J. B. Jabbar

J. B. Jabbar

Ural Federal University (Yekaterinburg, Russian Federation; e-mail: jeenat.jabbar@gmail.com)

THE IMPACT OF MIGRANT LABORS ON RUSSIAN ECONOMY: PRODUCTION FUNCTION APPROACH

Over the past few decades, the major flow of labor migrants coming to Russia happened because of higher wage, employment, and similar culture. This paper explored the direct economic contribution of labor migrants in Russian national income through their productivity performance. This empirical study analyzed the impact of migrants on the growth of GDP using Cobb Douglas production approach through linear transformation from the logarithmic form and showed the positive consequences of labor migrants in Russian economy. The study conducted quantitative analysis that was an anticipated outcome from a model which was being created to determine how much migrant workers contributed to the Russian economy which have been successful through the lenses of national income. All data in this study used a repository of 15 years of data from 2000 to 2014 that were collected yearly. The main data sources of this study are Russian Federal State Statistics Service, the World Bank data source and FRED Economic Data. This paper also investigated the heteroscedasticity and endogeneity test among the variables in order to check the robustness of the regression results of the first model. The study introduced a new instrument variable that was constructed with the ratio of GDP per capita in Russia and GDP per capital in the source countries. After that the instrument was implemented into the previous model through two stage least square method. Therefore, the statistical analysis of this empirical research inferred that migrants have a positive impact on Russian's economy resulted about 10% of national income which has significant growth due to migrants' employment.

Keywords: GDP, Cobb Douglas Production approach, heteroscedasticity, endogeneity, instrument, two stage least square

Introduction

Russia, the largest country in the world, is stated in Eurasia region with almost 146 million (2016) people (Federal State Statistics Service). Compared to its area, the number of population it has is not so dense. As Russia has enormous territory and shrinking indigenous population, it attracts striking number of immigrants. Not only for people from CIS countries but also from other countries, Russia is very attractive place to move because of high demand of labor and higher wages. Despite the collapse of oil prices and the Ukraine crisis, still Russia does not lose its impression to the immigrants. According to UN International Migration Report (2015), the Russian Federation is hosted 12 million people that is the third largest number of migrants worldwide [1]. Also, the rate of migrants coming to Russia remains constant; for instance, from 2000 to 2015, the rate of declining number of international migrants in the Russian Federation is less than 2 percent per annum (UN Migration Report 2015). The scale of international migration in Russia is primarily determined by temporary forms of mobility like permanent type migration flows to Russia amounted to 418 thousand in 2012 that is 17% big as in 2011 (International Migration Report 2013) [2]. In 2012, Russian migration authorities issued about three million documents permitting citizens of 141 countries to work in Russia and 1.4 million foreigners obtained work permits which was 15% increase from 2011 (*ibid*). It remained, indeed, an upward trend in temporary labor migration flows to Russia continues to grow in 2012 compared to 2011.

After the collapse of the Soviet Union in the early 90s, Russia had massive resettlements of people and faced inflows and outflows of immigration. The recent immigration has been primarily driven by economic incentives. There is a strong correlation between migration flow and the alternation of ups and down of economy for both receiving and source country. With business cycles, immigration helps to moderate wages of native workers in upturns, but it also raises the incentives for firms to invest, which benefit natives in the medium term (Dadush, 2014) [3]. On the other hand, immigration can have a positive impact on the economies of destination countries through a variety of other channels besides a pure expansion in labor supply. Immigrants can boost innovations, as they bring new ideas, knowledge and skills and they are likely younger age and risk loving. They also increase competition and affect specialization of natives, and raising productivity.

It is found that if migrants tend to delay their arrival and return home during recessions and conversely respond quickly to economic upturns, they help to stabilize both product and labor markets, acting as a cushion for native workers in the face of economic fluctuations (Dadush, 2014) [3]. Moreover, this benefit likely to be most pronounced for unskilled natives who disproportionately employed in cyclical sectors such as construction and manufacturing. In Russia, about 70 percent of immigrants has been employed in construction, trade, manufacturing and agriculture (WB) [4]. Nevertheless, most of the migrants in Russia are engaged to low skilled job because of having less educational background and limited opportunity, but now Russia is trying to hire more skilled labor from foreign countries. According to Federal Migration Service (FMS), the focus is shifting away from existing legislation, which is geared toward temporary immigrants and toward creating conditions for attracting skilled specialists [5].

Since it was clear from the possible channels of assumptions that migration largely impacts on the economy of a country, the study attempted to estimate and analyze the degree of migrants' contribution in overall economy. This paper mainly focused on the contribution of migrants on Russian current economy. The contribution of this study to the existing literature was in some folds; first, this study estimated the impact of immigration on the economic growth in the Russian Federation. Second, it found the growth portion not only based on the basic model, but grounded on sophisticated construction. The approach was taken for the ability to cover a wide range of locations as Russia is the biggest territory in the world. This report studied the impact of migration on growth in the output per worker and also in the Gross Domestic Product per worker in Russia over the period of 2000-2014.

This paper surveyed selectively and critically the recent literature on the migration theory, economic assumptions, and econometrics approaches. Although the main focus was on the low skilled labor migrants, the review looked more broadly at the effects on economic growth, employment and their living conditions. The main research question of this paper was how much migrant workers contribute to the Russian national economy over 15 years? It was an anticipated outcome from a model that was being created to determine how much migrant workers contribute to the Russian economy which has been successful through the lenses of national income. This study was conducted with the statistical analysis of labor migrants, Russian national income and their capital from last 15 years. Econometrics methods were applied to structure the model and later on in order to get more sophisticated result, other improved model be implemented with the use of instrumental variables. Thus, this empirical study has analyzed the impact of migrants on the growth of GDP using Cobb Douglas production approach through linear transformation from the logarithmic form and shows the positive consequences of labor migrants in Russian economy.

Theoretical review

The empirical literature on immigration and their contribution in their host countries mostly focus on their labor market and countries outcome from total population. Experts usually use different types of econometrical approaches to analyze the impact of immigrants such as production function approach, spatial correlation approach, and skill cell method. Analysis on the economic impact of migration has tended to concentrate on labor market, assumptions of new economics of migration containing neoclassical theory, and skill-based factors of labor migrants working in a country. At the time of changing global market in a dynamic way, it is essential to analyze the supply and demand of skills for business in order to develop labor market insight. Labor market analysis begins since the Keynesian economics. In Keynesian economics, unit-labor cost is the most important factor in determining the price level in a closed economy (Herr) [6]. It also says that due to insufficient goods demand in the overall economy, any level of unemployment can be occurred. Hansjorg Herr conducted a study where he researched on the nominal wages in the USA and the UK who followed this wage norm to a large extent; however, in Germany, wages increased below that norm or even decreased and in Japan this effect has been even more extreme. Thus, Keynesian economics infers labor cost and price level as the important factors of labor market.

The view of neoclassical economists on the labor market is similar to the other labor market where supply and labor jointly determine the price. The neoclassical theory says that employees with the same abilities and in the positions with the same characteristics should be remunerated with the same wage. If it was not so, the employees with the lower wage would migrate to better paid jobs, and the wages would gradually reach equilibrium. The wage differentials should correspond the different characteristics of

employees such as differences in their human capital or non-financial characteristics of the position. Thus, neoclassical theory explains one of the causes of migration underlying assumption that migration is stimulated primarily by economic consideration.

The purpose of neoclassical theory is to maximize behavior of agents and a flexible wage, which, using the supply and demand forces, cleans the market and leads to equilibrium. Nevertheless, the persisting unemployment caused the origins of new theory that is developed by George J. Stigler in 1960s that mentioned about economics theory of information. Stigler opened a new view on job searching useful for broadening the analysis of unemployment. A person continues to look for a job as long as the expected revenues are equal to searching costs because searching is essential and as to the alternative costs cheaper, when it is not optimal to accept the first job offer [7]. Therefore, Stigler's information on job searching can be related to the aim of labor migrants coming to Russia.

Before coming to Russia, most of the migrants were in crucial condition. The main motive of the most of the migrants coming to Russia is related to work and wage. Many of the immigrants coming to Russia are able to earn much higher wages than they could in their home countries. Though life for the average labor migrants in Russia is hard, at least it is better than the conditions they leave behind in their home countries. If there are no jobs in the town of Uzbekistan or Kyrgystan (which are among the major sending countries according to both UN and Russian official statistics), Russia is one of the best options to try their luck. According to an interview by The National Interest, while experiences differ widely, migrants in cities across Russia ranging from Moscow to Irkutsk often noted the appreciably better standard of living than in their home countries [8].

According to the World Bank, Russia is a destination country for over 12 million immigrants and has the highest number of foreign-born population in the world after the USA. The major immigration flows originate from the Former Soviet Union (FSU) countries driven primarily by economic incentives given widening income gap between Russia and FSU countries, and low costs of migration, such as commonly spoken language, cultural similarities shaped over 70 years of the Soviet power, no visa regime, and geographical proximity. The World Bank conducted an empirical study on the impact of immigration on growth in the Gross Regional Product per worker in Russia using 79 observations across the regions in Russia over the period of 1998-2008. The study used pooled OLS regression method and estimation result shows that the GRP per worker increases by 4-6 percentage points in response to increase in population due to immigration by one standard deviation [4]. However, they fix the endogeneity problem of pooled OLS regression by using 2-Step Difference and System GMM estimation methods.

Another study was conducted by National Institute of Economic and Social Research, UK and Ivie and University of Valencia, Spain. The study explored the direct economic consequences of immigration on host nations' productivity performance at a sectoral level with respect to UK and Spain. They adopted both growth accounting and an econometric approach using a specially conducted industrial panel data. The study used Cobb-Douglas production function through Generalized Method of Moments (GMM) estimation [9]. They correlated the output elasticities and elasticities of substitution with migrant share and found that output elasticities were negatively correlated with migrant share for some of the estimates like capital stock and hours estimates for Spain. On the other hand, the growth accounting results showed that migration was playing an increasingly important role in the economic performance of Spain. It fostered Gross Value Added Growth (GVA) during recent years, but it explains a great part of the poor evolution of labor productivity (Kangasniemi *et al*) [9].

In addition, the report by Dustmann *et al.* [10] provided a review of the economic literature on the socio-economic impact of immigration based on EU states especially migrants in UK and Wales. The study mainly focused on the immigration effect on wage and employment for native workers. In their model they discussed the capital price and immigrants' skill composition. They discovered that if capital supply was perfectly elastic and immigration are different in their skill composition from native workers, immigration would put downward pressure on wage of native workers who are competing with immigrants, and increase wages of native workers who are complements. The effect on average wage would be zero or slightly positive. So, this study assessed overall net gain or loss to the economy from immigration from both a theoretical and empirical point of view.

The skill cell approach was applied in the paper by Bonin (2005) on his Wage and Employment Effects of Immigration to Germany. He also analyzed labor market impact of migration by exploiting variation in the

labor supply of foreigners across groups of workers with the same level of education, but different work experiences. The study worked with panel data and had a regression analysis where dependent variables were the mean of log wages and the unemployment rate of the native population in a skill group. Bonin estimated the impact of immigration via skill group segmenting the labor market where immigrants and native workers are regarded as competitors. The result of the research indicated that a 10 percent rise of the share of immigrants in the workforce would be in general reduces wages by less than one percent and not increase unemployment. Though the adverse effects appeared stronger for less-skilled and older workers, the evidence altogether sharply contrasted from a parallel study for the United States indicating a consistent and substantial negative impact on an immigrant labor supply shock on native competitors (Bonin, 2005) [11].

Therefore, it is clear from above empirical studies that the potential impact of migration on growth is undoubtedly significant in recent decades. With these possible channels in mind, this study wished to explore the specific amount of national income generated by migrant workers in the Russian Federation. Though there were several empirical analysis already done regarding this area, this study particularly using advanced econometric approach to find out strong results. As it is mentioned above other's econometric approach on estimating migrants' contribution, comparing their method with this current study can be somewhat unique. Using the Cobb-Douglas function for overall national income made the estimation approach more simple and practical. Though other empirical analysis are done based on GMM approach, log-linear function and other theoretical model, this report followed the simple format of estimation which is fairly a new approach of estimating migrants' contribution on Russian economy.

Data source

The main data source of this study is Russian Federal State Statistics Service which is also known as Rosstat [5]. It is the government statistics agency in Russia that provides comprehensive statistical information to meet the need of governing bodies, media, public, scientific community, business organization and entrepreneurs in the various international organizations. In order to solve the system of state statistics, which consists of the central office of federal and territorial agencies to Rosstat that located in all regions in Russia. International expertise recognized statistical data of Federal State Statistics Service reliable, as the guidance of the Federal State Statistics Service carries out the Russian Government (Rosstat). The paper primarily relies on the Rosstat for migrants profile and determinant analysis. Also, their yearly report provides reliable data to make projections and graphical analysis.

In addition, this paper used two more data sources to consider econometrical analysis, they are the World Bank data source and another is FRED Economic Data [12]. The World Bank is popular, worldwide and the most reliable data source. Its databank is an analysis and visualization tool that contains collections of time series data on a variety of topics (The World Bank) [13]. This study mainly used The World Bank data source for one of its main independent variable that was the gross fixed capital formation which was measured in the US dollar and the unit of this data was millions of US dollar. In addition, this wide data source helped this study to generate table, charts, and statistical projection.

The other major data source that has been used in this research is FRED. FRED is the Economic Research of the Federal Reserve Bank of St. Louise that is the center of the Eighth District of the Federal Reserve System. The Research Division of the Federal Reserve Bank of St. Louise is responsible for advising on the matters of economic policy, monitoring the economic and financial literature and producing research in the areas of money, banking, macroeconomics, international and regional economics. This site offers a wealth of economic data and information to promote economic education and enhance economic research. This study used FRED data source to get its dependent variable, Real GDP of Russia and the unit of this data was measured by millions of 2011 US dollars. Therefore, all three data sources used in this paper are mostly reliable, popular and worldwide accessible database.

Model description: production function approach

The study primarily applied a production function approach to estimate the impact of migrant workers on Russian's economic growth from 2000 to 2014 using data on Gross Domestic Product (GDP), total labor

including migrants in Russia and Gross Fixed Capital. Productivity essentially indicates the efficiency of a company or a country that can transform resources into potential number of goods from less; that is why economists mostly look into the measures of productivity within a given system to determine how different factors of production affect the overall output. The reason behind using production function is that describes the relation between the production outcome and quantity of factors used for this production (Cobb & Douglas, 1928) [14]. For both micro and macroeconomics, the production functions are non-constant that specifies the output of a firm or an entire economy of a country for all combination of inputs.

This study considered the basic form of production function which has two production factors- labor and capital and those are interchangeable. In this research, it is proposed to modify this production function in Labor input. As it is intended to find out the contribution of migrants to the overall Russian economy, it is necessary to separate total migrant labor from total Russian labor. So, the current formula of production would be:

$$Y = A * (L + M)^{\alpha} K^{\beta}, \tag{1}$$

where

Y – Real GDP at constant National Prices estimate in millions of 2011 U.S. Dollars for the Russian Federation from 2000 to 2014.

L – Total employed labor in Russia (excluded migrants) actively work per hour.

M – Total foreign workers work actively work per hour in Russia/

K – Gross Fixed Capital formation in Russia.

A – total factor of productivity/ positive constant.

The estimation of equation (1) by OLS[1] encountered such estimates those were having a case that might have measurement difficulties. In order to fix this problem, it needed to be scaled up the independent variables in a proper measure. As there were some imperfections of the Russian Statistics, it should be recalculated the value to take into the account.

It was considered that the real GDP[2] calculated by constant price of 2011 and also Gross Fixed Capital Formation[3]. While constructing the model, this study assumed total labor force in the production function would be only the employed labor working average daily hours engaged for the Russian Federation. In the same way, for migrant workers it multiplied the average daily hours with active migrant labor engaged for the Russian Federation. So, the changes of labor can be defined as:

$$\Delta L = (L + M) - L = M$$

After scaling up the factors, it needed to linearize the function from the nonlinear form for easy estimation. Thus the function would be:

$$Y = \ln Y = lnA + \alpha \, ln(L + M) + \beta \, lnK + u_i, \tag{2}$$

In order to estimate this function, OLS estimation was encountered as an econometric approach. After linearization, national income Y was estimated with the input factors labor and capital. Now, another equation can be written with labor excluded migrant workers in Russia which is denoted as new Y* that is the national income only by migrant workers. Thus,

$$\frac{\Delta Y}{\Delta L} = \frac{\Delta Y}{\Delta M}$$

$$Y^* = \ln Y = lnA + \alpha \, lnL + \beta \, lnK + u_i, \tag{3}$$

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[1] OLS is Ordinary Least Square Method is a method for estimating unknown parameters in a linear regression model

[2] Real GDP is value of output adjusted for price changes that is calculated by constant prices

[3] Gross Fixed Capital Formation is measured by changes in inventories and acquisitions less disposals of valuables for a unit or sector

Therefore,

$$\Delta Y = Y - Y^*.$$

Thus, the changes of Y (ΔY) gave the result of gross national incomes generates by the foreign workers in the Russian Federation. It can be assumed that the percentage of ΔY on real GDP of Russia shows the potential portion of income that has been produced by migrant workers in Russia.

Implementing Instrumental Variable

This study applied another statistical method called Two Stage Least Square (2SLS) method in order to get improved result from the first model. 2SLS is used in the structural equation when there is endogenous explanatory variable. OLS method might have several limitations that can lead biased estimation; for example, the explanatory variables can be endogenous or jointly determined with the dependent variable and this problem can cause reverse causality in the formula. In such case, OLS is not capable to measure consistent parameters, that is why, the study turns to a general solution to the instrumental variable estimator and the popular form of that estimator, often employed in the context of endogeneity is called as two stage least square (2SLS).

In this stage, the study introduced a new variable as an instrument was Z. Z was constructed with the ratio of GDP per capita in Russia and GDP per capital in the source countries. So, the formula of Z is:

$$Z = GDP/L_R - GDP/L_A \tag{4}$$

where
GDP/L_R – GDP per capita in Russia from 2000 to 2014
GDP/L_A – GDP per capita in the CIS countries from 2000 to 2014
In order to calculate GDP per capita in the source countries, it considered 10 CIS countries such as Azerbaijan, Armenia, Belarus, Kazakhstan, Kyrgyzstan, the Republic of Moldova, Tajikistan, Turkmenistan, Uzbekistan and Ukraine. Because these are the main source countries of migrant labors in Russia, it is worth to take the average GDP per capita of CIS countries as a part of the instrumental variable. The difference of GDP per capital of Russia and GDP per capita of CIS countries can affect our dependent variable Y through its effect on independent variable like Labor in the formula.

Furthermore, in order to calculate Z it needed to measure the GDP per capita of source countries in a proper way.

$$GDP/L\_A = \frac{\sum GDP \ of \ source \ countries}{\sum labor \ of \ source \ countries} \tag{5}$$

Where, GDP and labor are from 2000 to 2014
Next, the paper attempted to implement this instrument into two stage least square method. Naturally, by running a regression in this type regression model, it is needed to construct an auxiliary regression of the form of equation with the available instrument included as explanatory variables. So, in the first step of my 2SLS estimation, it is considered:

$$M = a_0 + a_1 Z + e, \tag{6}$$

Where,
M – migration flow from the source countries
Z – instrumental variable
a_0, a_1 are ideal parameters and e is error
After the first stage, it was essential to find estimates b_0 and b_1 for ideal a_0 and a_1 applying the first stage of the two stage least squares method.

$$M_E = b_0 + b_1 Z + e, \qquad (7)$$

M_E is estimated migration flow to Russia
b_0, b_1 are ideal parameter and e is error

Next, it was required to replace migrant labors M by M_E what was found from the 2SLS estimation in equation (2). The current formula to be considered is:

$$\hat{Y} = \ln Y = lnA + \alpha \ln(L + M_E) + \beta \, lnK + u_i, \qquad (8)$$

Thus, equation (8) would be the formula that should be taken into this account in order to get the improved result.

Main results

In the first part of regression analysis, the study estimated two models, including equation (2) and (3). In the equation (2) (in the table Y), the regressors included both migrant workers and local workers as labor along with the other production factor capital and the equation (3) (in the table Y*), the regressor included only local work along with capital. After fixing up the scale effect and formulation, the next step was regression analysis in order to predict the entire performance. The following table shows the results of two regression models which are expressed in equation (2) and (3):

Table 1.

Regression results of Equation (2) and (3)

	Y			Y*		
	ln A (factor of production)	α (coefficient of labor)	β (coefficients of capital)	ln A (factor of production)	α (coefficient of labor)	β (coefficients of capital)
Coefficients	-12.26	1.13	0.18	-7.64	0.87	0.21
Standard error	3.31	0.17	0.01	3.53	0.18	0.01
T-statistics	-3.69	6.33	21.55	-2.17	4.64	27.66
Significance	0.00	0.00	0.00	0.05	0.00	0.00

We can see from the regression analysis results presented in the table, that the coefficients of both labor and capital are strongly significant. As it is known that the coefficients α and ß are the output elasticities of labor and capital. According to mathematical definition of elasticity, it represents that the ratio of percentage changes in labor or capital means the percentage change in labor or capital induce in output (Mankiw) [15]. The first regression results from equation (2) (Y) gave labor elasticity was almost 10% which was more than that of capital. The comparison of the experimental value of the t-statistics with its critical value showed that the significance of the obtained coefficient of α and ß are with error probability was equal to 0.00 which meant that the result was in 5% level of significance. At that, the coefficient of determination, R^2 was 0.99 which showed strong relation between examined coefficients.

In the same way, the regression results for equation (3) which was constructed only for native employed labors, excluded migrant labors, working in the Russian Federation. The results gave us the significant results which showed also the labor elasticity than that of capital. In this case, the combination of coefficients α and ß was 1.08 which is almost unit elasticity of output. And all t-statistics of coefficients were significant at 5% level. Therefore, results of both equations met the condition of Cobb-Douglas function that engaging of additional employees to production was more profitable for an enterprise, than an additional application of capital and in our case this spread was even larger because our labor engagement is more than 75% of additional revenue.

The main reason behind calculating regression results for two equations was to find out the contribution of migrant labors in the Russian Federation. By subtracting equation (3) from the equation (2), ΔY was found which showed the income generated by the migrant labors in the Russian Federation. The changes of Y gave us very significant results because additional labor supply by migrants added a good number of outputs of

this country that cannot be denied. The chart, given below, shows the difference of output from total labor and only native labor in Russia and the difference means the contribution of migrant labor and the trend is upward. The next chart shows the trend of contribution of migrant labor in the real GDP of Russia and the line indicates upward trend though it went down between 2010 and 2013.
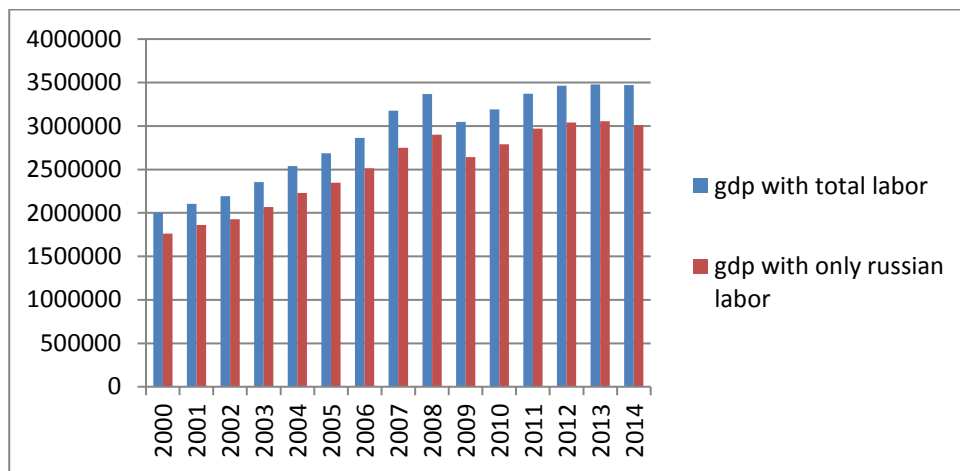

Fig. 1. *Real GDP generated by total labor*
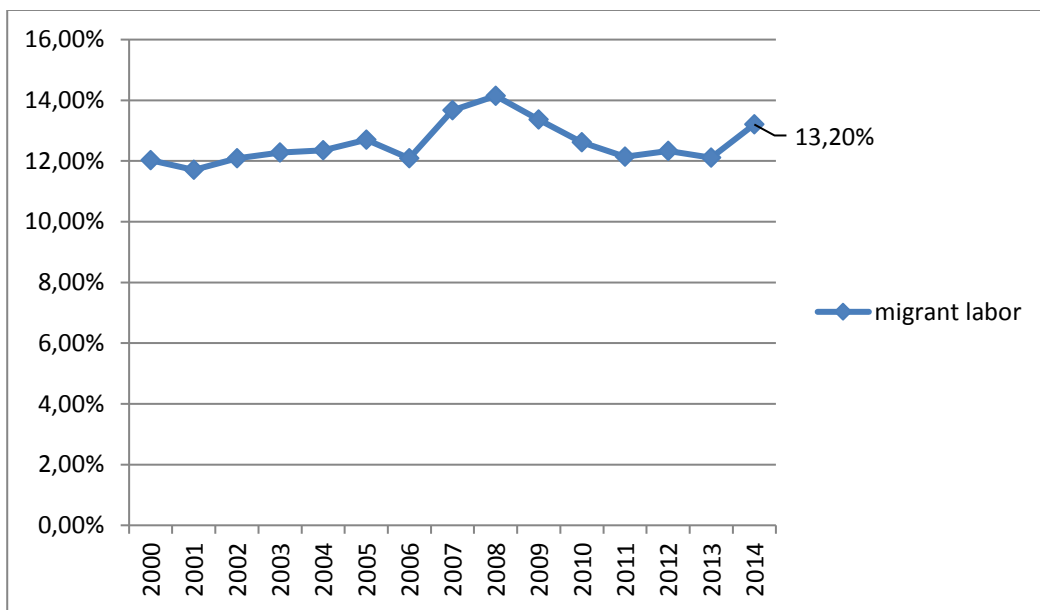*and migrant labors in the Russian Federation*

Fig. 2. *Contribution of Migrant Labor in the GDP of Russia*

Next step of econometric analysis would be the heteroscedasticity test. Heteroscedasticity refers to the circumstance in which the variability of a variable is unequal across the range of values of a second variable that predicts it (Taylor) [16]. It is necessary to test the model I ran and the residuals I got are heteroscedastic or not. There are several ways to test this problem like graphical method and other formal test, i.e. Breusch–Pagan test. First, I followed the graphical method as a simpler way to test the heteroscedasticity in the linear regression model. In order to make the graph, I needed to plot the residuals we are having and after that I got the expected scatterplot diagram which is shown below. In this diagram, we can see that there is no definite pattern of scatter figures; so this means data are homoscedastic and there is no heteroscedasticity in the model.
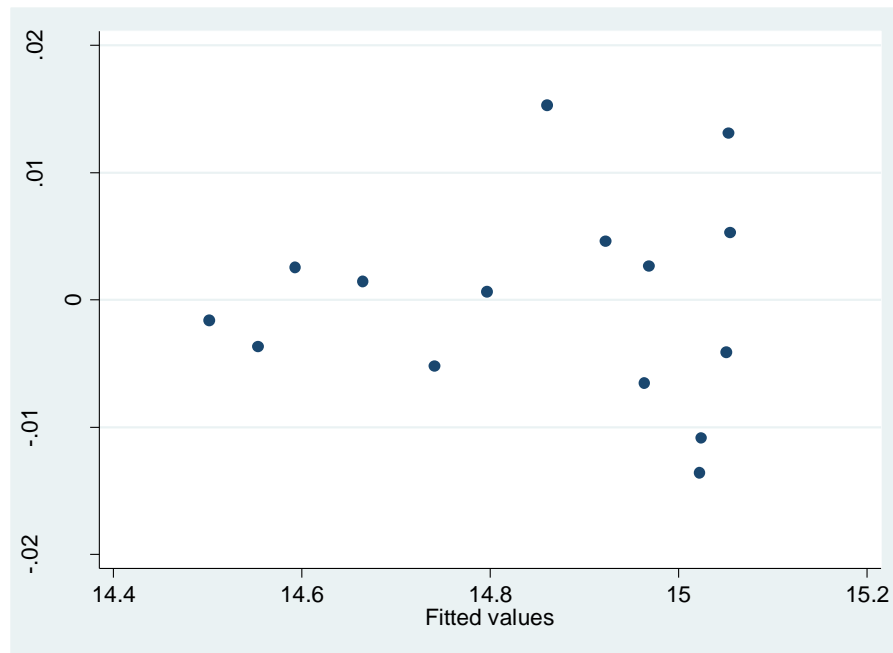
Fig. 3. *Graph of heteroscedasticity test*

Another way to test heteroscedasticity is Breusch–Pagan test[4]. In this test, the null hypothesis Ho is constant variance that means there is no heteroscedasticity in data. Here, the P value I got from the test was 0.1183 which was more than 0.05; so cannot reject null hypothesis.

```
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
        Ho: Constant variance
        Variables: fitted values of ln_gdp

        chi2(1)      =      2.44
        Prob > chi2  =    0.1183
```

Fig. 4. *Results of Breusch-Pegan test*

After executing regression through OLS method, the study applied two stage least square (2SLS) method using instrumental variable. 2SLS is the extension of the OLS method and it is used because the dependent variable's error term is somehow correlated with the independent variables. As the instrument Z was introduced in the above part and described the reason and how it was estimated, in this part it was shown how Z affected the primary regression model. With the instrumental variable Z, M_E was found that generated new coefficients for the improved results.

Table 2.

Regression results of Equation (8)

	$\hat{Y}$		
	ln A (factor of production)	α (coefficient of labor)	β (coefficients of capital)
Coefficients	-12.43	1.12	0.18
Standard error	3.3	0.15	0.01
T-statistics	-3.5	6.21	21.55
Significance	0.00	0.00	0.00

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[4] In statistics, the **Breusch–Pagan test**, developed in 1979 by Trevor **Breusch** and Adrian **Pagan**, is used to **test** for heteroskedasticity in a linear regression model. It was independently suggested with some extension by R.

New coefficients from the 2SLS regression result table indicated that instrument brought some changes in the previous outcome. The result of Ŷ is the equation of independent variables of full labor (including migrant labors) and capital in Russia and dependent variable of GDP of Russia. Here, it was considered that labor is endogenous variable because of the relationship between migrant labors and GDP; migrant labors coming to Russia can influence Russian GDP or GDP of Russia can influence migrant labors coming to Russia. Therefore, after having 2SLS regression using instrument, it was seen that the results of coefficients were quite significant. The coefficient of α was 1.12 that refers each additional labor is associated with an additional 1.12 million US dollar of annual income. Similarly, the coefficient of ß refers that capital is associated with nearly 0.2 million US dollar. Also, R-square of this model is 0.99 that seems very strong relationship between the variables. With this improved results, the study calculated the contribution of migrant labors in the Russian economy which is shown in the chart below:
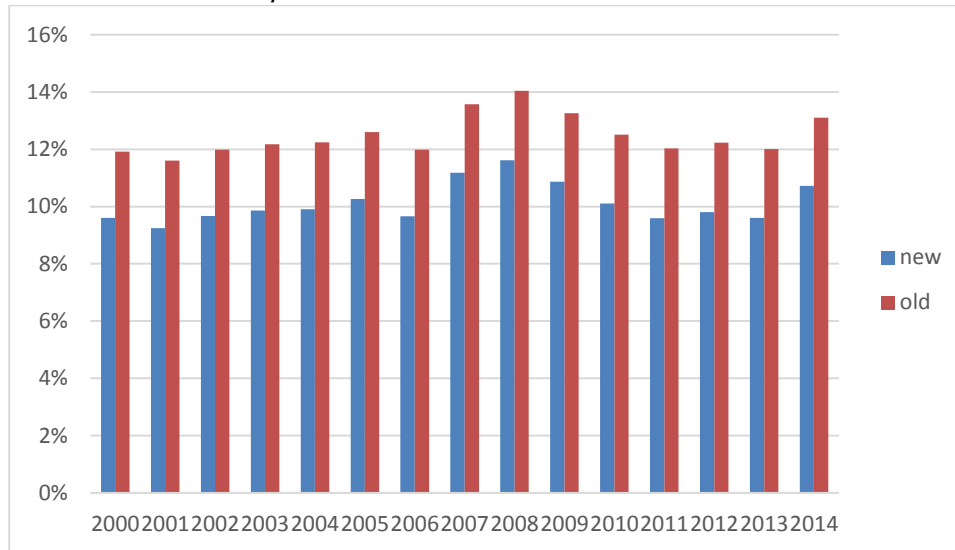

Fig. 5. *Comparison between old and new model of Contribution of Migrant Labors in the GDP of Russia*

The above graph shows the changes of rates using new model through two stage least square model. For example, in 2014 the contribution of migrant workers is 13.10% with the ordinary least square regression whereas the rate goes down that is 11%. So, it shows the percentage of GDP changes because of migrant workers is changed by more or less 2% each year which is not a very large change.

Since the difference of percentage generated by OLS and 2SLS model was not very large, it was necessary to investigate post-estimation test to see whether the variables were endogenous or not. In order to perform such kind of test, I did both Durban score statistics and Wu-Hausman statistics and P-values for both of them were more than 0.05. In this case, null (Ho) hypothesis could not be rejected where Ho indicates variables were exogenous.

```
Tests of endogeneity
Ho: variables are exogenous

Durbin (score) chi2(1)        =   .003367  (p = 0.9537)
Wu-Hausman F(1,11)            =    .00247  (p = 0.9613)
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Fig. 6. *Results from Test of endogeneity*

To sum up the whole mechanism, I adopt two approaches. First, I added capital and labor including migrant workers as independent variables in the OLS regression and observe the magnitude and significance of the coefficients on the GDP of Russia. Also, I checked the heteroscedasticity test of the variables in the linear regression analysis. Secondly, I used 2SLS regression using the difference of GDP per capital of Russia and GDP per capital of source countries. I recognized that while migrant workers affected the Russian national income, whether it is possible that GDP of Russia in turns affected the migrant workers coming to Russia or not. It was found that the coefficients of Ŷ regressors were quite similar to that of OLS regression. Also, post

estimation test for endogeneity between variables also found insignificant result. Therefore, on the basis of the data set, the results getting from the OLS regression met all requirements of robustness and it can be said that the estimated percentage I got from linear regression analysis is robust.

Conclusion

In order to assess the overall net gain from the migration to the economy is a challenging task both from a theoretical and empirical point of view. Theories which are developed to understand contemporary process of international migration, infer casual mechanisms that operate at widely divergent level of analysis. In the case of Russian migration, there is an established tradition and phenomenon that has profound impact on their labor demographics, regeneration of labor force and their activity rates. Russia ranks second in the list of top migration destination countries in the world after the United States. In the early 90-s, the collapse of the Soviet Union led to massive resettlements of people in the region to countries of their ethnical origin. The recent immigration has been primarily driven by economic incentives given the high income gap between Russia and the major migrants sending former Soviet Union countries.

This paper has attempted to explore the extent to which migration has affected national income over past 15 years. Most of the migrant workers coming to Russia tend to work in the low skilled job that is often much ignored and also they face different types of challenges while working. Nevertheless, this huge flow of migrant workers benefit their countries with remittances and the skills acquired during their migration experience, simultaneously they contribute a significant amount to the destination country's economic growth and development. The paper showed empirical analysis with the real life data over 15 years focusing Russian national income and migration.

The literature review part discussed a large variety of channels by migration can affect the receiving economy. The section focused on the labor market aspects and theoretical assumptions of new economics of migration. The most important findings from the theoretical reviews are: (i) wage effect on the productivity growth and inflation rate (ii) price level and labor costs as two important factors of labor market (iii) maximizing utilities, risk taking and income security influencing employment (iv) much flexibility of market leads more inequality and less job opportunity (v) heterogeneous degrees of labor market that refers to the migration due to the supply and demand of labor market (vi) labor demand drive more skill based employment in migration (vii) migration effects on more innovation, better education force and greater occupational specialization.

Since most studies concentrated on the analysis of overall migration literature focused on any specific region, this paper revealed a particular method of analyzing migration effect on the national income. This study infers that it is not an easy task to involve a number of challenging empirical issues. In order to bring these all channels together to assess the overall scenario and impact of migration is more difficult, indeed. In this context, with a view of future research on inequality and migration, it can be considered a potential starting of estimating the contribution of migrants in the overall economy that can be relevant to further study.

However, the calculation showed that the Cobb-Douglas function used in this case is a better instrument, but not the best one. The major limitation of this estimation is using yearly data instead of panel data due to lack of reliable data and resources. Also, the results of endogeneity test comes contradictory enough as it is known as intuitively that the national income of a country and migrants are endogenous to each other. Nevertheless, this work can be an inter-temporal choice to all the issues related to the labor market impact of migration. Though other empirical studies considered different type of quantitative approaches to estimate the substantial part of migration effects, they neglect some intergenerational issues the distribution. Thus, from our estimation we can make a projection on the practicability of using the production function approach for future research.

In the view of this study, it is necessary to be more careful in the evaluation of possible net effect of migration and generalizations should be avoided. In this report, the degree of uncertainty surrounding potential growth and output gap should be reduced in the methodology. Consequently, potential growth and output gap revisions, due to, for example, forecast and uncertainties, will inevitably remain a fact of life for policy makers to deal with. We always need to periodically fine-tuned method based on either the lessons learnt from individual country experiences; from evaluating advantages or disadvantages of alternative

estimation or specifications; from the experimenting with new data sources; or simply the need to keep the method consistent with developments in the literature.

Whatever the case, in the next few decades there are some issues will be the most important factors such as, given the size and the scale of contemporary migration flows and given the potential for misunderstanding and conflict inherent in the emergence of diverse, multi-ethnic societies around the world, political decisions about international migration. Likewise, sorting out the relative empirical support for each of the theoretical schemes and integrating them in the light of the evaluation will be among the most important task carried out by social scientist in the upcoming eras. By estimating through dynamic methods and explicating the leading theories of international migration with the clarification of assumptions will be the groundwork for the best policy implication.

Most importantly, the purpose of this study is to find out the contribution of migrants in Russian economy through the production function approach. In order to achieve this purpose, Cobb-Douglas production function was used and for statistical analysis, data from 2000 to 2014 served by Federal State Statistics Service were taken into the account. The coefficients for the selected functions were obtained using the correlation-regression or OLS regression analysis approach. Later on, the study also approach instrumental variable through two stage regression analysis. Using obtained functions, we can make some significant points such as, (i) the responsiveness of demand for labor that implies the relationship between the wage and employment, (ii) a large portion of labor shares in total productivity in Russia is higher which is an important to measure of labor demand elasticity (iii) The percentage of contribution of migrants in the Russian economy is nearly 10 % of total GDP (iv) The elastic demand of total labor included labor migrants is more than that of capital elasticity in Russia (v) Russian economy is mostly labor intensive economy where 70 percent of immigrants employment cover up the sector of construction, trade, agriculture, and manufacturing areas Therefore, immigrants have a positive impact on Russian's economy where national income has significant growth due to migrants' employment.

Finally, the modeling the impact of the labor migrants on national income of the Russian Federation gave us an impulse response indicating the labor demand, elasticity and intensity of resources of the country. It would play a vital role for policy makers who contribute to facilitate migrants' integration in the country, avoiding segregation and isolation. Overall, skill based migration tends in Russia should be more carefully taken into the account as their contribution is much more negligible. In the Russian national productivity, migrant labor inputs play a significant role which has been shown in the observed results. Searching of the source information, carrying out calculations and comparative analysis of the obtained production functions of the GDP, migration and capital for Russia can conclude that labor migrants have a positive impact on Russian economy beyond purely labor quantity effects.

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Author

Jeenat Binta Jabbar — Junior Research Fellow, Laboratory for International and Regional Economics, Graduate School of Economics and Management, Ural Federal University (19, Mira St., Ekaterinburg, 620002, Russian Federation; e-mail: jeenat.jabbar@gmail.com)