



NATIONAL BANK OF KAZAKHSTAN

CONTRIBUTION OF THE BALASSA-SAMUELSON EFFECT TO THE DYNAMICS OF KAZAKHSTANI TENGE REAL EXCHANGE RATE

Balance of Payments Department

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Turabay B.A.¹, Almagambetova M.Kh.², Uskenbayev A.B.³

Annotation

The NBK continues the series of studies devoted to the analysis of the external sector of Kazakhstan's economy. Within the framework of this work based on vector autoregression method (VAR model) empirical assessment of the presence of the Balassa-Samuelson effect on the dynamics of the RER of tenge (hereinafter – KZT RER) in relation to the currencies of major trading partners of Kazakhstan was carried out, and the reasons for the results obtained were determined.

Keywords: real exchange rate, Balassa-Samuelson effect, labor productivity, tradable and non-tradable sectors of the economy, exports, inflation, competitiveness, Dutch disease, fiscal policy.

JEL classification: E24, E31, E58, E62.

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1. Introduction

The real exchange rate (hereinafter – RER) reflects the purchasing power of the national currency, indicating a fundamental change in its competitiveness in relation to the currencies of trading partner countries. Its strengthening may have a negative impact on economic growth rates, lead to a loss of price competitiveness of locally produced goods and, consequently, to the rise in the price of exports of medium- and high-value-added products, as well as cheaper imports for domestic consumers. Weakening of the RER may cause a decrease in the efficiency of production and quality of goods, as well as deterioration in the welfare of the population.

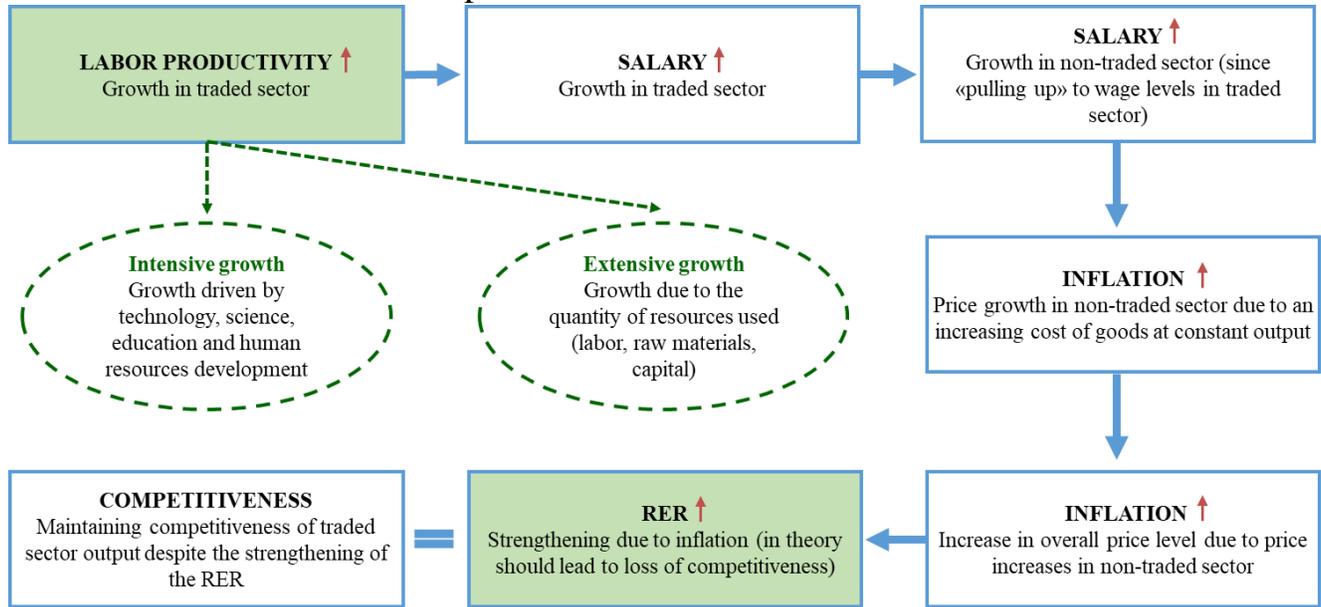
To deepen the assessment of the impact of the RER on the indicators of macroeconomic stability, there is a growing need to further study the causes of changes in the RER and assess the relationship between the RER of the Kazakhstani tenge and the fundamental factors that determine its long-term dynamics.

Real exchange rate appreciation can be observed both through qualitative improvement of the economy and through accumulation of imbalances in it. According to the **theory of Balassa B. & Samuelson P.**, in **developing** countries, the fundamental deviation of the RER from its equilibrium level towards **appreciation** is a consequence of faster **growth of labor productivity** in the country compared to trade partners. The step-by-step mechanism of the Balassa-Samuelson effect is as follows.

With the growth of labor productivity in the traded sector⁴ wages of workers in this sector increase. The resulting disparity between wages in the traded and non-traded sectors causes the wages of the non-traded sector to "pull up" to the levels of the traded sector. However, this "pull" leads to an increase in the cost of goods and services, which is not supported by an increase in output (for example, in oil-producing regions the growth of wages in the oil sector leads to an increase in wages in other sectors of the economy). The price growth in the non-traded sector provoked in this way raises the general price level in the economy. Price growth (higher inflation), in turn, with a disproportionate weakening of the nominal exchange rate or its invariance leads to a strengthening of the RER, which does not affect the competitiveness of the traded sector, the prices of which are determined on world markets. However, such appreciation does affect the competitiveness of the non-traded sector (graph 1).

⁴ Traded sectors of the economy are those involved in international trade. The demand for goods and services of traded sectors is determined by supply and demand both in the world market and domestically. In non-traded sectors of the economy, prices are determined by the balance of supply and demand in the domestic market.

Graph 1. Balassa-Samuelson effect



Note: compiled by the authors.

The purpose of this study is to test the presence of the Balassa-Samuelson effect on the dynamics of the KZT RER to the currencies of major trading partners of Kazakhstan, as well as to determine the reasons for the outcome when testing this hypothesis.

The paper consists of an introduction, literature review, results of empirical analysis and conclusions. The results of the empirical analysis cover the relationship of the KZT RER to the currencies of three major trading partners (Eurozone, Russia, China) with the differentials of labor productivity of the countries (areas) under consideration.

2. Literature review

The dynamics of the RER and factors influencing it are of great interest to economists, financial analysts, scientific community, population, businesses and economic policy makers. In this context, the understanding that the monetary and fiscal authorities have about the degree of influence of various variables on the RER is essential for effective macroeconomic policy.

One of the key factors explaining the dynamics of the RER is the labor productivity differential between trading partners. According to Balassa B. & Samuelson P. (1964), the fundamental deviation of the RER from its equilibrium level in developing countries is explained by the growth of labor productivity in one country at a faster rate compared to trading partners. The faster growth of labor productivity in the traded goods sector leads to higher wages in this sector, which in turn is reflected in higher wages and prices in the nontraded sector, subject to perfect labor mobility, and the resulting appreciation of the real exchange rate.

IMF economists Clark & MacDonald (1998) were the first macroeconomists to structure long-term macroeconomic indicators to explain the cyclical behavior of the RER (BEER – behavioral equilibrium exchange rate). Based on econometric methods, the authors estimated the impact of terms of trade, relative price of non-tradable goods, stock of net foreign assets, risk premium, and interest rate differentials as indicators of short-term relationships.

L.Komerak & M.Melecky (2007) based on the approach of Clark & MacDonald (1998) estimated short- and medium-term deviations of the RER of the Czech crown from its equilibrium level. The initial specification of the behavioral model included the labor productivity differential between the Czech Republic and Germany, foreign direct investment, terms of trade, economic openness, net foreign assets, government consumption and real interest rate differentials as potential fundamental determinants of the RER of the Czech krona against the euro (German mark). Estimates of the equilibrium exchange rate based on behavioral factors showed that the main determinants of the deviation dynamics are the difference in labor productivity, the difference in real interest rates, the terms of trade and net foreign direct investment. According to the authors' estimates, in all three methods used, an increase in the labor productivity differential between the Czech Republic and Germany leads to a strengthening of the RER of the Czech crown.

Researchers of the National Bank of the Republic of Belarus N.L. Mironchik and P.V. Bantsevich (2015) tried to explain the trend in the dynamics of the real effective exchange rate (hereinafter – REER) of the Belarusian ruble based on the Balassa-Samuelson effect on the basis of the methodology of constructing a behavioral equilibrium exchange rate model widely used in other studies. The authors considered not only the

difference in labor productivity growth in Belarus and Russia, but also the differential of real wage growth in the two countries.

As a result of empirical analysis, the authors found that the long-term elasticity of the REER of the Belarusian ruble with respect to the labor productivity differential in Belarus and Russia is negative, while being positive with respect to the real wages differential. The negative relationship between the REER of the Belarusian ruble and the labor productivity differential means that the growth of the labor productivity differential contributes to the depreciation of the REER of the Belarusian ruble. This indicates the absence of the Balassa-Samuelson effect and is explained by the researchers by the inverse long-term dependence of the REER of the Belarusian ruble on world oil prices.

3. Empirical analysis

To test the hypothesis about the presence of the Balassa-Samuelson effect in Kazakhstan, **three behavioral models** of the KZT RER were developed. Based on the developed econometric models the impact of the labor productivity⁵ growth compared to the labor productivity growth in main trading partners of Kazakhstan – Eurozone, Russia, China – on strengthening of the KZT RERs against euro, ruble and yuan was tested (table 1).

Table 1. Specification of the developed behavioral models

Model type	Model variables	Notations	Period	Data sources
1. VAR model for RER tenge/euro	RER tenge/euro	RER_EA	1Q2001 - 1Q2023 (frequency quarterly)	NBK
	Differential in labor productivity ⁶ indices between Kazakhstan and Eurozone	DPT_EA	–	BNS ASPR RK, Eurostat
2. VAR model for RER tenge/ruble	RER tenge/ruble	RER_RU	1Q2001 - 2Q2023 (frequency quarterly)	NBK
	Differential in labor productivity indices between Kazakhstan and Russia	DPT_RU	–	BNS ASPR RK, Rosstat
3. VAR model for RER tenge/yuan	RER tenge/yuan	RER_CH	1Q2001 - 4Q2021 (frequency quarterly)	NBK
	Differential in labor productivity indices between Kazakhstan and China	DPT_CH	–	BNS ASPR RK, Thomson Reuters

Note: compiled by the authors.

The conclusions drawn from the empirical analysis are presented below.

1. The Balassa-Samuelson effect on the dynamics of RER of tenge to euro is confirmed.

According to the results of the econometric estimations, the increase in the differential between labor productivity in Kazakhstan and the Euro area, other things being equal, contributes to the **strengthening** of the RER tenge/euro: the relationship is positive and significant (equation 1).

$$\mathbf{RER_EuroArea} = 0.15 * \mathbf{RER_EA}(-1) + \mathbf{0.32} * \mathbf{DPT_EA}(-1) - 0.03 - 6.29 * \mathbf{Dummy} (1)$$

Thus, empirically, the Ballasa-Samuelson effect is **confirmed**: strengthening of the RER tenge/euro is conditioned by faster growth of labor productivity in Kazakhstan compared to the Euro area (plus sign in front of the coefficient).

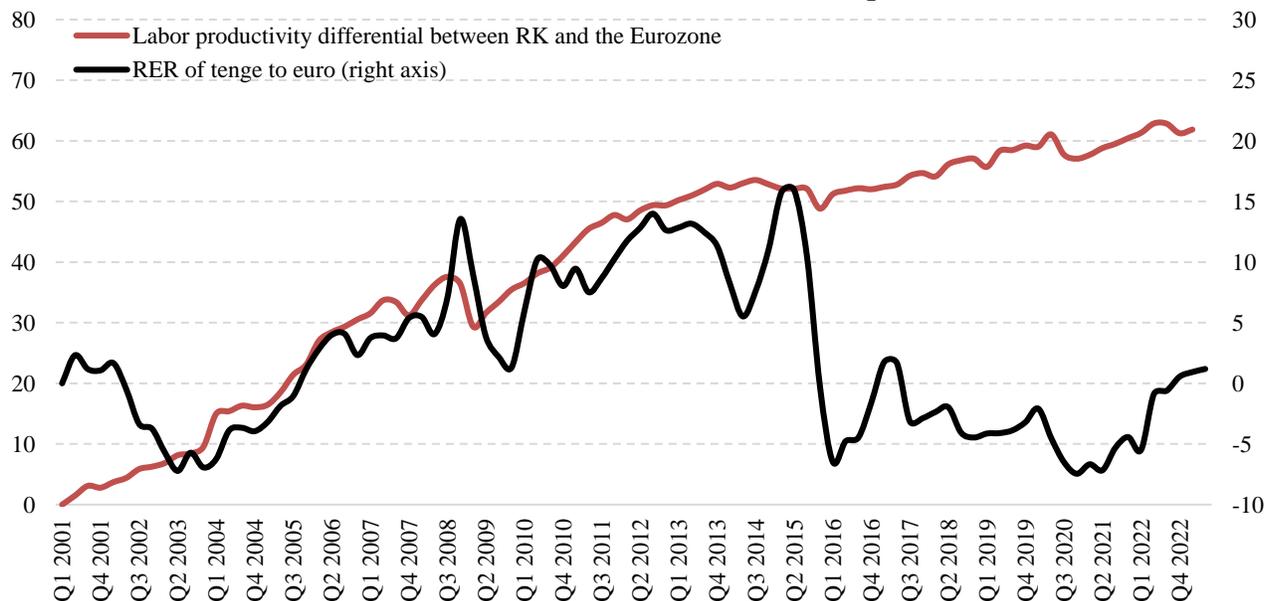
⁵ Wages were also included in the econometric models as an explanatory variable. However, due to the insignificance of the coefficients, wages were excluded from the regression equations at the modeling stage.

⁶ "Labor productivity" in this paper is calculated as "GDP per person employed".

Empirical evidence of strengthening of RER of tenge against euro due to the Balassa-Samuelson effect is based on number of **reasons**.

The first of them is the "catch-up growth effect"⁷. Thus, the growth rate of labor productivity in Kazakhstan was higher compared to developed countries of the Euro area (graph 2). The faster growth of Kazakhstan's economy was mainly due to favorable prices for raw materials (mainly crude oil), development of new oil deposits and expansion of production at existing ones.

Graph 2. Dynamics of the RER tenge/euro and the differential of labor productivity indices in Kazakhstan and the Eurozone (1q2001=100)



Note 1: hereinafter, to be able to interpret the data as growth rates, the variables were logged and multiplied by 100.

Note 2: hereinafter, a decrease in RER index means KZT depreciation, while an increase means its appreciation.

Note 3: compiled by the authors.

The second reason is that petrodollars coming from the growth of output of the traded commodity sector **"feed" the non-traded** sector of the economy.

The classic and less significant direct effect impacts on private non-tradable sector, when higher wages and, consequently, expenditures of commodity sector workers stimulate price growth in the non-tradable sector. At the same time, such price growth is not provided by output growth in the non-tradable sector.

In Kazakhstan, the indirect, but **more significant**, impact of petrodollars on the non-traded and traded non-commodity (finished goods) sectors is through the **fiscal channel**. Thus, when incomes of commodity exporters grow, revenues to the National Oil Fund of the Republic of Kazakhstan (hereinafter – NFRK) also grow. Funds channeled from the NFRK to the economy are not always used effectively and efficiently. As a consequence, the growth of output of non-traded and traded non-commodity sectors is

⁷ The catch-up growth effect implies that the economy of a developing country grows much faster than that of developed countries.

shown "**only on paper**" ("**paper effect**"): transfers and other withdrawals from the NFRK "feed" the economy and increase inflation levels without intensive improvement of its structure.

In addition, this increase in inflation is offset by the government through increased public and quasi-public sector spending, thereby tilting the inflationary spiral and leading to appreciation of the RER.

The third reason for the strengthening of the tenge/euro RER due to productivity growth is that the increase in commodity exports determines **not only** the growth of labor productivity in the form of "GDP/employment", but also the strengthening of the RER **through the nominal exchange rate**.

Kazakhstan's GDP growth is mainly driven by exports of oil and other commodities (the average share of raw materials and primary processed goods in exports of Kazakhstan – 92%). Prices for goods traded by Kazakhstan are determined on world markets in freely convertible currencies – US dollars and euro. Since the nominal exchange rate of tenge to euro is formed through the cross exchange rate of tenge to US dollar, the nominal value of tenge to euro is a reflection of the dynamics of tenge to US dollar.

As a result of increase in output (GDP) in the traded sector, an increase in inflows of export earnings denominated in foreign currency to the domestic foreign exchange market, other things being equal, causes **strengthening of the nominal exchange rate** or its **stability**, thereby allowing to increase the government's assets in foreign currency. Thus, the above empirically confirmed strengthening of the RER tenge/euro on the background of higher inflation in Kazakhstan is also a consequence of strengthening or insufficient weakening of the nominal exchange rate of tenge.

As a result, empirical evidence of strengthening of the RER of tenge against euro due to the Balassa-Samuelson effect may be a consequence of high inflation in Kazakhstan in combination with strengthening or relatively insignificant weakening of the nominal exchange rate of tenge. Such strengthening of the RER tenge/euro does not affect the competitiveness of the main share of the traded sector, i.e. the commodity industry, since revenues and costs of the industry are formed in foreign currency.

However, the strengthening of the KZT RER **affects** the rest of the traded sector – **exports of finished goods**, as well as the **production of highly processed goods** oriented to domestic consumption. This is due to the fact that the cost of such goods is mainly determined by internal factors ("Dutch disease"). This fact once again confirms the importance of sterilization of oil revenues and countercyclical fiscal policy.

2. The Balassa-Samuelson effect on the dynamics of the RER of tenge to ruble is not confirmed.

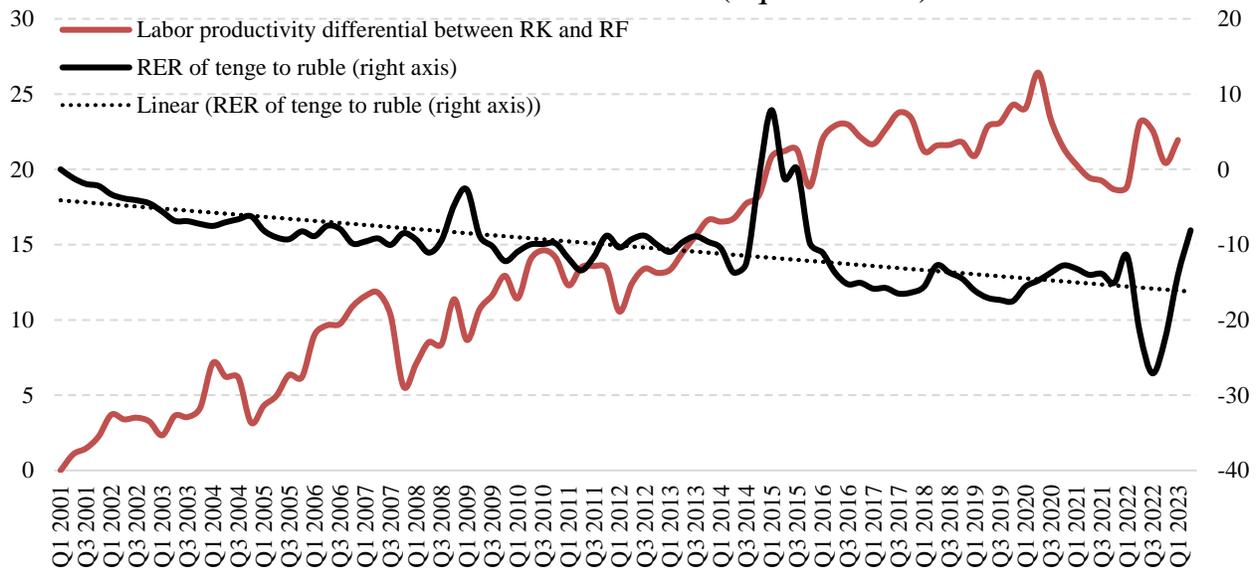
According to the results of empirical analysis, the relationship of the RER tenge/ruble with the differential between labor productivity in Kazakhstan and Russia is **negative** (the expected sign is positive) and **insignificant**. This shows that the

strengthening of the RER tenge/ruble is **not conditioned** by the Balassa-Samuelson effect (equation 2).

$$\mathbf{RER_RU} = 0.07*\mathbf{RER_RU}(-1) - 0.21*\mathbf{DPT_RU}(-1) - 0.26 + 3.52*\mathbf{Dummy} (2)$$

Both Kazakhstan and Russia are developing economies. However, labor productivity in Kazakhstan is growing faster than in Russia (graph 3). At the same time, this positive differential is less significant compared to the labor productivity differential between Kazakhstan and the Eurozone.

Graph 3. Dynamics of RER tenge/ruble and differential of labor productivity indices in Kazakhstan and Russia (1q2001=100)



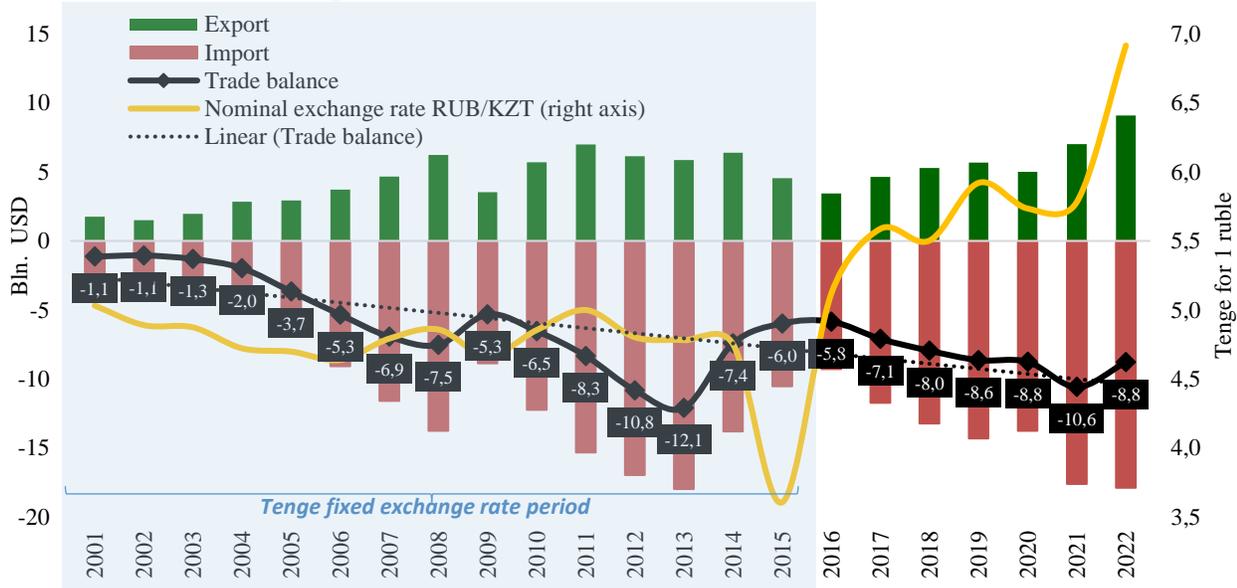
Note: compiled by the authors.

The faster growth rate of labor productivity in Kazakhstan compared to Russia, as in the case of the Eurozone, is mainly due to an increase in output in the oil sector, primarily due to three large oil fields. A more accurate assessment of the labor productivity of the two countries is possible by excluding the oil sector from the calculations. However, this task is complicated by the lack of data on non-oil GDP.

Thus, both econometric and visual analysis based on the **total** labor productivity (i.e. total GDP of oil and non-oil sectors) indicate that the outstripping growth rates of labor productivity in Kazakhstan are accompanied not by strengthening, but by weakening of the RER of tenge to ruble (for realization of the Balassa-Samuelson effect it **should be the other way around**).

Such a trend of real weakening of the tenge against the ruble, according to economic theory, should have led to a decrease in consumption of import from Russia and an increase in export to Russia. However, historical imports from Russia grew at a high rate, while exports to Russia grew moderately. As a result, the trade balance with Russia remains in deficit (graph 4).

Graph 4. Trade balance of Kazakhstan with Russia



Note: compiled by the authors.

In addition to the exchange rate factor, the dynamics is also determined by tariff and non-tariff regulation measures within the Eurasian Economic Union (hereinafter – EAEU). In conditions of insufficient volumes of internal production in Kazakhstan, EAEU countries gain competitive advantages compared to goods from third countries.

Another possible reason of non-fulfillment of the Balassa-Samuelson condition for RER tenge/ruble is **distortion** of historical dynamics of **nominal exchange rate** of tenge to ruble.

For a long time, Kazakhstan had a **fixed** exchange rate regime (until August 2015), while Russia had a **managed float** regime (until November 2014). This limited exchange rate formation based on supply and demand in the real economy, leading to the accumulation of imbalances in foreign trade. During the fixed exchange rate regime period, the nominal ruble/tenge exchange rate did not weaken despite the deepening of the trade deficit to a historic high of \$12 billion in 2013 (graph 4).

Thus, the historical dynamics of the nominal ruble/tenge exchange rate does not fully reflect the situation in the real economy, which may be the reason for biased estimation when checking the presence of the Balassa-Samuelson effect⁸.

The absence of the Balassa-Samuelson effect on the RER of tenge/ruble may also be a consequence of possible **predetermination** of the level of RER of tenge/ruble by **other factors**, such as oil price, terms of trade, differential of real interest rates, which are not considered in this paper.

⁸ The presence of the Balassa-Samuelson effect on the tenge/ruble RER was tested using data from 2015. The results (significance and sign before the coefficient) were similar to the results obtained using data from 2001.

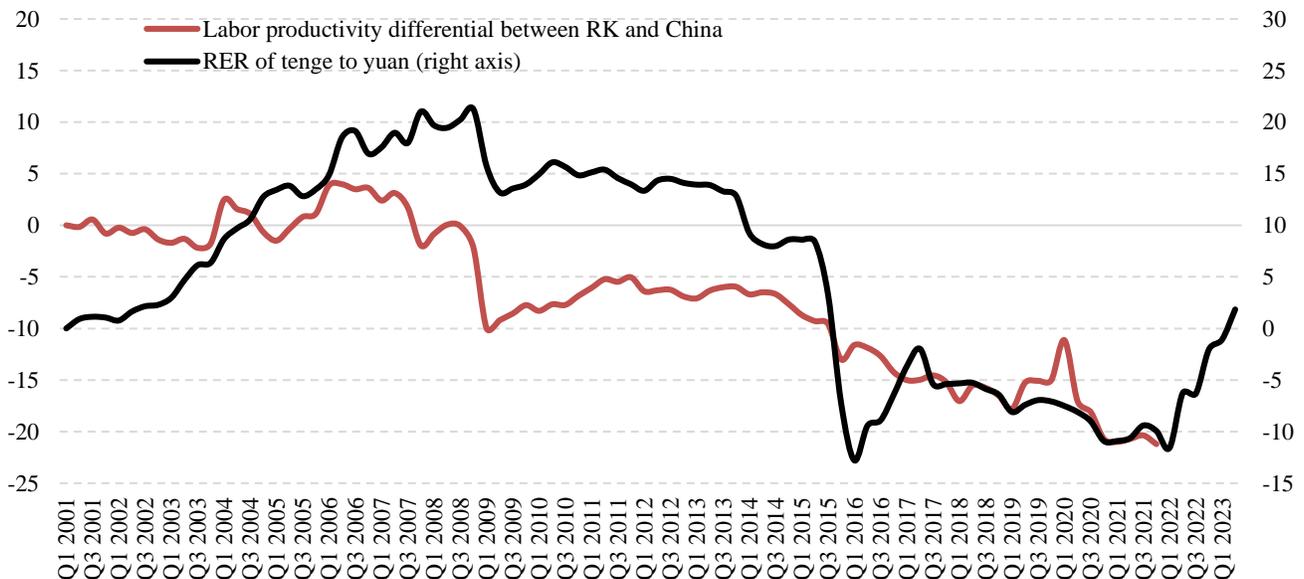
3. The Balassa-Samuelson effect on the dynamics of the RER of tenge to yuan is not confirmed.

According to the results of empirical analysis, the relationship between the RER tenge/yuan and the differential of labor productivities in Kazakhstan and China is confirmed: the coefficient in front of the variable "differential of labor productivities" is plus and significant (equation 3).

$$\mathbf{RER_CH} = 0.04 * \mathbf{RER_CH}(-1) + \mathbf{0.18} * \mathbf{DPT_CH}(-1) + 0.17 - 6.78 * \mathbf{Dummy} \quad (3)$$

China, as well as Kazakhstan, belongs to developing countries. At the same time, labor productivity in China is growing **more dynamically** than in Kazakhstan (graph 5). Consequently, the Balassa-Samuelson effect **holds for China**: the faster growth rate of labor productivity in China compared to Kazakhstan contributes to the strengthening of the RER yuan/tenge (inverse of the RER tenge/yuan).

Graph 5. Dynamics of RER tenge/yuan and differential of labor productivity indices in Kazakhstan and China (1q2001=100)



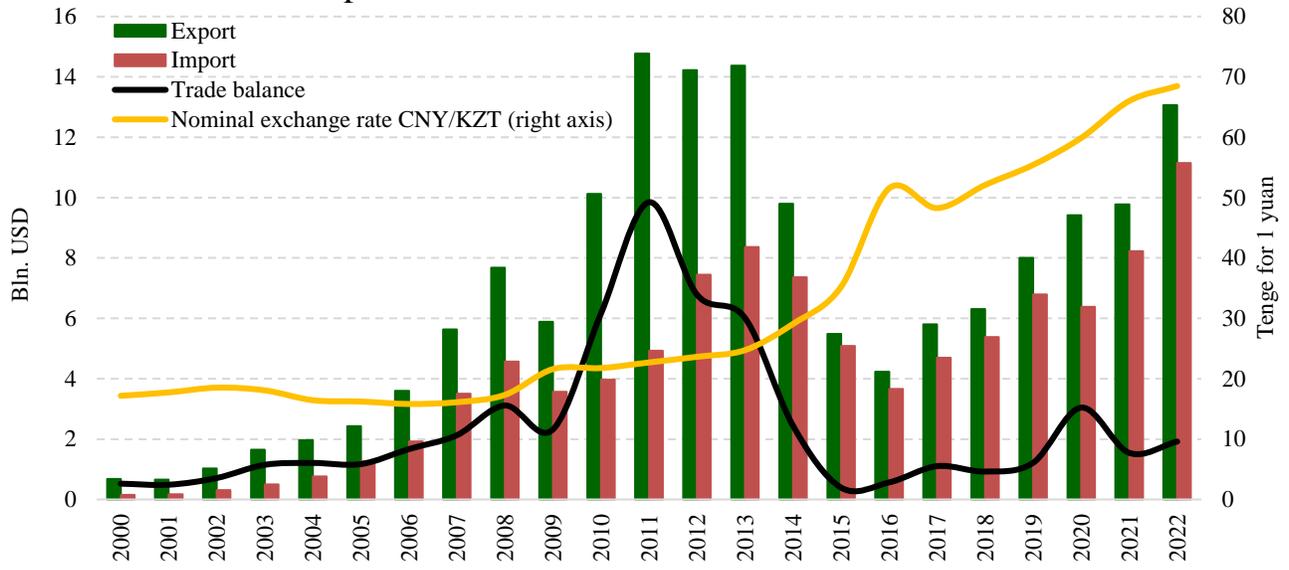
Note: compiled by the authors.

The faster growth of labor productivity in China compared to Kazakhstan is indirectly confirmed by the structure and dynamics of trade between the two countries.

China's exports are very diversified, which is confirmed by its deliveries to Kazakhstan: in 2021, China exported 3121 commodity items (6 HS signs) to Kazakhstan. In turn, the diversification of Kazakhstan's exports is insignificant: in the same year, Kazakhstan exported 354 commodity items to China.

In general, Kazakhstan's exports to China show dynamic growth. However, periods of growth in exports coincide with growth in imports, which causes a weakly positive trade balance (graph 6).

Graph 6. Kazakhstan's trade balance with China



4. Conclusions

The RER appreciation can be observed both due to qualitative improvement of the economy and due to accumulation of imbalances in it. The Balassa-Samuelson effect refers to the strengthening of the RER of developing countries due to the growth of **inflation in the non-traded sector** ("pulling" the wages of the non-traded sector to the traded sector) caused by faster growth of **labor productivity in the traded sector** of the country compared to trading partner countries.

In Kazakhstan, the presence of the Balassa-Samuelson effect is **confirmed** in relations **with the Euro area**, where most of Kazakhstan's exports⁹ are transported: the higher growth of Kazakhstan's traded commodity sector compared to the growth of the traded sector of the Euro area affects the **increase in inflation in Kazakhstani non-traded and traded non-commodity** (highly processed goods) **sectors** and, as a consequence, **leads to the strengthening of the KZT RER** against major freely convertible currencies – the euro and the U.S. dollar.

The above-mentioned growth of inflation in the non-traded and traded non-commodity (high value-added goods) sectors of Kazakhstan is mainly due to the **fiscal channel**. Thus, with the growth of incomes of commodity exporters, revenues to the NFRK grow. Funds channeled from the NFRK to the economy are not always used effectively and efficiently. As a result, the growth of output of the non-traded and traded non-commodity sectors is shown **"only on paper"** ("**paper effect**"): transfers and other withdrawals from the NFRK "feed" the economy and increase inflation levels without intensive improvement of the structure of the economy.

In addition, such an increase in inflation is offset by the government through increased public and quasi-public sector spending, thereby **tilting the inflationary spiral** and leading to appreciation of the KZT RER.

"Feeding" the non-traded sector of the economy with petrodollars encourages concentration of the production factors (labor and capital) in sectors which do not require special efforts, do not have high value-added and are not oriented towards international trade. This, in turn, reduces the attractiveness of highly productive traded sectors of the economy and discourages economic agents and the government from making attempts aimed at qualitative improvement of production processes.

Thus, strengthening of the RER tenge/euro due to price growth in the non-traded sector does not affect the competitiveness of the main share of the traded sector – the commodities sector, since revenues and costs of the industry are formed mainly in foreign currency.

⁹ In Kazakhstan's relations with China, the Balassa-Samuelson effect is performed not for Kazakhstan, but for China: the outstripping growth rate of labor productivity in China compared to Kazakhstan contributes to the strengthening of the RER yuan/tenge (inverse of the RER tenge/yuan).

However, the strengthening of the KZT RER affects the rest of the traded sector – **exports of finished goods**, as well as the **production of highly processed goods** oriented to domestic consumption. This is due to the fact that the cost of such goods is mainly determined by internal factors ("Dutch disease"). This fact once again confirms the importance of sterilization of oil revenues and countercyclical fiscal policy.

The classical Balassa-Samuelson effect implies strengthening of the RER due to **qualitative improvements in the traded sector** of the economy, for example, by increasing the complexity of goods, introducing innovations, improving the qualifications of labor resources. Confirmation of the Balassa-Samuelson effect in Kazakhstan in the case of "RER tenge/euro" has a **technical character** because the "boom" in exports is not accompanied by an increase in the complexity of traded products and is provided only by commodities¹⁰.

The RER **reflects the structure and degree of development of the economy**. It is not the main factor determining the competitiveness of goods and services produced by the country. Therefore, macroeconomic policy should be aimed at **increasing the effectiveness** of measures for the development of high value-added sectors.

¹⁰ According to the study "Analysis of the effectiveness of measures on import substitution and diversification", conducted by JSC "M.S. Narikbayev University of KAZGUU" under the grant allocated by the NBK, **Kazakhstan's participation in global value chains (GVCs) is decreasing**. The results of the analysis showed that in 2004-2008, participation of Kazakhstan in GVCs was quite intensive and amounted to more than **45%**. At the end of 2018, the considered indicator amounted to **42%**. Traditional sectors with relatively high participation in GVCs are mining, production of energy resources, rubber and plastic products, production of basic metals.

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