**The rise of the 'emerging economies':
Towards functioning agricultural markets and trade relations?**

25-27 June 2014 | Halle (Saale), Germany

Inflation and the Pattern of Trade: General Conclusions and Evidence for Russia

Konstantin Borodin*, Anton Strokov**

*** Russia, Moscow, 105064, PO box 342, Bolshoy Kharitonyevsky pereulok, 21/6, bld. 1,**

borkg_cd@mail.ru,

**** Russia, Moscow, 105064, PO box 342, Bolshoy Kharitonyevsky pereulok, 21/6, bld. 1,**

bandura3@yandex.ru.

Abstract: The purpose of this article is to investigate the effect of differences in the inflation rates of trade-partner countries on their foreign trade patterns. The results of the analysis of a simple trade model served as the basis for an empirical study of Russia's foreign trade. For the purposes of experimental verification, we built Russia's export and import gravity models, using trade data for 2005-2012, as well as indicators reflecting the ratio of inflation rates in Russia and its trade-partner countries by the main commodity groups (inflation data for 1995-2012). The results of the empirical verification have basically confirmed the conclusions derived from the trade model analysis: Russia intensifies its export of fuel and raw-material commodities to countries with lower inflation rates and, simultaneously, increases its import of engineering, chemical, and agricultural products from countries with lower inflation rates.

Keywords: trade pattern, inflation, gravity model, Russia

JEL classifications: F14, E31

This paper benefited from helpful comments of Natalia Volchkova (CEFIR, Moscow).

1 INTRODUCTION

Inflation is one of the most important macroeconomic phenomena in the global economy. At the same time, its effect on international trade still remains understudied.

The most developed line in the analysis of inflation/trade interaction processes has been theoretical and empirical research into interrelations between inflation and the openness of international trade. David Romer (1993) has shown that more closed economies have higher inflation rates.

Low inflation in the majority of cases is a sign of economies with a developed financial sector. A number of recent papers have analyzed the financial sector's effect on the pattern of international trade. Thorsten Beck (2002) has shown that countries with a more developed financial sector have comparative advantages in manufacturing industries and a higher export share in manufacturing goods. The effect of the quality of financial institutions on trade parameters has resulted in a separate research trend. Thus, Jiandong Ju and Shang-Jin Wei (2011) have shown that the structure of production and the size of the financial market depend on the parameters of financial institutions and factor endowment.

Inflation growth stimulates resources to move to industries with shorter cycles and consumers to buy more goods and invest free cash into hard currency, and these are far not all consequences that economies with growing or unstable inflation may face.

In many cases, countries with low inflation export mainly engineering products; the opposite picture is observed in economies with high inflation; viz., the export of raw materials and products with low value-added grows[1].

Clearly, FIR indicates that countries with different supplies of capital may specialize in the production of the same commodity groups; however, in practice, advanced developments in electronics, informatics, aircraft engineering, instrument making, biotechnology, and pharmaceutics are carried out mainly in developed countries with low inflation.

There are several examples of economies with fairly low per capita incomes also having low inflation rates, although the difference between inflation rates and nominal interest rates in these countries is usually higher than in developed countries. In most cases, these are agrarian economies that develop extractive industries. Very often this happens under the patronage of foreign companies that partially or fully own most banks and financial institutions, as, for example, in Paraguay[2].

Cameroon's banking sector (inflation in 2012 was 2.9% (2.4% over the past ten years)) is also dominated by foreign commercial banks. In addition, access to financial services is available mainly to large companies and not to Cameroonians (less than 5%)[3].

At the same time, low inflation rates in such countries ensure a sufficiently low loan value, which is becoming a source of development (although slow) of engineering industries and in some cases, electronics and information technologies. Industrial production is growing even

[1] Meanwhile, a strict interrelation between per capita incomes and inflation rates has not been established. In particular, inflation rates and per capita incomes in countries that are Russia's trade partners correlate rather weakly. The coefficient of correlation between per capita GDP and mean inflation over 10 years in 134 countries that import Russian products was -0.16 over the whole period of 2005-2012.

[2] http://en.wikipedia.org/wiki/Economy_of_Paraguay

[3] http://en.wikipedia.org/wiki/Economy_of_Cameroon

despite the fact that sometimes a major part of the budget is spent on the repayment of foreign debts.

The purpose of this paper is to show that the difference in inflation rates between countries affects the trade pattern in a certain manner, namely, the products of machine building and some other industries with a relatively large share of high-tech products are mainly imported from countries with lower inflation rates, and the commodities of raw-material industries, from countries with higher inflation rates. This statement rests on an absolutely simple logic. The development of new products and the construction of capital-intensive automated lines require an inflow of long-term investments, which become unprofitable under the conditions of high inflation and competition with similar specimens from developed countries with low inflation. As a result, large domestic capital migrates to the production of raw-materials, which are in high demand in the world market, or to highly profitable industries with short cycles, focused on the domestic market.

This differentiation is traced both at the level of large commodity groups and the level of smaller subgroups. For example, in Russia's agroindustrial complex (where inflation is rather high), businesses with a relatively high level of capitalization (dairy production) or with long cycles (beef) tend to phase out, while businesses with short cycles (poultry meat), relatively lower levels of capitalization, and high external demands (grain, sunflower seed), on the contrary, are successful.

Hereinafter, the paper is organized as follows. The second section contains a brief characteristic of inflation in Russia, as well as the analysis of the commodity pattern of Russia's foreign trade. The trade model analysis is given in the third section. The fourth section describes the economic model of Russia's foreign trade and data. The analysis of the empirical results is represented in the fifth section.

2 INFLATION AND RUSSIA'S TRADE PATTERN

2.1 Inflation in Russia

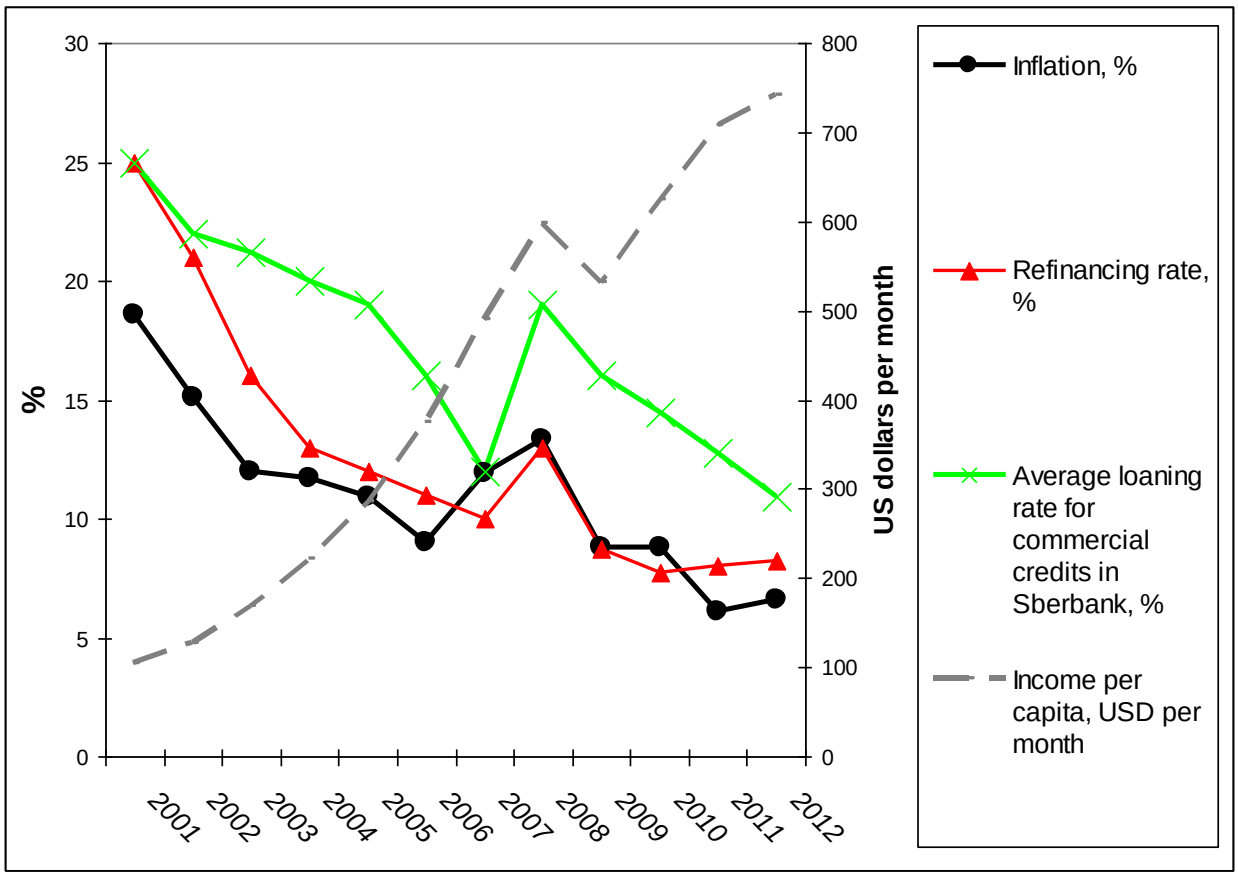
The refinancing and inflation rates in Russia are fairly closely interrelated (see Fig. 1), and it is easy to notice that they are characterized by a general downward trend. The credit interest rate of Sberbank, Russia's largest bank, noticeably exceeds both the discount rate and the inflation rate.

Among the major causes of high inflation in Russia are the absence of a developed competitive environment, high taxes and import fees, and the growth of inflationary expectations, related to the manifestations of monopolism as high rates in the fuel-energy and housing-and-utilities complexes.

A high inflation rate in Russia is maintained, among other things, by the inflow of export earnings from the fuel-energy complex into the country, because the banking system exchanges foreign currencies to the national currency (rubles).

A fairly high value of loans together with a high ruble exchange rate may ultimately become another source of inflation owing to the growing amount of loans borrowed by large domestic businesses from foreign banks at lower interests.

Figure 1: The inflation rate, the refinancing rate, the loan rate, and per capita incomes in Russia



Notes: Inflation → consumer price index for all goods and services, December to December of the previous year, %; Refinancing rate → Central Bank of Russia's discount rate as of the year end, %;

Source: Rosstat (Russian Federal Statistics Service), Central Bank of Russia, Sberbank.

2.2 Commodity pattern of Russia's foreign trade

Despite its small share in world trade (about 2%), Russia is among the world leaders in some commodities, especially in the export of oil and gas, as well as metallurgical and timber products.

In recent years, Russia's foreign trade has noticeably increased mainly owing to the growth of world prices for the main commodities of Russian export: in 2001-2012, the export grew by 5.3 times, and the import, by 7.6 times.

2.2.1 Export

The export commodity pattern is dominated by energy resources and metals, while finished goods have a very small share. In 2001-2012, the share of fuel and energy commodities grew from 54.7 to 71.4% (see Table 1).

Table 1: Pattern of Russia's exports

Code	Product label	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
	Total exports from Russia. mln USD	99868	106692	133656	181600	241452	301244	352266	467994	301796	397068	516993	524766
01-24	Agricultural and food products	2.0	2.6	2.6	1.8	1.9	1.8	2.6	2.0	3.3	2.2	2.6	3.2
25-27	Mineral raw materials	54.7	55.3	57.4	57.9	64.9	66.1	65.0	69.7	67.4	70.1	73.3	71.4
28-40	Chemical products	6.1	5.6	5.6	5.7	5.2	4.9	5.2	5.8	5.2	6.2	6.3	6.1
41-43	Leather products	0.2	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
44-49	Wood	4.4	4.6	4.2	3.9	3.4	3.2	3.5	2.5	2.8	2.4	2.2	1.9
50-67	Textiles and shoes	0.8	0.8	0.7	0.6	0.4	0.3	0.3	0.2	0.2	0.2	0.2	0.1
71	Precious stones	1.1	3.2	3.0	2.7	0.7	1.3	1.0	1.0	1.3	1.8	0.7	2.6
72-83	Metals	14.7	14.2	13.9	16.7	14.0	13.7	14.0	11.7	11.1	10.5	9.2	8.5
84-90	Machines and equipment	8.4	9.4	8.5	7.4	4.8	4.5	4.6	4.3	4.6	4.1	4.2	5.0
68-70, 91-99	Other products	13.0	9.6	9.5	9.2	8.7	8.5	8.6	7.9	9.4	8.3	9.1	1.0

Source: International Trade Center

The share of metals and metal products in the trade pattern decreased from about 14.7 to 8.5%, i.e., it is still significant.

The export of chemical products includes mainly mineral fertilizers. The share of this commodity group in the export is fairly stable; in 2012 it was 6.1%.

The machine-building group is mainly represented by automobiles; vessels; power-generating equipment (boilers and turbines); and machinery for the oil, gas, and chemical industries. Its share in Russia's total exports was 5.1% in 2012.

The share of food products and agricultural raw materials has somewhat increased in the value terms of the country's export compared to 2001, reaching 3.2% in 2012. The main export commodity in this group is grain.

2.2.2 Import

Roughly half of the Russian import is engineering products (see Table 2). The share of food products and raw materials for their production in the total import decreased, compared to 2001, to 12.8% in 2012.

The purchase of chemical products increased by 5.8 times in current prices, and its share in the pattern decreased to 15.3% in 2012.

The share of textile, textile products, and footwear in 2012 was 5.7%. Compared to 2001, the share of metals in the import has hardly changed; and the share of timber and pulp-and-paper products decreased by about two times.

Thus, the commodity pattern of Russia's foreign trade is characterized by the pronounced specialization of the economy in fuel and raw-material products and by the reduction in finished products, which is reflected in the export pattern as their extremely large share in the output of the fuel-energy sector and in the import pattern as a very large share of engineering products.

3 TRADE MODEL ANALYSIS

We will try to explain how inflation affects the trade pattern with the help of a simple trade model. The world is represented by two countries, A and B (see Fig. 2), and in this case, the role of country B is assigned to the rest of the world. The economies of the two countries make two goods, using two factors (labor and capital) to produce them.

Let economy B specialize in the production of capital-intensive products, and labor-surplus economy A, in the production of labor-intensive products.

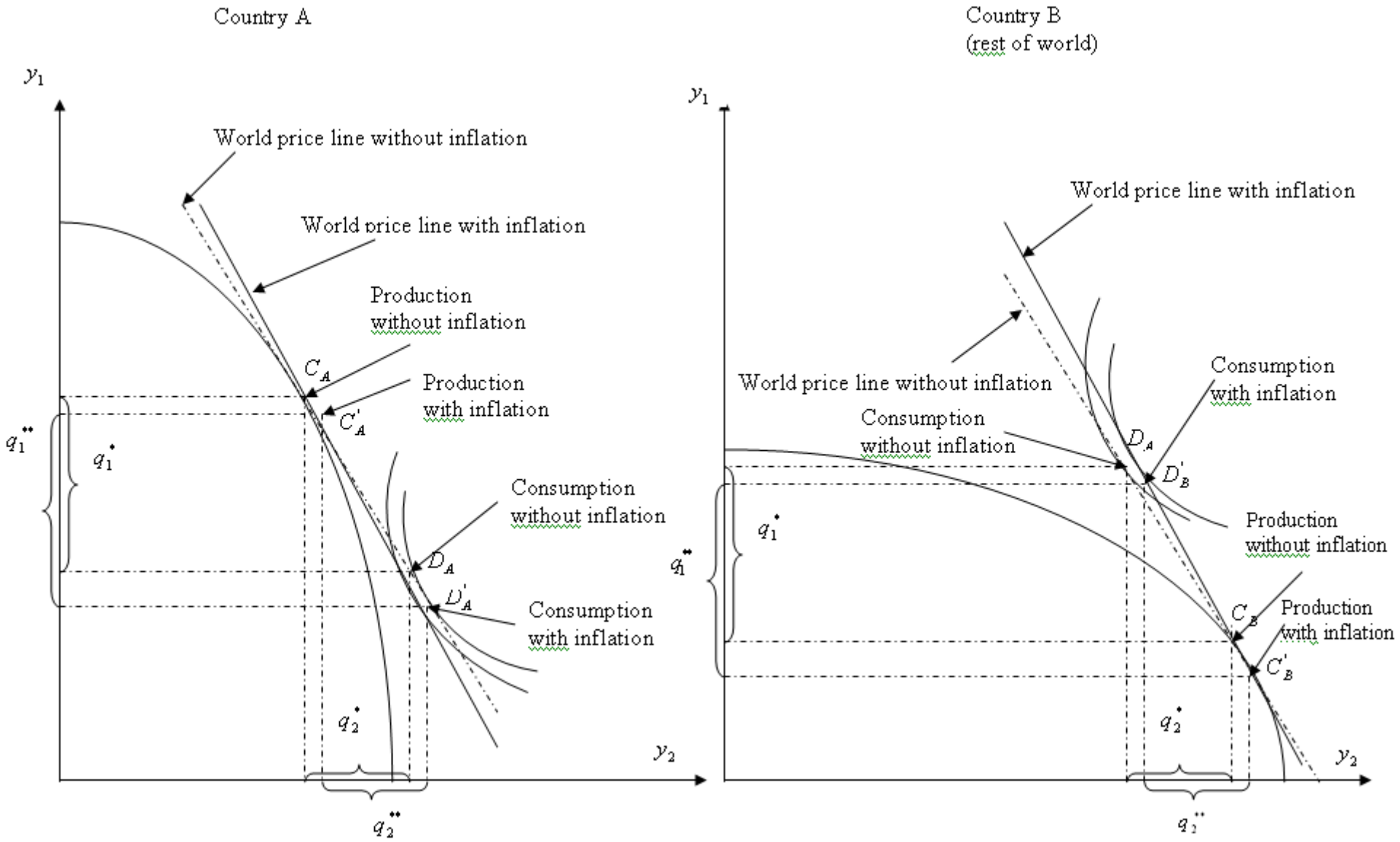
Both countries, A and B, have their national currencies in circulation. Under the initial conditions, the exchange rate is one currency unit of country A equals one currency unit of country B. In a capital-surplus country, capital has a lower value, which is revealed by lower loan rates; moreover, capital-surplus countries have more stable financial systems, allowing them to keep inflation sufficiently low; consequently, there are all grounds to believe that, most likely, inflation occurs in a capital-deficit economy, i.e., in country A.

Table 2: Pattern of Russia's imports

Code	Product label	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
	Total imports in Russia. mln USD	41865	46177	57346	75569	98707	137807	199726	267051	170827	228912	306091	316193
01-24	Agricultural and food products	22.0	22.5	21.0	18.3	17.7	15.7	13.8	13.2	17.6	15.9	13.9	12.8
25-27	Mineral raw materials	4.1	3.7	3.8	4.0	3.1	2.4	2.4	3.1	2.4	2.4	3.5	2.3
28-40	Chemical products	17.9	16.4	16.5	15.6	16.4	15.8	13.7	13.1	16.3	16.2	15.0	15.3
41-43	Leather products	0.5	0.5	0.4	0.3	0.3	0.3	0.3	0.4	0.5	0.5	0.5	0.5
44-49	Wood	4.0	4.2	4.2	3.8	3.3	2.9	2.7	2.4	3.0	2.6	2.2	2.0
50-67	Textiles and shoes	5.5	5.3	4.8	4.3	3.7	4.0	4.3	4.4	5.6	6.2	5.5	5.7
71	Precious stones	0.1	0.1	0.1	0.2	0.1	0.0	0.0	0.3	0.2	0.2	0.0	0.2
72-83	Metals	7.3	6.3	7.2	7.7	7.5	7.5	7.9	6.9	6.4	7.2	7.5	7.0
84-90	Machines and equipment	33.9	36.3	37.3	40.9	43.9	46.5	50.2	51.9	40.7	42.8	46.3	50.0
68-70, 91-99	Other products	4.8	4.8	4.8	4.9	4.1	4.9	4.7	4.3	7.4	6.0	5.5	4.1

Source: International Trade Center

Figure 2: Production under the conditions of international trade (with and without inflation in country A).



Consequently, if the economy of country B is less susceptible to inflation, it is logical to assume that international payments are made in the currency of country B.

Figure 2 shows the position of the world price line without inflation in country A, this country's export and import being q_1^* and q_2^*, respectively.

Since economy A is more susceptible to inflation, let us assume that inflation there has reached level π. Assume that inflation manifests itself exclusively in the proportionate growth of all prices and costs by a value of $(1+\pi)$; in other words, the scale of prices has changed in country A.

If the exchange rate in country A does not change, however, we will obtain an absolutely predictable result, viz., a reduction in output and trade in the two countries.

Therefore, let us assume that country A acts rationally and changes its exchange rate (s_A), expressed in the national currency units of country A, and has to buy one currency unit of country B so as to recover the changed price scale to the initial one, i.e., $s_A = \pi + 1$ in this case. Let us consider a change in the trade conditions in countries A and B.

As inflation grows, the demand for a hard currency (i.e., the national currency of country B), and on good 2 as on its substitute will grow in country A; this is the main assumption and the only difference in the conditions of a changing exchange rate in economy A without and with inflation.

It will contribute to the price increase on good 2 from p_1^* to p_1^{**} and the growth of its production in both countries. Thus, when the population of country A will purchase good 2 it will be a way of protecting their incomes.

In order to obtain larger currency earnings, the producers will increase their export, and, to this end, they will have to reduce the price for product 1. On the other side the slight shift of demand from good 1 on good 2 will promote it too. In our model the origin of good 2 doesn't differ, that's why in country A the demand on good 2 of local production will grow. This is in a certain way a result of using a simple model.

A relative price reduction will increase the slope of the world price line in the two countries. Production in country A will shift from point C_A to point $C_{A'}^{'}$; in addition, the manufacture of product 1 will somewhat decrease. Under the conditions of the growing demand for hard currency, inflation will encourage producers to be more oriented toward foreign trade, while deliveries to the domestic market will decrease, and a relative increase in the export of product 1 (q_1^{**}) will occur at the same time as the decline of internal demand. Thus, the consumption of product 1 in country A will decrease (shift from point D_A to point $D_{A'}^{'}$). The specialization of country A in producing good 1 will decline while the specialization of country B in producing good 2, on the contrary will increase.

In country B, on the contrary, as consumption grows, a new consumption point, $D_{B'}^{'}$, will be located on a higher indifference curve.

The parity of trade for country A will worsen. This is a consequence of the situation, when $q_2^* = q_1^* \frac{p_1^*}{p_2^*}$, and moving towards the new equilibrium $q_2^{**} = q_1^{**} \frac{p_1^{**}}{p_2^{**}}$, then $\frac{q_2^{**}}{q_1^{**}} < \frac{q_2^*}{q_1^*}$ because $\frac{p_1^{**}}{p_2^{**}} < \frac{p_1^*}{p_2^*}$.

The new equilibrium will result in additional trade benefits for country B and in losses for country A.

Thus, trade results in losses for countries with higher inflation rates, while countries with lower inflation rates obtain additional benefits.

Despite a certain decrease in the output of product 1, country A will increase the share of product 1 in its export in an inflationary environment.

The more losses in the welfare of country A, the more differences in the inflation rates of country A and its trade partner there are, i.e., $\frac{\pi_A}{\pi_B}$ (or $\frac{\pi_B}{\pi_A}$). This results absolutely logically from the assumption that these two countries would initially have the same inflation, π_B, that would then grow in A to $\pi_A > \pi_B$.

Accordingly, an increase in the welfare of country B will also depend on this ratio.

The effect of inflation lies not only in the growing demand for hard currency but also in the *disproportionate growth of prices for surplus and deficit factors*. Let us consider a labor-surplus economy as an argument. If we assume that, under inflationary conditions, a business hires an employee for each production cycle, the labor compensation will be determined at the time of signing a labor contract.

Upon the completion of the production cycle, the business will sell its products at a higher price owing to the growing inflation. However, the employees will receive a labor compensation based on the inflation rate at the time when production resources were purchased. Consequently, the labor-value growth will decrease in relation to inflation growth[4].

As distinct from the labor market, the difference in the nominal and real interest rates in the capital market depends not on the current, but on the expected, inflation rate (for example, see John H. Wood (1981)). In addition, in developing countries, taking into account a large number of their specific risks, the expected rate may tend to be overstated. Thus, the value of capital, a deficit factor, will increase in relation to the surplus factor.

4 EMPIRICAL METHODOLOGY AND DATA

4.1 Differences in inflation rates between trade-partner countries

[4] While trade unions in developed countries can provide employees with labor compensations based on predicted inflation, the efficiency of trade unions in developing countries is much lower; therefore, employees in these countries are unable to receive the full compensation for losses incurred by inflation.

The ratio of mean inflation values over a ten-year period in country j and in Russia was assumed as an index characterizing differences in inflation rates of trade-partner countries:

$$\bar{\pi} = \frac{\pi_{jt}}{\pi_{RUt}}, \quad (1)$$

where π_{jt} is the average inflation rate in country j at time t;

π_{RUt} is the average inflation rate in Russia at time t, in which case the average inflation rate for year *t* is calculated as a average value for the period [t-9; t].

The choice of a ten-year period was based on the fact that the value of inflation during a short or medium period may change as affected by various factors, including monetary-policy measures. We assume that a ten-year period is sufficient to smooth the effect of arbitrary factors.

In order to evaluate the effect of the difference in inflation rates on Russia's foreign trade pattern, we chose eight groups of industries: agriculture and its processed products (1-24 of the Foreign Trade Nomenclature of Goods (FTN)), mineral products (25-27), chemical products (28-40), timber and pulp-and-paper products (44-49), textile and footwear (50-67), metals and primary processed products (72-83), engineering products (84-90), and other goods (41-43, 71, 68-70, 91-97).

In observations where export or import was represented by a corresponding commodity group, the coefficient value was calculated according to (1), and, for the rest of the commodity groups in this observation, the index was assigned the value of 1. In this case, observations with no trade in commodities of the corresponding group are unable to affect the value of the index that characterizes the differences in inflation rates in a given commodity group.

4.2 Gravity model

Gravity models are widely used in theory and practice to study international trade. At the same time, analysis of the effect of inflation on the commodity pattern of trade using gravity models has not been conducted.

In order to evaluate changes in the pattern, the first stage involved the construction of two regression equations in which export and import logarithms were distance- and GDP-dependent variables.

In order to evaluate the effect of differences in inflation rates between Russia and its trade partners on trade in commodities of certain commodity groups, we introduced variables reflecting differences in inflation rates between the countries for the following commodity groups: agriculture and its processed products (FTN 1-24), mineral products (25-27), chemical products (28-40), timber and pulp-and-paper products (44-49), textile and footwear (50-67), metals and primary processed products (72-83), and engineering products (84-90). The "other commodities" group aggregates three commodity groups: rawhides, furs, and hide/fur products (41-43); precious stones, precious metals, and their products (71); and other commodities (68-70, 91-97). The export and import shares of the commodities of the latter group are 2.8 and 4.1%, respectively (2012).

Other variables were not introduced into the model at the first stage to reduce the effect of other factors.

In gravity equations the dependent variables (export and import) are interdependent (endogenous) with variables, depicting the relation between average levels of inflation in countries trade partners and Russia. Despite low correlation of sector variables with standard errors the empirical part of the paper was done with no only OLS but with IV.

4.2.1 Stage one (base case)

The regression equations have the following view:

$$\begin{aligned}\ln EX_{jt} &= \beta_{10} + \beta_{11}\ln DIS_{RUj} + \beta_{12}\ln GDP_{RUt} + \beta_{13}\ln GDP_{jt} + \beta_{14}\ln IN\_AGR_{jt} \\ &+ \beta_{15}\ln IN\_OIL_{jt} + \beta_{16}\ln IN\_CHE_{jt} + \beta_{17}\ln IN\_WOO_{jt} + \beta_{18}\ln IN\_TEX_{jt} \\ &+ \beta_{19}\ln IN\_MET_{jt} + \beta_{20}\ln IN\_MCH_{jt} + \beta_{21}\ln IN\_OTH_{jt}\end{aligned} \quad (2)$$

$$\begin{aligned}\ln IM_{jt} &= \beta_{30} + \beta_{31}\ln DIS_{RUj} + \beta_{32}\ln GDP_{RUt} + \beta_{33}\ln GDP_{jt} + \beta_{34}\ln IN\_AGR_{jt} \\ &+ \beta_{35}\ln IN\_OIL_{jt} + \beta_{36}\ln IN\_CHE_{jt} + \beta_{37}\ln IN\_WOO_{jt} + \beta_{38}\ln IN\_TEX_{jt} \\ &+ \beta_{39}\ln IN\_MET_{jt} + \beta_{40}\ln IN\_MCH_{jt} + \beta_{41}\ln IN\_OTH_{jt},\end{aligned} \quad (3)$$

where j denotes Russia's trading partners and t denotes time.

EX_{jt} is real exports from Russia to country j at time t; IM_{jt} is real imports from country j to Russia at time t; and GDP_{RUt} and GDP_{jt} are the real GDPs of Russia and country j at time t. DIS_{RUj} is the distance between Russia and country j.

Coefficients that characterize differences in inflation rates between country j and Russia at time t are the following:

IN_AGR_{jt} denotes the group of agriculture and its processed products (FTN 1-24),
IN_OIL_{jt} denotes the group of mineral products (25-27),
IN_CHE_{jt} denotes the group of chemical products (28-40),
IN_WOO_{jt} denotes the group of timber and pulp-and-paper products (44-49),
IN_TEX_{jt} denotes the group of textile and footwear (50-67),
IN_MET_{jt} denotes the group of metals and primary processed products (72-83),
IN_MCH_{jt} denotes the group of engineering products (84-90), and
IN_OTH_{jt} denotes the group of other products (41-43, 71, 68-70, 91-97).
Coefficients β capture the effect of explanatory variables on the corresponding dependent variable.

4.2.2 Stage two (extended case)

In order to extend the concept of Russia's foreign trade conditions, additional variables were introduced into regression equations (2) and (3).

Accordingly, the following regression equations were derived:

$$\ln EX_{jt} = \beta_{50} + \beta_{51} \ln DIS_{RUj} + \beta_{52} \ln GDP_{RUt} + \beta_{53} \ln GDP_{jt} + \beta_{54} \ln IN\_AGR_{jt}$$
$$+ \beta_{55} \ln IN\_OIL_{jt} + \beta_{56} \ln IN\_CHE_{jt} + \beta_{57} \ln IN\_WOO_{jt} + \beta_{58} \ln IN\_TEX_{jt} \quad (4)$$
$$+ \beta_{59} \ln IN\_MET_{jt} + \beta_{60} \ln IN\_MCH_{jt} + \beta_{61} \ln IN\_OTH_{jt} + \beta_{62} \ln RER_{jt} + \gamma_{51} CIS_{jt}$$
$$+ \gamma_{52} EU_{j} + \gamma_{53} CU_{j} + \gamma_{54} BOR_{RUj}$$

$$\ln IM_{jt} = \beta_{70} + \beta_{71} \ln DIS_{RUj} + \beta_{72} \ln GDP_{RUt} + \beta_{73} \ln GDP_{jt} + \beta_{74} \ln IN\_AGR_{jt}$$
$$+ \beta_{75} \ln IN\_OIL_{jt} + \beta_{76} \ln IN\_CHE_{jt} + \beta_{77} \ln IN\_WOO_{jt} + \beta_{78} \ln IN\_TEX_{jt} \quad (5)$$
$$+ \beta_{79} \ln IN\_MET_{jt} + \beta_{80} \ln IN\_MCH_{jt} + \beta_{81} \ln IN\_OTH_{jt} + \beta_{82} \ln RER_{jt} + \gamma_{71} CIS_{jt}$$
$$+ \gamma_{72} EU_{jt} + \gamma_{73} CU_{jt} + \gamma_{74} BOR_{RUj},$$

where

CIS_{jt} is a binary dummy that is unity if partner country j at time t is a member of the Commonwealth of Independent States (CIS);

RER_{jt} is the real bilateral exchange rate between Russia and country j at time t;

EU_{jt} is a binary dummy that is unity if partner country j at time t is a member of the European Union;

CU_{jt} is a binary dummy that is unity if partner country j at time t is a member of the EurAsEC Customs Union; and

BOR_{RUj} is a binary dummy that is unity if Russia and country j share a land border.

Coefficients γ capture the effect of explanatory variables on the corresponding dependent variable. According to the conclusions of the trade model analysis, a country with a higher inflation rate must export fewer capital-intensive products and more labor-intensive products.

An empirical study must show that countries with lower inflation rates must export to Russia, primarily, industrial products, i.e., goods whose production most intensively uses capital, a deficit factor for Russia.

In turn, Russia as a country with a relatively high inflation rate must export, primarily, labor-intensive products, whose export is more of a raw-material nature (oil, gas, metals), to countries with lower inflation rates.

4.3 Data

Information on inflation in trade-partner countries was taken from the World Bank database.

Data on bilateral trade (import and export) between Russia and its partners were obtained from the International Trade Center. Value indicators were then converted into rubles at an average annual rate. Information on real GDPs and the share of population ages 15-64 was obtained from the World Bank database.

Distances between Russia and its trade partners were measured with the help of Yandex Maps.

5 EMPIRICAL RESULTS

Correlation between all inflation variables was verified by pairs; its values did not exceed 0.1, indicating the absence of correlation between industry variables, which characterize differences in inflation rates between Russia and its trade-partner countries.

5.1 OLS results

In this subsection the analysis of OLS results is made. The results are presented in the first four columns of Table 3.

5.1 1 Base case

Export

For the export model's base case, we used 6090 observations: exports to various countries of the world by two-digit groups of Russia's customs statistics[5] for 2005-2012. All export and import variables were calculated in Russian rubles and adjusted to 2005 prices.

Then we evaluated the regression of consolidated time series (taken in cross-section).

Table 3 shows the result of evaluation of equation (2) (second column). We should preliminarily note that GDP coefficients and distances are significant.

Table 3: Gravity model estimations

	OLS				**IV**			
	Dependent Variables				**Dependent variables**			
	IM	***EX***	***IM***	***EX***	***IM***	***EX***	***IM***	***EX***
DIS_{RUj}	-1,880***	-1,957***	-1,045***	-1,390***	-1,855***	-1,947***	-1,040***	-1,394***
	(0,041)	(0,039)	(0,059)	(0,055)	(0,043)	(0,041)	(0,062)	(0,058)
GDP_{RUt}	1,149***	-1,125***	1,674***	-0,135	0,605	-3,401***	1,596***	-1,071**
	(0,451)	(0,426)	(0,443)	(0,408)	(0,540)	(0,556)	(0,525)	(0,539)
GDP_{jt}	1,185***	0,831***	1,221***	0,918***	1,132***	0,786***	1,198***	0,904***
	(0,020)	(0,018)	(0,020)	(0,018)	(0,020)	(0,019)	(0,021)	(0,019)
IN_AGR_{jt}	-0,514***	0,828***	-0,708***	0,537***	-0,453***	0,545***	-0, 568***	0,367***
	(0,065)	(0,064)	(0,065)	(0,063)	(0,059)	(0,055)	(0,057)	(0,053)
IN_OIL_{jt}	1,317***	-0,463***	1,163***	-0,761***	0,857***	-0,314***	0,769***	-0,500***
	(0,072)	(0,065)	(0,071)	(0,063)	(0,067)	(0,056)	(0,065)	(0,054)
IN_CHE_{jt}	-0,092	0,200***	-0,281***	-0,101*	-0,185***	0,159***	-0,296***	-0,030
	(0,066)	(0,062)	(0,066)	(0,060)	(0,061)	(0,053)	(0,059)	(0,051)
IN_WOO_{jt}	1,087***	0,708***	0,902***	0,410***	0,638***	0,430***	0,528***	0,242***
	(0,067)	(0,061)	(0,066)	(0,060)	(0,062)	(0,052)	(0,060)	(0,051)
IN_TEX_{jt}	0,744***	2,269***	0,552***	1,987***	0,432***	1,426***	0,320***	1,253***
	(0,066)	(0,067)	(0,066)	(0,065)	(0,061)	(0,058)	(0,059)	(0,055)
IN_MET_{jt}	0,610***	-0,033	0,425***	-0,331***	0,380***	-0,099*	0,266***	-0,287***
	(0,067)	(0,062)	(0,067)	(0,061)	(0,063)	(0,053)	(0,061)	(0,051)
IN_MCH_{jt}	-0,311***	0,481***	-0,496***	0,177**	-0,338***	0,301***	-0,447***	0,109**

[5] The so-called two-digit level (FTN 01-99).

	(0,066)	(0,061)	(0,066)	(0,060)	(0,061)	(0,052)	(0,059)	(0,050)
IN_OTH_{jt}	0,715***	0,712***	0,522***	0,410***	0,370***	0,322***	0,258***	0,134***
	(0,066)	(0,062)	(0,065)	(0,060)	(0,060)	(0,052)	(0,058)	(0,050)
RER_{jt}			-0,047***	-0,053***			-0,060***	-0,062***
			(0,014)	(0,013)			(0,014)	(0,013)
CIS_{jt}			2,403***	2,599***			2,517***	2,695***
			(0,132)	(0,122)			(0,134)	(0,126)
EU_{jt}			1,350***	0,374***			1,310***	0,342***
			(0,103)	(0,097)			(0,107)	(0,102)
CU_{jt}			-0,362	-0,841**			-0,369	-0,875**
			(0,376)	(0,355)			(0,391)	(0,374)
BOR_{RUj}			1,095***	1,162***			1,080***	1,149***
			(0,109)	(0,103)			(0,114)	(0,108)
Constant	-8,866	36,360***	-26,151***	12,727*	0,629	75,389***	-24,742***	28,739***
	(7,688)	(7,272)	(7,575)	(6,970)	(9,204)	(9,479)	(8,972)	(9,201)
F-stat	550,099	504,173	442,815	431,039	469,741	401,885	383,196	353,284
R^2	0,511	0,477	0,551	0,532	0,472	0,421	0,515	0,482
DW	1,617	1,605	1,755	1,770	1,720	1,625	1,866	1,794

Notes: Standard errors in parentheses.*, **, *** are 10%, 5%, 1% significance levels

Let us consider coefficients that characterize differences in inflation rates between trade-partner countries.
The value of the coefficient for the group of mineral products (25-27) is negative, reflecting the feedback between growing exports and a decreasing ratio between inflation rates in an importing country and Russia. In other words, these products are exported mainly to countries where inflation is lower than in Russia.

If the variables have the positive sign of the coefficient, this does not at all mean that the average value of fraction (1) must exceed unity. This may be caused by the growth of an indicator from very small values to larger ones, which, at the same time, may remain less than unity. Before the beginning of the 2000s, inflation was very high in Russia, gradually decreasing with time, and, simultaneously, the country's exports grew stably. Therefore, regression could show an increase in the fraction value as export grew. Consequently, in this case, it is rather hard to make unambiguous assessments; therefore, hereinafter, we had to abandon the analysis of variables with the positive values of coefficients.

By the results of the export model calculations, correlation coefficient R was 0.691, and determination coefficient R^2 was 0.477. The correlation coefficient is statistically significant, because F-statistics is 504.2. The determination coefficient is relatively low because we were unable to fully identify the factors that affected Russia's exports to various countries of the world. The DW coefficient is 1.605, indicating an insignificant positive autocorrelation of the remainders.

Import

For the base case of the import model, we used 5802 observations: imports from various countries of the world by two-digit groups of Russia's customs statistics for 2005-2012. The results of regression equation (3) are given in the first column of Table 3.

It is seen that the GDP coefficient of an exporting country and the distance coefficient are very significant.

Let us consider the coefficients that characterize differences in inflation rates between exporting countries and Russia.

The negative values of these coefficients for the groups of agriculture and its processed products (1-24) and of engineering products (84-90) indicate that these commodity groups are mainly exported from countries with lower inflation rates.

This result confirms the assumption that engineering products are delivered to the Russian market mainly by developed countries with low inflation rates.

At the same time, it is necessary to comment on the somewhat unexpected, as it may seem at first sight, result for agriculture, which is traditionally regarded as labor-intensive production. Meat (mainly beef and pork), fruit, and dairy products and beverages constitute the main share in the Russian import of agricultural products and derivatives (see Table 4). Thus, Russia imports products the production of which is disadvantageous for the country, such as fruit, individual species of fish, and wines. In addition, Russia imports products with relatively long production cycles (it is not by chance that the share of beef is the highest in the meat import pattern) and individual types of capital-intensive products (milk and dairy products). The data in Table 6 confirm the modeling results: the aggregate share of individual countries where inflation rates are lower than in Russia and that deliver agricultural products to the Russian market exceeds 50%; in addition, the aggregate share of capital-surplus countries (EU-27, the United States, and Canada) exceeds 40%.

Table 4: Imports of agricultural and food products to Russia and the structure of them

Code	Product label	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
01-'24	**Russian agricultural and food imports, total, bln. USD**	**9.2**	**10.4**	**12.0**	**13.9**	**17.4**	**21.6**	**27.6**	**35.2**	**30.1**	**36.3**	**42.5**	**40.6**
	Structure, %												
02	Meat and edible meat offal	20.1	23.0	19.1	17.3	18.4	22.1	19.3	21.4	22.3	17.9	16.6	18.2
	Including												
0201 and '0202	Beef, fresh or chilled and frozen	6.0	6.1	5.6	5.7	6.2	8.2	7.0	8.2	8.9	7.3	6.9	7.3
'0203	Pork, fresh, chilled or frozen	4.1	6.8	5.6	4.7	5.0	6.9	6.1	6.6	6.5	5.6	5.5	6.1
'0207	Meat and edible offal of poltry meat	8.4	8.0	6.0	4.9	5.0	4.3	3.9	3.8	3.8	2.6	1.8	2.1
0204. '0205. '0206. '0208. '0209. '0210	Other meat	1.6	2.2	2.0	2.0	2.3	2.7	2.3	2.8	3.1	2.5	2.5	2.8
'03	Fish, crustaceans, mollusks, aquatic invertebrates nes	2.3	3.0	3.5	4.7	5.5	5.6	6.3	5.8	5.7	5.6	5.5	5.9
'04	Dairy products, eggs, honey, edible animal product nes	6.0	5.5	7.3	8.3	8.5	7.0	7.6	7.4	7.0	9.6	8.8	8.1
'08	Edible fruit, nuts, peel of citrus fruit, melons	7.5	7.9	9.5	11.4	12.3	13.8	13.6	12.7	14.6	15.1	14.7	15.5
'17	Sugars and sugar confectionery	15.6	11.0	9.9	6.9	6.7	6.6	5.4	3.7	2.9	4.6	5.3	1.6
'22	Beverages, spirits and vinegar	6.1	6.3	7.7	8.5	8.8	7.0	8.2	7.4	5.9	6.2	6.5	7.6
01, '05-'07, '09-'16, '18-'21, '23, '24	Other groups of food and agricultural products	42.5	43.3	43.0	43.0	39.8	37.9	39.7	41.5	41.5	41.0	42.7	43.1

Source: International Trade Center

Table 5: Regional structure of Russian agricultural and food imports, several low-inflation countries, %

Region	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
EU-27	32.0	35.1	33.5	32.4	30.2	32.7	33.0	31.9	31.4	33.7	33.9	35.3
USA	10.5	7.2	5.6	5.4	5.1	5.0	5.0	6.2	6.0	3.8	3.9	5.2
Brazil	9.8	12.0	11.7	9.0	12.2	12.3	13.0	11.6	11.0	10.6	9.4	6.9
China	2.0	3.4	3.3	3.2	3.4	3.7	4.0	3.8	3.8	3.7	4.0	3.9
Canada	0.7	0.6	0.4	0.4	0.6	1.1	1.1	1.4	1.1	1.1	1.5	2.0
Argentina	1.1	1.8	1.8	2.4	3.4	4.1	3.7	3.1	3.5	2.2	2.0	2.3
the sum of these countries	56.0	60.0	56.3	52.8	54.8	58.8	59.8	58.1	56.9	55.0	54.8	55.8

Source: International Trade Center

For the purposes of an additional analysis of import, we excluded variable IN_OTH_{jt} from consideration. As a result, all the above-considered coefficients remained significant and preserved their signs; variable IN_CHE_{jt} also became significant with the minus sign; and this means that chemical products (mainly, pharmaceuticals, plastic and rubber products, etc.) were imported from countries where the inflation rates are lower than in Russia.

By the results of the calculation of the basic import model, correlation coefficient R was 0.714, and determination coefficient R^2 was 0.511; i.e., in this case, it was a little higher than in the export model. The correlation coefficient is statistically significant, because F-statistics is 550.1. The DW coefficient is 1.617.

5.1.2 Extended case

The number of export and import observations here was the same as in the base case.

Export

Practically all coefficients that characterize differences in inflation rates preserved their signs, except for IN_CHE_{jt}, which changed it to the minus sign.

The analysis of additionally introduced variables has shown that the CIS countries are important market outlets for Russian products, unlike the countries of the EurAsEC Customs Union. The significance of the European Union as an outlet for Russian products is low.

Correlation coefficient R was 0.729, and determination coefficient R^2 was 0.532. The correlation coefficient is statistically significant, because F-statistics is 431.0. The DW coefficient is 1.770.

Import

All coefficients that characterize differences in inflation rates retained their signs. Note the high significance of the coefficient that reflects differences in inflation rates for mineral products.

The analysis has shown that the CIS and EU countries are important product suppliers to the Russian market.

Correlation coefficient R was 0.742, and determination coefficient R^2 was 0.551. The value of F-statistics was 442.8, and the DW coefficient was 1.755.

The important result is that Russia exports mineral products and metals to countries with lower inflation rates, importing, in return, from these countries engineering, agricultural, and chemical products.

5.2. Instrumental variables results

To evaluate gravity equations we used the instrumental variable method (IV), which helped us to solve the problem of potential endogeneity between imports (exports) and sector variables, which depict the differences between inflation patterns in countries trade partners. It should be mentioned that endogeneity can come up only between the depended variable – imports (export) of Russia and the particular part of the sector variable which consists of the average inflation in Russia (i.e. – the denominator of the sector variables). It's obvious that the average inflation in one trade partner can't be endogenous with imports or exports of another country (in this case – Russia).

Therefore an instrument to depict the Russian inflation in year *t* should be selected. We characterize inflation as a discrepancy between the supply of goods on the internal market and money supply.

The share of the population capable of working provides the supply of goods on the domestic market and on exports, earnings from which are then used for purchasing imports, i.e. for supplying the domestic demand for goods. At the same time the share of the population capable of working as an indicator doesn't portray the current countries policy (including foreign trade), which can influence the dynamics of inflation. Therefore we can use the indicator population ages 15 - 64 as an instrument.

Meanwhile if we analyze Table 6 in which the correlation between inflation and population ages 15 - 64 are presented for different countries, we can notice that for the developed countries in most cases this interrelation is positive. Meanwhile for the developing countries and for transition countries the correlation index has a minus sign. In most cases it can be explained by the type of the particular economy – either with labor abundance or capital abundance. In labor abundant economy the increase of economically active population contributes to the growth of goods supply and thus, *with other conditions being constant*, stimulates the inflation decline. In capital abundant economy the positive dynamics of the labor share *with other conditions being constant* helps to increase the number of social programs, which, by-turn, can help to some inflation increase.

In certain extent it confirms by interrelation directly between the estimated coefficients of correlation (between inflation and the population ages 15 - 64) and GDP per capita in 1991 (as an indicator of economies development), correlation between which was estimated as 0.325 (for 155 countries – Russia and it's trade partners).

Due to the fact that the list of countries- trade partners are almost the same in the equations for export and import were used the same regression relations between Russian inflation and the instrument.

For russian inflation, expressed in this instrument the following estimates were received:
R^2 =0,490; F-stat =16,325. B=-27,987*** (6,927), Constant = 2000,749*** (484,410).

First of all we should mention that correlation between the sector variables and the residuals of the equation didn't exceed 0,053 by module.

5.2.1 Base case

Export

The estimates made by IV method show that Russian GDP coefficients increased significantly, as the GDP importer's coefficients slightly decreased. The β-coefficients in absolute degree also declined in almost all sector variables.

Import

Unlike the OLS results the IV estimates show the increase of β-coefficient in machinery variable, i.e it's significance for machinery imports improved. The β-coefficient also grew higher for chemistry.

5.2.2 Extended case

The coefficients by the CIS dummy increased which confirms the importance of this regional organization for Russia. At the same time we can state that trade with countries members of Customs Union of EurAzEC and Russia doesn't develop, and the IV method shows more negative estimates. For other variables the absolute definitions were lower than the results made by OLS.

6 CONCLUSION

The main purpose if this paper was to establish the effect of inflation on the trade pattern; to this end, at the first stage, we had to justify this effect using a simple trade model. The analysis of the model has shown that, in a country with a higher inflation rate, the export share of labor-intensive products grows and the welfare decreases, compared to that of its trade partner with a lower inflation rate.

At the next stage, we used sets of export and import gravity models to verify empirically the effect of inflation on Russia's foreign trade pattern. The analysis has shown that Russia as a country with a relatively high inflation rate exports the products of raw-material industries, such as mineral products and metals, to countries with lower inflation rates, and, in turn, it imports engineering, agricultural, and chemical products from these countries.

Overall, the results of the empirical analysis confirmed the main conclusions of the trade model analysis.

In conclusion, we should note that the transfer to an industrial or high-tech economy, whose structure is dominated by high value-added processing industries, is hard to implement under conditions where inflation is higher than in trade-partner countries.

References

Jiandong, J., W. Shang-Jin (2011). When Is Quality of Financial System is Source of Comparative Advantage?, *Journal of International Economics, vol. 84 (2)*.

Romer, D. (1993). Openness and Inflation: Theory and Evidence, *Quarterly Journal of Economics, vol. CVIII (4)*.

Thorsten, B. (2002). Financial Development and International Trade. Is there a Link?, *Journal of International Economics, vol. 57 (1)*.

Wood, J.H. (1981). Interest Rate and Inflation, *Economic Perspectives, May/June*.

Table 6: Correlation between inflation and the percentage of population ages 15-64, GDP per capita

Countries	GDP per capita, USD	Correlation between inflation and the percentage of population ages 15-64	Population ages 15-64, percentage of total population	
Countries	1991		1991	2012
Aruba	17342*	-0,03	68,1	69,0
Angola	1145	0,21	49,9	50,0
Albania	329	-0,50	61,2	68,1
Armenia	589	-0,45	63,7	69,3
Antigua and Barbuda	6575	0,56	62,0	67,5
Austria	22181	-0,21	67,3	67,2
Azerbaijan	1209	-0,39	61,5	72,1
Burundi	203	-0,20	48,8	53,4
Belgium	20786	0,23	66,7	65,5
Benin	383	-0,13	50,8	54,2
Burkina Faso	346	-0,17	49,5	51,9
Bangladesh	282	0,42	54,6	64,7
Bulgaria	1268	-0,36	66,5	67,5
Bahrain	9058	0,49	65,6	77,7
Bahamas, The	11915	-0,11	63,5	71,0
Belarus	1747	-0,66	66,1	71,1
Belize	2324	-0,11	52,5	61,7
Bolivia	768	-0,23	55,3	59,9
Brazil	2677	-0,62	60,6	68,1
Barbados	7714	0,52	66,3	70,4
Brunei Darussalam	14004	-0,41	63,2	70,2
Bhutan	467	-0,28	53,3	66,8
Botswana	2768	-0,58	53,1	62,7
Central African Republic	462	-0,03	52,7	56,1
Canada	21234	0,02	67,9	68,8
Switzerland	36310	0,45	68,3	67,8

Countries	GDP per capita, USD	Correlation between inflation and the percentage of population ages 15-64	Population ages 15-64, percentage of total population	
Countries	**1991**		**1991**	**2012**
China	330	-0,41	65,0	73,3
Cote d'Ivoire	837	-0,27	53,0	55,4
Colombia	1214	-0,94	59,4	66,0
Cabo Verde	1046	-0,32	49,6	64,3
Costa Rica	2270	-0,71	59,3	69,2
Cyprus	9696	-0,54	64,7	70,8
Czech Republic	2783	-0,81	66,2	69,2
Germany	22604	0,39	68,7	65,7
Denmark	26520	-0,18	67,4	64,9
Dominican Republic	1315	-0,17	57,8	63,3
Algeria	1700	-0,80	53,5	67,9
Ecuador	1640	-0,66	57,8	63,3
Egypt, Arab Rep.	644	-0,11	55,9	63,1
Spain	14378	-0,46	66,8	67,3
Estonia	2596*	-0,65	66,0	66,5
Ethiopia	266	0,51	50,5	53,3
Finland	24991	-0,11	67,1	65,3
Fiji	1882	0,22	59,0	65,9
France	21268	0,35	65,9	64,3
Gabon	5555	-0,07	52,5	56,3
United Kingdom	18571	-0,05	65,1	65,3
Georgia	1310	-0,52	65,8	68,1
Ghana	439	-0,48	53,6	57,9
Gambia, The	727	0,19	51,1	51,7
Guinea-Bissau	247	-0,71	52,5	55,5
Equatorial Guinea	338	-0,21	57,0	58,2
Greece	9776	0,31	67,3	66,0
Grenada	2504	0,22	53,0	65,9
Guatemala	1034	-0,46	51,3	54,7

Countries	GDP per capita, USD	Correlation between inflation and the percentage of population ages 15-64	Population ages 15-64, percentage of total population	
Countries	**1991**		**1991**	**2012**
Guyana	466	0,47	60,8	59,9
Hong Kong SAR, China	15466	-0,40	70,0	74,7
Honduras	609	-0,69	51,3	59,9
Croatia	4026	0,54	68,4	67,0
Haiti	479	-0,57	52,9	60,1
Hungary	3288	-0,90	66,3	68,3
Indonesia	705	-0,04	60,3	65,6
India	310	-0,17	58,8	65,4
Ireland	13834	0,07	62,1	66,7
Iran, Islamic Rep.	1019*	-0,45	51,6	71,1
Iceland	26406	0,57	64,4	66,7
Israel	11956	-0,89	60,2	61,9
Italy	21155	0,64	68,6	65,1
Jamaica	1707	-0,55	57,9	64,3
Jordan	1226	0,05	51,6	62,4
Japan	28541	0,47	69,9	62,5
Kazakhstan	1512	-0,68	62,7	68,0
Kenya	336	-0,49	48,8	55,0
Kyrgyz Republic	576	-0,70	57,3	65,6
Cambodia	251*	0,29	51,8	63,5
Korea, Rep.	7118	-0,65	69,9	72,9
Kuwait	5506	0,03	64,5	72,9
Lao PDR	235	-0,37	52,2	60,6
Libya	7339	-0,32	55,5	65,8
St. Lucia	3078	-0,09	56,3	67,0
Sri Lanka	521	-0,09	62,8	66,6
Lesotho	374	-0,32	52,1	59,1
Lithuania	2777	-0,34	66,4	69,3
Luxembourg	35439	0,35	69,0	68,5

Countries	GDP per capita, USD	Correlation between inflation and the percentage of population ages 15-64	Population ages 15-64, percentage of total population	
Countries	**1991**		**1991**	**2012**
Latvia	2549	-0,40	66,5	66,9
Macao SAR, China	9378	0,03	67,7	80,0
Morocco	1098	-0,69	56,4	67,2
Moldova	835	-0,74	63,7	72,2
Madagascar	223	-0,12	51,9	54,5
Mexico	3578	-0,65	57,8	64,7
Macedonia, FYR	2342	-0,54	66,5	71,1
Mali	298	-0,12	49,6	50,0
Malta	7688	-0,31	66,1	69,4
Mongolia	1073	-0,63	55,8	69,1
Mozambique	198	-0,06	50,5	51,4
Mauritania	694	-0,06	52,4	56,6
Mauritius	2669	-0,27	66,6	71,5
Malawi	228	0,59	51,8	51,4
Malaysia	2626	-0,44	59,5	68,2
Niger	291	0,14	49,9	47,4
Nigeria	279	-0,57	52,4	53,1
Nicaragua	351	0,22	51,1	62,0
Netherlands	20131	0,37	68,9	66,3
Norway	28077	-0,20	64,7	65,9
Nepal	211	-0,03	54,4	59,4
New Zealand	12104	0,43	65,7	66,1
Oman	6017	0,67	53,4	73,1
Pakistan	398	0,23	52,5	61,3
Panama	2301	0,58	59,8	64,3
Peru	1555	-0,50	58,1	64,6
Philippines	716	-0,60	56,1	61,6
Papua New Guinea	889	-0,11	55,8	58,8
Poland	2187	-0,82	64,9	71,0

Countries	GDP per capita, USD	Correlation between inflation and the percentage of population ages 15-64	Population ages 15-64, percentage of total population	
Countries	**1991**		**1991**	**2012**
Portugal	8839	-0,58	66,1	66,6
Paraguay	1602	-0,72	54,6	61,9
Qatar	14189	0,05	70,7	85,7
Romania	1254	-0,83	66,0	70,0
Russian Federation	3427	-0,68	66,7	71,6
Rwanda	274	0,01	48,9	54,1
Saudi Arabia	7846	0,55	55,0	67,4
Sudan	429	-0,70	51,8	55,3
Senegal	725	-0,17	50,1	53,4
Singapore	14413	0,59	72,9	73,8
Solomon Islands	999	-0,45	52,3	56,3
El Salvador	979	-0,55	54,2	62,3
Serbia	2795*	-0,77	66,2	69,5
Suriname	1086	-0,51	62,1	65,6
Slovak Republic	2474	-0,84	64,6	72,3
Slovenia	6339	-0,61	68,6	68,8
Sweden	30192	-0,15	64,1	64,4
Swaziland	1303	-0,35	49,3	58,5
Seychelles	5291	0,38	58,9	70,2
Syrian Arab Republic	1013	0,09	50,6	60,7
Chad	306	0,08	49,1	49,0
Togo	412	-0,29	50,9	55,4
Thailand	1718	-0,40	65,8	72,1
Tajikistan	468	-0,90	52,3	61,0
Tonga	1387	-0,32	58,2	50,5
Trinidad and Tobago	4360	0,19	61,0	70,5
Tunisia	1572	-0,38	58,1	69,7
Turkey	2751	-0,87	59,7	66,7
Tanzania	194	-0,87	51,4	52,0

Countries	GDP per capita, USD	Correlation between inflation and the percentage of population ages 15-64	Population ages 15-64, percentage of total population	
Countries	**1991**		**1991**	**2012**
Uganda	183	0,71	49,2	49,0
Ukraine	1490	-0,64	66,3	70,5
Uruguay	3578	-0,35	62,4	63,9
United States	24405	-0,17	65,7	66,7
St. Vincent and the Grenadines	1971	0,08	56,3	67,5
Vietnam	143	0,53	57,1	70,6
Vanuatu	1253	-0,30	52,8	58,6
West Bank and Gaza*	1195	-0,47	49,8	56,4
Samoa	682	0,06	55,8	57,0
Yemen, Rep.	479	-0,50	45,3	56,5
South Africa	3346	-0,72	58,3	65,0
Congo, Dem. Rep.	251	-0,06	51,4	52,0
Zambia	420	0,48	51,4	50,6

Source: The World Bank, * - GDP per capita (Aruba, Estonia, Iran, Cambodia, Serbia, West Bank and Gaza) due to the lack of data they were taken for the next after 1991.