Internationalization of Renminbi and the Real Effective Exchange Rate

*Eva JANČIKOVÁ – Leonid RANETA – Denys BRAGA**

Abstract

The idea of examining the effects of chosen variables versus the real effective exchange rate (REER) arose after observing the current tendencies in global trade processes and the position of China on global markets. Also the eruption of the world financial and economic crisis led to devaluation processes of world currencies and introduction of massive quantitative easing programs which distorted competitiveness of countries. China is not an exception. The key objective of the article is to find out how the foreign direct investment (FDI), openness of Chinese economy, GDP growth and total unemployment affects the REER of China during the periods between 1991 and 2014. In addition, terms of trade and net foreign trade will be tested additionally as explanatory factors. The OLS method was used to establish the relationship as well as the direction of causation between variables.

Keywords: *renminbi, real effective exchange rate, foreign direct investment, import, export*

JEL Classification: D53, E01, F31

Introduction

Chinese currency is gaining on importance as a global currency. In the world finance year after year for the last few decades the importance and the economic power of the People's Republic of China (PRC) was gaining momentum and there is still plenty of room for the renminbi (RMB) to grow as an international currency. The PRC is the world's second largest economy by nominal GDP and by purchasing power parity after the United States. It has been among the

* Eva JANČIKOVÁ – Leonid RANETA – Denys BRAGA, University of Economics in Bratislava, Faculty of International Relations, Department of International Economic Relations and Economic Diplomacy, Dolnozemská cesta 1/b 852 35 Bratislava 5, Slovak Republic; e-mail: eva.jancikova@euba.sk; leonid.raneta@euba.sk; denys.braga@euba.sk

world's fastest-growing economies, with growth rates averaging 10% through 2013. China is also the largest exporter and second largest importer of goods in the world. Some expectations presume that China will become the world's largest economy, with a GDP (Gross Domestic Product) surpassing that of the U.S. in the early 2020s.

An important tendency is that in the recent decade there was a massive increase in Chinese international trade settled in RMB, starting from a few percent to about 20 – 25% today, with a tendency to increase further. In this context, there is scope for RMB to become part of international reserves and increase its role in international transactions. During research authors where confronted with a series of questions, such as what indicators to use for more adequate expression of value changes of the currency? What factors drive the Chinese currency, in real terms, over longer time periods? These actual questions are interesting not only for academic purposes but also from the point of view of investment community, mainly for longer term investments and subjects of international trade.

Literature Review on the Factors of Exchange Rate Volatility

The economic crisis opened the key issues of civilisation model (theory of the different form of capitalism, the issues of access to new technological developments, as well as redistribution of wealth in society and new forms of state monopoly capitalism (China, Russia and Brazil). The new centres of the global economy, virtual (traditional developed countries) and real resources (i.e. the developing countries), the role of TNC (Transnational Corporations), the knowledge society, the polarization of wealth, global consumption are all questions that put new challenges to developing new paradigms of theory and practice (Hontyova and Ivanova, 2012).

Fixed versus flexible exchange rate has become a subject of rigorous academic discussions for decades. Advantages of exchange flexibility contrasted benefits of Exchange rate variability and its positive effects on the fear of floating favoured exchange rate variability and its positive effects on economies (Mirdala, 2016).

Economic factors are having significant impact on the national currency exchange rate. Economic growth is one of the most important factors affecting exports and imports and respectively exchange rate. A positive GDP development is generally deemed to lead to a strengthening of a specific currency, all else being equal. The relationship between the economic growth and exchange rate is certainly an important subject. In 1964, Bela Balassa and Paul Samuelson independently observed that countries which had higher productivity experienced

rapid growth in real wages coupled with real exchange rates (RER) appreciation (Balassa, 1964). In recent years, a significant body of research has focused on the relationship between real exchange rates and economic growth (Eichengreen, 2007; Gala, 2007).

The unemployment rate is considered to be inversely related to the exchange rate. Employment levels make an immediate impact on economic growth rate. As unemployment increases, consumer spending declines because jobless people have less disposable income and spend less on non-essentials. Those who are still working worry about the future and tend to have a lower propensity to spend and substitute saving for spending.

Rising unemployment leads to a decrease in the exchange rate (Fu and Lin, 2012), as it causes decline in GDP. High unemployment may be caused by poor competitiveness, which reduces the value of the exchange rate over time. In addition, studies have been done on the reverse effect, volatility and instability of exchange rate to have a negative impact on employment (Belke, 2005; Feldmann, 2011).

A great deal of research has been conducted examining the relationship between Exchange Rates and the Balance of Payments. The balance of payments is one of the most important factors that determine the exchange rate since it is the outcome document of a country's foreign economic activity for a certain period and directly determines foreign currency demand and supply in the market. Thus, the balance of payments directly affects the exchange rate. Traditionally, the greatest influence on the formation of the exchange rate are exerted by those accounts of the balance of payments, which reflect current transactions, including trade transactions.

If a country has a current account deficit, it needs foreign Exchange to finance it. Large net capital inflows or outflows are caused by current account deficits or surpluses that have direct implications on exchange rates. In the same direction, as concerns the current account deficit, it needs foreign exchange generated through larger export than imports can be used (Sipko, 2014).

A negative balance of trade usually points to low competitiveness of national products on the world markets and relative attractiveness of foreign goods compared to domestic goods.

A negative balance of payments creates a downward trend in the national currency, as debtors change it for foreign currency to pay their external liabilities. In this case, the demand for foreign currency significantly exceeds supply and there is a steady downward trend in the national currency. When a country has a positive trade balance, the opposite situation develops. A positive balance of payments contributes to an increase in the value of the national currency, as it increases demand for it from foreign debtors.

Besides, exchange rate may be affected by the state's economic policy in the field of balance of payments regulation, both current account and capital account. For instance, export subsidies, trade quotas, import restrictions and customs duties may affect a country's trade balance. With an increase in the trade surplus, demand for national currency also increases, which thereby contributes to an increase in the value of the national currency. The negative trade balance triggers the opposite processes. Short-term and long-term capital movements depend on the level of national interest rates and policy of capital control (restricting or encouraging capital import and export). Changes in the balance of capital account also have a certain impact (similar to that one of exports and imports) on the exchange rate of the national currency. Normally the surge in capital inflows to the economy is accompanied by real exchange rate appreciation. An increase in capital inflows involves stronger demand for both tradable and non-tradable goods, which in turn, may result in a rise in the price of non-tradable goods to restore market equilibrium. With an increase in tradable consumptions, the balance of trade tends to deteriorate without any change in the domestic price of traded goods. Recent studies (Athukorala and Rajapatirana, 2003) have showed that the impact of capital movements largely depends on both the capital structure (FDI or portfolio investments) and on the extent to which real exchange rate responses to capital flows. However, there might be a negative impact of excessive amounts of short-term capital inflows on the national currency exchange rate because large amounts of capital inflows may create an excess money supply, which in turn can lead to higher prices and the depreciation of the national currency.

Globalization also reduces the possibility of supervision over the activities of financial institutions, increasing investment risk at the same time. Additionally, we are witnessing a specific feedback between financial markets. Therefore, building a model most accurately reflecting changes in the currency market is such a difficult and complicated task (Miciula, 2014).

The flows of FDI (Foreign Direct Investment) are affecting the demand for local currency and in case of their outflow a demand for foreign currency, resulting in changes in exchange rates one way or the other respectively. Foreign direct investment flows with the expectation of earning a return on it in the short run and can be a potential source of instability, the latter tend to take the form of imported machinery and/or equipment and therefore cause appreciation effect.

The influence of the balance of payments on the exchange rate is determined by the degree of openness of an economy. Thus, the higher the share of exports in GDP (the higher the openness of the economy), the higher the elasticity of the exchange rate with respect to a change in the balance of payments. The instability of the balance of payments leads to an abrupt change in demand for the relevant currencies and their supply.

MacDonald and Ricci (2005) studied the long-term determinants of real exchange rate including economic openness, capital flows and terms of trade. Rana, Akhtar and Rana (2002) found out a direct relationship between exchange rate and budget deficit under the managed floating exchange system.

Calderon and Kubota (2009) showed that by allowing for aggregate price flexibility, trade openness can decrease the effect of nominal or real shocks on the volatility of real exchange rate.

Hau analyzed (2002) analyzed the impact of openness of an economy on the exchange rate movements, assuming the existence of a negative correlation between trade integration and real exchange rate volatility. According to Hau, more open economies show more flexible aggregate price levels. Thus, increased trade openness leads to lower real exchange rate volatility.

Romer (1991) argues that inflation and openness are negatively and significantly correlated. His work titled *Openness and inflation: Theory and Evidence* conveys that unpredictable monetary expansion may lead to real exchange rate depreciation, and since the harms of real depreciation are greater in more open economies, the benefits of unanticipated expansion are decreasing in the degree of openness.

Openness degree, size of an economy, and general government gross debt at nominal value are important in explaining the rate of nominal depreciation, since they tend to have an impact on inflation. Nevertheless, the results for the terms of trade, another factor that is supposed to affect the nominal exchange rate through its influence on the real exchange rate, differ. In particular, in case with the OECD countries, the factors causing inflation tend to dominate the determination of the nominal exchange rate (Lane and Milesi-Ferretti, 2002).

The effect of terms of trade (ToT) manifests itself in two different ways (Edwards, 1989; Elbadawi, 1999). First, an improvement in ToT that represents a positive income effect causes an increase in domestic purchasing power and demand for non-traded goods (Jongwanich, 2009). Therefore, the real exchange rate will be appreciated. Second, a negative substitution effect makes imports more expensive. The net effect of terms of trade deterioration on real exchange rate depends on the relative strength of the substitution and income effects.

In modern conditions, international capital movements start playing a more and more important role in the exchange rate formation. As already noted, the bulk of the world's payment transactions are connected with capital movements rather than trade. Therefore, one of the most important factors that determine exchange rate movements is the level of interest rates. A rise in interest rates on deposits and (or) higher yields on securities denominated in a foreign currency will increase demand for this currency, which will cause its appreciation.

Hypothesis Statements

As we have mentioned above there are different approaches to the explanation the changes of exchange rates. We can summarize and express these approaches in following explanatory factors: GDP growth rates, openness of the economy, indicators of international trade, terms of trade, FDI flows and unemployment rates. These factors were chosen in order to prove their effect on real effective exchange rate of RMB.

The exchange rate of a selected currency is always influenced by a variety of factors, starting from country's economic performance and other exogenous factors such as policies of central banks and other political factors. The exchange rate is a very complex parameter and from the explanatory power of any selected model will always have serious limitations. On the other hand, exchange rate is usually measured by cross rates of two currencies, which is not suitable for our regression analysis. Authors had chosen the real effective exchange rate as more suitable for their needs because it monitors changes of values to a basket of most important trading partners (67 and 172 most important trading partners).

The explanatory factors for our research have been chosen on the base of prior researches of different authors mentioned in the literature review. Authors' assumption was that there would be a positive relationship between GDP growth and the value of Chinese currency. On the contrary, unemployment, openness of the economy and net FDI outflow was expected to have a devaluing effect.

China's Economic Rise and Renminbi Internationalization

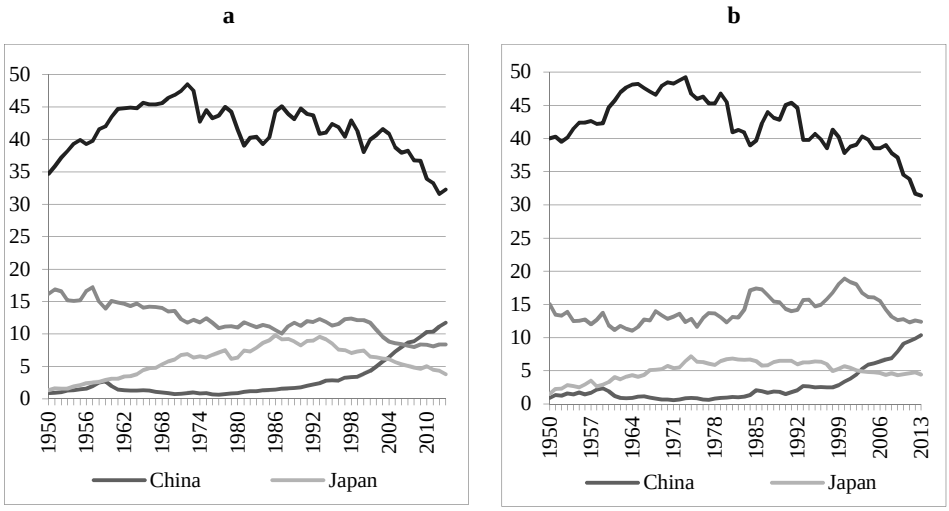
China's economy has expanded rapidly since the country joined the World Trade Organization. Rapid economic expansion has also led to a sharp rise in the country's importance globally. Figure 1 shows that it has become the world's largest export nation, accounting for 12% of global exports in 2013. Its imports have also increased and reached 10.3% of the global total in 2013. China's share of the global export market grew very fast after 2000, which suggests that there is a competitive threat for other countries, which are concerned with the RMB's depreciation in recent years against their currencies.

In recent years, the authorities of China have made great efforts to internationalize its currency. In 2009 China authorities allowed exporters and importers to use RMB to settle merchandise trade. One more important step towards the national currency internationalization is capital account liberalization. Substantial, if not complete, capital account liberalization must therefore take place to achieve meaningful currency internationalization. China has been extremely

cautious in implementing a series of capital account liberalization measures since its adoption of economic reforms in the late 1970s.

F i g u r e 1

Global Share of China's Exports (a) and Imports (b) (% of world total)



Source: Developed by authors based on OECD (2016a) data.

In 2012, four capital account items out of 40 were not convertible, 22 were partially convertible, and 14 were basically convertible. No item has achieved full convertibility so far. Credit instruments transactions and foreign direct investments, which represent essentially long-term capital flows, are the items that have been liberalized the most, while capital and money market transactions, derivatives and other instruments transactions, real estate transactions, and individual capital transactions are the least liberalized items (Kawai and Pontines, 2014).

Capital-account liberalization continues steadily and will be completed by 2022 according to an internal document of the People's Bank of China.

Prior to 1994, China maintained a dual exchange rate system where the official exchange rate was set at a much higher level than the market rate.

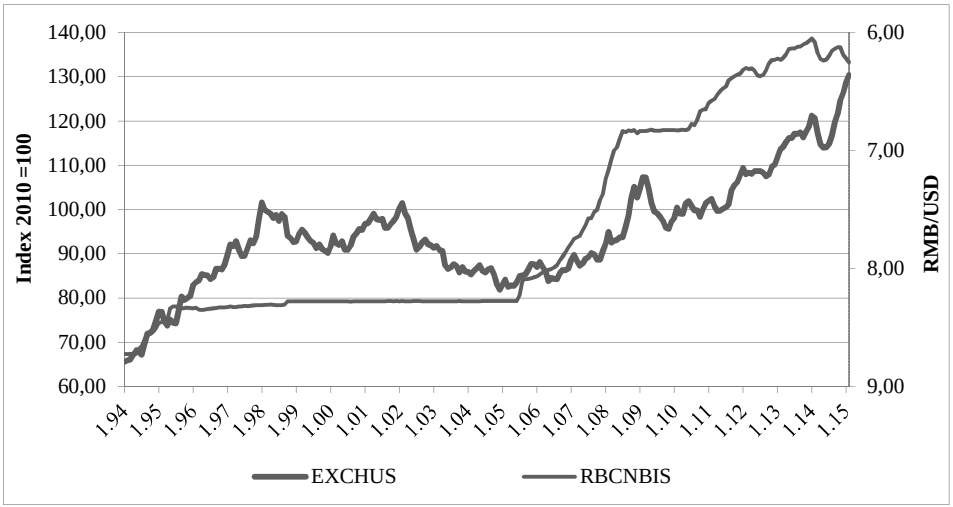
In 1994 various official exchange rates were unified, with the official rate being devalued by about 30%. Thereafter, the exchange rate appreciated slightly and fixed at the rate of RMB 8.28/USD. It remained at that rate until July 2005 (see Figure 2).

Although China's exchange regime was defined by China authorities as a managed float with fluctuation of the RMB/USD exchange rate only permitted within a 0.3% band, in reality it remained a fixed exchange rate regime against

the US dollar. After July 2005, China allowed the RMB to appreciate steadily, but very slowly. Appreciation remained slow and well-controlled but persistent until the summer of 2008. In the summer of 2008, China abandoned this process and once again fixed the CNY against USD. The RMB exchange rate was set at CNY 6.83/USD until May 2010. In June 2010, the temporary dollar peg was again abandoned, allowing RMB to appreciate against the USD again.

F i g u r e 2

China/US Foreign Exchange Rate and Real Effective Exchange Rate for China



Note: EXCHUS – China / U.S. Foreign Exchange Rate, Chinese Yuan to One U.S. Dollar, Monthly, Not Seasonally Adjusted; RBCNBIS – Real broad effective exchange rate for China.

Source: Developed by authors based on FRB (2016) data.

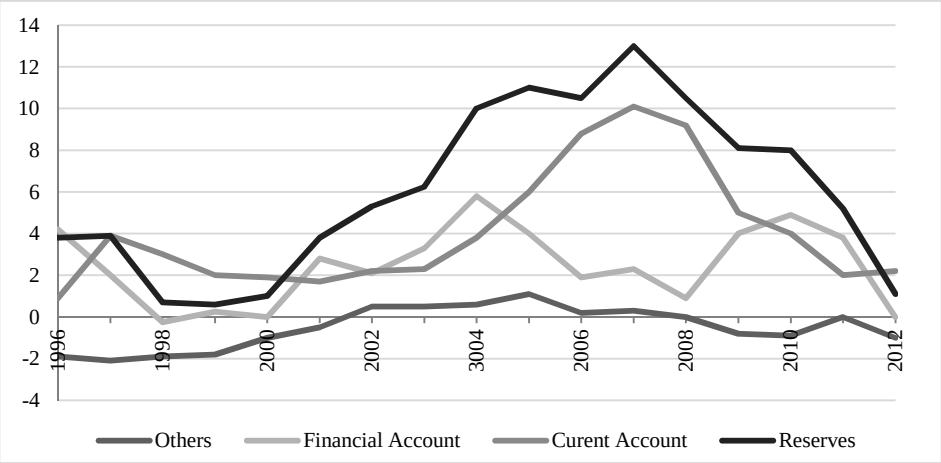
As Figure 3 shows, between 1991 and 2013, China ran current account surplus. In the second half of the 2000s it reached 10% of GDP in 2007, though rapidly contracted thereafter. The country's reserve accumulation was also notable given large and growing surpluses of both the current and financial account. The country's foreign exchange holdings reached around USD 3.8 trillion at the end of 2013.

The ongoing internationalization of the renminbi may have further increased the weight of RNB in some currency baskets and reinforced the co-movements between the renminbi and other Asian currencies. Many central banks and global investors are increasingly seeing the RMB as another alternative in trade settlements.

This may be an additional motivating factor for Asian central banks to seek RMB exchange rate stability with a view of smoothing fluctuations in the trading environment of their domestic firms.

Figure 3

The China's Current Account, Financial Account, and Reserves



Source: Developed by authors based on FRB (2016) data.

Objectives, Methods, Data Base and Measurements

The key objective of the article is to find out how the FDI, openness of Chinese economy, GDP growth and total unemployment affects the *REER*. In addition, terms of trade and net foreign trade will be tested additionally as explanatory factors. The plotted data, which are used in regression analysis, are presented below on Figure 4. All data observed annually from 1991 to 2014 (the last available date for the moment of analysis). This objective is met through quantifying changes in selected variables and their impact on international competitiveness of China.

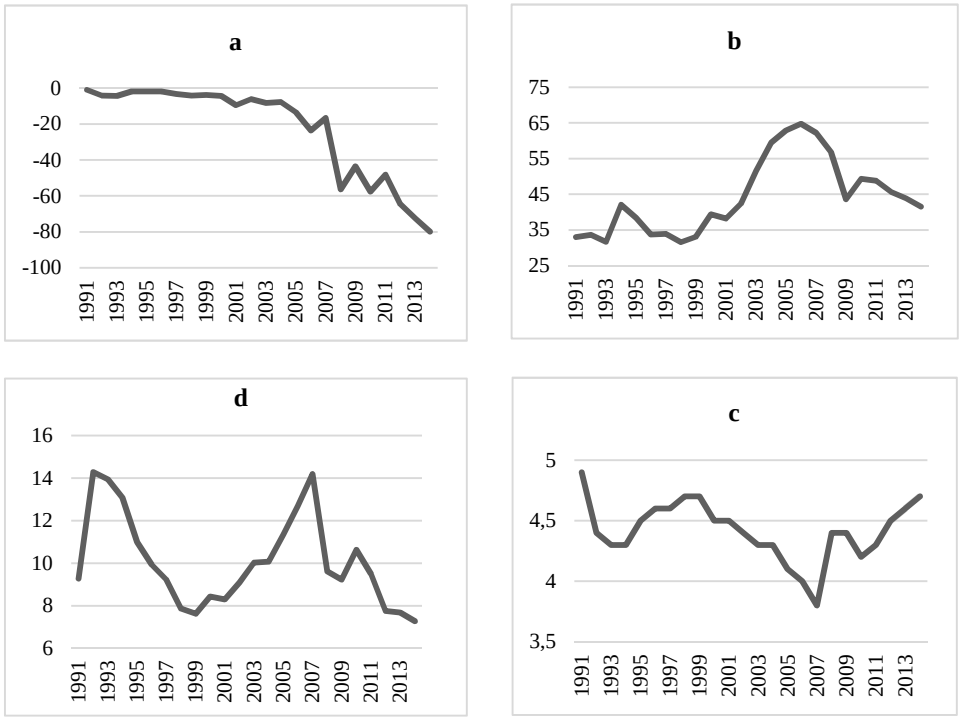
Log-level regression model have been selected as a method for achieving our goals. The logarithmic transformation of the dependent variable *y* have been chosen to minimize effects of the real effective exchange rates high fluctuations. The basic log-level equation is presented below.

$$\log(y) = \beta_0 + \beta_1 x_1 + \varepsilon \tag{1}$$

For purposes of our article, we will use data that have been gathered from trusted sources. Data on *REER*, net FDI, share of trade in GDP, GDP growth and total unemployment as a share of total labor force were obtained from the official international databases (IMF, The World Bank and OECD). The Table 1 presents all variables with descriptions, their measurements and sources to be used in the regression analysis.

Figure 4

Variables Data



Notes: Graph **a** represents FDI net outflow; **b** – trade as % of GDP; **c** – unemployment (%); **d** – GDP growth

Source: Developed by authors based on The World Bank (2016a) data.

Table 1

Data, its Measurements and Sources Used in the Analysis

Variable	Description and measurements	Source
REER_67_CN	Chinese real effective exchange rate with 67 main trade partners, fluctuations, annual data	To compute $REER\ CPI$ from the 2015 IMF World Economic Outlook (International Monetary Fund, 2016) and trade statistics from the World Bank Global Economic Monitor data sets (The World Bank, 2016b) were used.
REER_172_CN	Chinese real effective exchange rate with 172 main trade partners, fluctuations, annual data	
Trade	Foreign trade (% of GDP), annual data	The World Bank national accounts data (The World Bank, 2016c), and OECD National Accounts data files (OECD, 2016b).
GDP_growth	The growth rate of GDP, percentage, annual data	
Unemployment	Unemployment, total (% of total labor force), annual data	International Labour Organization, Key Indicators of the Labour Market database (ILO, 2016).
FDI_net	Foreign direct investment, net outflows (BoP, current billions USD), annual data	IMF Balance of Payments Statistics Yearbook and data files (International Monetary Fund, 2014).

Source: Developed by authors.

Data on Chinese annual *REER* computed to its main 67 and 172 trading partners, were used in regression analysis. The nominal exchange rate transformed into real effective exchange rates (*REER*). The *REER* measures the development of the real value of a country's currency against the basket of the trading partners of the country. Basically, *REER* is a measure of the relative price or cost between the country under study and its trading partners. The movements of *REER* will reflect changes in the goods competitiveness on the world market. Higher value of *REER* reflects that countries' goods are becoming more expensive relative to its competitors, and real appreciation of the domestic currency. While lower value captures a real depreciation of the domestic currency or an increasing in country's ability to compete internationally.[1] If a countries real exchange rate is rising it means its goods are becoming more expensive relative to its competitors.

There are various ways how *REER* can be calculated. In the article we will focus on *CPI* based *REERs* – the most popular measure (see equation 2).

$$REER_t = \frac{NEER_t \cdot CPI_t}{CPI_t^{foreign}} \tag{2}$$

Where $REER_t$ is the real effective exchange rate of the country under study against a basket of currencies of trading partners, CPI_t is the consumer price index of the country under study, $NEER_t = \prod_{i=1}^{N} S(i)_t^{(w)^i}$ is the nominal effective exchange rate of the country under study, which is in turn the geometrically weighted average of $S(i)_t$, the nominal bilateral exchange rate between the country under study and its trading partner i (measured as the foreign currency price of one unit of domestic currency), $CPI_t = \prod_{i=1}^{N} CPI(i)_t^{(w)^i}$ is the geometrically weighted average of *CPI* indexes of trading partners, CPI_t is the consumer price index of trading partner i, w_t is the weight of trading partner i and N is the number of trading partners considered. The weights sum is equal to one, i.e. $\sum_{i=1}^{N} w^{(i)} = 1$. We use geometrically weighted averages, because this is the most frequently used method in the literature.

Model Specification, Empirical Results and Tests

Due to the availability of unemployment data only from 1991 year, the matrix was balanced to omit missing values effects and observed time period has been limited to 24 years starting from 1991 (total number of observations is 120). To

[1] There are some studies using real exchange rate (*RER)* instead of *REER*, however basically the sign and magnitude of the results is almost similar.

achieve our goals two models have been computed: for *REER* with 67 and 172 main trade partners.

The selected models were calculated using *gretl* (Baiocchi and Distaso, 2003) software and the results are presented in Table 2. The equations to be used with the features for our needs are presented below.

$$log\left(REER\_67\_CN\right) = const - \beta_1 Trade - \beta_2 GDP\_growth - \beta_3 Unemployment - \\ -\beta_3 FDI\_net + \varepsilon \tag{3}$$

and

$$log\left(REER\_172\_CN\right) = const - \beta_1 Trade - \beta_2 GDP\_growth - \beta_3 Unemployment - \\ -\beta_3 FDI\_net + \varepsilon \tag{4}$$

T a b l e 2

Model 1: OLS (Ordinary Least Squares**), Using Observations 1991 – 2014 (T = 24); Dependent Variable:** $log\left(REER\_67\_CN\right)$

	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
Const	6.82123	0.656119	10.3963	<0.0001	***
Trade	−0.00554181	0.00203814	−2.7191	0.0136	**
GDP_growth	−0.0458528	0.00905585	−5.0633	<0.0001	***
Unemployment	−0.354182	0.115323	−3.0712	0.0063	***
FDI_net	−0.00328426	0.00048804	−6.7295	<0.0001	***

Mean dependent var	4.622989	S.D. dependent var	0.130356
Sum squared resid	0.050202	S.E. of regression	0.051403
R-squared	0.871551	Adjusted R-squared	0.844509
F(4, 19)	32.22965	P-value(F)	3.17e-08
Log-likelihood	39.98249	Akaike criterion	−69.96498
Schwarz criterion	−64.07471	Hannan-Quinn	−68.40229
rho	0.208620	Durbin-Watson	1.554323

Model 2: OLS, Using Observations 1991 – 2014 (T = 24); Dependent Variable: $log\left(REER\_172\_CN\right)$

	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
Const	6.94253	0.859521	8.0772	<0.0001	***
Trade	−0.00630038	0.00241618	−2.6076	0.0178	**
GDP_growth	−0.0431201	0.0106286	−4.0570	0.0007	***
Unemployment	−0.379006	0.153733	−2.4653	0.0240	**
FDI_net	−0.00324663	0.000506829	−6.4058	<0.0001	***

Mean dependent var	4.634177	S.D. dependent var	0.122773
Sum squared resid	0.049855	S.E. of regression	0.052628
R-squared	0.849658	Adjusted R-squared	0.816248
F(4, 19)	25.43169	P-value(F)	3.39e-07
Log-likelihood	37.90696	Akaike criterion	−65.81392
Schwarz criterion	−60.13645	Hannan-Quinn	−64.38605
rho	0.236932	Durbin-Watson	1.433874

Note: ***, ** represents a confidence level at 99%, 95% respectively.

Source: *Gretl* output, authors` own calculations..

The output shows the results of fitting a multiple linear regression models to describe the relationship between $log(REER\_67\_CN)$ (and $log(REER\_172\_CN)$) and 4 independent variables. The equations of the fitted model 1 and 2 are

$$log(REER\_67\_CN) = 6.81523 - 0.35308 * Trade - 0.00554231 * GDP\_growth - \\ -0.0457471 * Unemployment - 0.00328758 * FDI\_net \quad (5)$$

and for the model 2

$$log(REER\_172\_CN) = 6.94253 - 0.00630038 * Trade - 0.0431201 * GDP\_growth - \\ -0.379006 * Unemployment - 0.00324663 * FDI\_net \quad (6)$$

Since the p-value in the ANOVA tables in both cases is less than 0.05, there is a statistically significant relationship between the variables in both models at the 95.0% confidence level. The results for dependent variable $log(REER\_172\_CN)$ are reported in parentheses in the interpretation below.

The R-squared statistics indicates that the models as fitted explains 87.1551% (84.9658%) of the variability in $log(REER\_67\_CN)$ ($log(REER\_172\_CN)$). The adjusted R-squared statistics, which is more suitable for comparing models with different numbers of independent variables, is 84.4509% (81.6248%). The standard errors of the estimates show the standard deviations of the residuals to be 0.051403 (0.052628).

These values can be used to construct prediction limits for new observations. The Durbin-Watson (DW) statistic tests the residuals to determine if there is any significant correlation based on the order in which they occur in our data file. Since the p-value in both cases is less than 0.05, there is an indication of possible serial correlation at the 95.0% confidence level.

In determining whether the model can be simplified, notice that the highest p-value on the independent variables is 0.0136 (0.0240), belonging to *Trade* (*Unemployment*). Since the p-value is less than 0.05, that term is statistically significant at the 95.0% confidence level. Consequently, we probably do not want to remove any variables from the model.

The obtained results allow us to interpret the coefficients. Summarized interpretation for both models is gathered in Table 3. All the obtained coefficients showed a negative relationship with our dependent variables which not in all cases was in line with our theoretical expectations. A comparative interpretation of our results versus expectations was also summarized in Table 3.

To comply with the basic conditions of the regression model, the model should have been tested. For our purposes the following test have been performed: autocorrelation (Breusch-Godfrey test), heteroscedasticity (White test),

normality of residuals (Jarque-Bera test), linearity (RESET test – Ramsey Regression Equation Specification Error Test) and parameter stability (CUSUM test). The test methods and test results are in the table below.

T a b l e 3

Comparative Interpretations for Model 1 and 2 Coefficients

Variable	Expected relationships	Model 1	Model 2	Interpretation
Trade	negative	−0.0055	−0.0063	As had been expected our models reported a negative relationship between the openness of Chinese economy and REER. A 10% change in the openness of the economy is leading to –0.05% (–0.06%) change in the value of REER, which means that the more involved in international trade China became the more competitive became it's goods. The result is in consensus with our theoretical expectations.
GDP_growth	positive	−0.0459	−0.0431	From the theoretical point of view was expected that GDP growth would have a reevaluating effect on RMB, leading to lower competitiveness and higher values of REER. Our models showed negative relationship, so that a 1% change in GDP growth is resulting in –0.05% (–0.04%) in the value of REER so leading to higher competitiveness of China. In other words, the higher is growth in China the more competitive are their goods on global markets. In recent years, after global financial and economic crisis, not only growth in China is slowing, in comparison with past decades, so leading to lower competitiveness, but also other major central banks initiated policy changes in order to devalue their currencies affecting the values of REER.
Unemployment	negative	−0.3542	−0.3790	In case of China, unemployment is a crucial indicator as it directly linked with it's most important comparative advantage – it's labor force. So the obtained results are in consensus with our expectations and a 10% change in unemployment is leading to –3.5% (–3.7%) change in REER so making it's goods more competitive in versus 67 biggest trading partners and even stronger effect with bigger group of 172 trading partners. The economical interpretation in this case is straightforward: the higher the unemployment the lower are the wages and it ambiguously is resulting in lower prices and higher competitiveness, respectively lower values of REER.
FDI_net	negative	−0.0033	−0.0032	The FDI net outflow, as a phenomenon, was expected to have a devaluing effect on RMB, which was expected to lead to a decline in REER measures and higher competitiveness. In our case, China had a positive net outflow during the whole study period with a tendency to increase after the global financial and economic crisis erupted. Our obtained coefficients confirmed theoretical expectations and USD 10 billion increases in FDI outflows is leading to –0.033% (–0.032%) change in the value of REERs.

Source: Authors` own calculations.

T a b l e 4

Test results for Model 1 and Model 2

Model 1	Model 2
White's test for heteroscedasticity: Null hypothesis: heteroskedasticity not present Test statistic: LM = 20.3302 with p-value = P(Chi-square(14) > 20.3302) = 0.12007	White's test for heteroskedasticity**:** Null hypothesis: heteroskedasticity not present Test statistic: LM = 19.8064 with p-value = P(Chi-square(14) > 19.8064) = 0.136366
RESET test for specification: Null hypothesis: specification is adequate Test statistic: F(2, 17) = 0.741792 with p-value = P(F(2, 17) > 0.741792) = 0.491059	RESET test for specification: Null hypothesis: specification is adequate Test statistic: F(2, 16) = 0.70358 with p-value = P(F(2, 16) > 0.70358) = 0.509491
CUSUM test for parameter stability: Null hypothesis: no change in parameters Test statistic: Harvey-Collier t(18) = 0.0219497 with p-value = P(t(18) > 0.0219497) = 0.98273	CUSUM test for parameter stability: Null hypothesis: no change in parameters Test statistic: Harvey-Collier t(17) = –0.171388 with p-value = P(t(17) > –0.171388) = 0.865942
LM test for autocorrelation up to order 1: Null hypothesis: no autocorrelation Test statistic: LMF = 0.81337 with p-value = P(F(1, 18) > 0.81337) = 0.379036	LM test for autocorrelation up to order 1: Null hypothesis: no autocorrelation Test statistic: LMF = 1.05768 with p-value = P(F(1, 18) > 1.05768) = 0.317366
Test for addition of variables: Null hypothesis: parameters are zero for the variables ToT net_trade Test statistic: F(2, 17) = 1.13206 with p-value = P(F(2, 17) > 1.13206) = 0.3455	Test for addition of variables: Null hypothesis: parameters are zero for the variables ToT net_trade Test statistic: F(2, 16) = 0.586096 with p-value = P(F(2, 16) > 0.586096) = 0.568007

Source: Gretl output, authors` own calculations..

White's test is a test of the null hypothesis of no heteroskedasticity against heteroskedasticity of some unknown general form. The test statistic is computed by an auxiliary regression, where we regress the squared residuals on all possible (nonredundant) cross products of the regressors (Greene, 2000).

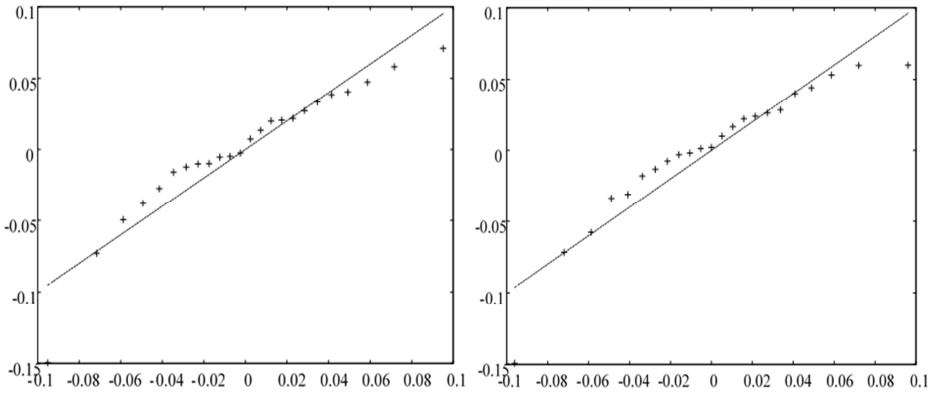
We have used the normal rules for rejecting the null which is if p is below alpha we reject the null. Estimated p-value is 0.120070 (0.136366) is grater then alpha at level 5% and more, so we would accept the null. Since the null is that heteroskedasticity is not present we accept the null hypothesis: heteroskedasticity not present.

Breusch-Godfrey test for autocorrelation shows that we accept the null that autocorrelation in not present at one lag since p-value was higher than any acceptable level of significance.

Analyzing residuals is an important part of all statistical modeling. Cautiously looking at residuals can tell us whether our assumptions are intelligent and our choice of model is proper. There is a sufficient evidence to conclude that the error terms are normally distributed (see Figure 5). We can proceed assuming that the error terms are normally distributed.

Figure 5

Q-Q Plot for Residuals from Model 1 and 2 Respectively

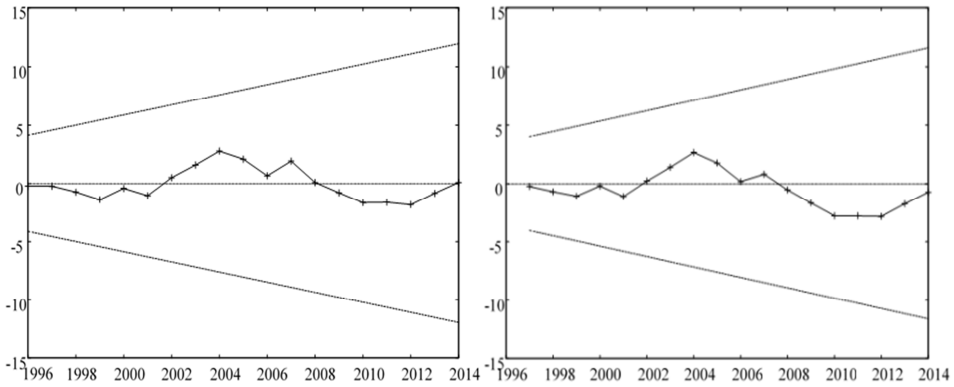


Source: *Gretl* output, authors` own calculations.

The RESET test is used to assess the adequacy of your functional form. The null hypothesis is that our functional form is adequate. The alternative is that it is not. The results of RESET test is present above. In both cases the reported p-values are grater at any level of significance, so adequacy of the functional form is not rejected at the 5% level by the test, so we accept that the our functional form is adequate.

Figure 6

CUSUM plots with 95% Confidence Band for Model 1 and 2 Respectively



Source: *Gretl* output, authors` own calculations.

A CUSUM chart is a plot of the cumulative differences between successive values and a target value (Stapenhurst, 2005). To interpret the CUSUM we are

interested in slope and changes in the slope. The difficulty comes not in deciding what the slope is, but rather whether a change in slope is significant. The slope on our graph is horizontal, the process average equals the target and continually changing. The graph results of the CUSUM test are presented below.

As have been shown in the analysis of current researches, scientists also test models with terms of trade and net balance of payment variables. In addition to be sure that we include all influential variables, we use test for addition of variables. Interpreting results, which are presented in the table above, we cannot reject the null hypothesis that parameters are zero for the variables “ToT” and “net balance of payment”, so out question do not require additional variables and function form is adequate.

Conclusions

New tendencies in global finances catalyzed by the global financial and economic crisis raised questions about the shifts in competitiveness of China and the factors influencing these shifts. People's Republic of China as a world leader in international trade was hit by these changes the most because of its export oriented economic model. The main goal of the current paper was to analyze the factors influencing Chinese competitiveness on global markets measured in terms of real effective exchange rate. Identifying the most important factors and the magnitudes of their impact on REER was a primordial purpose of our research. From a methodological point of view a log-level regression model was used in order to quantify the impact of selected factors on Chinese real effective exchange rate calculated for 67 and 172 trading partners.

Our models reported a negative relationship between the openness of Chinese economy and REER. The more percentage points international trade account on Chinese GDP the more competitive it becomes. Our findings show that a 1% change in the openness of the economy has a negative effect on REER, calculated for 67 trading partners, in a range from −0.0035% to –0.0076%, if we take into the account the error term, and from −0.0038 to −0.0087 for 172 trading partners. This means that the more involved in international trade China became the more competitive it’s goods.

In case of GDP growth our models showed a negative relationship, so that a 1% change in GDP growth is resulting in a decrease in REER (67) in a range from −0.036% to −0.055% and from −0.032 to −0.053 in case of REER (172) taking into the account the error term, leading to higher competitiveness of China. In other words the higher is growth in China the more competitive are their goods on global markets.

Unemployment is one of the most important indicators for China, as it is directly linked with its comparative advantage – it's labor force. Results are showing that a 1% change in unemployment is leading a decrease in REER (67) from −0.24% to −0.47% and from −0.22% to −0.53% in REER (172) also taking into the account the error term, so making it's goods more competitive in versus China's trading partners. Which means that the higher is the unemployment the lower are the wages and it is resulting in lower prices and higher competitiveness, respectively lower values of REER.

The obtained results for the FDI net outflow were in line with our expectations and showed that they lead to a decline in REER measures, so respectively to higher competitiveness on global markets. An increase in FDI net outflows of 10 billions USD per annum leads to a decrease in REER (67) from −0.028% to −0.037% and almost the same results for REER (172).

As it was shown all the factors where statistically significant and all the factors had a negative effect on both REER (67) and REER (172) but from a quantitative point of view the strongest effect had the unemployment, what is not an unexpected result taking into account the importance of the labor force factor for Chinese economy.

In the context of current situation, the ongoing world financial and economic crisis, there are some important tendencies. The GDP growth in China is slowing because of globally declining demand, net outflow of FDI is gaining momentum, the indicator of openness of the economy is trending downwards and unemployment in current environment has a rising tendency (see Figure 4). Further declining GDP growth and a decline of the openness of the economy will have dragging down effect on competitiveness (rising REER). On the other hand, a continued increase of FDI net outflow and rising unemployment will have a positive effect on competitiveness (decline in REER). In these contradictory tendencies, Chinese economic model of export-oriented economy will be put at a serious test and a very serious question for the Chinese governing circles is how to balance these trends and increase competitiveness of China.

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