitive edge and an import potential in Russia may not be full exploited, i.e. the domestic market is protected by the undervalued rouble. Therefore, the undervaluation of prices measured by the PCA index may not

be as significant as it really is, the PCA index based on the consumer prices exhibits a significant exchange rate distortion.

In Table 5 in the appendix we see that based on the consumer prices prospective advantages of Russia contain motor cars, tobacco, medical and pharmaceutical products. Some moderate prospective advantages can be also found in clothing materials, whereas clothing industry itself is characterized with no advantages.

To deepen our prospective advantages analysis we will consider producer price indices as a base for the PCA mechanism, as these indices present production costs at a larger extent. Owing to a lack of data for the European Union as a whole, calculating the PCA we will consider Germany, the biggest trading partner of Russia, as the foreign partner (see Table 6 in the appendix).

As we see the obtained results differ from the PCA indices based on the consumer price index, i.e., producer prices volatility between the countries is more significant than volatility in consumer prices. One of the reasons for this may be that consumer prices between different markets are closely connected. Thus, an increase in prices in Germany on motor vehicles will most likely cause an increase in prices in Russia as well, and not only on imported cars, but on most cars, because other car sellers will react to the changes on the market. In contrast, a similar increase in production costs will hardly invoke respective changes in production cost in Russia. These changes in relative producer prices reflect differences in industrial process, investments in R&D and, consequently, dynamics of prospective comparative advantages to a greater extent. Due to the non-simultaneous character of these processes in Russia and Germany, the PCA index based on producer prices for a particular industry may change substantially from one year to another. Therefore, these indices must be analyzed for a sequence of years to make a conclusion in regard to the existence of prospective advantages.

Observing the PCA indices of Russia based on manufacturer prices, we can see that Russia has prospects in diversifying its export structure in a wide set of low, medium and high technological industries (see Table 6).

3.3.3 Discussion

In the following we will interpret the obtained results of CAs to reveal those industries where the stimulation of comparative advantages may show the most promise.

In the clothing sector Russia has some moderate revealed disadvantages. At the same time we need to consider the fact that domestic products are nevertheless competitive on the foreign market (there is also a substantial

export of products in this industry). We can also see that the obtained PCA indices based on consumer and producer prices are not consistent: there are prospective advantages in production of clothing and clothing materials in terms of producer prices, but in terms of consumer prices these advantages are not evident. This is an example when the exchange rate distortion has a significant effect. On the Russian market foreign-made clothes form a considerable part of the overall assortment, and because of the Russian roubles undervaluation advantages in this industry based on consumer prices may not be observed. In fact, the undervalued rouble gives a competitive edge to Russian companies enabling them to set higher prices and maintain a comparative price level with foreign apparel. This overvaluation of prices is also induced by import tariff rates, which are among the highest for textile and clothing in Russia (Tarr 2007). Therefore, we observe no undervaluation in terms of consumer prices on the market. But based on the producer prices we obtain a much less distorted estimation that points to advantages in this sector. After the Soviet Union collapse many of the existing factories were closed or significantly reorganized, so we can consider this industry as "quasi-infant". Besides, the foreign companies are very active on the Russian market using different market entry and competitive strategies. Considering that Russia has prospective advantages not only in production of clothes but also in textile materials and machinery for textile production, we suggest that this industry can be considered as prospective.

Revealed disadvantages of Russia in the pharmaceutical industry have significantly increased during the last years. At the same time prospective advantages remained more or less stable. There is no doubt that this industry is supported by the Russian government, but considering that this industry has a good basis of related chemical sub-industries in Russia and related research institutes we assume that this industry is prospective. But to realize this potential and to generate new technologies, large investments are essential given that the pharmaceutical industry is one of the most capital-intensive industries in the world (Agrawal 1999).

Manufacturing of electronic equipment is one of the truly infant industries in Russia, since many enterprizes in this sector got bankrupt in the early 1990s, while others were conversioned from the military sector. Since then this industry is characterized as disadvantageous based on the trade statistics. Nevertheless, there exist prospective advantages in manufacturing of television and radio receivers based on the producer prices (PCA indices based on consumer prices are distorted by the exchange rate undervaluation). Therefore, investments in this industry are promising, as the prices there will rise in the course of time and the potential of the industry may be fulfilled under the condition that new technologies will be developed and a

prospective field of specialization will be found.

Russia also has prospective advantages in manufacturing machinery, e.g. for food processing and mining. These industries are characterized with revealed disadvantages at the moment, but have a good potential for growth. Mining and construction machinery are of high demand on the Russian market as the economy is growing and exploration industries remain prevalent in the Russian economy. Therefore, investments in these industries may be considered as prospective.

There are also prospective advantages in production of motor vehicles and railway equipment. In these two sectors Russia has revealed disadvantages during the last years. How can we explain this "undervaluation"? It is widely known that the motor vehicles sector in Russia has a strong public support and its competitive position is poor. This can be a reason for prospective advantages in motor cars in terms of consumer prices as prices on domestic cars are artificially lowered. Thus, we can expect that after economic liberalization this sector will likely be reduced and substituted by international companies and their assembling plants. This process takes place already. In comparison to the motor sector there are some differences with the railway sector. Though companies that produce railway equipment are partly owned by the government, this sector is more competitive on the international market. An evidence for this fact can be observed, if we consider the trade performance of this sector more closely: in sub-industries like self-propelled railway coaches or rail locomotives powered from an external source of electricity there is a positive net export (see Table 4). But the industry is lacking in new technologies and investments. Therefore, the high-speed railroads projects in Russia are implemented in a close cooperation with foreign companies. As a result, we consider this sector as "prospective" for stimulation of comparative advantages.

4 Conclusion

In this paper we demonstrate that the known instruments of comparative advantages theory provide an analysis of "realized" advantages but do not forecast which industries may be prospective for stimulation of new CAs. Nevertheless these forecasts are relevant, especially in Russia as the economy is still in a period of transition.

To solve this problem we suggest a new approach that forecasts these dynamics based on the relative price differences under the assumption that the trade relations of a particular country are not liberalized yet. Russia, as the biggest economy outside the WTO agreements and other effective free-trade zones like the EU, fits this assumption.

We also show that the Prospective Comparative Advantages mechanism should not be considered independently. In contrary, it needs to be interpreted in conjunction with both revealed comparative advantages and possible exchange rate distortions. It should also be noted that the calculation of the PCA indices based on producer price indices provides less distorted figures on prospective advantages in comparison to those based on consumer price indices.

We use an example of CEE countries most of which had structural problems in their economies similar to Russia and show that most of the industries in which these countries managed to gain comparative advantages during the last ten years were undervalued in comparison to the EU sectors. An empirical analysis of the PCA forecasting power provides us with good results. That supports our claim for the Prospective Comparative Advantages mechanism as a noteworthy forecasting instrument.

Finally, we calculated Russian revealed and prospective comparative advantages, analyzed their dynamics during the last five years, and suggested that the Russian Federation has prospective advantages in some medium and high technological industries like pharmaceutical industry, electronic equipment, machinery building and railway transport as well as in some other industries like production of clothes. But to realize this prospective advantages, a policy with accurate stimulating instruments needs to be applied to these industries, first of all in stimulating innovations, i.e., accumulating investments and generating new technologies. Research on the efficiency of stimulating instruments for these sectors remains for future study.

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References

Adam, A., T.S. Kosma and J. McHugh (2003). Trade liberalization strategies: What could southeastern europe learn from CEFTA and BFTA. Technical Report 239. IMF Working Paper.

Agrawal, M. (1999). *Global Competitiveness in the Pharmaceutical Industry: the Effect of National Regulatory, Economic and Market Factors*. Haworth Press.

Backe, P. (1999). Exchange rate regimes in Central and Eastern Europe: A brief review of recent changes, current issues and future challenges. Technical report.

Balance, R.H., H. Forstner and T. Murray (1987). Consistency tests of alternative measures of comparative advantage, the review of economics and statistics. *The Review of Economics and Statistics* **69**(1), 157–161.

Balassa, B. (1965). Trade liberalization and "revealed" comparative advantage. *The Manchester School of Economic and Social Studies* (33), 92–123.

Balk, B.M. (1983). Does there exist a relation between inflation and relative price change variability?. *Economic letters* **13**(2–3), 173–180.

Bardhan, A.D. and C. Kroll (2006). Competitiveness and an emerging sector: The russian software industry and its global linkages. *Industry and Innovation* **13**(1), 69–95.

Belousov, A. R. (2006). The scenarios of russian economic development for the next 15 years. *"Problemj Prognosirovanija"* **13**(1), 3–53.

Brenton, P., N. Tourdyeva and J. Whalley (1997). The potential trade effects of an FTA between the EU and Russia. *Review of World Economics* **133**(2), 205–225.

Bruno, M. (1965). The optimal selection of export-promoting and import-substituting projects. In: *Planning the External Sector: Techniques, Problems and Policies* (United Nations, Ed.). New York.

Cyprus: June 1997 (1997). Technical report. WTO: Trade Policy Reviews: First Press Release, Secretariat and Government Summaries.

Diewert, W.E (1993). The economic theory of index numbers: A survey. In: *Essays in Index Number Theory* (Diewert W.E and A.O. Nakamura, Eds.). Vol. 1. pp. 163–208. Amsterdam: North-Holland.

Dixit, A. K. and V. Norman (1989). *Theory of International Trade: a Dual, General Equilibrium Approach*. Cambridge University Press.

Dornbusch, R., S. Fischer and P.A. Samuelson (1977). Comparative advantage, trade and payments in a ricardian model with a continuum of goods. *American Economic Review* **67**(5), 823–839.

Durand, M. and C. Giorno (1987). Indicators of international competitiveness: Conceptual aspects and evaluation. Technical Report 9. OECD Economic Studies.

Feenstra, R. C. (2004). *Advanced International Trade. Theory and Evidence*. Oxford.

Gerschenkron, A. (1962). *Economic Backwardness in Historical Perspective: A Book of Essays*. Cambridge, MA: Belknap Press of Harvard University Press.

Grossman, G. and E. Helpman (1991). *Innovation and Growth in the Global Economy*. Cambridge: MIT Press.

Krugman, P.R. and G. N. Hatsopoulos (1987). The problem of u.s. competitiveness in manufacturing. *New-England Economic Review* pp. 18–29.

Lafay, G. (1992). The measurement of revealed comparative advantage. In: *International Trade Modelling* (M. G. Dagenais and P. A. Muet, Eds.). pp. 209–234. London: Chapman & Hall.

Landesmann, M. A. and R. Stehrer (2001). Convergence patterns and switchovers in comparative advantage. *Structural Change and Economic Dynamics* **12**, 399–423.

Leung, P. and J. Cai (2005). A review of comparative advantage assessment approaches in relation to aquaculture development. In: *Species and System Selection for Sustainable Aquaculture* (P. Leung, C.-S. Lee and P.J. O'Bryen, Eds.). pp. 43–56. Blackwell Publishing.

Marconi, D. and V. Rolli (2008). Comparative advantage patterns and domestic determinants in emerging countries. Technical Report 81. World Institute for Development Economics Research, Research Paper.

Montobbio, F. (2003). Sectoral patterns of technological activity and export market share dynamics. *Cambridge Journal of Economics* **27**, 523–545.

Nakamura, E. and J. Steinsson (2008). Five facts about prices: A reevaluation of menu cost models. *The Quarterly Journal of Economics* **123**(4), 1415–1464.

Porter, M. (1990). *The Competitive Advantage of Nations*. Harvard Business Review.

Rogov, V. V. (2004). Russian export potential: Current state, lines and conditions of development. *"Vneshneekonomicheskij Bulleten"* (5), 61–83.

Siggel, E. (2006). International competitiveness and comparative advantage: A survey and a proposal for measurement. *Journal of Industry, Competition and Trade* **6**(2), 137–159.

Stehrer, R. and J. Woerz (2003). Technological convergence and trade patterns. *Review of World Economics* **139**, 191–219.

Tarr, D.G. (2007). The structure of import tariffs in the Russian Federation: 2001-05. Technical Report 4265. World Bank Policy Research.

Technological Performance and Industrial Competitiveness (1986). Technical Report 2. OECD Science and Technology Indicators.

Tiusanen, T. (2007). Development of rouble exchange rate in russia. Technical Report 45. NORDI series. Lappeenranta.

Woerz, J. (2005). Dynamics of trade specialization in developed and less developed countries. *Emerging Markets, Finance and Trade* **41**, 92–111.

Zaghini, A. (2005). Evolution of trade patterns in the new EU member states. *Economics of Transition* **13**, 629–658.

5 Appendix

Table 4: Lafay indices of Russia on different goods.

	Industry	2002	2003	2004	2005	2006
2709	Crude petroleum oils	10,51	11,24	12,3	11,22	13,63
2710	Petroleum oils, not crude	4,32	4,26	4,28	4,75	6,19
2711	Petroleum gases	6,01	5,99	4,79	4,35	6,13
72	Iron and steel	1,93	1,77	2,63	1,43	1,43
44	Wood and articles of wood, charcoal	1,00	0,91	0,87	0,79	0,79
31	Fertilizers	0,64	0,61	0,64	0,58	0,58
74	Copper and articles thereof	0,32	0,29	0,42	0,57	0,57
2701	Coal, briquettes, ovoids	0,32	0,38	0,50	0,42	0,50
71	Pearls, precious stones, metals, coins, etc	1,30	1,21	1,04	0,24	0,24
29	Organic chemicals	0,14	0,14	0,19	0,16	0,16
47	Pulp of wood, fibrous cellulosic material, etc	0,20	0,18	0,15	0,11	0,11
10	Cereals	0,24	0,19	-0,11	0,10	0,10
8401	Fuel element for reactor; Nuclear reactor	0,25	0,24	0,19	0,11	0,10
8411	Turbo-jets, propellers, other gas turbines	-0,03	0,02	-0,03	-0,01	0,04
51	Wool, animal hair, and fabric thereof	-0,02	-0,01	-0,01	0,00	0,00
53	Vegetable textile fibres nes, woven fabric	0,02	0,00	0,00	0,00	0,00
8603	Self-propelled railway/tramway coache	0,01	0,02	0,22	0,05	0,00
8601	Rail locomotives with ext source of energy	0,00	0,00	0,00	0,00	0,00
43	Furskins and artificial fur, manufactures	-0,01	0,00	0,00	-0,02	-0,02
60	Knitted or crocheted fabric	-0,41	-0,75	-0,06	-0,05	-0,05
45	Cork and articles of cork	-0,24	-0,19	-0,13	-0,06	-0,06
42	Articles of leather, harness, travel goods	-0,11	-0,09	-0,07	-0,07	-0,07
1	Live animals	-0,02	-0,02	-0,02	-0,08	-0,08
52	Cotton	-0,22	-0,19	-0,17	-0,11	-0,11
8413	Pumps for liquids; liquid elevators	-0,24	-0,22	-0,23	-0,14	-0,17
86	Railway, tramway locomotives, rolling stock	-0,22	-0,15	-0,30	-0,19	-0,19
61	Articles of apparel, accessories, knit etc	-0,15	-0,15	-0,13	-0,20	-0,20
89	Ships, boats and other floating structures	-0,10	-0,07	0,02	-0,20	-0,20
8429	Self-propelled bulldozer, excavator, etc	-0,14	-0,16	-0,15	-0,15	-0,25
38	Miscellaneous chemical products	-0,44	-0,38	-0,36	-0,30	-0,30
88	Aircraft, spacecraft, and parts thereof	0,67	0,67	0,48	-0,31	-0,31
64	Footwear, gaiters, parts thereof	-0,21	-0,21	-0,16	-0,36	-0,36
94	Furniture, lighting, prefabricated buildings	-0,42	-0,38	-0,35	-0,36	-0,36
28	Inorganic chemicals	-0,84	-0,53	-0,42	-0,43	-0,43
33	Essential oils, perfumes, cosmetics	-0,60	-0,65	-0,63	-0,53	-0,53
48	Paper & paperboard, articles of paper	-0,75	-0,79	-0,70	-0,59	-0,59
73	Articles of iron or steel	-0,74	-0,72	-0,76	-0,86	-0,86
90	Optical, photo, technical, etc apparatus	-0,98	-1,14	-0,98	-1,11	-1,11
2	Meat and edible meat offal	-2,11	-1,62	-1,23	-1,40	-1,40
39	Plastics and articles thereof	-1,10	-1,20	-1,13	-1,43	-1,43
30	Pharmaceutical products	-1,38	-1,62	-1,53	-1,91	-1,91
85	Electrical, electronic equipment	-2,96	-2,83	-3,26	-4,30	-4,30
87	Vehicles other than railway, tramway	-1,57	-2,47	-3,67	-5,49	-5,49

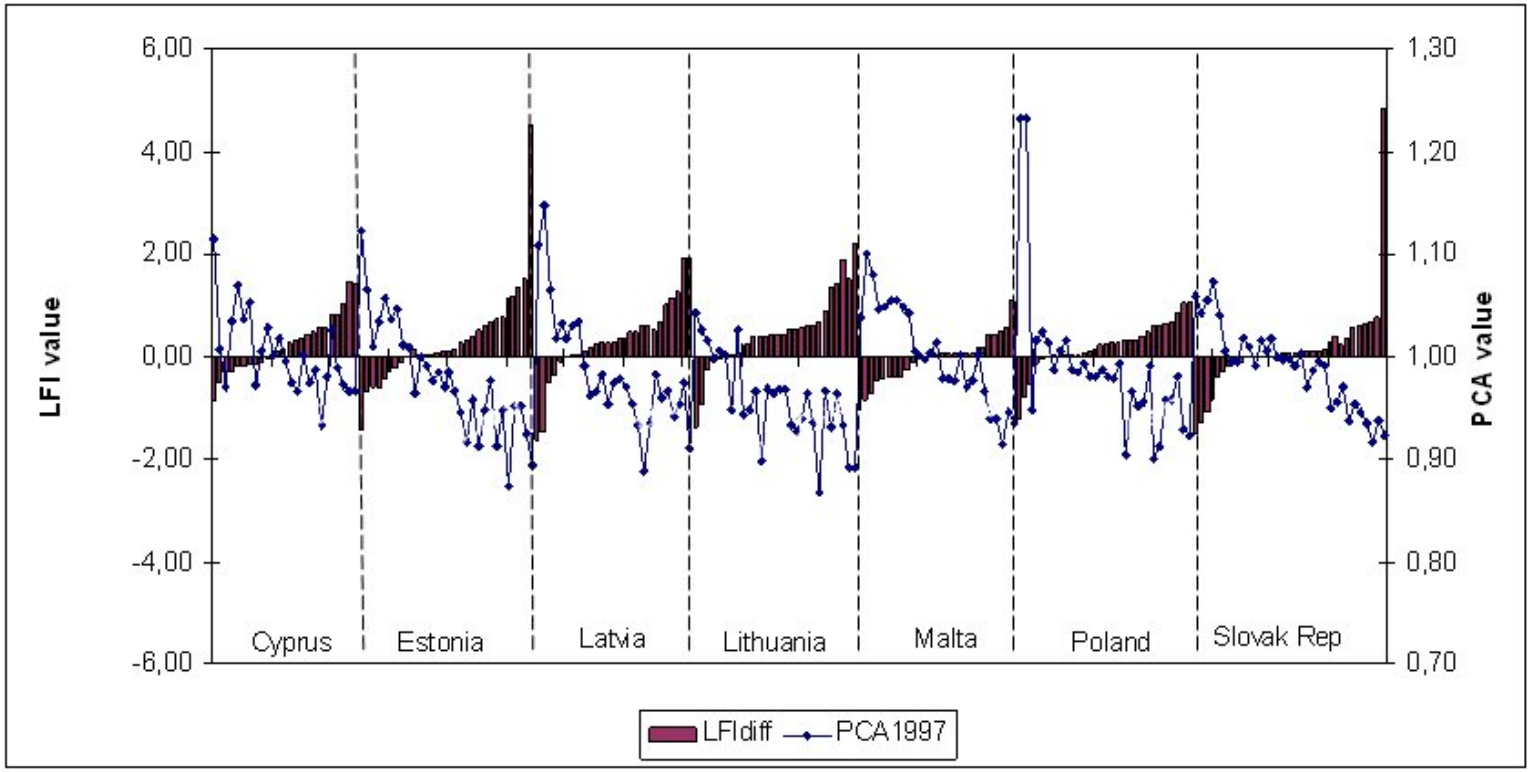

Figure 2: Correlation between the LFI index value difference and the PCA index.

Table 5: Potential comparative advantages of Russia on different goods based on the consumption price index.

COICOP classification		2003	2004	2005	2006	2007
cp0711	Motor cars	0,98	0,97	0,96	0,97	0,93
cp022	Tobacco	0,92	0,86	0,91	0,97	0,93
cp061	Medical products, appliances and equipment	0,97	0,88	0,94	0,96	0,95
cp0611	Pharmaceutical products	0,96	0,89	0,93	0,96	0,95
cp0311	Clothing materials	0,96	0,96	0,96	1,00	0,95
cp0712_713_714	Motor cycles, bicycles and animal drawn vehicles	0,97	0,96	0,98	1,00	0,96
cp0112	Meat	0,97	1,07	1,05	0,98	0,97
cp0722	Fuels and lubricants for personal transport equipment	1,03	1,13	0,97	0,99	0,97
cp0511	Furniture and furnishings	0,99	0,98	0,98	0,99	0,97
cp10	Education	1,03	1,00	1,02	1,04	0,97
cp031	Clothing	1,01	0,99	1,00	1,02	0,99
cp082	Telephones and telefaxes	0,89	1,06	1,14	1,06	1,01
cp094	Recreational and cultural services	1,08	1,07	1,05	1,05	1,02
cp0612_613	Other medical products, therapeutic appliances and equipment	1,08	0,96	1,07	1,06	1,02
cp112	Accommodation services	1,11	1,05	1,06	1,04	1,04
cp0913	Information processing equipment	1,07	1,03	1,09	1,00	1,05
cp045	Electricity, gas and other fuels	1,07	1,01	0,98	1,01	1,05
cp0111	Bread and cereals	1,16	1,04	0,94	1,02	1,07
cp0911	Equipment for the reception, recording and reproduction of sound and pictures	1,04	1,03	1,04	1,08	1,11

Table 6: Potential comparative advantages of Russia on different goods based on the producer's price indices.

NICE classification		2002	2003	2004	2005	2006	2007
dl323	Manufacture of television and radio receivers, other reproducing apparatus	0,81	0,87	0,80	0,97	0,92	0,78
dk2953	Manufacture of machinery for food, beverage and tobacco processing	0,87	0,89	0,93	0,98	0,98	0,80
dm3542	Manufacture of bicycles	0,94	1,02	0,84	0,98	0,96	0,81
dk2911	Manufacture of engines and turbines, except aircraft and vehicle engines	1,00	1,00	0,90	0,94	1,01	0,81
dm341	Manufacture of motor vehicles	0,89	0,99	0,88	0,93	1,02	0,82
db176	Manufacture of knitted and crocheted fabrics	0,96	0,97	0,85	0,92	0,97	0,82
dl331	Manufacture of medical and surgical equipment	0,95	1,02	0,87	0,96	1,00	0,83
dm352	Manufacture of railway, tramway locomotives, rolling stock	0,96	0,94	0,81	1,12	0,99	0,83
dk2954	Manufacture of machinery for textile, apparel and leather production	1,16	1,07	0,82	0,84	0,93	0,84
dm343	Manufacture of parts, accessories for motor vehicles	1,03	0,98	0,86	1,01	0,97	0,85
dk2952	Manufacture of machinery for mining, quarrying and construction	0,84	0,94	0,88	0,94	1,15	0,86
dg2452	Manufacture of perfumes and toilet preparations	1,02	0,97	0,86	0,96	1,23	0,86
db1721	Cotton-type weaving	0,84	1,05	0,87	0,91	0,96	0,87
dn365	Manufacture of games and toys	0,88	1,01	0,80	1,02	1,10	0,87
dn361	Manufacture of furniture	0,93	1,02	0,89	0,94	1,01	0,88
dn3622	Manufacture of jewelery and related articles n.e.c.	0,87	0,99	0,85	0,94	1,06	0,90
dk2922	Manufacture of lifting and handling equipment	0,88	1,04	0,91	0,95	1,03	0,90
dk293	Manufacture of agricultural and forestry machinery	0,86	1,11	0,81	1,01	1,10	0,95
df232	Manufacture of refined petroleum products	0,96	1,00	0,99	0,82	1,02	1,00
dl3002	Manufacture of computers and other information processing equipment	1,01	0,92	0,98	1,09	1,13	1,12