

# FDI AND REGIONAL INCOME DISPARITY IN THE CZECH REPUBLIC

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**Abstract:** *The aim of this paper is to evaluate the impact of FDI along with domestic physical investment and human capital on the regional income, and their role in the regional income convergence within the Czech economy over the periods from 1998-99 to 2013-14. The paper considers 14 regions of the Czech Republic and uses panel fixed effect regression and dynamic panel growth framework for the empirical analysis. The result finds that the role of physical capital formation and FDI along with the human capital are crucial for the regional disparity in income in the Czech Republic. There is also evidence of the convergence of per capita income at the speed of 7.8 per cent among the regions by conditioning physical investment and human capital along with FDI. This paper suggests that regional disparity in income can be reduced by the equitable allocation of investment and FDI, and equal development of human capital.*

**Keywords:** *Investment, Convergence, Regional Growth, Panel Data Methods.*

**JEL Classification:** *E22, R11, C23.*

## Introduction

In light of the below discussion, this paper aims at evaluating the impact of FDI along with domestic physical investment and human capital on the regional income, and their role in the regional income convergence within the Czech economy. The detailed empirical analysis of the study may suggest the policies to achieve balanced and inclusive growth, which will ensure regional convergence in terms of per capita income and spread the benefits of the growth processes among different regions of the Czech Republic. Actually, it can be suitable for many other countries that are facing similar “growth-inequality issues” like the Czech Republic. The paper is designed as follows: Section 1 introduces the problem by discussing the importance of income inequality issue in the European Union (EU) and the Czech Republic, as well as the implication of regional policy to deal with inequalities via investment and advent of human capital at most. Section 2 describes the theoretical framework to examine the factors of regional income disparity and explains the methodology for the empirical analysis and data. Section 3 discusses the results. The last section concludes the paper.

## 1 Income inequality issue in the European Union and the Czech Republic

The increasing disparities in development of regional economics can result in a tremendous imbalanced structure of national economics and European economy as a whole and, of course, large disparities in standards of living of inhabitants as well - the reason for such a disparities increasing rests in cumulating of pretty small differences over a long-run, that impacts the level of development significantly (Barro, Sala-i-Martin, 2004). The issue is that imbalanced economics impacts the subsequent growth and development negatively (Alesina, Rodrik, 1994). Clear evidence of such meaning can be found in works of Murphy et al. (1989) and Perotti (1993) who argue that income distribution determine the level of demand and equilibrium; hence, it impacts the

industrialization potential and growth. Stiglitz (2009) even claim that the rise of inequalities during last decades was one of the main causes of the economic crisis of 2008. In particular, disparities have to be seen as important reasons for tensions across nations, regions and society.

Based on the principle of solidarity, many tools to facing disparity within the EU area have been developed. In fact, the basic strategic document Europe 2020 is aimed to make growth more inclusive in terms of benefits of growth flowing to all inhabitants, especially those facing poverty or dealing with additional challenges. The strategy suggests that investment and education improvement should be the right path to achieve that goal. Besides, the main objective of last programming periods “Convergence” was designed upon solidarity between the regions - to reduce disparities at the NUTS 2 level of regions, i.e. between the regions across countries, but is not aimed at the countries themselves.

There are several studies, e.g. Geppert et al. (2008), Armstrong (1995), advocate the convergence hypothesis for EU regions. In contrast, many other studies proved that the disparities across the EU are decreasing while inner-country disparities are increasing in many EU member states (Marzinotto, 2012; Barca, 2009; Zdražil, Applová, 2016). Now, one can say, that the main objective of EU cohesion policy i.e. reducing disparities between the EU regions, is fulfilling, but the national objectives of reducing regional disparities are not achieved in many countries. An example of such a development, where regions converge towards the EU average while inner-country disparities between the regions are increasing, is the Czech Republic. The gap between the GDP per capita of the EU and the Czech average decreased from 28.1% to 15.6% between 2000 and 2014, while the disparities (measured by the coefficient of variation) among the Czech NUTS 2 regions increased from 36.3% to 39.7% during this period (Eurostat, 2016). In addition, one can say the disparities among the Czech NUTS 2 regions are pretty high, since the Czech Republic ranked 4<sup>th</sup> position among the EU countries between 2000 and 2014 (Eurostat, 2016). All those lead us to conclude that the issue of regional disparity in the Czech Republic and its determinants is demanding and calls for a deeper analysis.

The recent EU strategy is focusing investment and education improvements. This paper seeks to examine the role of both investment and education in the dynamics of economic growth in the Czech regions. Both factors can be seen as instruments to reducing disparities, but they are able to raise disparities as well (Kraftová, Kraft, 2016; Capello et al., 2011). We are focusing the role and importance of FDI due to its significant volume in a small open economy like Czech Republic, and its huge impacts on regional development as well. In fact, FDI are very important for Czech economy, since it is located in the middle of Europe – the major magnet for inward as well as the leading source of outward FDI – the Europe (Dicken, 2015). Furthermore, we are focusing the role of education, since education - as well as the technological progress - is the crucial factor of endogenous growth (Romer, 1986; Lucas, 1988; Rebelo, 1991; Barro, Sala-i-Martin, 2004).

Even repeating the well-known rule, we should point out that education and investment capability are much more interconnected than one can suggest. The well-educated population is always regarded to be the key to economic development in any region (Machlup, 1975; Graff, 1999). The evidence of that can be found in literature as follows: education is one of the main prerequisites to work (Maddison, 1994); adoption

of technological change requires education (Easterlin, 1981) and, at the same time, well-educated workers have comparative advantage in implementation of new technologies (Bartel, Lichtenberg, 1987); education is more productive and more stable than the level of technology factor (Nelson, Phelps, 1966; Schultz 1975); education impacts the capability to adopt innovations from foreign countries (Dowrick, Gemmel, 1991; Nelson, Phelps, 1966); and, investment is probably the best growth indicator while by considering conditions of income and education, we can get pretty solid indicator of further development (Rodrik, Chen, 1998).

In the recent study, Majeed (2017) found that FDI contribute to disparity reducing in countries with better developed human capital, while in that undeveloped FDI rather supports disparity increase. Kheng et al (2017) also found strong connections and suggest that FDI and human capital development policies, in particular spending on education and training, should be coordinated. Moreover, FDI and human capital seems to be associated with higher income in the European regions as they are positive interaction of FDI and human capital in relation to the income growth dynamics (Vollmecke et al., 2016; Jimborean, Kelber, 2017).

### **1.1 Regional inequalities, investment and human capital in the Czech Republic**

Many recent studies conclude that the economic growth in the Czech Republic is stemming from connections between the Czech and German economics, and effects of the EU accession via the catching-up process of lesser developed regions (Crespo-Cuaresma et al., 2014). In fact, the solid performance is caused by investment inflows, technology transfer and export opportunities (Forgó, Jevčák, 2015; Dobrinsky, Havlik, 2014). Slavík (2007) suggests that the growth of the Czech Republic was slower than it should be when we consider the level of real income; still, his research is developed on EU pre-accession period (pre-2004). Considering recent data, we know the economic growth accelerated after 2004 significantly, then experienced big fall due to the economic crisis (2009) and recovery phase started in 2014 (Czech Statistical Office, 2016); hence, it is hard to offer the reliable evaluation of the current relationship between the production and income level.

According to Popescu (2014), the Czech Republic unambiguously dominates in the investment inflows with second highest FDI amount in the Central and Eastern Europe. Crespo-Cuaresma et al. (2012) developed similar conclusions when arguing that the Czech regions are among the most attracting FDI destinations in the Central and Eastern Europe, and actually currently leading FDI recipients. However, the effect of FDI on regional attractiveness from the inhabitants' point of view is ambiguous since the living standard indicators are influenced only partially and only in some of the Czech regions (Zdražil, 2015). Another study adds an additional point to this discussion when results that the gross fixed capital formation share of GDP was high in the Czech Republic during last decade, even during the crisis – at least 25% (Forgó, Jevčák, 2015). Besides, we have to consider the findings of Kraftová and Matěja (2014) who argue that industrial structure changes in Czech regions are limited due to the low qualification capability of population; and hence, this limitation is a large barrier to major long-term growth and development impulses. With all those facts, we can say that both development drivers - investment and education - play the crucial role in process of subsequent growth and development.

## 2 Theoretical framework and empirical methodology

The neoclassical growth theory has been used to understand the regional disparity in income due to its theoretical foundation (Barro and Sala-i-Martin, 2004; Baumol, 1986; Cashin, 1995; DeLong, 1988; Mankiw et al., 1992; Mallick, 2014; Mallick, 2017). This paper makes use of the theoretical framework as provided in Mankiw et al. (1992). The Cobb-Douglas production function with inputs labour, physical capital and human capital, which are paid at their marginal productivities, and with decreasing returns in accumulable factors, the production function can be specified as (1)  $Y_{it} = K_{it}^{\alpha} H_{it}^{\lambda} (A_{it} L_{it})^{1-\alpha-\lambda}$ , where,  $0 < \alpha + \lambda < 1$  (1)

where,  $Y_{it}$ ,  $A_{it}$ ,  $K_{it}$ ,  $H_{it}$  and  $L_{it}$  represent output, level of technology, stock of physical capital, human capital and quantity of labour respectively, in region 'i' at time 't'. The coefficients  $\alpha$ ,  $\lambda$  and  $(1-\alpha-\lambda)$  reflect the elasticities of output with respect to physical capital, human capital and labour. Whereas,  $L$  is assumed to grow exogenously at 'n' (i.e. growth of population) and  $A$  is also assumed to grow at rate 'g' (i.e. growth of technology). Following Mankiw et al. (1992), the human capital along with labour and physical capital as the factors of production, the natural log of per capita income ( $y$ ).

$$\ln y_{it} = a + \frac{\alpha}{1-\alpha} \ln s_{it} + \frac{\lambda}{1-\alpha} \ln h_{it} - \frac{\alpha}{1-\alpha} \ln(n_{it} + g + \delta) + \varepsilon_{it} \quad (2)$$

The equation (2) says that natural log of per capita income ( $\ln y$ ) is positively related to the natural log of physical investment rate ( $s$ ) and human capital ( $h$ ), and negatively to the effective depreciation rate ( $n+g+\delta$ ). Whereas,  $n+g+\delta$  is the growth rate of labour force with adjusted  $\delta+g$  ( $= 0.07$ ),  $\varepsilon_{it}$  is the random disturbance term in the equation and  $a = \ln A_0 + gt$ . According to Mankiw et al. (1992), based on the Solow-Swan growth model (Solow, 1956; Swan, 1956), the equation (2) can be modified to address the issue of conditional convergence of regional per capita income as follow.

$$\frac{1}{t} (\ln y_{it} - \ln y_{i0}) = \tilde{\alpha} - \left(\frac{1-e^{-\beta t}}{t}\right) \frac{\alpha}{1-\alpha} \ln y_{i0} + \left(\frac{1-e^{-\beta t}}{t}\right) \frac{\alpha}{1-\alpha} \ln s_{it} + \left(\frac{1-e^{-\beta t}}{t}\right) \frac{\lambda}{1-\alpha} \ln h_{it} - \frac{\alpha}{1-\alpha} \ln(n_{it} + g + \delta) + \varepsilon_{it} \quad (3)$$

where,  $\tilde{\alpha} = \left(\frac{1-e^{-\beta t}}{t}\right) + a$  and the convergence rate,  $\beta = (1-\alpha-\lambda)(n+g+\delta)$ .

Equation (3) represents that the per capita income depends on the initial levels of per capita income ( $y_{i,0}$ ) and technology ( $A_0$ ), the growth of technology ( $g$ ), the saving rate ( $s_{it}$ ), the growth rate of population or labour force ( $n$ ), the rate of capital depreciation ( $\delta$ ), the rates of physical and human capital ( $\alpha$  and  $\lambda$ ), and the rate of convergence to the steady state ( $\beta$ ). Thus, the equation indicates that a high investment rate is positively related to the growth in per capita income and the growth of labour force is negatively related to the growth in per capita income after being adjusted for technological progress and capital depreciation. Further, the assumption of diminishing returns to reproducible capital is the base for predicting the rate of conditional convergence. Equation (3) indicates that regions with low initial per capita income grow faster than that with higher, conditioning upon the values of  $s$ ,  $h$ ,  $n$ ,  $g$  and  $\delta$ . This equation is used as the framework for empirical estimation of this study under the assumption that there is common production structure in all 14 regions of the Czech economy. As the focus of the study is to evaluate the role and importance of FDI on the per capita income and long-run dynamics of economic growth, equation (3) is extended to include FDI as a factor of production.

The study considers all the 14 regions of the Czech Republic for the duration from 1998-99 to 2013-14. We have focused on the NUTS 3 level of regions which is below the main level where the EU cohesion policy is performed. The reason is that the NUTS 2 regions of the Czech Republic are just formally arranged units, which have been created only due to the management and funding of the EU regional policy. In fact, the Czech lower-level government is organized at the level of NUTS 3 regions. The study includes 224 numbers of observations by pooling 14 regions over 16 years. The first objective of the study used panel data method to control for individual heterogeneity of the regions with more degree of freedom and efficiency (Baltagi, 2001). There are three types of panel data methods. They are pooled regression, fixed effects regressions, and random effects regressions. There are two tests viz. Breusch and Pagan Lagrange Multiplier (LM) and the Hausman specification, which are used to diagnose the appropriate method out of above three. The significance of LM test statistics indicates that the estimation using 3<sup>rd</sup> or 2<sup>nd</sup> method is more appropriate than the 1<sup>st</sup> one. Whereas, the statistical significance of Hausman test confirms preferring estimation by using fixed effect regression over random effect regression.

The second objective of the study uses dynamic panel growth framework of Islam (1995), which is derived from the basic neoclassical growth model. The yearly time periods are too short to study regional growth convergence. The disadvantage of using annual data on per capita real income is the increasing serial correlation due to the effects of business cycle and shocks. In contrast, using a long-period average captures the changes in the steady state per capita income. We use a panel of four-year spans (i.e.  $\tau = 4$ ). Hence, for the period 1998–99 to 2013–14, we have four panels. With time span ( $\tau$ ), the equation (3) can be modified as follow.

$$y_{it} = \psi y_{i,t-1} + \sum_{j=1}^3 \theta_j x_{it}^j + \mu_i + \varepsilon_{it} \quad (4)$$

Where  $y$  is the per capita income.

$$\begin{aligned} y_{it} &= \ln Y_{it} & y_{it-1} &= \ln \gamma y_{it-1} \\ \theta_1 &= (1 - e^{-\beta\tau}) \frac{\alpha}{1-\alpha} & \theta_2 &= -(1 - e^{-\beta\tau}) \frac{\alpha}{1-\alpha} & \theta_3 &= (1 - e^{-\beta\tau}) \frac{\lambda}{1-\alpha} \end{aligned}$$

The implied  $\beta$  (rate of conditional convergence) is  $-\frac{\ln(\psi)}{\tau}$ . This analysis includes 56 numbers of observations by pooling 14 regions over four periods (each spanning a period of 4 years). Hence, the analysis of this objective uses the pooled regression.

## 2.1 Data

The data are based on secondary sources. The functional form of (4) has been used to evaluate the impact of FDI, physical investment and human capital on income at the regional level by using the annual data. The data on FDI are taken from the Czech National Bank (CNB) while the GDP, GFCF and population data are sourced from the Czech Statistical Office (CZSO). Human capital is expected to positively influence the income at the regional level. Human capital allows the operation of tasks that are more complicated and which produce high-skill products, thereby improving productivity. Further, Lucas (1988) argued that human capital generates positive externalities. The total number of enrolments in tertiary education, representing human capital at the regional level, is sourced from CZSO regional departments' databases. The detailed measurements of variables and data sources are described in Tab. 1. The summary statistics of the variables are presented in table A1 of appendices.

**Tab. 1: Variables and data sources**

variables	measurement	sources
Income	Gross domestic product per capita (PGDP) at constant prices 2005 in CZK	CZSO
Domestic investment	Gross fixed capital formation per capita (PGFCF) at constant prices 2005 in CZK	CZSO
Foreign direct investment	Foreign direct investment per capita (PFDI) at constant prices 2005 in CZK	CNB
Human capital	The attendance of tertiary education per 1000 inhabitants (TER)	CZSO

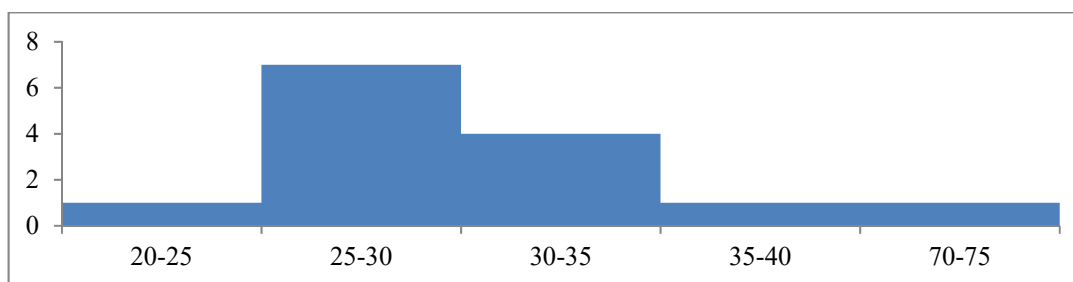
Source: own processing

The long-run dynamics of income at the regional level is examined by using the dynamic panel growth equation (4). The annual time length's data are very short to study growth convergence and hence the total time period from 1998–99 to 2013–14 is divided into four-year shorter time periods to estimate equation (4). The four-year periods are 1998-2001, 2002–2005, 2006–2009 and 2010-2013. The dependent variable is the natural logarithm of per capita income [ $\ln. (PGDP)$ ] in the estimation. The independent variables are natural log of per capita income at the beginning of the each four-year period [ $\ln. (PGDP_0)$ ], the natural log of per capita domestic investment [ $\ln. (PGFCF)$ ] and foreign direct investment [ $\ln. (PFDI)$ ], adjusted population growth rate [ $\ln. (APG)$ ] and human capital [ $\ln. (TER)$ ].

### 3 Problem solving and results

This section provides the patterns of income disparity and also the econometric analysis. The histogram of the regional per capita income (in tens of thousands CZK) for the latest year 2013-14 is plotted in fig. 1. This shows that the per capita income of 50 per cent of regions out of 14 lies in the range of 250000 CZK to 300000 CZK. Karlovy Vary and Prague regions are placed at the extreme left and right positions in the histogram, respectively. This indicates that there is existence of income inequality across the regions in the Czech Republic.

**Fig. 1: Regional per capita income inequality in 2013-14**

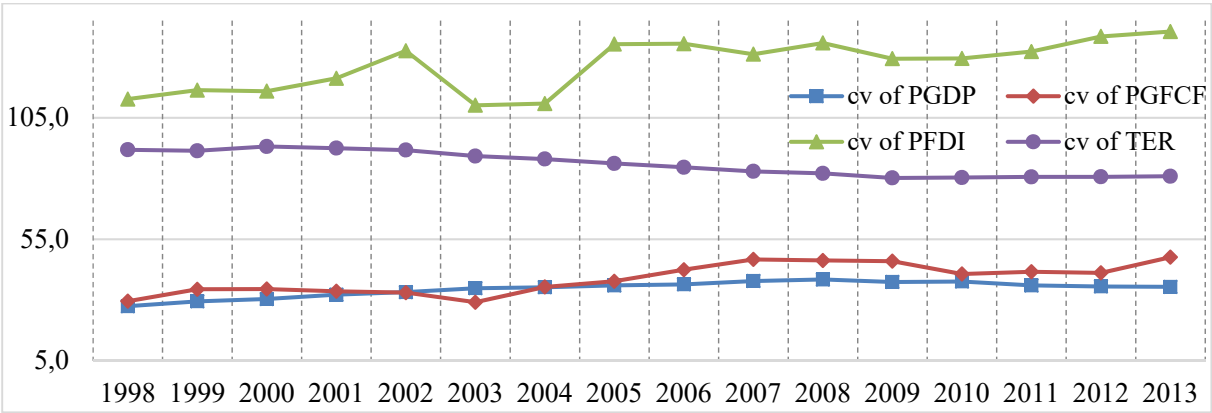


Sources: basic data of Czech Statistical Office (2016; 2017)

As mentioned in the literature we observe that there is a systematic relation of per capita income with the per capita FDI and physical investment, and human capital at the national level. The per capita income of Czech economy has positive trend from 1998-99 to 2013-14, which is accompanied by the positive trends of per capita FDI, per capita physical investment and human capital (see, fig. A1 in appendices). Hence we expect that these factors may be responsible for such outcome of the regional income distribution.

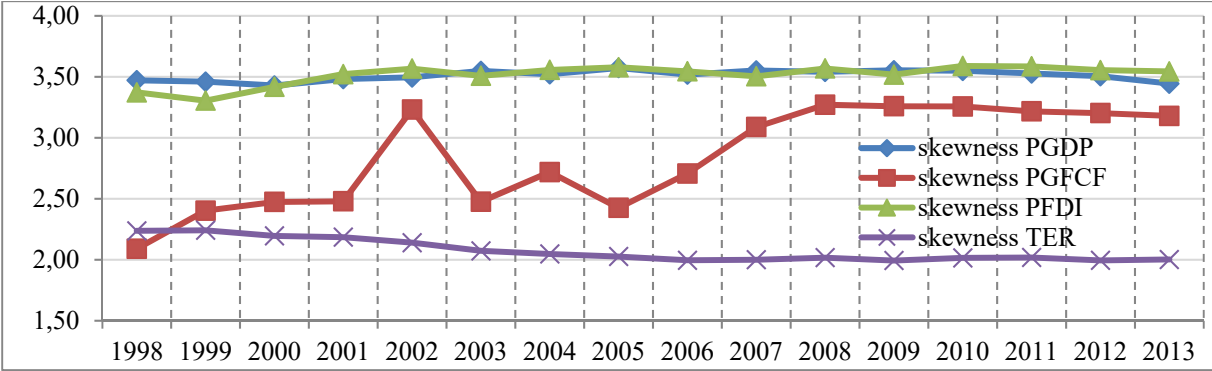
We used the coefficient of variations (CV), Skewness and Kurtosis to measure the patterns of per capita income inequality across 14 regions in 1998-2013-14. The CV of per capita income, per capita FDI, per capita physical investment and human capital are plotted in Fig. 2. There is rising trend of CV of per capita income from 1998-99 to 2013-14, which indicates that the regional inequality in terms of per capita income has been increasing. Correspondingly, the trends of CV of per capita physical investment and FDI have been rising in this period too. Hence, it indicates that the rising disparity in FDI and physical investment are associated with the rising disparity in per capita income across the Czech regions. Further, though the inequality in human capital development has not been rising, its CV values are very high as it ranges from 81% to 92 %. That means the high degree of inequality in the level of human capital exists, which is associated with the rising income inequality across the Czech regions.

**Fig. 2: Disparity in PFDI, PGFCF, PGDP and TER**



Sources: basic data of Czech Statistical Office (2016; 2017) and Czech National Bank (2016)

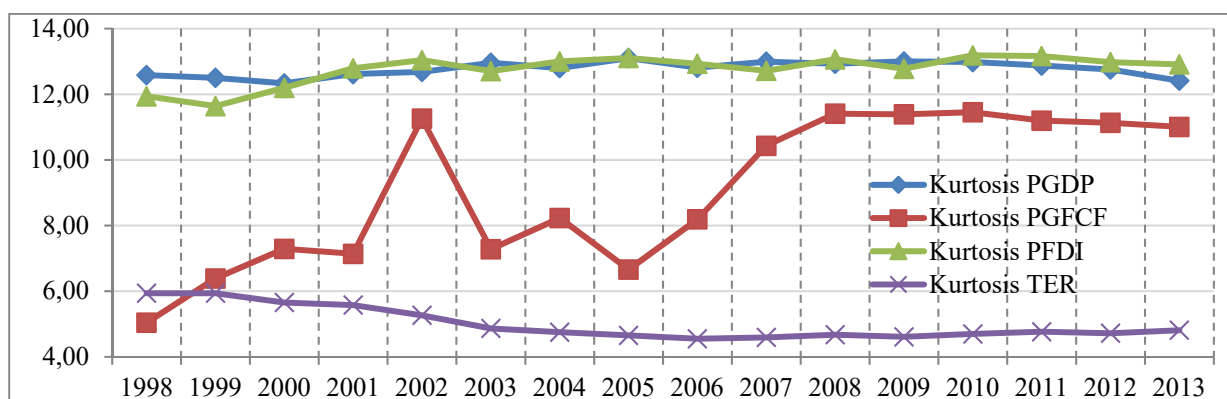
**Fig. 3: Trends of Skewness of per capita income and associated factors**



Sources: basic data of Czech Statistical Office (2016; 2017) and Czech National Bank (2016)

To support the above trends the Skewness and Kurtosis results are presented in figures 3 and 4, respectively. The results confirm with the above observation about the regional per capita income in the Czech Republic. There is positive skewness of per capita income, per capita domestic investment, per capita FDI and tertiary education. That means for all these variables the mean is greater than their respective mode.

**Fig. 4: Trends of Kurtosis of per capita income and associated factors**



Sources: basic data of Czech Statistical Office (2016; 2017) and Czech National Bank (2016)

The empirical analysis started with the diagnostic tests to choose the appropriate methods of the panel data (see Tab. 2). The results show that the value of LM statistics and Hausman statistics are statistically significant in all the regressions. Hence, all the regressions are estimated using the fixed effect method. The F-statistic for the region-specific coefficients is significant at 1% in all the regressions, which indicates the significance of region-specific factors across the regions of the Czech economy.

The regression 1 includes per capita income as the function of per capita domestic investment and foreign investment. The result shows that all the coefficients have their expected sign and they are statistically significant. Further, the regression 1 is expanded to include the interaction of foreign direct investment and physical investment (PGFCF\*PFDI). The finding is in confirmation with the argument made by Kay (2007), that FDI is a challenge to the domestic firms or investment. The analysis finds the negative interaction coefficient, which indicates that the FDI has crowd-out effect on the domestic investment in 1998–99 to 2013–14. This is also evidenced in the context of the developing countries like India and China (Mallick, 2017; Mallick 2015).

Further, the human capital (TER) along with the FDI and physical investment is used in the specification of regression 3. This also shows that all the included factors are statistically significant with the expected positive signs. The human capital is affecting the regional income through improving productivity. The interaction effect of FDI and physical investment is incorporated in regression 4, which also confirms the crowding out effect of FDI in the domestic investment in Czech regions. Finally, along with the three factors and the interaction terms between physical investment and FDI, the second interaction term of FDI with the human capital (PFDI\*TER) is used as an additional regressor in regression 5. The result confirms the findings as obtained from the previous regressions, and also shows that there is positive interaction effect of FDI on the human capital. This indicates that the FDI has been driving the human capital across the Czech regions. The multinational investors required the skilled labour, which forces the residents to go for higher education to get a job. Consequently, FDI is affecting the human capital development across the Czech regions.



**Tab. 2: Impact of FDI on regional income**

Variables	Regression 1	Regression 2	Regression 3	Regression 4	Regression 5
PGFCF	1.31 (0.14)***	1.51 (0.12)***	0.63 (0.11)***	0.80 (0.11)***	0.43 (0.12)***
PFDI	0.23 (0.02)***	0.55 (0.05)***	0.11 (0.02)***	0.26 (0.04)***	0.28 (0.04)***
TER			3.33 (0.23)***	2.92 (0.24)***	3.43 (0.24)
PGFCF*PFDI		-0.000001 (0.0000001) ***		-0.000001 (0.0000001) ***	-0.000001 (0.0000003) ***
PFDI*TER					0.000003 (0.0000006) ***
F test for all u <sub>i</sub> =0	F(13, 208) = 13.98 ***	F(13, 207) = 19.47 ***	F(13, 207) =31.63***	F(13, 206) = 29.88 ***	F(13, 205) = 37.9 ***
Over all Rsq.	0.94	0.94	0.87	0.901	0.90
Hausman test	39.99 ***	29.99 ***	15.99 ***	20.28 ***	43.97***
n	224	224	224	224	224

Note: the figures in parenthesis are the standard error of estimates. \*\*\*, \*\* and \* represent the statistical significance at 1%, 5% and 10% level.

Source: Author's estimation

The role and importance of physical investment, human capital and FDI in the long-run dynamics of income at the regional level is analysed by using dynamic panel growth equation (4) as suggested by Islam (1995) and Mankiw et al. (1992). The empirical result is presented in Tab. 3.

**Tab. 3: Regional convergence of income**

Independent variables	Dependent variable: LnY
LnY <sub>0</sub>	0.73 (0.09) ***
LnPGFCF	0.14 (0.05) ***
LnPFDI	0.02 (0.03)
LnTER	0.02 (0.01) **
Ln APG	- 0.05 (0.10)
F test	F(5, 50) = 229.89 ***
Rsqu.	0.96
n	56

Note: the figures in parenthesis are the standard error of estimates. \*\*\*, \*\* and \* represent the statistical significance at 1%, 5% and 10% level. APG represents the adjusted population growth ( $n+g+\delta$ ).

Source: Author's estimation

Regression includes per capita income as the function of initial per capita income, per capita domestic investment, foreign investment, human capital and population growth. The result shows that all the coefficients have their expected sign and they are statistically significant except the coefficient of adjusted population growth. The coefficient of initial income is found to be 0.73, which indicates the conditional convergence of income across the Czech regions. Hence by Islam (1995) the speed of convergence among the Czech region is 7.8%, conditioning to domestic investment, FDI and human capital in 1998–99 to 2013–14.

There is empirical evidence of conditional convergence of steady state income across the Czech regions. The FDI along with the physical investment and human capital is crucial in the regional income convergence of the Czech economy. This conclusion seems to be important for the understanding of disparities mechanism in the Czech Republic. In addition, the findings of Pinho et al. (2015) suggest that the impact of the financial aid accessed via the EU cohesion policy on regional growth are marginal,

moreover the impacts seem positive and significant only in regions with low levels of human capital. Hence, we have to conclude that the regional policy focused on FDI with the physical investment and human capital seems to be a much better instrument to solve the problem of imbalance in economic growth.

## 4 Conclusion

This paper sought to examine the role of foreign and domestic physical investment along with human capital in the regional disparity in income within the Czech economy during the period from 1998–99 to 2013–14. The preliminary analysis shows that there is existence of income inequality across the regions in the Czech economy. The results of trends of coefficient of variation, skewness and kurtosis show that such income inequality has been rising over the periods. The empirical analysis of panel fixed effect regressions concludes that FDI is crucial along with physical investment, human capital and region specific factors for the variation in per capita income in the Czech regions. This also observes that the FDI has a crowding-out effect on the domestic investment, and FDI affects positively to the development of human capital at the regional level in the Czech economy.

This paper also examined the long-run dynamics of economic growth within the regions of the Czech economy by using dynamic panel growth method as suggested by Islam (1995). The analysis concludes that there is the  $\beta$ -convergence of per capita income at the speed of 7.8 % by conditioning FDI, physical investment and human capital. Therefore, the equitable allocation of domestic physical investment and FDI along with the development of human capital in the low-income regions may help to mitigate the problem of imbalanced economic development within the Czech economy.

While this paper has examined the role and importance of foreign and domestic investment and human capital in the inter-regional disparity in the Czech Republic, many opportunities for extending the scope of this study remains. During this globalisation era there labour is moving from lower productivity sectors to the higher productivity sectors and also migrating from the lower wage regions to the higher wage regions. Similarly, capital as the factor of production is also reallocating from lower productivity sectors and regions to the higher productive sectors and regions. The future studies can relate such factor reallocation with regional disparity in income in the Czech Republic which will give a complete understanding of this issue.

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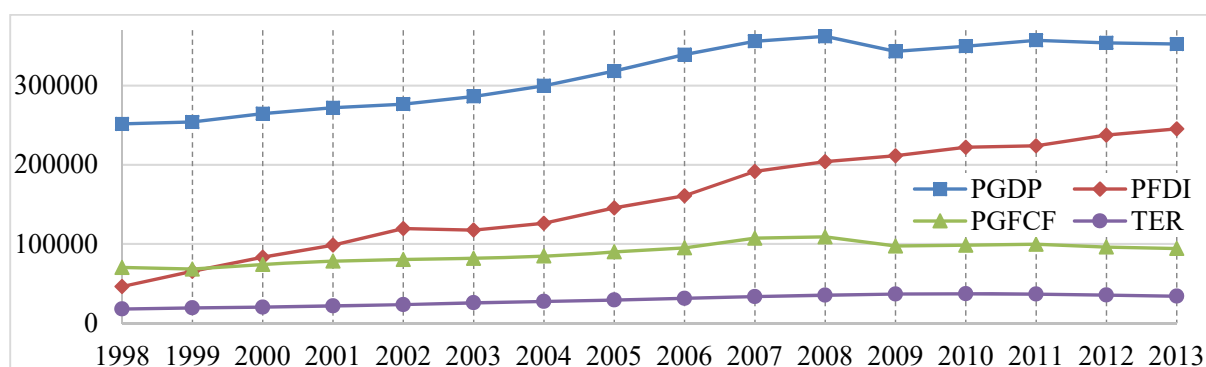
## Appendix

**Tab. A1: summary statistics of variables**

Variable	Obs.	Mean	Std. Dev	Min	Max
PGDP	224	294315	110470	199027	789063
PGFCF	224	81676	34667	45919	253035
PFDI	224	123043	179661	12461	1108924
TER	224	24497	21966	2093	105560

Source: own processing

**Fig. A1: Trends of PGDP, PFDI, PGFCF and TER at the national level**



Sources: basic data of Czech Statistical Office (2016; 2017) and Czech National Bank (2016)

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