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How to Support the Convergence of Socioeconomic Indicators in Provinces of Indonesia?

Diploma Thesis

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Bc. Veronika Ježková

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ABSTRACT

The thesis looks for the answer to the question how to support the convergence of Socioeconomic Indicators in Provinces of Indonesia. Together with literature review, the analytical part concerns the regional disparities and convergence of socioeconomic indicators in given period from 2010 to 2015. The analytical contains the analysis of beta-convergence calculated by regression line and the analysis of sigma-convergence computed on the base of standard deviation change throughout the years. All this implies in proposal part where the suggestion to continuous convergence are specified: sustainable development, human development, capital mobility, labour force mobility.

Keywords: *Indonesia, provinces, convergence, socioeconomic indicators, regional disparities, analyses*

ABSTRAKT

Závěrečná práce hledá odpověď na otázku jak prohloubit konvergenci v rámci socioekonomických indikátorů v provinciích Indonésie. Společně s literární rešerší se analytická část věnuje regionálním rozdílům a konvergenci socioekonomických indikátorů v průběhu stanoveného období 2010 až 2015. Analytická část obsahuje analýzu beta-konvergence počítanou na základě regresní křivky a analýzu sigma-konvergence, která kalkuluje změnu směrodatné odchylky v průběhu časového období. Tyto analýzy vyplývají v návrhovou část, ve které je navržena soustavná nepřetržitá konvergence na základě: dlouhodobě udržitelného rozvoje, lidského rozvoje, mobility kapitálu a mobility pracovní síly.

Klíčová slova: *Indonésie, provincie, konvergence, socioekonomické indikátory, regionální rozdíly, analýzy*

TABLE OF CONTENT

1. INTRODUCTION

Regional inequality has become an issue of academic research and policy debate. From the point of encouraging of globalization and internalization, the government and non-government organizations have an interest in decreasing the regional disparities and straightening of the entire world population.

It is almost twenty years, Indonesia has become a decentralized country and the discussion about the change of system has been positive as well as negative. Decentralization happened over/on the base of the fact that Indonesia had been going through the Asian Financial Crisis that time. The fact is that Indonesian provinces are various in meaning of geographic conditions, natural resources, structures of agriculture, industry and services, with a plenty of ethnic representation and different conditions of all types of infrastructure.

Nowadays, Indonesia is the most fast growing economy among ASEAN member countries and has a high potential in many spheres of business. Even though, there are the remote provinces that are still untouched by tourism and industry, provinces with low population density, highly forested areas and at the same time provinces which are attached to civil wars and armed conflicts or big cities and islands full of high technologies where the direct investments flow constantly.

Those are reasons why the thesis concerns the regional disparities, measurement of disparities and seeks for answers to question: "*How to Support the Convergence of Socioeconomic Indicators in Provinces of Indonesia?*". The partial analyses give the leads to the overall picture of socioeconomic standard within Indonesia and set a direction to suggestions how to promote the convergence in the country. Measuring of the changes in inequality helps to determine the effectiveness of policies and to generate the data that necessary use inequality as an explanatory variable in policy analysis. Inequality becomes an important matter if the level is too high since it becomes one factor that can cause the social unrest, especially in countries with stronger economic growth and lower poverty rate.

From the point of decentralization change in Indonesia, many various analyses and research are available. Majority of them are considered to inequalities of GDP and economic conditions. In contrary, the thesis roofs the economic indicators together with social indicators

and evaluates them with the same weight and importance. In spite of this, the thesis has few limits which will be restricted thanks to analytical tools.

Firstly, the correlation of indicators will be verified, as the double of indicators with very high correlation is not desirable for the sake of the thesis. Secondly, Indonesian Statistic Office provided the primary data in order on analysis. However some of the data was published in Indonesian Rupiah and some of the data is missing. For higher transparency and more suitable data management, the data are recounted to US dollars according to average exchange rate. The missing data are replaced by mean, or not considered at all. Furthermore, migration is a part of important factor of socioeconomic state of development thus it is taken into account. In order of thesis it is subsequently divided into two sub-indicators of immigration and emigration. Even thought, the migration indicators do not correspond to the geographical size, population size and density and other relatives, and are robust characteristics connected to capital mobility.

The thesis follows the structure of the literature review, analytical part and proposal part. The review considers the theoretical level of regional disparities together with the outline of integrated indicators. The analytical part serves the results of convergence analysis and builds the basement for proposal part where the socioeconomic situation is evaluated and subjective support of regional convergence is suggested.

2. OBJECTIVES

The thesis sets a target to assess development of individual Indonesian provinces on the base of general and specific scientific methods and finally, the suggestion how to support the convergence of regional disparities and possibly use the variance of disparities for specific provinces. The practical part follows the theoretical part of the thesis, where the general phenomenon, procedures of analysis and integrated indicators are introduced and their fundamental theories are described. Establishing of the most convergent indicators, that have eliminated their variation in individual provinces throughout the time, provide the foundation for the Proposal Part. Suggestions that would point to sustainable convergence or would improve the inequality among Indonesian provinces are stated in Proposal Part. The chapter focuses to sustainable growth of socioeconomic indicators, promoting of labour force mobility and capital mobility, improving of human development regarding education and health care, and employment. Also, it suggests how to overcome the disparities caused by geographical factors and uses the natural regional dissimilarity.

Before the determination of propositions, how to course the growth of diverging socioeconomic indicators, if so, the thesis must found the following partial goals:

1) Calculating the basic statistical methods and correlation between integrated indicators to find out the specificities about the dataset
2) Assuming whether the Indonesian provinces point to convergence on the base of statistical procedures of beta-convergence for each individual integrated indicator,
3) Subsequently, computing of variance for each individual integrated indicator throughout the given period
4) Calculating the sigma-convergence and percentage of convergence/divergence speed
5) Decide whether sigma-convergence support beta-convergence, or whether the calculated convergence is significant

3. METHODOLOGY

In order of thesis, number of various professional, scientific and methodological publications and articles are used. Most of the literature is written in English and published by international organizations, research institutes and faculties studying phenomena of regional disparities and methods of convergence. The foundations for analysis are drawn from data of the Indonesian Statistical Offices.

The Literature review serves an overview of knowledge from the primary and secondary literature sources of regionalism, regional development and regional disparities. An effort is to articulate the general definitions of regions as a fundamental and key concept of regional development. Secondly, the review looks into detail to the scientific methods of measurement and evaluation of regional disparities, for the sake of the thesis, the analysis of convergence is considered. Regarding to general definitions and measurement methods, the part explains the equations of factors and phenomena to introduce the mathematic outline. The explanatory notes to equations are further attached in Appendix 1. Finally, the literature review thoroughly introduces the integrated indicators that are used as variables throughout analysis subsequently.

The Analysis part familiarizes Indonesia as a country of subject, its economic overview and details about population since these information is necessary as a springboard for the research work. Afterwards, this part outlines the characteristics of analyzed dataset, respectively the basic statistics methods of variance, standard deviation, skeweness, kurtosis and correlation matrix of integrated indicators, etc. The basic statistical methods are used for appropriate interpretation of data composition and better orientation in analysis´ output. In order to analysis, indicator of GRDP has been recalculated from Indonesian rupiah to US dollars. Inferior calculation of geometric mean and secondary computing of improvement of 34 cases (province) throughout the given period 2010 – 2015 is provided in Microsoft Excel 2010.

Furthermore, the convergence analysis is found in the chapter of Analytical Part. The analysis has three general objectives. With application of STATISTICA Software, the dataset is analyzed for beta-convergence trend occurrence. Further question is whether sigma-convergence supports the results of beta-convergence and if so, calculation of improvement/deterioration is announced in regard to reduction of regional disparities. The

graphical outputs of beta-convergence are found in text as the interpretation of results relies to regression line of scatter plot. The graphical results of sigma-convergence are attached in appendix as the final scores may be seen in text.

The Proposal part stands on the foundation of previous scientific researches that are concentrated to regional disparities and supporting of convergence. The surveys and studies from which the inspiration of proposal part flows are worked for Indonesian provinces and are published by international and Indonesian universities, international organizations and Indonesian Bank.

4. LITERATURE REVIEW

4.1 REGION

First notion of the composition is known from the ancient times when the foundations for the word as itself had been laid. Very likely, *"regio"* in the meaning of boarders or landscape has been united with the *"regnum"* which means the establishment of the power over land. (Krejčí, 2011) Other sources tend to continual development of *"regere"* world (which means to rule) into *"regio"* world and in figurative sense it had the same impact to determination of territory by power. (Klapka & Tonev, 2008)

Regions are still geographic or political objects that are described on the basis of diverse conclusions as mutually dissimilar parts of geographic sphere that are smaller than the overall area of analysis´ interest (world, continent, state, mountain range) but at the same time are bigger than the specific place (every region is a part of superior spatial unit and contains subordinate units). From the analytical point of view, regions are the most logic way of organization of geographic information and play a role of valid sphere for chosen criterion. (Klapka & Tonev, 2008)

The meaning of the region concept represents various forms of interpretation and academic definitions. The presentation of the term comes with the general presentation or – on the other hand – is specified very tightly. (Krejčí, 2011) Generality that is connected with vagueness does not performance the sufficient answers to the questions of the regionalist exploratory. Especially, under the development of economy and practical usage of regionalism the different theories of region have been constructed.[1]

Klapka & Tonev (2008) describe that within two last centuries four approaches have been settled to understand the form of region. *Deterministic approach* classifies the regions as social, economic and cultural units that diverse by their natural conditions. At the same time, the natural potential is crucial for development of specific economic activity. *Possibilistic*

[1] As an example of the advanced theories of region, Wokoun (2001) highlights authors as following: Walter Christaller (1933) and Adam Lösch (1940) who progressively worked out the Theory of Central Place Hierarchy – one of the most influential theories of theoretical geography and theoretical spatial economic analysis; Nikolaj Kolosovsky who presented the Theory of Territorial Production Complex in which the economic divisions are delivered into regions intentionally in the course of planned economy. (Wokoun, 2001)

approach sees each region as a unit of unique qualities that outcomes on the base of natural and socio-economic interaction. This implies in complexity of approach. *Indeterministic approach* follows the possibilism, however, deny the relationship of socioeconomic system with nature. This approach concerns these components as independent to each other in process of developing. *Postmodern approach* – understands region as a social construction which has a subjective disposition. The approach distinguishes the perception of individuality of region for particular groups that have various traditions and habits (state, community, etc.). In contrary to other approaches, the postmodernism supports to reveal the common issues across the regions.

According to Hudec and his concept in the context of system, the region is a spatial complex of the open and dynamic systems with high number of components. These components have a various quality and relations, structures, and have a plenty of diverse characteristics, respectively attributes. (Hudec, 2009) Krejčí extends this theory by addition of actors who performance the interaction and put forward the assumptions of regions (Krejčí, 2011, p. 116). Krejčí concerns the region as an outcome of regionalist processes as abstraction and construction. On the base of regional policy, the region is the district where the territorial policy comes into implementation and realization. Thus, it is a subject that roofs the cooperation of municipalities (e.g. voluntary beam of municipalities). Eventually, from the geographic point a region is a complex which is determined by landscape differentiation.

Therefore, the above mentioned explains region as a more less bounded, difficult, dynamic and spatial system, which was settled as a result of social activity of natural and socioeconomic phenomena and processes, and which shows the specific type of organizational unit so it differs from the other regions.

4.2 REGION CLASSIFICATION

The general meaning of region serves greatly wide foundation for the most of analytical reasons. Thus the classification needed to be carried on the base of specific criterions. The classification is used for identification of the significant types of regions. According to Klapka & Tonev (2008), there is sorting of regions due to four specific attitudes shown in the Figure 1 below.

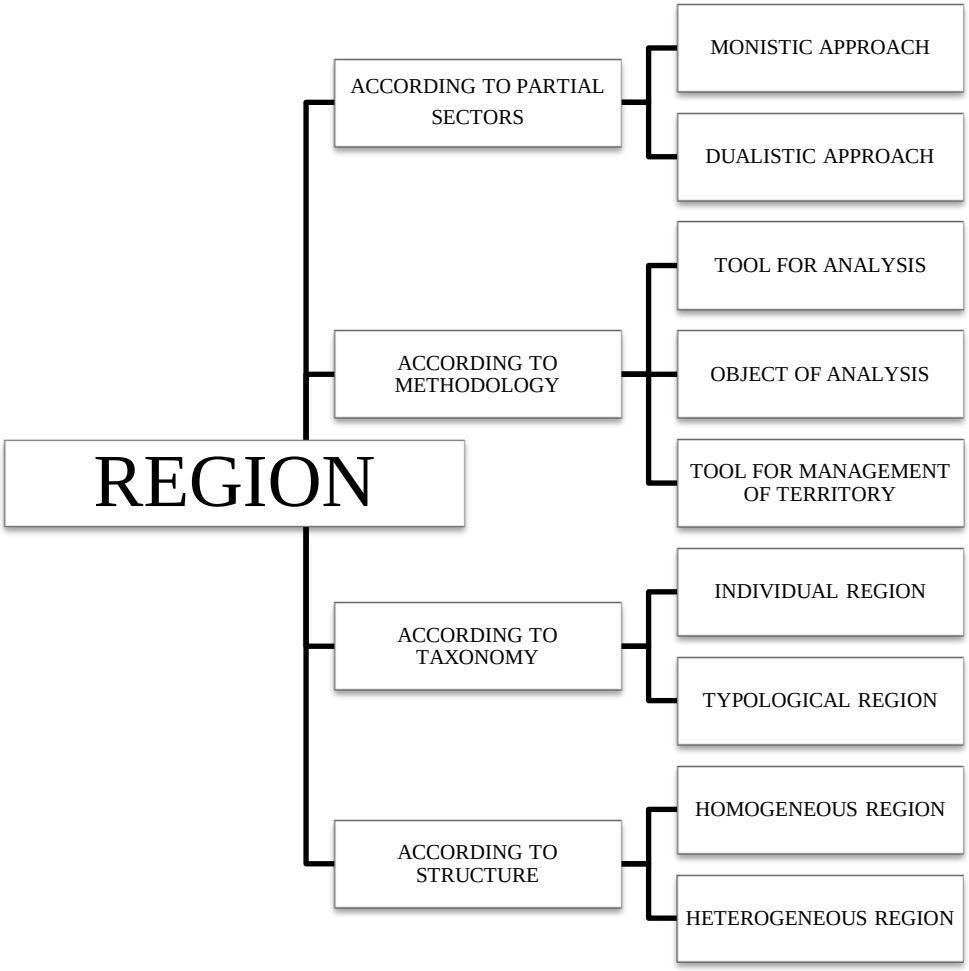

Figure 1 - Hierarchical Diagram of Region Classification (Source: Klapka & Tonev, 2008; own work)

4.2.1 Regions according to partial sectors

This classification is elementary concentration of two approaches – *monistic and dualistic*. Monistic approach considers the geography as the united scientific discipline, and settles the type of *complex geographic region*. Dualistic approach divides the geography into physical natural sector – *physical-geographic type of region* – and humane sector – *humane-geographic type of region (socioeconomically geographic region)*.

In case of state administration and in need to distinguish the purpose of region, there is a classification for the necessity of public administration as *administrative regions* and *purpose regions* that are determined on the base of solving a specific problem. Within the meaning of this classification, an instance of the regions where the state central support is aimed may be according to Žítek (2002) as structurally affected regions and economically weak regions. Structurally affected regions are the areas represented by high rate of industry and urbanization. Industrial basement undergoes significant restructuring and decrease, typically,

with high rate of unemployment. Economically weak regions represent the areas familiar for low life standard, high employment rate within primary sector, low population density, low unemployment rate, on the other hand there is acceptable environmental standard. Respectively, rural regions with low rate of urbanisation and economic development account here.

From the economic development point of view, general classification is represented by three types of region. *The growth regions* built new segments of industry and services which is supported by the growth of population and migration. In *the stagnate regions*, economic development is not significant in contrary to actual structure. *The problematic regions* usually show long-time low economic performance or contain more unfavourable socioeconomic phenomenon.

4.2.2 Regions according to methodology

Methodological viewpoint clarify the purpose of the region classification. Regions are used as *a tool for analysis*, where region plays the role of complex statistical unit, o*bject of analysis*, where the determination of region is the output of analysis, or *tool for management of territory*, where the strategic/regulating plan for region is settled and the plan of development is in place. (Klapka & Tonev, 2008)

4.2.3 Regions according to taxonomy

Taxonomy classification works with the exact geographic location of region. *The individual regions* are determined on the base of specific characteristics and marks and commonly have own name (e.g. the Himalayas, the Maghreb, etc.). Therefore, the individual region is unique and cannot be repeated in any geographical material.

The typological regions are more numerous and repeatable. These regions are determined by common characteristic (e. g. any nature park, regions containing high share of men population).

4.2.4 Regions according to structure

The structure of region is one of the most significant properties of region. Interpretation of Johan Heinrich von Thühen and Alfred Weber or German geographer Hans H. Blotevogel refers to two types of region according to their structures. (Krejčí, 2011) *Homogeneous region*

is characterized by the identical attributes within the whole area. It is favourable to search for the criterion of homogeneity and for the types of interrelationship between landscape spheres. Commonly, the homogeneous regions represent the physical geography rather than the socioeconomic geography. (Wokoun, 2001)

Heterogeneous region are united in the internal structure/organizational relations. It is composed by nodal centres and peripheries which are connected with centres via flows and lines. Heterogeneous region requires for interrelationship among components of landscape spheres. This regionalism determinates the mutually active spatial elements, flows of material, energy, information which act as linkage. At the same time it describes the position of these elements within the hierarchical scale of system. (Wokoun, 2001)

4.3 REGIONAL DEVELOPMENT

In order to establish theories, the former movement that studied regions and tried to implement existence of unsubstantial disparity and name the uniqueness of individual region was regionalism. At the same time, regionalism endeavored to deal with cultural and ethnic emancipation of regions on the beginning of 20th century (after the World War I). Besides the social issues, the movement searched for administrative (municipal), economic and cultural concerns. (Krejčí, 2011) Simultaneously, the precondition of classical economic theories about renovation of economic balance seemed to be unfilled. Thus the analysis of the causes of diversification and looking for solution in reducing the disparities induced in the forming of regional policy. (Žítek, 2002)

The strategy of regional development[2] according to OECD (2016) is in meaning of a broad term but can be seen as a general effort to reduce regional disparities by supporting economic activities in regions.

According to Stejskal & Kovárník (2009) the term of regional development is understood as a complex growth of socioeconomic potential and standard of region. The activity of local regional potential and rising of competitiveness is purposeful and strategically aimed effort of

[2] The development can be understood as the process of changes which are held progressively and which bring the higher efficiency and utility in terms of using the sources and realizing of possibilities from the initial state towards desirable state. (Macháček, 2011)

local participants that is oriented to improvement of social, economic and environmental (overall) quality of living.

The phenomena of reducing regional disparities and the rising of regional competiveness are obviously staying in contradiction to each other. Practically, the regional development could be divided into two general groups in which the criterions are delimiting or – on the other hand – partially overlapping.

First group is so-called *convergent group*. The theories of regional balance are covered in this group and authors tend to the hypothesis that regional development improves the disparities among regions. Secondly, *the group of divergence* supports the hypothesis that development on the level of regions broads the interregional disparity and affect the natural balance. The classification needs to be taken only in the general account and goes in line with the trends in regional policy. Main implications for theories of regional development are stated in the Table 1. (Blažek & Uhlíř, 2013)

GENERAL APPROACH	PREVAILING THEORY OF REGIONAL DEVELOPMENT
Neoclassical (1920 – 1940)	convergence theory (particularly the neoclassical models)
Keynesian (1950 – 1975)	divergence theory (e.g. Theory of Cumulative Causation, Theory of Polarization)
Neo-Marxist (1970-1985)	divergence theory (e.g. Theory of unequal exchange)
Neoliberal (1975 – nowadays)	convergence and divergence theory (e.g. new Theory of growth, Past dependence theory)
Institutional (1980 – nowadays)	divergence theory (e.g. Location theory, Learning regions theory)

Table 1 - Convergence/Divergence Theories of Regional Development (Source: Blažek & Uhlíř, 2013; own work)

Kutscherauer (2007, p. 11) follows the classification of convergence/divergence theories of Blažek & Uhlíř and determines the limits of factors within observations of regional trends, beside the existence of different definitions of convergence and divergence. For instance the socioeconomic level between compared territories may be different (e.g. the explanatory

power of factor is various for developing countries in comparison to developed countries) and the level of reliability and comparability of the dataset may differ. In addition, there are subjective differences in the spheres that are just difficult to quantify, but still have a significant impact to regional development (differences in social-functioning phenomenon – prestige, fame, power, etc.). Character of used indicators is relevant, aggregate indicators and partial indicators need to be distinguished and the aspect of absolute or relative monitoring of territorial disparities must not to be overlooked. Another limit can be removed by emphasis to selection of areas and specific factors that reflect the development of regional disparities as various indicators have diverse representativeness in capturing the regional trends. Simultaneously, the developmental paradigm is specific for each period which is connected with various fashionable indicators. The length of period is important in terms of convergence trends – the period in which an analysis is carried out and the length of the period during which the analysis is performed must be reviewed. Time plays an important role within the analysis in relation to the progressive reduction of inequality in observed phenomenon.

4.4 REGIONAL DISPARITIES

According to Kutscherauer (2010, p. 8) regional disparity means divergence or inequality of characters, phenomena or processes having specific territorial allocation (may be allocated in defined territorial structure) and occurring at least in two entities of the territorial structure.

As the most significant disparities that show differences between regions are considered socioeconomic indicators. (Matlovič & Matlovičová, 2005) Due to the study of European Parliament, the disparities account for results of the process of polarization. Growing of regional disparities is caused by steep performance growth of particular regions what leads to accumulation of wealth and producing means on one hand and on the other hand on overall social situation and unemployment of region. (Dubois, 2007)

More preciously, Kutscherauer (2010) and Žítek (2002) defines primary and secondary factors that influence the existence of disparity between regions.

PRIMARY FACTORS CAUSING REGIONAL DISPARITY	
Relatively low mobility of labour force	The labour force reacts slowly to the demand of wage, thus the disparity in revenue occurs across the regions; this causes the important disparity in incomes and employment

Relatively low mobility of capital	The rigidity of capital exist toward the differences in producing costs; this causes the important disparity in incomes and employment together with relatively low mobility of labour force
Geographical factors	Geography directly affects the disparity and creates the disadvantage of peripheral region or regions with weak natural diversity (high shipping costs leads to high prices, low revenues and limited markets, limited access to city centres for specific services, high distance from client, low frequency of public transportation)
Economic structure of regions	There are regions that stagnate or are slow in economic development in contrary to economically growing regions where the demand for labour is progressive
Other primary factors	Centralization/decentralization, state regional policy, psychological factors

Table 2 - Primary Factors causing regional disparity (Source: Kutscherauer, 2010; Žítek, 2002; own work)

The secondary factors flow from primary factors and contribute to unequal regional development.

SECONDARY FACTORS CAUSING REGIONAL DISPARITY	
External economy	Connection system and administration system with centre
Demography situation	e.g. differences between urban and rural population
Rigidity of costs and prices	The market in developing regions does not work naturally, the adaptation to demand and supply is none or very slow
Environmental factors	Attractiveness of environment
Other secondary factors	Differences in innovation, differences in social and industrial platform

Table 3 - Secondary factors causing regional disparity (Source: Dušek, 2011; Kutscherauer, 2010; Žítek, 2002; own work)

Partnership between developing and wealth regions leads to negative or positive effect. In case of positive consequences, the developing region profits from the relation and gain the effective growing impulses and developing instruments. (Kutscherauer, Šotkovský,

Adamovský & Ivan, 2013) These instruments by which the development is driven flow from external or internal application. The regional policy concerns an optimal combination of these instruments for specific object and region. In order to support economic growth regions apply means from financial sphere as is straightening of intensity of interregional economic relations, providing of capital to entrepreneurs, grants, subsidy, endowment etc., further on from administrative sphere where direct or indirect impacts of state policy, legislation, organizational norms and obligatory procedures plays important role. Administration sphere is tightly connected with institutional sphere where cooperation among institutions, regional management and localization of firms support economic growth. As a result from administration and institutional sphere flows the means of conceptual and reconstruction sphere that is made up from development strategy, programmes, local planning, land modification, investing building, reconstruction of infrastructure, providing of specialized services and consultancy etc. Essential for economic growth is the socio-psychological sphere in meaning of education, communication, motivation and the like. (Dušek, 2011, p. 34; Stejskal & Kovárník, 2009; Žítek 2002)

The application of economical instruments relates with competitiveness of regions. Wokoun and Kouřilová (2012) quoted Turok´s classification of competitiveness of regions and municipalities. Besides descriptive economic indicators (employment rate, GDP per capita, FDI) it is necessary to monitor the general and supportive factors of economic development. Firstly, it is the ability of local firms to purchase products on external markets and the effectiveness of production and value of these products. Secondary, the usage of labour, capital and natural resources must be regarded.

In the meaning of primary factors that influence the interregional balance, phenomena of labour and capital cause the disparity. According to Žítek (2002, p. 117) the standard of wages is pivotal to remove differences or renewal a balance in regional economic development. The developing region decreases wages and establishes the competitiveness advantage for capital. After the flow of the capital in the region, unemployment rate declines, average standard of wages is growing and therefore the disparity in socioeconomic level is removed. This hypothesis works in case that the limits of wage policy do not cause emigration and population of region is cooperating with the regional strategy.

Currently, the social alternative indicators take place in the analysis more frequently. The individual is not perceived only as a unit of GDP but is taken as a personality with many needs which cannot be stabilized only by monetary means. There are globally introduced Human development index, Human poverty index, Gender-related development index, Gender Empowerment Measure, etc. (Trávníčková, 2010)

For instance, within the framework of the Initiative for ASEAN Integration established to narrow the development divide and enhance competitiveness, the organization aims to three essential pillars in which the development is supported. Economic policy, socio-cultural policy and political security are the issues to provide a structure for regional cooperation through which the more developed ASEAN members could help those member countries that most need it. This includes specific regional cooperation activities aimed at assisting the less developed member states to achieve closer economic integration, to benefit from ASEAN schemes for regional economic integration activities, to supplement national efforts directly aimed at poverty reduction and the promotion of equitable and inclusive development. (ASEAN, 2009)

4.5 REGIONAL DISPARITIES MEASUREMENT AND EVALUATION

The attitude of researchers towards the measurement and evaluation of regional disparities is not homogenous. Most of the actual approaches to regional disparity evaluation use several disparity indicators that are processed by different mathematical and statistical methods. Usually, the aim is to obtain one comprehensive index that represents each of the analysed territories. (Poledníková, 2014) However, five general methods have been assessed for practical measurement of regional disparities (Kutscherauer, Šotkovský, Adamovský, & Ivan, 2013, pp. 67-72):

4.5.1 Method based on scaling technique

When estimating own classification scale, a list of various indicators must be developed. In any case, these indicators must be precisely and unambiguously defined.

An advantage of this approach is the quite good transparency and trouble free extensibility of analysed group due to the fact that when the number of examined indicators is increasing no additional calculations of values of different indices are needed to be performed. But, the process itself is not a form of measurement and does not provide concrete quantitative data.

4.5.2 Traffic-lights method

Traffic-lights method is a sophisticated scaling method. Specific symbols (green, orange, red colour) are assigned to each values of indicator that match with given percentage level of indicator. The clear arrangement and fast results is the advantage of the method. Traffic-lights method is appropriate in case of analysing and evaluation of dataset organized in tables.

4.5.3 Average deviation method

Average deviation method shows variability defined as an arithmetic mean of absolute deviations of different values of examined indices from chosen value.

The way of calculation depends on formula of unvalued absolute average deviation:

$$\bar{d}_i = \frac{\sum_{i-1}^{p} |x_i - \bar{x}|}{n_i}$$

valuable absolute average deviation:

$$\overline{d_\iota} = \frac{\sum_{i=1}^{p} |x_i - \bar{x}| n_i}{\sum_{i=1}^{p} n_1},$$

or as a relative average deviation:

$$\overline{d_\iota'} = \frac{\overline{d_1}}{\bar{x}} \cdot 100$$

Disadvantage of above approach consists namely in impossibility to define average value of the whole system from average deviations defined for different sets of indicators, i.e. from average sub-deviations.

4.5.4 Point-by-point method

The result of point-by-point method is assessment of region which reach the minimum/maximum value in case of analysed indicator. The minimum is concerned in situation that decline is a progress of indicator. The maximum value is evaluated in the

opposite situation. This region is evaluated by point-by-point method by 1,000 points while other regions score within 0 up to 1,000 points depending on per mile range given by value of their own indicators from criteria value given in advance. In case of the MIN criterion, the dataset is arranged in ascending order.

The point-by-point method is suitable for graphical presentation when the changes throughout development of disparities are preferred and the long-term dataset is required.

The minimum indicator is defined by formula:

$$B_{ij} = \frac{x_{i\,min}}{x_{ij}}$$

The maximum indicator comes on the basis of formula:

$$B_{ij} = \frac{x_{ij}}{x_{i\,max}}$$

Total summarization of calculated points put the final value of aggregated indicator. The principal advantage can be seen in the opportunity to gather indicators expressed in different units. At the same time, the result of analyse gives the scoring number of each region, define the regional disparities and formulate the conclusion.

4.5.5 Standardize variable method

The method has the cumulative value approach and provides knowledge of actual situation or the development in recent years thanks to standard deviation across the regions. The value of variables is calculated on the base formula:

$$u_{ij} = \frac{x_{ij} - x_{i\,max}}{s_{xi}}$$

or

$$u_{ij} = \frac{x_{i\,min} - x_{ij}}{s_{xi}}$$

After the detailed look to methods mentioned above is obvious that each method has own pros and cons while their usage depends not only on the level of difficulty in the practice but, at the same time, on existence of suitable indicators due to the fact that only quantitative indicators may be used.

Kutscherauer et al. (2013, p. 66) defines the methods for evaluation of regional disparities as following. However, in order to following application in the thesis not all methods mentioned below are closer delineated:

- interregional comparison method
- methods utilizing the Geographical information system
- method of real convergence
- variability level (spatial statistical methods)
- cluster analysis
- factor analysis
- simplistic model
- territorial Gini coefficient modified by OECD
- method of artificial neuron nets

4.6 CORRELATION

The correlation shows the proximity and similarity between variables. In case that variables are highly correlated, the overall analysis´ result would be distorted by multiple weights of correlated variables. (Řehoř, 2010; Minařík, Borůvková, & Vystčil, 2013)

The correlation as a statistical linear dependency is measured by correlation coefficient. The coefficient is a number in absolute terms for which stands $|r| \leq 1$. The dependency of r has levels as following (Řehoř, 2010):

$\|1.0\| \geq r \geq \|0.9\|$	indicates very high correlation,
$\|0.9\| > r \geq \|0.7\|$	indicates high correlation
$\|0.7\| > r \geq \|0.5\|$	indicates moderate correlation
$\|0.5\| > r \geq \|0.3\|$	indicates low correlation

|0.3| > r = 0 indicates no correlation

4.7 CONVERGENCE

The term of convergence became popular in 80´s and 90´s of the last century to define growth of the GDP. Nowadays, the meaning has spread among other fields as well. According to Minařík, Borůvková & Vystčil (2013), the convergence is assessed in case that statistical units draw near in time. If they draw apart, the divergence is observed. In the strict meaning, the phenomena may be measured only in a two-object-case. Otherwise the phenomena are understood only as a prevailing tendency. Units standing outside the prevailing tendency are referred to as negative or positive disparities.

In the meaning of real convergence, the method is at first assessed development of different indicators characterising territorial differences and then is defined whether these differences are converging or – on the contrary – diverging. (Kutscherauer, Šotkovský, Adamovský, & Ivan, 2013) The development of growth is measured by mean coefficient of growth written as (Dufek, Minařík, & Sojková, 2009):

$$\bar{k} = \sqrt[n]{\frac{y_n}{y_0}}$$

There are three types of convergence which the economists work with. From the hypothesis that the developing regions are generally economically faster growing than the developed regions follows the *absolute type of (unconditional) convergence* that has never been and never will be occurred. The economies must converge to the same level of steady state with the same institutional, technological, etc. organization. (Gaspár, 2012; Čadil, 2010)

However, there are many factors that may lead to divergence apart from others that may show convergence. This state is called *conditional convergence*. Thus countries with different structural variables automatically diverge. At the same time, the states having same initial conditions will always converge. In this order *the convergence club* exists. (Gaspár, 2012; Čadil, 2010)

Convergence itself covers two approaches that are suitable in terms of the thesis. These processes differ according to calculation the change within given period with utility of different indicators (Minařík, Borůvková, & Vystčil, 2013; Gaspár, 2012):

4.7.1 Beta-convergence

Beta-convergence works on the assumption that units showing originally low values grew faster than units showing originally high values. The base-year values (or log-values if right-skewed or in case of outliers) are plotted on x-axis against mean coefficient of growth (log-geometric mean) on y-axis. A scatterplot obtains a straight line with slope down tendency.

The method of least squares is used. The regression model is calculated according to formula:

$$log\bar{k}' = \alpha + \beta \log y_0$$

Based on sign of slope β the sloping line must be assumed:
β < 0 downward sloping line – prevailing tendency is convergence
β > 0 upward sloping line – prevailing tendency is divergence
β = 0 line is parallel to x-axis – neither convergence nor divergence occurs

The coefficient of determination is calculated and expressed as following formula. If coefficient of determination approaches 100, the indicated tendency is significant. In contrary, if it approaches zero, the tendency is deemed as non-significant:

$$100r^2 = 100 \cdot \frac{var \log \bar{k}'}{var \log \bar{k}}$$

4.7.2 Sigma-convergence

Sigma-convergence is based on underlying assumption whether variability of values (or log-values if original values are right-skewed or the outliers exist) decrease in time systematically then the convergence takes place.

Variability of dataset is measured by standard deviation. If standard deviation increases systematically, divergence occurs. Sigma convergence is calculated as (Dufek, Minařík, & Sojková, 2009):

$$\sigma_t = \sqrt{\frac{1}{m-1}\sum_{j-1}^{m}\left(logy_{jt} - \overline{\log y_t}\right)^2}$$

Sigma-convergence may be assessed without beta-convergence. Beta-convergence is necessary however not sufficient precondition for sigma-convergence. Sigma-convergence shows the result on the ground of each period of time. Thus the standard deviations of given years create plot where the systematic development can be observed.

Minařík, Borůvková & Vystčil (2013) focus on few limits of convergence analysis. When measuring convergence, the attention must be paid to the fact, that some indicators cannot exceed the value of 100 %. If the sample is made up from developed regions with high values of indicator, the measuring of convergence may be a problematic issue as the change is in very small-scale. Secondary, if the convergence and divergence occurs at the same time throughout the same sample, the issue must be solved. Typically, the convergence is observed among less developed regions and divergence is found among more developed ones. In such instance, the dataset is supposed to be split to analyse the regions separately. Finally, sigma-convergence may explain inconclusive/monotone results of beta-convergence while analysing the long-term period. Sigma-convergence may reveal that within the period the tendencies of convergence and divergence are changing.

4.8 INTEGRATED INDICATORS

The integrated indicators are supposed to represent the socioeconomic sphere and lead to appropriate conclusion. One of the indicators combines three sub-indicators from economic and social sector. The rest are determined by either economic, social or demography theories. All integrated indicators are commonly and widely used in terms of evaluation of development.

4.8.1 Gross Regional Domestic Product (GRDP)

The gross domestic product at purchasing power parity represents the final conclusion of production activity in the given country of producing units. It goes in line with overall production of goods and services together with overall consumptions. In addition, GDP is calculated with value added taxes, custom duty and net exports. (Žítek, 2002)

When calculating the GDP, three sophisticated approaches can be found. *The expenditure approach* which is the most common and the one used on most Wall Street trading floors, calculates with (Yamarone, 2010; Gottheil, 2013; Žítek, 2002):

$$GDP = C + I + G + NX$$

Second approach, *the income approach*, is an alternative calculation. Instead of determining GDP by computing the total value of all final goods and services produced in the economy, this approach computes the total payments made to households that provide the resources used in producing the final goods and services. Thus the GDP is composed by (Gottheil, 2013; Yamarone, 2010):

$$NI = W + R + i + PR$$

After establishing the expenditure and the income approach, *the production (product) approach* arrived in seclusion. This approach is not preferred as it contains the difficulty to differentiate between intermediate and final goods. The method counts the production by sector of activity, sometimes extrapolates value added with tools such as Index of Industrial Production, physical quantity indicators or sales type statistics to estimate the value added in manufacturing. (Khan, 2014)

To achieve the optimal results, the thesis works with GDP per capita which enable to compare the economic production across the regions. In the World Bank methodology, GDP per capita is a gross domestic product divided by midyear population. Population is based on the de facto definition of population which counts all residents regardless of legal status or citizenship, except refugees not permanently settled in the country. (The World Bank, 2008) Population, land area and income as measured by GDP are used throughout the World Development Indicators to normalize other indicators. (The World Bank, 2003)

The Gross Regional Domestic Product (GRDP) is conceptually equivalent to gross domestic product (GDP). The GRDP measures newly created value through production by resident production units in the domestic economy, while for the former measures newly created value through production by regional production units in the regional economy that may be

represented by a state, province or a district. (Department of Economic and Social Affairs, UN, 2010)

The GRDP calculates the difference between total production and intermediate consumption of individual sectors of the region. The regionalization of GDP is provided by methods bottom-up/top-down or pseudo-bottom-up/pseudo-top-down (if regional data are missing; are compensated by highly correlated data). (Žítek, 2002) Since it is expressed in current market prices, it includes the development of changes due to price fluctuations. (Český statistický úřad, 2016)

4.8.2 Human Development Index (HDI)

The Human Development Index (HDI) is relatively modern demographic criterion. HDI was published in 1990 by the United Nations Development Programme (UNDP). The measure was established to emphasize that people and their capabilities should be the ultimate criteria for assessing the development of a country. At the same time, economists struggled with the fact that no national accounting concepts capture all dimensions of economic welfare (e.g. quality of life, social justice, etc.). The HDI provides a means by which inter-country and inter-temporal comparisons of living levels may be undertaken. (Doessel & Gounder, 1994) The HDI may also be used to question national policy choices asking how two countries with the same level of GNI per capita may turn out with different human development outcomes.

The HDI is the geometric mean of normalized indicators for the three dimensions. The scores for the three HDI dimension indicators are then aggregated into a composite index using geometric mean. The measure summarizes three sub-indicators, respectively the key dimensions of human development (Development Programme, UN, 2015):

- Health (*Life expectancy*)
- Education (*Literacy and school enrolment*)
- Decent standard of living (*GDP/GDRP*)
- It does not reflect on inequalities, poverty, human security, empowerment, food security, migration etc.

According to International Development Department of OECD (2016) the link between economic growth and human development operates in two manners. Firstly, from the macroeconomic perspective the growth increases a tax base of country and therefore makes

government to spend more on the key public services of health and education. Growth is essential if government continues to provide public services which directly benefit the poor population. Although aid may provide initial support, increasing public expenditure in developing countries must ultimately be financed by collecting greater tax revenues. Secondary, the primary and secondary school enrolment are positively associated with higher level of per capita income. Life expectancy is clearly positively related to level of GDP per capita according to cross-county evidence.

Health is represented by *life expectancy, education by literacy and school enrolment*. The literacy and school enrolment indicators are combined in weighted average as the education and standard of living by GDP per capita. The value for each these components is transformed into an index using a normalization formula in which the actual value is compared to a stylized range of values across all countries (Stanton, 2007)[3]:

$$Index_1 = \frac{LE_i - minimum}{maximum - minimum}$$

$$Index_2 = \frac{2}{3} \cdot \left(\frac{LIT_i - 0\%}{100\% - 0\%}\right) + \frac{1}{3} \cdot \left(\frac{ENR_i - 0\%}{100\% - 0\%}\right)$$

$$Index_3 = \frac{\ln(GDP_i) - \ln(minimum)}{\ln(maximum) - \ln(maximum)}$$

In the final step for calculating HDI, the health, education and income indices are averaged together, with each one given an equal weight. (Stanton, 2007) The index ranges from 0 to 1. If actual value of index is equal to minimum value, the index is zero. If the actual value of index is equal to maximum value, the index is one. (Mukherjee, 2002):

$$HDI_i = \frac{(Index_1 + Index_2 + Index_3)}{3}$$

[3] The per capita GDPs used in the income index are in USD and are purchasing power parity adjusted to eliminate differences in national price levels. Natural logarithms are calculated for the actual minimum and maximum values in order to account for the diminishing marginal utility of income. (Stanton, 2007)

HDI has plays two roles in the field of applied development economics. Firstly, HDI as a tool to popularize human development as a new understanding of well-being, and secondly, it is an alternative to GDP per capita as a way to measure levels of development for comparison across the countries and time. Ranking of countries according to their HDI fairly correlate to ranking of per capita income rankings. The deviation is found in case of the oil-exporting countries which have high GDP per capita but low values on social development indexes. (Mukherjee, 2002)

It is important to note that national and international data of HDI (and other indexes) can differ because international agencies standardize national data to allow comparability across countries, and in some cases may not have access to the most recent national data. (Development Programme, UN, 2015)

4.8.3 Poverty Gap Index

The poverty phenomenon is a multidimensional topic that covers various forms of material aspects of poverty. Hunger and food insecurity remain the core concerns. Thus next to classification of poverty by monetary income (per capita income, consumption of households, consumption per capita, etc.), there are indicators taking the food and health into account (the health data of population, the basic needs, calories per capita, etc.). In addition, poor population is less able to access the heath care, is under higher risk of illness and disability. Although, the poverty rate clearly relates to national income, it is a global phenomenon which is seen in low, middle and high income countries. (WHO, 2016)

In order to consequences, the poverty is classified by two terms. *Absolute poverty* refers to a set of amount by which the individual´s basic necessities of life may be purchased or reached. Once the individual´s income drops under the level of given amount, theoretically the individual may be confronted by death. For the establishing of the absolute minimum of income, the national and cultural differences must be regarded. *Relative poverty* defines poverty in relation to the economic status of other members in the society. The poverty then flows from the set at 60 % of a country´s respective median disposable income. (UNESCO, 2016; Želinský, 2009; The International Labour Organization, 2016)

The most objective source of calculation the poverty is the World Bank, undoubtedly. The mission of this institution is concerning the issues of world poverty and its sustainable

reduction. For computing of the rate of poverty, so-called *head-count index* is the most spread measurement of proportion of poor population, formally quoted as a percentage calculated in direct proportion as (The World Bank Institute, 2005; Želinský, 2009):

$$P_0 = \frac{N_p}{N}$$

Disadvantages of the general proportion are described by the World Bank Institute (2005). Firstly, the intensity of poverty is not taken into consideration. Secondly, the head-count index does not indicate how poor the poor people are and does not capture if the line of poverty increase/decrease.

Next to Gini index of distribution of poverty across the society/state, far more suitable measure of poverty is the *poverty gap index* that adds up the extent to which individuals on average fall below the poverty line. As the poverty gap is a poverty line minus the income of the poor individuals, the individuals which fall under into the poverty gap have a gap of zero. The aggregated deficit of poverty is in proportion to the poverty line. After a determination of the poverty gap, the index may be written as (The World Bank Institute, 2005; Želinský, 2009):

$$P_1 = \frac{1}{N}\sum_{j=1}^{N}\frac{G_j}{z}$$

In particular, for emerging and developing countries was estimated poverty line of USD 1.25 a day and USD 2 a day for extreme and moderate poverty. Respectively, extreme poverty is defined as living on a household per capita income of less than USD 1.90 PPP per day. Moderate poverty is defined as living on between USD 1.90 PPP and USD 3.10 PPP per capita per day.[4] (The International Labour Organization, 2016; The World Bank Institute, 2005)

[4] Beside the risk rate of poverty, there are others primary indicators affecting the society. The European Commission (2006) determinates indices as the rate of long-term unemployment, population living within unemployment households, people premature quitting education, gap in employment of immigrants, material deprivation, standard of living, welfare of children, etc.

However, according to the International Labour Organization (2016) there are data limitations and related methodological issues regarding to analysis across countries. When comparing the poverty, the countries provide data from various sources (registered data, specific surveys, etc.). Some countries lack the data of national income thus not all variables required for complete analysis are presented. In particular situations, the data are not treated and harmonizes in the same way and the methodological approaches may differ as well.

4.8.4 Unemployment

According to Žítek (2002, pp. 59-61), the willingness to work represents the cognition of effect of work that is at least equal to sacrifice during the performance. This performance of work directly leads to achieving of means which is necessary to satisfying the needs. In the contradiction to supply of work from individuals, there is a supply of work from employers, more preciously the demand of work. This demand is affected by microeconomic, demographic and social factors.

The theory of unemployment due to the Guidelines of the International Labour Organisation, which is now the most widely used definition, is determined by condition valid for unemployed person, such as someone aged from 15 up to 74 years without working at least one hour during the reference period but is available for and actively seeking work. (O´Higgins, 1997)

Eurostat (2016) specifies the theory of an unemployment person by the availability to start working within the next two weeks (or has already found a job to start within the next three months) and the fact that the individual had actively sought employment at some time during the last four weeks.

Žítek (2002) shares the definitions mentioned above and provides the emerging conclusion. If anyone does not fulfil the conditions, is classified as employed or economically inactive. At the same time Žítek provides the essential formulas of direct proportion (defined in percentage) for computing the rate of unemployment as following, respectively $L = E + U$:

$$u = \frac{U}{E + U} \cdot 100$$

or

$$u = \frac{U}{L} \cdot 100$$

The traditional classification of unemployment serves three types. *Frictional unemployment* implies from the vivid character of the market. The dynamic decision making results in any period when frictional unemployment depends on the natural processes in population. *Structural unemployment* occurs in the case of discrepancy of qualification demands on the side of market, or unfulfilled professional qualification on the side of labour. The structural unemployment ends in migration or requalification. Respectively, sometimes is so-called balance unemployment. The third type is *cyclical unemployment*. It occurs during the recession phase of the market cycle when investment and consumption expenditures begin to fall and the economy is unable to generate same number of jobs as existed at the previous cyclical peak. It falls as the prosperity is restored. Cyclical unemployment is a variance between real and natural unemployment rate. (Hughes & Perlman, 1984; Žítek, 2002; Baumol & Blinder, 2009)

4.8.5 Net Migration

Migration represents the moving of population as well as the increase or decrease of the total summary of population. From the above mentioned follows the migration is made up from two essential processes (Koschin, 2005):

- Immigration, calculated as:

$$i_t = \frac{I_t}{\bar{P}_t}$$

- Emigration, calculated as:

$$e_t = \frac{E_t}{\bar{P}_t}$$

These two processes are sometimes completed by return migration when the migrating people come back to the former place of living within one year. (Zemánek, 2012; Mužáková, 2010)

For interpretation of the change within population the difference of immigration and emigration $I_t - E_t$ is made. Even though, many countries either do not have accurate figures for immigration and emigration, or have no figures at all, net migration could be estimated. It is usually calculated as the difference between the total population change and the natural increase during the year. Net migration gives no indication of the relative scale of the separate immigration and emigration flows to and from a country (e.g. a country may report low net migration but experience high immigration and emigration flows). (Eurostat, 2015)

Klufová & Poláková (2010) describe the internal migration is caused due to better job opportunity, the expected life quality and the rate of unemployment, the public background and access to facilities, services and activities, the standard of traffic lines, transportation and technical operation.

The internal migration is classified as *inside-municipality migration* (moving within the municipality), *outside-municipality migration* (moving out of the municipality), *horizontal migration* (moving from a city to another city, from rural area to another rural region), or *vertical migration* (moving from rural area to city). (Klufová & Poláková, 2010)

The consequences of migration are determined by contradictory theoretical concepts. *Neoclassical growing concept* leads to the hypothesis that – owing to migration – the equalization of wage rate is realized across the regions. At the same time, empirical analysis proves that migration mutually correlates with economic growth.[5] (Čadil, 2010; Varadzin, Frait & Červenka, 2004)

4.8.6 Foreign Direct Investment (FDI)

Foreign direct investment belongs among key indicators according which the success and development of economic transformation and the economic integration is evaluated. On the

[5] However, migration may have the negative impact. In case of situation that supply of educated labour force grows, the demand for educated labour grows simultaneously. Those two effects press the wage rate down. This is specified in *cumulative causality concept*. (Čadil, 2010)

macroeconomic level, the structure and significance of FDI is assessed within national economics. At the same time, the FDI is an element of international integration, referred to as globalization. (Hlaváček, 2012; OECD, 2008)

Within the regional development references, the FDI is one factor by which the economic growth and competitive position of regions as well as international market is supported. It also provides a means for creating direct, stable and long-lasting links between economies. FDI also encourage the flow of technology and know-how into the hosting country. (OECD, 2008; Turnock, 2005)

OECD (2008) provides a complex definition of FDI as following. Foreign direct investment reflects the objective of establishing a lasting interest by a resident enterprise in one economy (direct investor) in an enterprise (direct investment enterprise) that is resident in an economy other than that of the direct investor. The lasting interest implies the existence of a long-term relationship between the direct investor and the direct investment enterprise and a significant degree of influence on the management of the enterprise.
The character of FDI may be direct in form of provided capital or through the related enterprises. The direct investment transactions are made up of three basic instruments (Duce, 2003, p. 5; OECD, 2008). Firstly, *the equity capital* containing comprising equity in branches, shares in subsidiaries and associates and other capital contributions such as provisions of machinery. Furthermore, *the reinvested earnings* consisting of the direct investor´s share of earnings not distributed, as dividends by subsidiaries or associates and earnings of branches not remitted to direct investor. And *other direct investment capital* in meaning of borrowing and lending of funds, including debt securities and trade credits between direct investors and direct investment enterprises and between two direct investment enterprises that share the same direct investor.

The methodological basis for the compilation of FDI statistics is the IMF Balance of Payments and International Investment Position Manual and the OECD Benchmark Definition of FDI. The OECD Manual sets the world standard for FDI statistics whereas the IMF Balance of Payments provide the statistical framework for national accounting. All these manuals share basic concepts, definitions, classifications and conventions in order to ensure consistency and data comparability. (Eurostat, 2014)

5. ANALYTICAL PART

The analytical part concerns the Indonesia as a country of research, its economic and population overview and serves basic schema of differences among provinces according to GRDP indicator. Furthermore, the chapter provides the results of basic statistics method and correlation analysis of integrated indicators what is used subsequently to breakdown of the data characteristics. The beta-convergence analysis finds the approximation or extension of regional disparities. The sigma-convergence analysis put forward the results that either prove the results of beta-convergence, or displays another direction of regional development.

In order to compute the convergence, the variable of *net migration* needs to be split into two sub-indicators – *immigration* and *emigration* (in thesis, labelled by terms of *IN-migration* and *OUT-migration* for better orientation). The dividing is held due to the fact that overall net migration works with negative values of immigration and therefore the logarithmic transformation is not able to perform whereupon the sub-indicators are calculated in positive values.

5.1 INDONESIA

The official name of the country is the Indonesian Republic. Indonesia is situated in the Southeast Asia, as an archipelago between the Indian Ocean and the Pacific Ocean. The total area accounts to 1,904,569 km^2. (Central Intelligence Agency, 2016) Indonesia lies in the tropic temperate zone. It crosses the equator, so the country is situated in both hemispheres, largely on the southern hemisphere. Indonesia is located on about 17,000 islands, of which the largest are Kalimantan and Papua, but the best known by tourists are Java, Sumatra and Bali. (Orbion, 2014)

Indonesia is a presidential republic where the president and vice president are directly elected by absolute majority popular vote. Country's strategic location lies along major sea lanes from the Indian Ocean to the Pacific Ocean. (Central Intelligence Agency, 2016) Before and on the beginning of 21st century, the strategic power – Netherlands – lied on different continent. Indonesia went through exhausting form from the colony over early democracy to dictatorship and one round again. History of Indonesia is accompanied by many various forms of forces and terrorism as well as the outbreak of civil conflicts and violence (religious, ethnic, state or communal violence). (Svoboda, 2010)

In the modern history, Indonesia went down in the world´s awareness by civil war in Aceh. (Amnesty International, 2015) When the tension within population was released, the Asian financial crisis occurred and caused poverty, unemployment and uncertainty about the future in many households. (Indonesia Investments, 2016b)

5.1.1 Indonesian Economic Overview

According to World Economic Situation and Prospects 2015 produced by Department of Economic and Social Affairs of United Nations, Indonesia is classified as developing country with low middle income. (Němečková & Harmáček, 2009; The World Bank, 2016) However, Indonesia is the largest economy in South East Asia and is experiencing fast-growing economical trend when the GDP value increase rapidly. The country has been growing steady in the last few years mostly due to the high domestic consumption and growth in exports of manufactured products and commodities. In year 2014, the Indonesian GDP decreased due to a surge in government spending and a faster increase in investment were unable to balance a slowdown in private consumption and decline in exports. (Husna, 2016) Stronger domestic demand generated slightly faster economic growth in the first half of 2016 but at a lower trajectory than suggested due to a more moderate increase in investment. (Asian Development Bank, 2016) There is a forecast that supposes the Indonesian economy will double its total GDP by year 2023. Since year 2021, Indonesia´s GDP value should overtake the GDP of Russian Federation. (Ekonomický deník, 2015)

OVERALL THE MOST RECENT DATA ABOUT INDONESIAN ECONOMY	
GDP (billion)	USD 861,934
GDP per capita	USD 3,346.49
GDP Growth	4.8 %
GNI (trillion)	USD 2,75
GNI per capita	10,680
Inflation per year, average in the consumer prices	6.36 %
FDI (billion)	USD 15,508
Share of agriculture on total GDP	13.5 %
Share of industry on total GDP	40 %
Share of services on total GDP	43.3 %

Table 4 - Overall the most recent data of Indonesian Economy (Source: Asian Development Bank, 2015; The World Bank, 2015; own work)

Regarding FDI in Indonesia in last year 2015, Singapore was the leading investor followed by Malaysia, Japan, Netherlands and South Korea. Investment from China grew sharply (especially for smelters and plants in Kalimantan and Sulawesi). However, it is not uncommon for Chinese companies to invest through their Singapore-based subsidiaries. The biggest beneficiaries of FDI in 2015 were mining, transportation, telecommunication and the mineral-processing sector. The continuously rising investment over the past years, support the expectation, particularly as the Indonesian government has been unveiling a series of economic stimulus packages in autumn 2015. With these packages the central government aims to attract more investment by deregulation and by offering fiscal incentives to actual and potential investors. (Sibarani, 2016)

5.1.2 Indonesian Population Overview

The current population of Indonesia is *261,623,813* people based on the United Nations estimates (2016). The Indonesia population is equivalent to 3.5 % of total world population. The country accounts for rank 4 in comparison to world. (United Nations, 2015)

The official language is Indonesian, whose bases consist of Malay completed and amended local languages and dialects. Next to it, Indonesians are used local languages (Javanese, Sundanese, etc.). The language of foreign trade is English and Dutch. (Ministerstvo zahraničních věcí České republiky)

OVERALL THE MOST RECENT DATA ABOUT INDONESIAN POPULATION	
Population in total	261,623,813
Population Density	144 people per km^2
Median age	28.6 years
Life expectancy at birth (years)	68.89
Urban population	53.4 %
Economically active population	67 %
Economically active population working in agriculture	35.9 %
Economically active population working in industry	20.6 %
Economically active population working in services	43.5 %
Labour force with tertiary education	7.9 %
Child labour (age of 5 to 14 years)	6.9 %

Human development index	0.684
Poverty headcount ration (USD 1.9 per day)	8.25 %
Unemployment	6.2 %
Net migration	-700,000

Table 5 - Overall the most recent data about Indonesian population (Source: United Nation, 2015; United Nations Development Programme, 2015; Worldometers, 2016; The World Bank, 2016; own work)

Close to 80 % of the Indonesian population lives in the west of the country, on the islands of Java and Sumatra, but this part of the population is growing in the slower trend than the rest of the country. (Piesse, 2015) On the base of the UN data, the Indonesia is one of the nine countries where the half of the world population will live by the year 2050. Indonesia population lives in intermediate fertility phase that have already experienced substantial fertility decline and women have on average between 2 and 5 children. (United Nations, 2015)

The region from both of Maluku over West Papua to Papua has the next smallest population. According to the 2010 census, roughly 3.6 million people live here. In the decade up to 2010, the population increased by 64 % due to increasing migration and a higher than average birth rate. In the west of the country, outward migration and low birth rates contributed to a slower rate of population growth. (Piesse, 2015)

After stabilization of Asian Financial Crises, Indonesia has experienced robust macroeconomic growth in recent years and the country has started in supporting the unemployment rate into steady downward trend. The success in decreasing of unemployment goes in line with the economic development and broadens working opportunities. (Indonesia Investments, 2016a) On the base of wider job supply, the internal migration is in the process. Beside the job seeking, the reason to migrate is study opportunities, movement due to pension or returning to the original region. (Susanti & Damayanti, 2015)

According to the UN Development Programme, the Indonesia is ranked 110 on the base of HDI. (Development Programme, UN, 2015) Between 1980 and 2014, Indonesia´s life expectancy at birth increased by 9.3 years, average years of schooling increased by 4.5 years and expected years of schooling increased by 4.3 years. In comparison to countries that are close to Indonesia, the HDI of Indonesia is above the average for countries in the medium

human development group (0.630) and below the average for countries in East Asia and the Pacific (0.710). (Development Programme, UN, 2015)

Poverty statistics published by the government in 2012 show that, while the highest incidence of rural poverty exists in the eastern islands, most of Indonesia rural poor live in the densely populated western regions of Java. Specific ethnic minority groups and women are also more likely to experience poverty. These communities are often not fully integrated into mainstream economic activities. (Rural Poverty Portal) At the same time, women tend to have less access to education, earn less than men, and are subject to discrimination and exclusion from decision-making processes within households and communities. Affected are also those who have been displaced from their land for industrial or agriculture reasons. (Rural Poverty Portal)

5.2 INDONESIAN PROVINCES

After decades of centralized national government, the Indonesia's institutional reforms which were implemented in the latter half of 1998 have led the country to become more democratized, decentralized, and deregulated. Referring to the Indonesian decentralization Law No. 22/1999, the local governments have authorities in all governmental functions except foreign policy, security and defence, religion, judiciary, fiscal and monetary policy and some other aspects. Moreover, local governments are also permitted to establish cooperation with organizations in foreign countries which could increase their openness and subsequently should accelerate the financial development of the regions. (Trinugroho, Agusman, Ariefianto, Darsono & Tarazi, 2015)

The main objective of regional autonomy is to promote improved delivery of government services and to raise the level of local government accountability. The application of decentralization policy is driven as the local governments are more familiar with the needs of their communities than the central government, and are expected to be able to create more suitable public policies. (Usman, 2002)

During the time the number of provinces is rising and the borders of regions are getting closer. The North Kalimantan has been established as the newest province thus most of data are not available for entire period of 2010 – 2015 determined for the purposes of thesis.

The provinces of Indonesia are displayed on Figure 2, defined due to GRDP per capita standard. The white provinces are the poorest, produce only *less than UDS 1,400*. The grey coloured are the under-average provinces (*up to USD 2,800*). Above-average *up to USD 4.200* provinces are the light blue ones (West Papua, Papua). Three purple provinces (Riau, Riau Islands, and North Kalimantan) reach *up to USD 7,000*. The darkest (DKI Jakarta, East Kalimantan) achieve *over USD 10,000*.

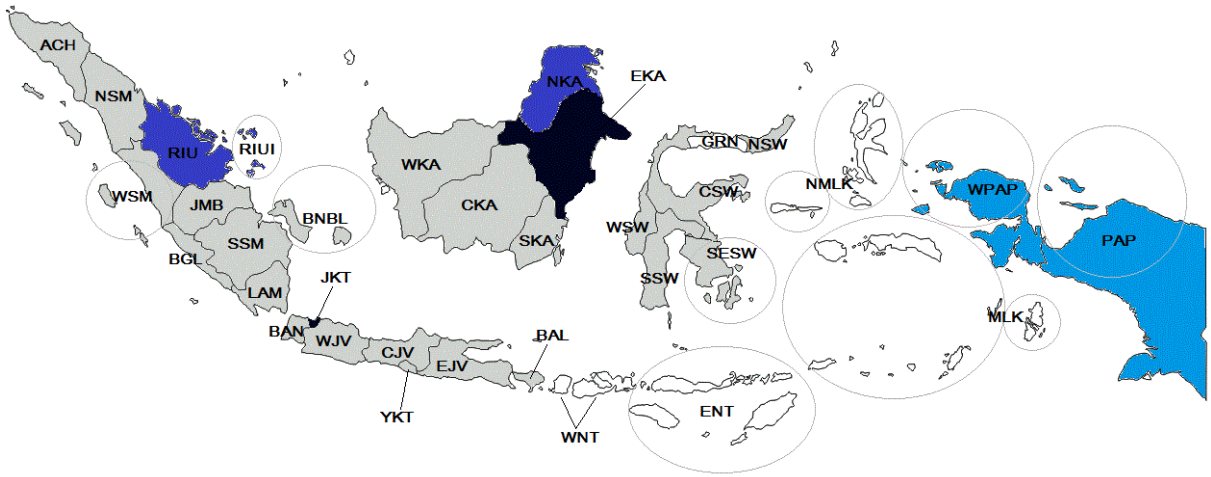

Figure 2 - Indonesian Map of Provinces (Source: World Press, 2014)[6]

[6] ACH – Aceh, NSM – North Sumatra, WSM – West Sumatra, RIU – Riau, RIUI – Riau Islands, JMB – Jambi, BGL – Bengkulu, SSM – South Sumatra, BNBL – Bangka Belitung Islands, LAM – Lampung, BAN – Banten, JKT – DKI Jakarta, WJV – West Java, CJV – Central Java, YKT – DI Yogyakarta, EJV – East Java, BAL – Bali, WNT – West Nusa Tenggara, ENT – East Nusa Tenggara, WKA – West Kalimantan, CKA – Central Kalimantan, SKA – South Kalimantan, EKA – East Kalimantan, NKA – North Kalimantan, NSW – North Sulawesi, GRN – Gorontalo, CSW – Central Sulawesi, WSW – West Sulawesi, SSW – South Sulawesi, SESW – Southeast Sulawesi, MLK – Maluku, NMLK – North Maluku, WPAP – West Papua, PAP - Papua

The correlation graph below displays the mutual relations of indicators on the base of initial data (mean from the given period) for each individual province. The median in the middle of box and the vertical lines corresponding to upper and lower quartile display values of variables.

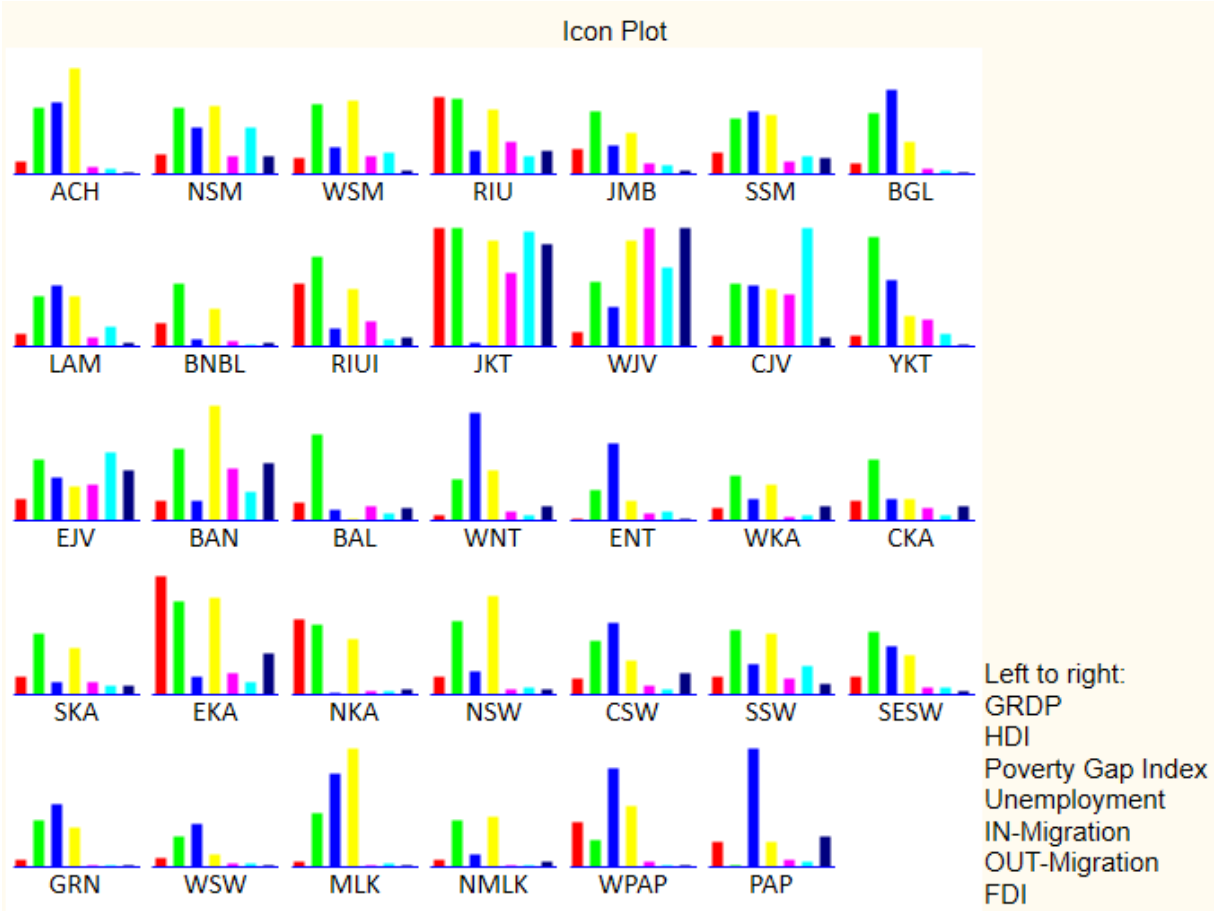

Figure 3 - Correlation graph of integrated indicators for each province (Statistics Indonesia; own work)

The highest *GRDP* was estimated at DKI Jakarta, not surprisingly, and East Kalimantan what is obvious when looking at the Figure 2 and overall set of correlation in Figure 3. The representatives of lowest regional gross product are the southern and northern remote provinces – East Nusa Tenggara and Maluku region.

As supposed, the highest value of *HDI* is seen for DKI Jakarta and DI Yogyakarta. Provinces being liable to the lowest human development, and at the same time the most remote from the capital centre of country, are West Papua and Papua.

Considering the *poverty gap index*, there is obvious development comparing year 2010 and 2015 at cases West Papua, Papua, Maluku, Gorontalo, Southeast Sulawesi and East Nusa Tenggara when the poverty gap become lower very significantly. However, these provinces still rank among ones with higher average poverty gap rate. In the contrary, Benguku province experiences upward trend in poverty gap index.

Perhaps due to the advanced tourism and growing connected services the lowest rate of *unemployment* is in Bali province followed by West Sulawesi. The numerous unemployment within the country may be found in Maluku and Banten although the share of unemployment people has been decreased rapidly, followed by DKI Jakarta.

Central Java and DKI Jakarta are the regions with high values of OUT-migration. On the other side, the West Java experiences the extra values of IN-migration. The question could be whether West Java province is the gradient area to DKI Jakarta and Central Java, or whether there are different socioeconomic phenomena causing such a significant immigration. In contrary, the West Java together with Banten are found in the relatively high IN-migration, which may correspond with the FDI described immediately afterwards, respectively the new job opportunities. The steadiest region concerning migration is the North Maluku displaying low values of IN-migration as well as OUT-migration. The differences in overall net migration are certainly caused by the size of province and the population density.

The object for foreign direct investments seems to be West Java, DKI Jakarta and Banten. On the other side, the investors are not interested in provinces of West Sulawesi and East Nusa Tenggara and Gorontalo.

In interest of the assuming dynamics of convergence within socioeconomic indicators, the essential variable is GDP that is essential when assuming the level of regional disparities. However, not only GDP growth is the concern on possible outliers. In the set of the cases, there may be provinces that experience faster growth/decline or have extreme values of indicators and may distort the results of convergence analysis. Therefore the possible outliers must be taken into account and at the same time, the estimation of these values is done before techniques of basic statistics are displayed in Table 6.

INDICATOR	FAST DEVELOPMENT (POSSIBLE OUTLIER) (highlighted green in Appendix 2 – Initial Data)	EXTREME VALUES TO OTHER REGIONS (highlighted red in Appendix 2 – Initial Data)
GRDP	Central Sulawesi – growth of 91 % (high geomean almost 1.14) South Sulawesi – growth of 88 % (high geomean 1.13) Aceh – the slowest growth (low geomean 1.03)	DKI Jakarta, East Kalimantan – average over USD 10.000
HDI	-	-
Poverty Gap Index	West Papua – reduction of 92.2 % (low geomean -0.22) Papua – reduction of 98.1 % (low geomean -0.34)	-
Unemployment	South Sulawesi, Aceh – growth of almost 20 % (high geomean 1.037, 1.034)	Bali – average rate only 2.31 % Banten – average rate almost 11 %
IN-migration	West Nusa Tenggara, Central Java – fast growth of almost (geomean 1.17, 1.11)	West Java – average of almost 900.000 emigrants
OUT-migration	Central Java – slow growth (geomean 0.92) Central Kalimantan – fast growth (geomean 1.08)	DKI Jakarta, Central Java – extremely high values of immigrants
FDI	Maluku – Coefficient of growth (1.95)	Gorontalo, West Sulawesi – extremely low values

Table 6 - Assessment of possible outliers (Source: Statistics Indonesia; own work)

For some cases, the possible outlier may be the region of North Kalimantan as is the most recently established province and the most of data is missing. In some cases (poverty gap

index, unemployment) are data available only for year 2015 thus the coefficient of growth is not possible to calculate.

5.3 CONVERGENCE OF INTEGRATED INDICATORS

The objective of this chapter is to analyse the dataset and decide whether the disparities across Indonesian provinces converge or diverge considering the integrated socioeconomic indicators. Results of the analysis reply the questions as following:

1. *Does the beta-convergence occur in each case of indicator/variable?*
2. *Do the results of sigma-convergence support the results of beta-convergence?*
3. *If so, what is the reduction of disparities expressed as a percentage?*[7]

Particularly, the measuring of convergence/divergence is used for assuming of the economic phenomena for group of regions having something in common (e.g. membership in particular union). In this case, the analysis is applied for demographic and socioeconomic indicators what is not typical. Therefore the results are presented more universally.

5.3.1 Basic Statistics

For statistical measuring the basic analysis of data distribution is carried. In STATISTICA Software, the minimum and maximum value, the variability characteristics of variance, standard deviation and coefficient of variation, and asymmetry parameters as skeweness and kurtosis.

[7] The calculation of sigma-convergence speed follows the analysis of Minařík & Dufek & Sojková (2009).

Variable	Descriptive Statistics			
	Mean	Minimum	Maximum	Variance
GRDP	2849,7	827,68	10290,4	5616782,592
HDI	67,2	55,90	77,8	17,992
Poverty Gap Index	1,7	0,41	3,9	0,914
Unemployment	5,7	2,04	9,9	4,329
IN-Migration	150654,5	20864,50	899981,5	33219416908,310
OUT-Migration	142859,3	14752,00	813671,0	43413919666,561
FDI	705,1	4,05	4974,7	1348075,775

	Std.Dev.	Coef.Var.	Skewness	Kurtosis
GRDP	2370,0	83,165	2,233339	4,408988
HDI	4,2	6,315	0,077749	1,559581
Poverty Gap Index	1,0	55,586	0,622155	-0,566719
Unemployment	2,1	36,381	0,591254	-0,433267
IN-Migration	182261,9	120,980	2,715099	8,477523
OUT-Migration	208360,1	145,850	2,361973	4,944453
FDI	1161,1	164,664	2,632451	7,019914

Table 7- Basic statistics of integrated indicators (Source: Statistics Indonesia; own work)

The minimum and maximum values correspond to the range of variability. The lowest expected squared deviation from the mean of values is measured at *Poverty Gap Index* what is given by the relatively consistent data of indicator which does not evince any extreme values. Its standard deviation is equal to 1. The highest variance is computed for both types of *migration*. Thus naturally the standard deviation of both migrations has the highest square roots of given variances. However the variance is not robust technique as it is a dimensional technique expressed in individual units of the data.

Coefficient of variation is more suitable to report the variability. With no dimension is expressed in percentage. The lowest quotient of standard deviation and mean is measured at *HDI* indicator ($V = 6.315\ \%$) and it means that HDI dataset is more concentrated around mean. The highest coefficient of variation has FDI indicator as the contrast between maximum and minimum value increases the mean, gives evidence about remote values and high variability.

Evidently, four indicators (*GDP*, *both migrations* and *FDI*) are right-sided skewed what indicates the number of values located under the average. This is probably caused by individually high values at DKI Jakarta and other provinces of Java which does not indicate the normal symmetry of data. Remaining indicators (*HDI*, *Poverty Gap Index* and

Unemployment) evince the dataset of no skeweness, more preciously HDI is almost equal to Gaussian function of distribution ($g = 0.08$).

The ideal form is not found at kurtosis parameter. Majority of indicators are of greater than normal kurtosis, especially *IN-migration* ($k_4 = 8.5$) and *FDI* ($k_4 = 7$) which correspond with the hypothesis of extreme values. *Poverty gap index* and *Unemployment* evince the flat distribution of low values.

5.3.2 Correlation Matrix

Before the convergence analysis takes place, there is a need to verify whether dependences between variables are not significant on the base of Pearson correlation coefficient, respectively are not approaching |1|. The high correlation would mean the measurement of one variable twice and would double the weight of criterions what has been specified as a limit of the thesis – question of GRDP toward HDI, in which the GRDP represents the third of total index.

Correlations
Marked correlations are significant at p < ,05000
N=34 (Casewise deletion of missing data)

Variable	GRDP	HDI	Poverty Gap Index	Unemployment	IN-Migration	OUT-Migration	FDI
GRDP	**1,000000**	0,510724	-0,407688	0,337539	0,272866	0,246540	0,405748
HDI	0,510724	**1,000000**	-0,577933	0,357711	0,421900	0,358164	0,308730
Poverty Gap Index	-0,407688	-0,577933	**1,000000**	-0,107765	-0,209065	-0,129847	-0,203509
Unemployment	0,337539	0,357711	-0,107765	**1,000000**	0,448918	0,341174	0,454674
IN-Migration	0,272866	0,421900	-0,209065	0,448918	**1,000000**	**0,799349**	**0,879212**
OUT-Migration	0,246540	0,358164	-0,129847	0,341174	**0,799349**	**1,000000**	**0,671595**
FDI	0,405748	0,308730	-0,203509	0,454674	**0,879212**	**0,671595**	**1,000000**

Table 8 Correlation Matrix for Variables (Source: Statistics Indonesia; own work)

The correlation matrix in spite of dependences on regression line does display significant relationship, however no of them is not reaching number |1|. Obviously the dependences of IN-Migration and FDI evince the important correlation (almost 0.9). This means that foreign direct investments stimulate workers, pensioners or students of different regions to immigrate for better opportunities. Second highest correlation is displayed between IN-migration and OUT-migration (0.799). Causation of such a significant relationship may be various. City people tend to move out to rural regions for pension, students stay at the place of studying due to direct job opportunities, the regional conflicts or environmental problems may cause a high share to migration especially in Indonesia. The relationship between HDI and Poverty Gap Index that reach the value of -0.58 proves that the development of human is directly

connected with poverty in meaning of GDP increasing. The correlation of GRDP and HDI (0.51) shows that the specified limitation of thesis is not a serious concern.

5.3.3 Beta-Convergence Analysis

In order of beta-convergence, the coefficient of growth needs to be calculated. The computing is processed as a quotient of y_n and y_0 for single variable with regard to the determined period. In this analysis, it is fifth root for the vast majority of cases. The only case when the root differs is the province of North Kalimantan. The root depends on the shorter period for which the data is published.

Generally, the beta-convergence works with logarithmic transformation of dependent variables (base-year value and coefficient of growth). The base-year value is fitted on horizontal x-axis and coefficient of growth is fitted on y-axis of scatterplot. Logarithmic transformation has been carried concerning to eliminate right skeweness that is determined by basic statistics techniques, eliminate the extreme values of outliers and transmit the different units of indicators into dimensionless form. Due to regression model, the beta coefficient is calculated as well as coefficient of determination by which the quality of the fit is indicated.

All the outputs are computed via STATISTICA Software. The results are displayed on regular linear-fit type scatterplot graph. The graph contains the correlation diagram to divide the scatter into four quadrants. The correlation diagram is an intersection of parallel lines to axis established by the mean of depended variables. In situation of unproved convergence/divergence (determination coefficient does not approach at least 50 %) the result follows from the distribution of cases across the quadrants. If the most of cases is located in second and fourth quadrant, the convergence is ascertained. The majority of cases founded in first and fourth quadrants indicate highly proved divergence. The lowest coefficient of determination, the wider variability of cases occurs over quadrants.

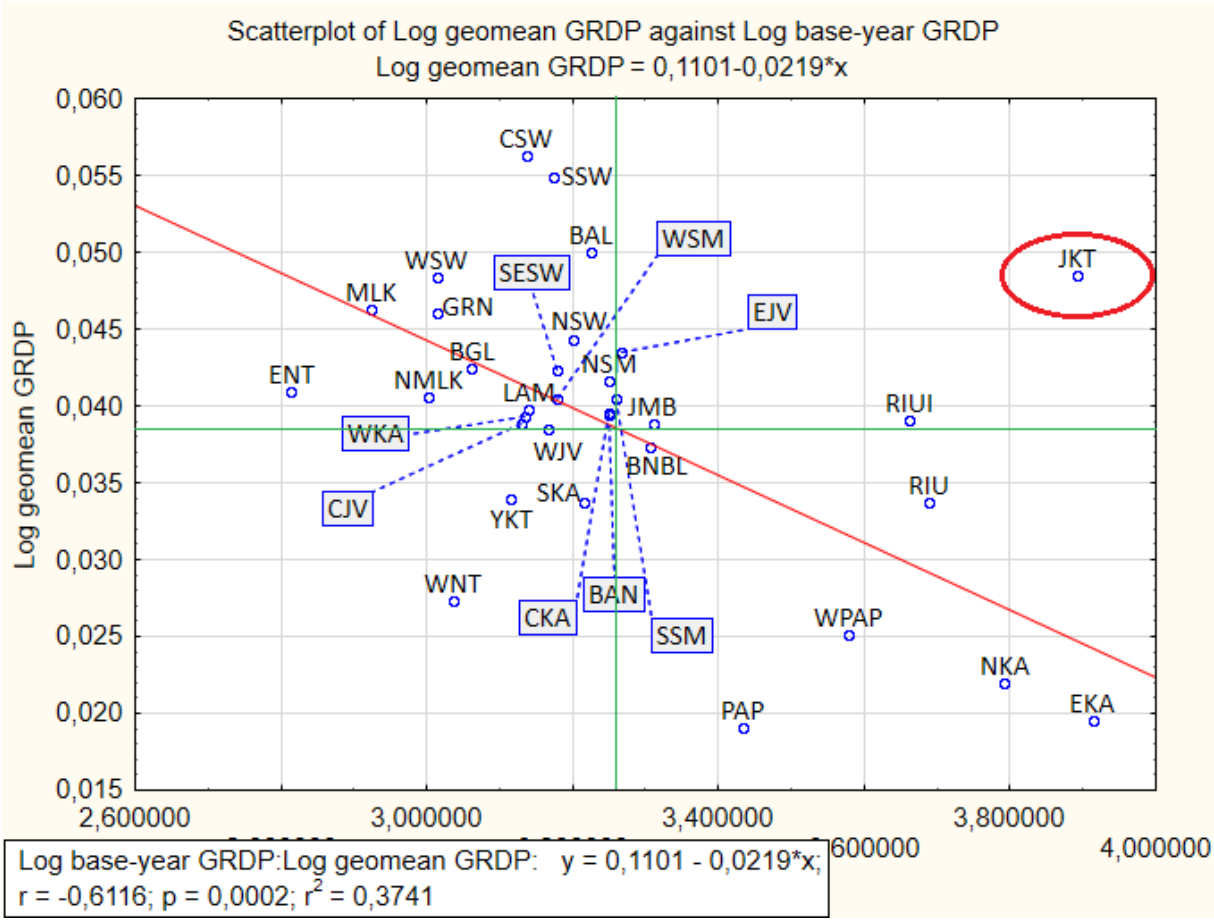

Figure 4 - Convergence of Indonesian provinces within indicator of GRDP (Statistics Indonesia; own work)

Parameters of regression line displayed in Figure 4 evince the convergence of disparities in *the indicator of GRDP* on the first look. However, on the base of the possible outliers' overview two cases have been excluded. The initial regression line demonstrates $r = -0.3906$ with the coefficient of determination $r^2 = 0.1526$. After calculating the regression model without case of Aceh having the lowest coefficient of growth and case of DKI Jakarta distorting the dataset by extreme high values comparing to the rest of dataset, the final regression parameters are $r = -0.6116$, $r^2 = 0.3741$. The coefficient of determination does not point to highly significant fit.

Due to previous discussion of possible outliers, the provinces of Central and South Sulawesi with significant coefficient of growth have been tested as well but in the total regression these regions are influential point on very small level, the parameters would not change seriously thus the regions remain.

Provinces which concentrate around intersection of parallels (means) to x- and y-axis show the initial under-average value, and slower growth of GDP throughout the period. North and East Kalimantan´s extreme values only decrease the intensity of convergence but have the same direction of trend as they are only remote points of the model. However, with a look to the variability of model and numbers of cases in each quadrant, the regression points rather to **neither convergence, nor divergence**.

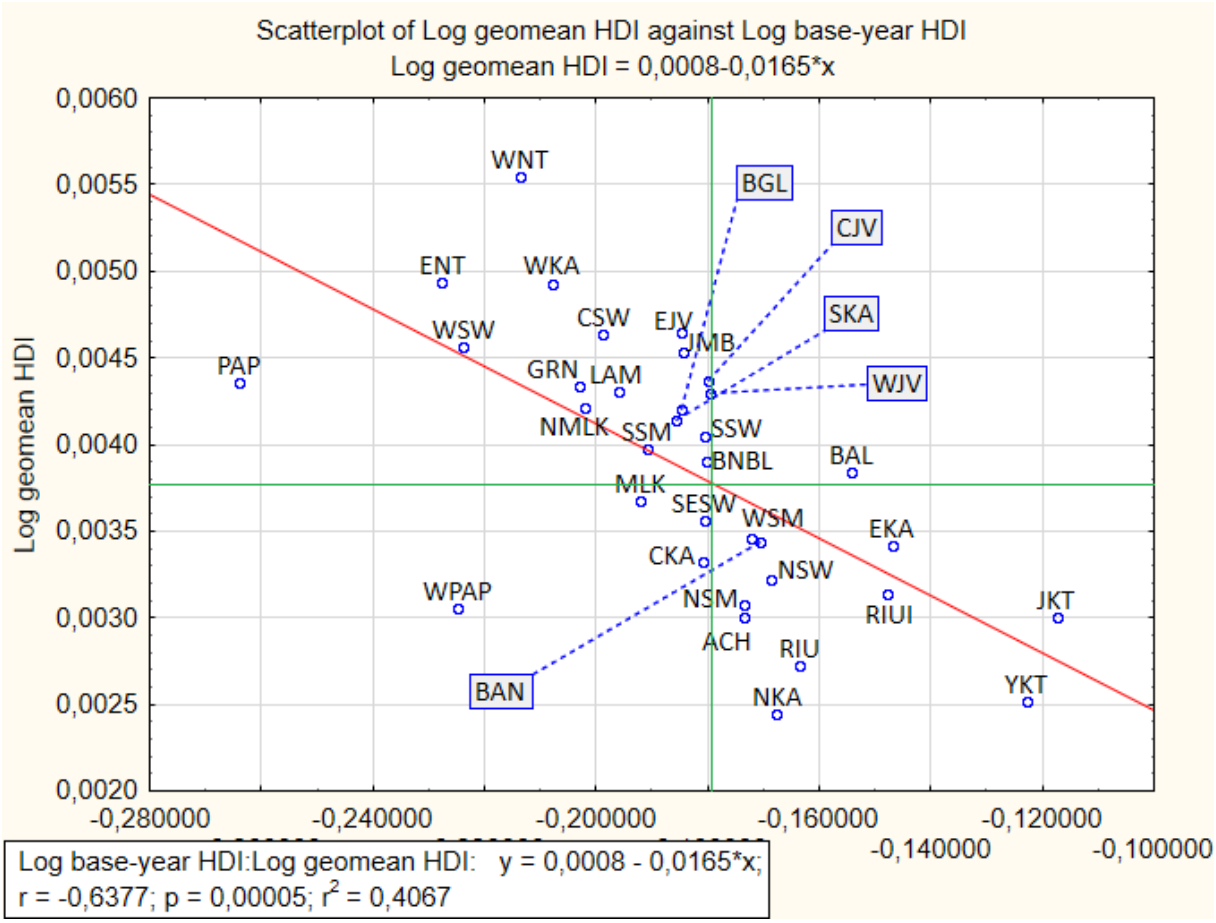

Figure 5 - Convergence of Indonesian provinces within indicator of HDI (Statistics Indonesia; own work)

The model of Figure 5 does not show any extreme values. Therefore the fit of *HDI* analysis has not been adjusted. The fit itself, displays more significant correlation $r = -0.6377$, however the determination coefficient is not convincing $r^2 = 0.4067$. In any case, majority of provinces are concentrated around the regression line and the variability is tight so the **convergence** may be indicated.

There is not an important difference among values concerning no extremes. However the location due to coefficient of growth is apparent. The lowest values are reported by

Yogyakarta, DKI Jakarta and Riau founded in the fourth quadrant. The highest HDI value is kept by West Nusa Tenggara and East Nusa Tenggara located in upper second quadrant in interest of supporting divergence within the model.

The 40% determination is partly caused by vertical establishment of provinces whose values twist around the mean of base-year (Central and West Java, South Sulawesi, Bangka Belitung Islands, Southeast Sulawesi and Central Kalimantan). Therefore the variability is extended and the coefficient of determination is lowed.

In case of analysis within indicator of *poverty gap index*, *unemployment* and both *migration indices* the region of North Kalimantan has been excluded straightaway. As the only data for this index is from year 2015, the coefficient of growth would point to one (zero after log-transformation) and would represent the purposeless value in the whole dataset.

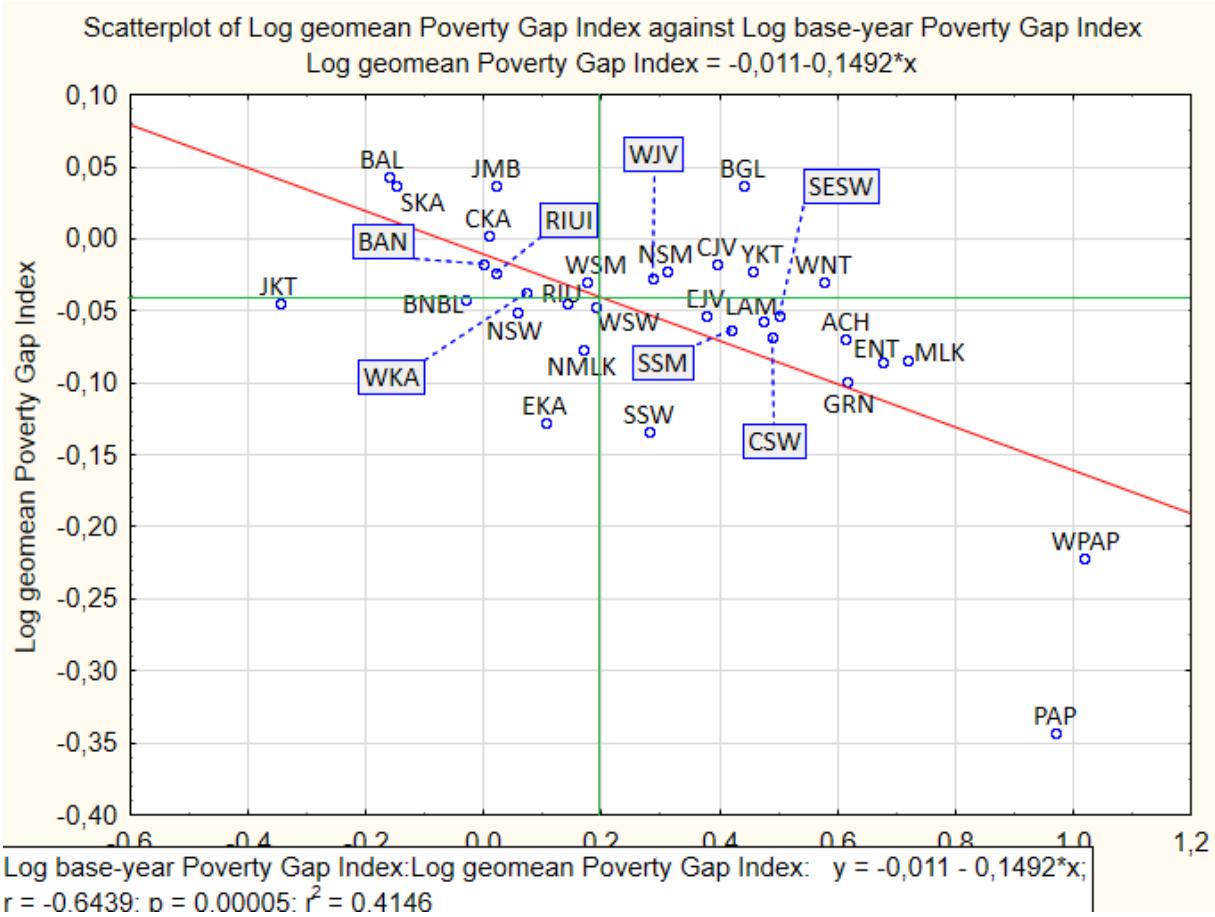

Figure 6 - Convergence of Indonesian provinces within indicator of Poverty Gap Index (Statistics Indonesia; own work)

The indicator of Poverty Gap Index (Figure 6) shows the regression of $r = -0.6439$, $r^2 = 0.4146$ and due to this parameters ranks second most significant convergence out of integrated indicators with 41.5% indicated intensity of relationship. The coefficient of determination is not significant. Especially the cases seem to move from fourth quadrant up to first quadrant what would mean development discontinuation of indicator´s values for almost all provinces.

Even though the regions of West Papua and Papua have been classified with extreme values supported by fast decline of over than 90 % in determined period, they seem to be only remote points of the given **convergence** model. After excluding the total parameters of beta coefficient and determination coefficient decrease. In the second quadrant above the fitted regression line, there are concentrated provinces (Bali, South Kalimantan, Jambi and Central Kalimantan) which only reported the increase of poverty gap index rate, all up to 50 – 60 % during the given period.

Especially at this model, the convergence is the most desirable. The serious indicator of the analysis performs convergence and better standard for living simultaneously at all cases of Indonesian provinces which shows the approaching the most remote regions (West Papua and Papua) to the most developed ones.

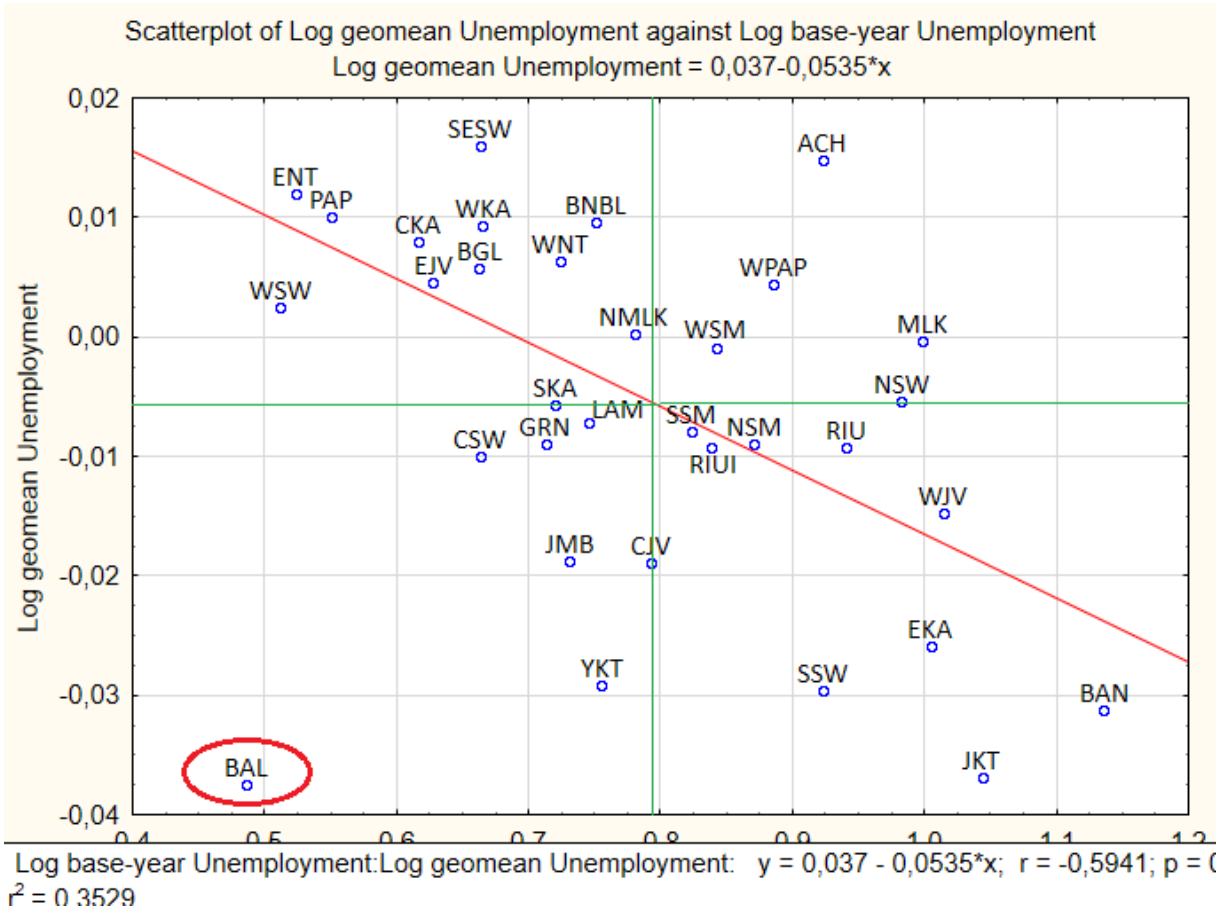

Figure 7 - Convergence of Indonesian provinces within indicator of Unemployment (Statistics Indonesia; own work)

The regression analysis of indicator *unemployment* (Figure 7) evinces the parameters of $r = -0.594$ and $r^2 = 0.3529$. The case of Bali has been removed from model due to very low values for the entire analysed period. Then the regression line declined and beta coefficient changed by almost 20 %. Despite this fact, the parameters of regression are not pointing to real convergence together with the high variability of the model. Therefore, the result of sigma-convergence is desirable and for now it points to **neither convergence, nor divergence**. However, the model is statistically significant in charge of *p-value = 0.0003*.

The potential outlier of Banten with extremely high values throughout the period seems to be only remote point placed in the same trend as the regression line. Southeast Sulawesi and Aceh have not changed the beta coefficient neither determination seriously, thus the model remains in the original form.

These provinces concentrated in the fourth quadrant show the fastest change while having the highest values (West Java, DKI Jakarta and East Kalimantan). In contrary, number of provinces concentrated in second quadrant (typically East Nusa Tenggara, Papua and Central Kalimantan) has experienced only slight growth of unemployment throughout the analysed period.

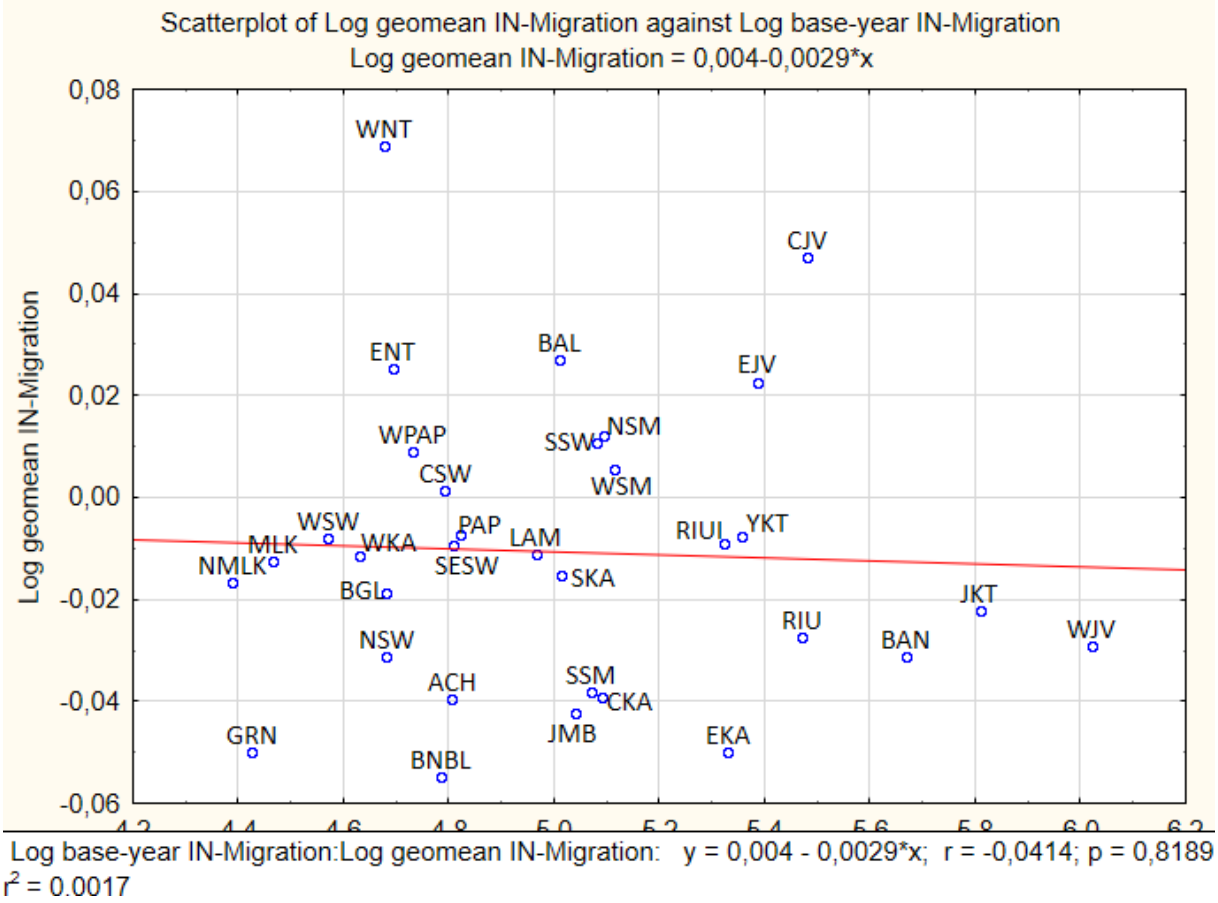

Figure 8 - Convergence of Indonesian provinces within indicator of IN-migration (Statistics Indonesia; own work)

Disparities that may be found on Figure 8 of *IN-migration* point to almost no development and do indicate typical **neither convergence nor divergence**. The very low coefficient of beta $r = -0.0414$ is supported by very weak quality of the regression fit $r^2 = 0.3529$.

In contrast to expectations, the trend of the line would not change in case of excluding the regions of West Nusa Tenggara and Central Java. The first of them would point to inconsiderable divergence as it reports the high values and extremely fast growth, and the second of them would change the regression back to convergence direction, the result of

horizontal line would stay unchanged. On the other way around, the West Java showing extreme values is remote outlier in the same direction of the fit.

The divergence is caused by second quadrant concentrating the provinces that have coefficient of growth greater than one which mean that the provincial migration is highly persistent and growing in comparison to the rest of dataset. Alongside, p-value of the model is greater than 0.05 which implies to statistically insignificant regression that do not allow the model to reject the null hypothesis.

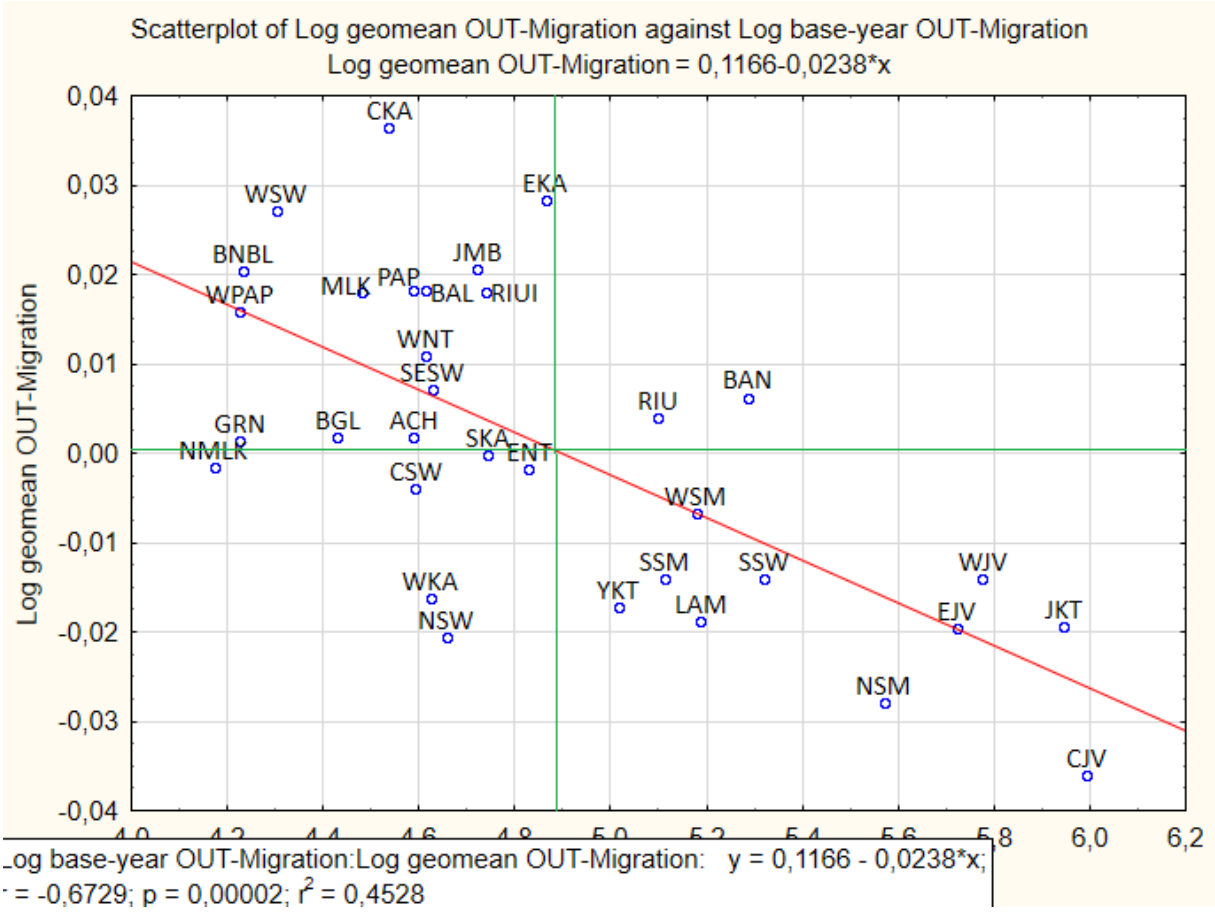

Figure 9 - Convergence of Indonesian provinces within indicator of OUT-migration (Statistics Indonesia; own work)

The *OUT-migration* indicator (Figure 9) evinces the most significant **convergence** out of the integrated indicators, and naturally, this regression has the highest intensity of indicated relationship of 45 %.

Convergence of OUT-migration indicator does not display significant outliers either. The regression model points to beta coefficient $r = -0.6729$ and determination coefficient of $r^2 = 0.4528$. In case of removing the Central Kalimantan province, the correlation improves insignificantly and determination increase only by 1 %. Central Java and DKI Jakarta have the purpose of remote points of the same trend as the model.

In contrary, there are various provinces distributed around zero mean of coefficient of growth and oscillated between second and third quadrant which are having small growth in comparison of base-year and geometric mean of growth (between 15 – 20 % throughout the period). With the direction up in second quadrant, the determination level of model decelerates as the OUT-migration factor decrease (Bangka Belitung Islands 27 %, West Sulawesi 37 %, or Central Kalimantan 52 %).

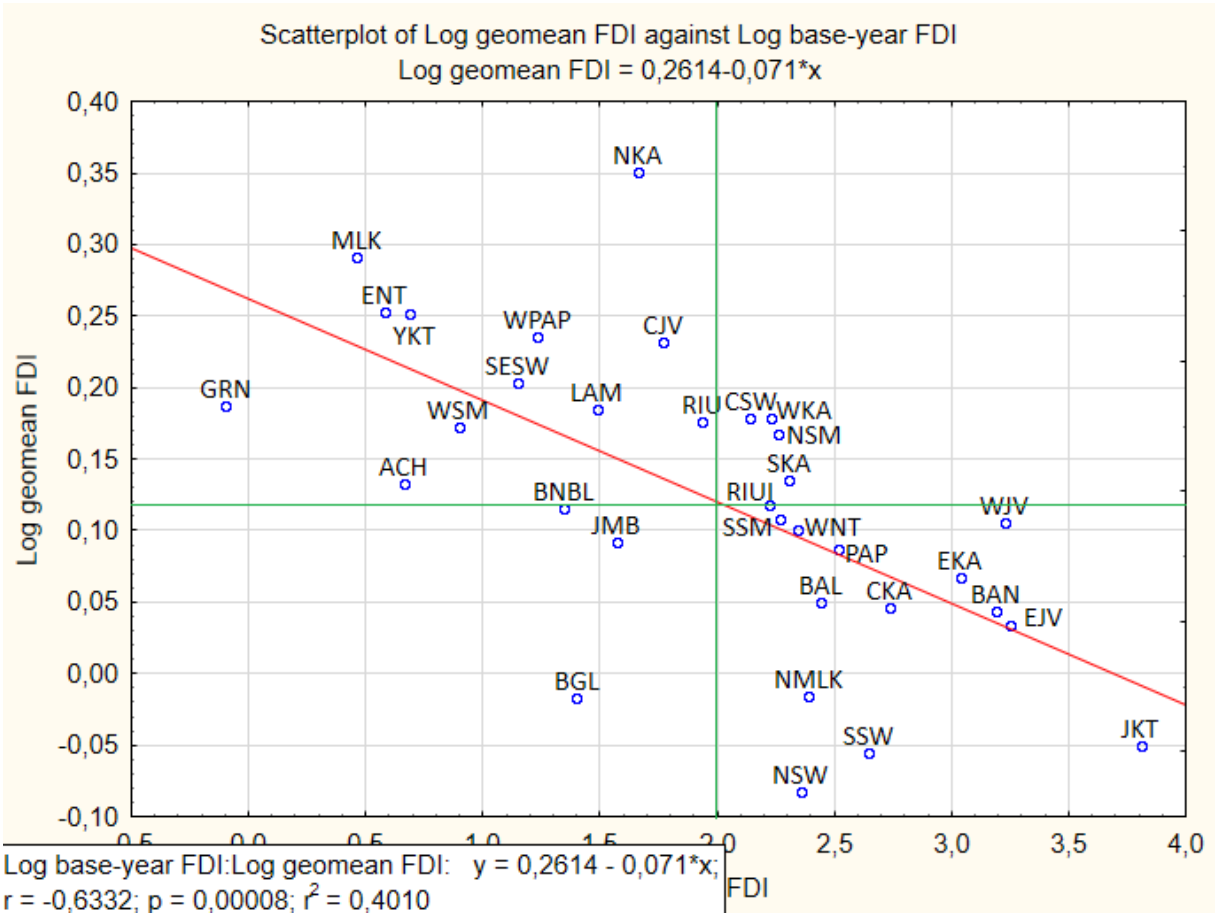

Figure 10 - Convergence of Indonesian provinces within indicator of FDI (Statistics Indonesia; own work)

Regional disparities among receiving of *foreign direct investments* (Figure 10) seem to converge with the parameters of beta coefficient $r = -0.4956$ supported by quality of the fit $r^2 = 0.2456$. West Sulawesi looks as an outlier due to the fact that decline of the FDI income

has been -95 % during the given period. Its removing changes the regression rapidly. The new values report the relation of *r = -0.6332* and the determination grows up to 40 %. Thus the **convergence** trend may be estimated.

The downward trend follows the leading province in foreign investments income – DKI Jakarta. Simultaneously, Jakarta (together with East Java, North Maluku, North Sulawesi, etc.) evinces the fastest decline in receiving of FDI.

North Kalimantan for which the data are known since 2013 and are above-average seems to be supported more than other same developing regions what is evident in its fast growing trend. However, the province does not influence the convergence model significantly as the constriction raise by 4 %. The quadrant where North Kalimantan belongs contains numerous provinces which are having the steady or growing dynamics.

5.3.4 Sigma-Convergence Analysis

Beta-convergence analysis proved the almost all indicators converge on the base of coefficient of growth. The standard deviation of variables for each year and its development in time support or disprove the previous results.

The evaluation of sigma-convergence implies in table 7 and is graphically designed on the graphs (see Appendix 3: Sigma-convergence Graphs[8]) where the standard deviation evinces the progress (shape) in diffracted line. Calculation and graphical outputs comes from the interface of STATISTICA Software.

[8] The multiple line plot of sigma-convergence carries the time coordinates on x-axis and values of standard deviation as depended variables. The diffraction line does not cover indicators of IN-migration and OUT-migration as only the base-year and last year data are available.

Year	GRDP[9]	HDI	Poverty Gap Index	Unemployment	IN-Migration[10]	OUT-Migration	FDI
2010	0.225891	0.028699	0.313109	0.157055	0.393206	0.499852	0.895301
2011	0.230470	0.028214	0.299324	0.168513	-	-	0.844120
2012	0.228049	0.027819	0.289428	0.165046	-	-	0.896057
2013	0.236263	0.026790	0.278636	0.162341	-	-	0.796325
2014	0.229940	0.026362	0.261284	0.158936	-	-	0.779748
2015	0.215040	0.026171	0.288795	0.128346	0.411552	0.445164	0.775601
Speed of convergence	-4.64 %	-8.80 %	-7.77 %	-18.28 %	+4.67 %	-10.94 %	-13.37 %
Beta coefficient	-0.6116	-0.6377	-0.6439	-0.5941	-0.0414	-0.6729	-0.6332
Quality of fit	37.4 %	40.7 %	41.5 %	35.3 %	17 %	45.3 %	40.1 %
Trend[11]	C/D	Converg.	Converg.	Converg.	C/D	Converg.	Converg.

Table 9 - Sigma-convergence Results (Statistics Indonesia; own work)

The *GRDP* sigma-convergence indicates alternating dynamics of trend (see Appendix 3 – Figure 11). The speed evinces low growth of -4.64 %. However, sigma-convergence analysis support beta-convergence results of wide distribution, extended variability and extreme differences between provinces of high GRDP income and provinces reporting under-average GRDP, therefor the decision implies in **neither convergence, nor divergence**. By this speed of convergence -0.63 % per year, it would take about 50 years for a typical under-average province to reduce its income gap with the national average of GDP (USD 3,346.49).

According to sigma-convergence results, the only indicator that is converging throughout entire period is *HDI*. With the regard to steady decreasing line of graph (see Appendix 3 – Figure 12), the speed of convergence for the given time is -8.80 % (-1.47 % per year). The convergence of HDI is similar to the convergence of poverty gap index and FDI only with small differences. Thus, sigma proves the quality of fit 40.7 % and concerns sample **convergence** trend.

On the base of *poverty gap index* standard deviation (see Appendix 3 – Figure 13), the indicator shows the regional disparities have begun to increase recently. The extending variability is supported by the values of poverty gap rate that increased by year 2010.

[9] Sigma-convergence of GRDP calculated without province of Aceh and DKI Jakarta to avoid distorted values

[10] Sigma-convergence of Unemployment calculated without province of Bali to avoid distorted values

[11] C/D – neither convergence, nor divergence

However, together with beta analysis it points to **convergence** for now. The *FDI* sigma-convergence displays (see Appendix 3 – Figure 15) increasing of disparity within year 2012. The slope down model had been cough up in following years and final speed of convergence is calculated as -13.37 % what is equivalent to -2.23 % yearly. This implies in obvious **convergence** result.

The *unemployment rate* has the most satisfying results of sigma-convergence analysis (see Appendix 3 – Figure 14). Its variability is steady decreasing what is partly supported by beta-convergence that does not evince the surprising determination. However, if the speed of sigma-convergence remains unchanged the under-average provinces catch up the mean of rate 6.2 % within 10 years. Over all the variability proves the fastest speed of **convergence** and support the regression of -0.59.

Result of sigma-convergence of *IN-Migration* goes in line with the beta. The convergence has not been proved and the trend of disparity remains still – model of **neither convergence, nor divergence**. Very likely, together with the *OUT-Migration* results the overall issue of migration is decreasing on one hand, but Indonesians rather move out from Indonesia than moving into another province. As the factors of migrations are connected directly to each other, the development of both would follow the same trend of grow/decrease. This is based in the sigma speed of +4.67 % (0.78 % per year) of IN-migration indicator and **convergence** of -10.94 % (1.82 % per year) for OUT-migration indicator, what is highly supported by results of beta-convergence.

6. PROPOSAL PART

By the analytical part, the convergence of disparities among provinces of Indonesia has been assessed for indicators of HDI, Poverty Gap Index, Unemployment, OUT-migration and FDI. The speed of convergence differs, however the development throughout the given period is noticeable. The indicators of GRDP and IN-migration are classified as neither converging nor diverging. Subsequently, the discussion how to support continuous elimination of disparities need to be settled.

For the record, the neutral indicators are not proved to highly correlate or to have any significant connection to each other. The GRDP partially influence the HDI indicator as there is a positive correlation. The IN-migration positively correlates with FDI, thus the practical part encourages FDI and takes IN-migration as continuity. The following part provides suggestion how to support the convergence process within Indonesian provinces with the look scientific analysis done in the past and with the approach to GRDP and IN-migration indicator. (Firdaus & Zulkornain, 2009; Irawan, 2014; Tirtosuharto, 2013; Wihardja, 2014; Maimun, Hamzar, Syechalad, & Nazamuddin, 2014)

6.1 SUSTAINABLE GROWTH

Although, decentralization is necessary in welfare-enhancing policy and effective in addressing regional disparities, the continuing of implementation of decentralization is necessary. First of all, the local development strategies must be worked out together with local governments of provinces and economic and social subjects as stakeholders as the development strategies are driven in attracting the economic activities and cooperation with other (wealthier) provinces must be settled as the source of government financing is limited however is rising aligned to GDP growth. Provincial development strategies should cover all needs and shortages of individual provinces including to a view to cultural and geographical issues and socioeconomic level.

The most important strategy concerning the development of entire country is *Master Plan Acceleration and Expansion of Indonesia Economic Development 2011-2015* which goes in line with the vision set in the national long-term development plan (2005-2025). Initially the Master Plan had been targeted to the 8 % growth after year 2013. However the intention changed into aiming to turn Indonesia to one of the world´s largest economy by 2025.

The heart of Master Plan is the Indonesian government´s awareness about potential and comparativeness of each province. In order to this plan, the country is divided into six corridors of economic acceleration and expansion.[12] With the regard to regional policy, the improvement of regulations and permits on regional level should be following. Firstly, the economic potential development through economic corridors is set. Secondly, the straightening of national connectivity is provided and straightening the national human resources capability and science and technology need to be executed. At the same time, the provincial spatial planning must be finalized as it is used as a basis to overcome potential land use conflict in utilization as forest, plantation, and mining area. There are still challenges in the security sector. Local governments need to improve safety and security capabilities through the implementation of strict rules and sanctions for crimes (corruption).

From the mention of the Master Plan follows that Indonesian central government does not admit any other direction of provinces. The unbalanced development should be established which means that limited sector should be supported in specific Indonesian province to achieve the determined direction. For instance, the poorest region of Nusa Tenggara is classified to be used as a touristic destination and food support. This leads to the lack of secondary industrial sector as only agriculture and services are expanded. In case of implementation of food industrial processing, the region would reach the higher IN-migration and foreign direct investments. Even though West and East Nusa Tenggara experience the positive development in migration and FDI, they still lag behind the rest of the country. However, due to Hamada (2013) Indonesia has entry the global production networks recently so there is a space for change now.

At the same time, building of the sustainable growth means to deliver the exceptional experience. However, the decentralization of Indonesia had negative impacts that cause the instable and unreliable environment. Besides a corruption within the local government structures, the competitive advantage for foreign investors is not fulfilled plus the earlier

[12] Sumatra is a centre for production and processing of natural resources and as nation´s energy reserves. Java is a driver for national industry and service provision. Kalimantan is a centre for production and processing of national mining and energy reserves. Sulawesi is a production and processing of national agricultural, plantation, fishery and oil and gas. Bali together with West and East Nusa Tenggara is a gateway for tourism and national food support. Papua and Maluku Islands is a centre for development of food, fisheries, energy and national mining.

researches (e.g. Lučić, Radišić, Dobromilov, 2016) demonstrate the negative correlation between corruption and GDP (GRDP) growth.

6.2 PROMOTING OF HUMAN DEVELOPMENT

The Human Development Index in the last six years shows there is still a significant number of people who have poor nutrition and health status, lack of access to drinking water and health services (Papua, West Papua, East Nusa Tenggara, West Sulawesi). These indicate that education, health, nutrition and basic infrastructure are among sectors that should receive more attention in a poverty reduction strategy, although the poor provinces are peripheral areas with high shipping costs and limited access to the centre. (Ministry of National Development Planning, Republic of Indonesia, 2006)

The HDI may be encouraged by GRDP (as a sub-indicator of the overall indicator) growth on the base of industry and services extension, or may be promoted thanks to centrally-driven help of government. The mixture of both is an outcome of healthy society and inventive market. In fact, Indonesia has launched the ambitious project to establish a compulsory national health insurance system with the aim of making basic care available for everyone by 2019 by state provisions and NGOs support. (Razavi, 2015) At the same time, government has doubled the budget spending for education since 2000, especially in increasing the access to education. In order to decentralization, the Government launched a massive program as a way of injecting funds directly into schools in order to keep children in school and give schools some flexibility in managing their own funds. (The World Bank, 2014a) According to the speed of development of HDI, the change should be taken more specifically.

The strategy to promote the health status and education together is a system of assigned general practitioners and teachers (whose number is actually rising in Indonesia) working in poor regions divided to gradient areas. These workers managed by central government together with provincial government would replace stakeholders that gather and evaluate the monitoring process within the poor regions. With no need to cash transfer, the delivery of necessary goods and final products to schools and medical centres/doctor offices, the team of doctor and teachers may evaluate the needs, predominantly in health, education, basic infrastructure, drinking water and sanitation, food and nutrition.

In case of education and health care free for everyone, the human development index should be rising. The objective is to provide higher accessibility to medical centres and schools in remote areas by continuous increasing of number of schools. Free drinking water in schools and medical centres would be provided through the NGOs support and thanks to the water filter technologies, together with free education schoolbooks, unlimited disinfection agents, social assistance especially for woman and children, and community empowerment. In the context of costs for delivery of intention, final products transports, there is always an option of full-loading system of transportation for all directions familiar from the central-driven economy and special cooperation of PPP system together with NGOs which assign the specific tasks to private sector roofed by strictly concluded budget and contractual in change for advantage tax payment.

Otherwise, the international organizations as the World Bank may be included in foundation of the program´s technical implementation. As the World Bank works closely with the central government of Indonesia in its efforts to reduce poverty which covers a broad range of areas, such as poverty trends, social assistance, social insurance, community-based programs and generating more and better jobs. (The World Bank, 2014b)

In order of HDI analyses, some the speed of development was found regarding to school enrolment. Surprisingly, the fastest growing provinces are the poorest (West and East Nusa Tenggara, West Kalimantan, East Java, Central Sulawesi). The slowest growing are DKI Jakarta, Riau or North Kalimantan. Nevertheless, the regional disparities are obvious as at primary school level the net enrolment rate ranges from 94.7% in Bali to 83.1% in West Papua. For lower secondary school enrolment, the provincial disparity in net enrolment rates is wider, from 94.7% in the DKI Jakarta to 31.6% in Papua, due to the fact that enrolment in urban areas is literally higher than in rural which is at the same time connected with high-quality schools in cities and least skilled teachers and school management in least-well equipped schools. (OECD/Asian Development Bank, 2015) It asks for improving of social and economic standard and improvement of school enrolment.

Therefore, every province should be required to design a targeted programme what is recommended by OECD and ADB (2015) to ensure all schools reach the set minimum service standards and should work out a plan to reach the minimum number of schools per capita what may be a standard for whole country. It would provide differentiated support to help

provinces reach the establishment of school number and to help schools to achieve the standards in remote and disadvantaged areas. More preciously, the provinces with high rural share (Papua, West Papua) should cooperate with NGOs as Global Partnership for Education in developing quality education sector plans and reduce the schools distance established on the base of province´s needs.

The quality is different issue. Which is measured and year-by-year improved by higher budged allocated for quality betterment. Therefore the focus on quality of education, on-spot industry and education and the management approach to human resources must be in place. (Benson & Rowley, 2002; the World Bank, 2014a)

At the same time, the poorest provinces of Indonesia carry a big potential for NGOs interested in power supply support. This may be one of the options how to overcome the geographic conditions that possibly create the regional inequalities as the Nusa Tenggara and Sulawesi are islands with improper infrastructure and lack of industry potential but at the same time not that far from the centre of country. There is a great capacity for wind, sun and sea power stations producing power for local population as well as power for sale in the power engineering market. This intention is proved by Singapore investment financing the wind energy farm in West Sulawesi in the near future. (Ver-Bruggen, 2016)

6.3 PROMOTING OF CAPITAL MOBILITY

According to various analyses (Tirtosuharto, 2013; Dutu, 2015), the decentralisation of Indonesia had a negative impact on economic growth of GRDP per capita and requirements to foreign direct investment beside the fact that Indonesia is highly GDP growing country (the largest of ASEAN). From the economic point of view and from the evidence of right skewed data of GRDP, the gap between central and the most developed provinces (DKI Jakarta, North Kalimantan, Riau and Riau Islands) which have the highest income of GRDP, and provinces that are poor/developing (Maluku, East Nusa Tenggara, North Maluku, etc.) is broaden due to lack of central economic interventions, unequal distribution of market segments and unequal bargaining of labour force. Thus, the decentralized Indonesia allowed regions greater political autonomy and to retain a substantial share of generated income.

In case of central government´s economic interventions of the Master Plan, a cluster analysis would display the business sector networks to subsequent operation with promoting the

collaboration with real and already existing investors to entry the new markets through branches, licensing, and joint ventures, franchising or building the remote producing subsidiaries in less developed provinces as there is more capital in the richest regions, and as there are lower marginal returns to capital and slower economic growth what proves the right skeweness of unequally distributed data of GRDP and FDI.

Nevertheless, Indonesian investors could be divided into two groups that are distributed among wealth and poor provinces with no surprise. Firstly, the international holdings or firms who are able to arrange their own infrastructure and which are oriented to local natural resources or services and purchase in big cities. Secondly, there are possible national investors who lack the capital and do not afford the own investment to the infrastructure establishment.

The effort must be supported by state or provinces to grant of entrepreneurship, secondary and tertiary education and promoting of employment of local population for all positions to improve and increase the power of purchasing. In this case, the lack of infrastructure may be compensated by public-private partnership projects of long-term contracts between state or province and private party to provide a public asset or services.

Also, the infrastructure is connected to export. In several related studies, the development is straightened by role of exports in economic models. The successful promotion of export is primarily responsible for rapid industrialization. (Sugiharti, 2014; Fukuda & Toya, 1995) This unfortunately comes with improper sustainable growth establishment and weak governance and administration which does not use the development budged aimed to infrastructure fully. Although the government's development investment budget is 10% of the whole, the problem is not the amount but the ability to sufficiently enforce the allocated budget. (Hamada 2013)

In case of well-doing export policy together with improved and efficient usage of budget to develop infrastructure and in case of successful implementation of PPP project in the sphere of infrastructure, the FDI may lead to transformation of Indonesian capital into the direct investment in other countries. This does not need to be connected directly to central government but the governments of provinces located on the borders invest in external projects or establish the cross-border partnership (e.g. West Kalimantan in Malaysia, Maluku in Philippines) and learn the business collaboration from the wealthy regions as Riau and Riau Islands (cooperating with Singapore).

The preferences should be given to the small foreign investors (mainly in private sector) as a source of economic volume. So then, if the one marginal investor leaves the country, it would not cause the unemployment problem. Plus, the small investors bring the technology innovation that is not exaggerated and far more costly and whose knowledge may be devolved to local firms and producers.

6.4 PROMOTING OF MOBILITY OF LABOUR FORCE

According to the geometric mean of growth of GRDP calculated in order of convergence analysis, no one of the Indonesian provinces experienced the decrease of GRPD since 2010. The provinces which range the weakest GDP growth are the above-average provinces (except Aceh that evinces slow growth and is under-average province) as this phenomenon is in line to researchers´ expectations and precondition that poorer regions experience the fastest economic growth. In Aceh, there is a need to establish the regional characteristic industry and to manage the natural resources by capital investment and to improve the quality of science and technology oriented to natural resources, e.g. supported by detached departments of Jakarta institutions and universities.

The Master Plan notices a promoting of touristic destinations in meaning of Bali model, respectively the Bali´s three times higher GRDP income, minimum unemployment, low rate of poverty, etc. This would cover the poorest regions of West and East Nusa Tenggara and would encourage the development. Tourist industry would lead to minimal unemployment, higher income of GRDP and better social platform in the provinces. The advantage of the tourism set up is the nearness of Nusa Tenggara to Bali therefore the project may be driven as volcanoes and virgin nature tourism or lucrative destination for wealthy pensioners.

The poor countries with low productivity tend to grow more rapidly by copying the technology from the wealthy countries. The same is valid in regional disparities. An ability to absorb the more advanced technologies is dependent on its social capability. Thus, the quality of secondary and tertiary education is vital factor in determining the technical competence of the labour force. As a crucial point, the early childhood education extension may seem as an opportunity for labour force straightening. In case of widely accessible kindergartens and early childhood groups in remote areas, the women (especially single mothers) gain an advantage to entry the job market, reinforce the agriculture and industry sector, achieve more monetary means to family and approach more suitable social status within population. Again,

the early childhood education may be negotiated with private investors, NGOs (Global Partnership for Education, UNESCO) or may be established from budged overlap of individual provinces.

The social factors of HDI, poverty gap rate, unemployment net migration are influenced by the inequality of wage income. According to Wihardja (2014), problem of rising regional disparities are the real wages that are far more highly for skilled workers while wages for unskilled workers with primary education or below. Repeatedly, it extends the differences between wealthy and poor provinces. Indonesia rises its minimum wages every second year, however the minimum wage does not directly implies the success, and the wage raising without an accompanying productivity could become a factor decreasing Indonesia´s international competitiveness. In the case of multi-coloured country as Indonesia is, the minimum wage should be stated by the local governments with the look to local market and business situation, province´s capacities, migration and investment mobility as it may reduce and avoid undesired decreasing of labour and capital quantity.

7. CONCLUSION

At the end of 90´s of the 20th century, Indonesia has implemented new decentralized policy to facilitate the central apparatus and to encourage and reinforce the power of local provincial governments. By this step, the country has divided into 33 (that time) almost independent provinces regarding the socioeconomic development. In order of this change the regional disparities occurrence may be evident.

Therefore the thesis puts a question: *How to Support the Convergence of Socioeconomic Indicators in Provinces of Indonesia?* From the beginning, the thesis studies the socioeconomic system. Firstly, it focuses on literature review in meaning of the theoretical framework of regional disparities, its measurement of regional disparities as well as basic concepts of integrated indicators. For the calculation of convergence of regional disparities, the indicators as GRDP, HDI, Poverty Gap Index, Unemployment, IN-migration, OUT-migration and FDI have been selected as they represent the socioeconomic state adequately.

Secondary, the thesis introduces the convergence analysis throughout the analytical part. The analysis has two fundamental parts – beta-convergence analysis and sigma-convergence analysis. Both measurements of regional inequality cooperate together and form the final results about the research. After the calculation of beta-convergence and sigma-convergence, the results are compared and evaluation comes from as the convergence has occurred in indicator of HDI, Poverty Gap Index, Unemployment, OUT-migration and FDI. The last two integrated indicators – GRDP and IN-migration have evinced weak development and slow growth (GRDP sigma-convergence speed -4.64 % for entire period; IN-migration beta coefficient -0.0414 and sigma-convergence speed +4.67 %) thus neither convergence nor divergence is successfully defended.

In order to calculation of convergence analysis, the speed of development of each province for every integrated indicator has been partially calculated (see Appendix 2: Initial Data – Tables 10 – 16) and the multidimensional character of convergence analysis has been used as well (basic statistics methods, correlation, quadrant layout within the scatter plot). Therefore, the speed of individual provincial growth is discovered, the relations among indicators in the country are overviewed and the specific knowledge brings an appreciated contribution to the proposal part.

The proposal part concerns the primary factors supporting the regional disparities especially in the sphere of GRDP and IN-migration. Besides, it describes an establishment of sustainable growth within the socioeconomic indicators that are desired to deliver the expected results from the view of population. This means to eliminate the marginal problems and issues easy to solve which affect the significant factors of human development, respectively encouragement of education and health care, promoting of capital mobility by improvement of FDI direction and encourage the investments coming directly from Indonesia, finally promoting of labour force mobility, and empowering the targeted education of population as well as early childhood education and minimum wage.

The answer to the main thesis´ question "*how to support the convergence of socioeconomic indicators*" flow from the partial analyses and leads to promoting the social and economic systems in poor provinces as the scholastic precondition says that the poorer regions evince fastest growth. However, the growth of indicators needs to be balanced, and preferably with no slope down trends.

At the same time, the proposal part serves subjective and specific directions of development in meaning of supporting the convergence. They may be used as suggestion for wide range of other consequential works whether the proposals would be fully functioning and applicable and if the application would bring the expected results. On the other hand, it may serve as grounding for comparative analysis to work with an alternative model of regional disparity measurement (Gini coefficient, cluster analysis, factor analysis, etc.).

8. LIST OF ACRONYMS

ADB	The Asian Development Bank
ASEAN	The Association of South East Asian Nations
DKI (Jakarta)	The Special Capital Region (of Jakarta)
FDI	Foreign direct investment
HDI	Human development index
GDP	Gross domestic product
GNI	Gross national income
GRDP	Gross regional domestic product
IMF	The International Monetary Fund
NGO	Non-governmental organization
OECD	The Organization for Economic Co-operation and Development
ppp	Purchasing power parity (GDP)
PPP	Public-private partnership
UN	The United Nations
UNESCO	The United Nations Educational, Scientific and Cultural Organization
UNDP	The United Nations Development Programme
WB	The World Bank
WHO	The World Health Organization

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13. APPENDIXES

APPENDIX 1: Explanatory Notes to Equations

Calculation of absolute, valuable absolute, relative average deviation:

d_i – deviation of i-th indicator

$\overline{x}$ – indicator arithmetic mean

x_i – i-th indicator

n_i – number of available values of i-th indicator

Calculation of point-by-point method for maximum and minimum indicator:

B_{ij} – point value of i-indicator for j-th region

x_{ij} – value of i-indicator for j-th region

$x_{i\,min}$ – minimum value of i-th indicator

$x_{i\,max}$ – maximum value of i-th indicator

Standardize variable method calculation:

u_{ij} – standard variable of i-th indicator for j-th region

s_{xi} – standard deviation of i-th indicator

Coefficient of growth calculation:

n = analysed period of years

y_n = last year value

y_0 = base-year value

Regression model of beta-convergence calculation:

$log\ \overline{k}$ – log value of computed mean coefficient of growth

$log\ y_0$ – log of base-year value

α, β – parameters of regression line

Sigma-convergence calculation:

m = number of regions

y_{jt} = value of j-th indicator in t-th year

y_t = value in t-th year

Calculation of GDP according to expenditure approach:

C – private consumption expenditures (nondurable/durable goods, services)

I – total investment (fixed investment + inventory investment + residential investment)

G – governance´s purchases

NX – net exports (foreign country´s spending on the country´s goods – country´s spending on foreign goods)

Calculation of GDP according to income approach:

W – labour income (salaries, wages, fringe benefits, unemployment insurance, taxes for social security)

R – rental income (income from property received by households, patents, copyrights, imputed rent)

i – interest income

Index_2 of Human Development Index calculation:

LE_i – life expectancy of the year

LIT_i – literacy of the year

ENR_i – school enrolment of the year

Headcount index calculation:

N_p – number of poor

N – the total population (or sample of population)

Calculation of poverty gap index:

N – the total population (or sample of population)

G_i – the poverty gap of a individual

z – the poverty line

Rate of unemployment calculation:

U – number of unemployment population

E – number of employment population

L – economically active population

Migration calculation:

i_t – number of people immigrating into the country

e_t – number of people emigrating into the country

$\bar{P}_t$ – estimated mid-year population

APPENDIX 2: Initial Data

GROSS REGIONAL DOMESTIC PRODUCT (PPP) PER CAPITA (USD) IN PERIOD 2010 - 2015

	PROVINCE	2010	2011	2012	2013	2014	2015	Mean	Geomean	log_Geomean	log_2010	log_2011	log_2012	log_2013	log_2014	log_2015	speed (%)	rank
1	ACEH	1 571,51	1 640,00	1 700,63	1 765,32	1 826,40	1 808,08	1 718,66	1,028443	0,012180							15,05	33
2	NORTH SUMATRA	1 778,84	1 996,27	2 177,65	2 418,09	2 653,97	2 871,37	2 316,03	1,100501	0,041590	3,250137	3,300219	3,337988	3,383472	3,423896	3,458089	61,42	12
3	WEST SUMATRA	1 510,94	1 683,97	1 840,03	2 029,61	2 249,26	2 408,78	1 953,77	1,097767	0,040510	3,179247	3,226334	3,264825	3,307413	3,352040	3,381797	59,42	15
4	RIAU	4 879,07	5 936,78	6 649,73	7 048,40	7 694,83	7 198,01	6 567,80	1,080874	0,033775	3,688337	3,773551	3,822804	3,848091	3,886199	3,857212	47,53	27
5	JAMBI	2 041,21	2 287,74	2 496,03	2 768,75	3 030,88	3 191,48	2 636,02	1,093505	0,038821	3,309888	3,359407	3,397250	3,442284	3,481569	3,503992	56,35	23
6	SOUTH SUMATRA	1 815,20	2 088,13	2 298,13	2 506,71	2 698,29	2 892,45	2 383,15	1,097661	0,040468	3,258924	3,319758	3,361375	3,399104	3,431089	3,461266	59,35	16
7	BENGKULU	1 152,46	1 285,82	1 420,90	1 565,06	1 722,42	1 879,52	1 504,36	1,102768	0,042484	3,061626	3,109180	3,152564	3,194531	3,236139	3,274047	63,09	10
8	LAMPUNG	1 380,57	1 538,70	1 673,76	1 803,83	2 014,38	2 183,16	1 765,73	1,095987	0,039805	3,140058	3,187154	3,223693	3,256196	3,304141	3,339086	58,13	17
9	BANGKA BELITUNG	2 023,47	2 272,58	2 470,18	2 682,02	2 936,39	3 110,03	2 582,45	1,089767	0,037334	3,306097	3,356519	3,392729	3,428462	3,467814	3,492765	53,70	25
10	RIAU ISLANDS	4 599,23	5 080,02	5 616,82	6 139,72	6 631,24	7 212,21	5 879,87	1,094149	0,039077	3,662685	3,705885	3,749491	3,788149	3,821595	3,858068	56,81	21
11	DKI JAKARTA	7 807,02	8 787,37	9 720,08	10 860,80	12 229,40	13 641,30	10 507,66	1,118083	0,048474							74,73	4
12	WEST JAVA	1 468,25	1 627,58	1 769,06	1 943,71	2 108,28	2 285,62	1 867,08	1,092549	0,038441	3,166800	3,211542	3,247743	3,288631	3,323928	3,359004	56,67	24
13	CENTRAL JAVA	1 344,65	1 481,40	1 600,58	1 746,65	1 931,94	2 102,76	1 701,33	1,093544	0,038836	3,128609	3,170672	3,204277	3,242206	3,285994	3,322790	58,38	22
14	DI YOGYAKARTA	1 305,71	1 423,33	1 522,14	1 653,67	1 786,60	1 929,15	1 603,43	1,081195	0,033904	3,115847	3,153306	3,182455	3,218449	3,252027	3,285366	47,75	26
15	EAST JAVA	1 845,98	2 072,91	2 293,93	2 522,60	2 791,64	3 045,02	2 428,68	1,105281	0,043473	3,266227	3,316580	3,360580	3,401848	3,445859	3,483590	64,95	9
16	BANTEN	1 777,84	1 958,39	2 114,17	2 309,41	2 562,45	2 798,41	2 253,45	1,094974	0,039404	3,249893	3,291899	3,325140	3,363501	3,408655	3,446911	57,41	19
17	BALI	1 679,48	1 850,34	2 061,05	2 319,46	2 666,76	2 988,45	2 260,59	1,122008	0,049996	3,225175	3,267252	3,314089	3,365387	3,425984	3,475155	77,82	3
18	WEST NUSA	1 086,92	1 041,59	1 039,76	1 093,93	1 197,58	1 488,01	1 157,97	1,064833	0,027282	3,036198	3,017697	3,016933	3,038990	3,078305	3,172606	36,90	29
19	EAST NUSA	652,18	713,58	788,82	866,53	953,34	1 044,96	836,57	1,098872	0,040947	2,814364	2,853443	2,896978	2,937784	2,979250	3,019100	60,23	13
20	WEST KALIMANTAN	1 365,70	1 508,37	1 639,89	1 789,31	1 964,70	2 146,74	1 735,79	1,094674	0,039285	3,135355	3,178508	3,214815	3,252686	3,293296	3,331779	57,19	20
21	CENTRAL KALIMANTAN	1 781,85	2 026,71	2 206,12	2 405,71	2 578,89	2 809,77	2 301,51	1,095388	0,039560	3,250871	3,306792	3,343629	3,381243	3,411433	3,448671	57,69	18
22	SOUTH KALIMANTAN	1 639,29	1 961,61	1 973,80	2 104,06	2 282,27	2 415,72	2 062,79	1,080633	0,033678	3,214656	3,292613	3,295303	3,323058	3,358367	3,383047	47,36	28
23	EAST KALIMANTAN	8 186,24	9 816,07	10 219,90	11 093,10	11 005,10	10 252,20	10 095,44	1,046036	0,019547	3,913084	3,991938	4,009447	4,045053	4,041594	4,010817	25,24	31
24	NORTH KALIMANTAN	N/A	N/A	N/A	6 189,06	6 745,43	6 850,09	6 594,86	1,052049	0,022036	N/A	N/A	N/A	3,791625	3,829010	3,835696	10,68	34
25	NORTH SULAWESI	1 589,55	1 740,76	1 916,14	2 108,48	2 364,34	2 648,84	2 061,35	1,107532	0,044356	3,201274	3,240739	3,282427	3,323969	3,373710	3,423056	66,64	8
26	CENTRAL SULAWESI	1 369,10	1 578,32	1 779,51	2 006,45	2 231,66	2 618,19	1 930,54	1,138448	0,056313	3,136435	3,198195	3,250300	3,302428	3,348628	3,418001	91,23	1
27	SOUTH SULAWESI	1 491,47	1 701,82	1 936,96	2 171,96	2 487,38	2 807,67	2 099,54	1,134871	0,054946	3,173815	3,230914	3,287121	3,336852	3,395742	3,448346	88,25	2
28	SOUTHEAST	1 510,12	1 701,15	1 930,78	2 074,88	2 247,80	2 457,23	1 986,99	1,102267	0,042287	3,179011	3,230743	3,285733	3,316993	3,351758	3,390446	62,72	11
29	GORONTALO	1 036,84	1 146,72	1 274,55	1 410,80	1 580,77	1 762,88	1 368,76	1,111993	0,046102	3,015712	3,059457	3,105357	3,149485	3,198869	3,246223	70,02	7
30	WEST SULAWESI	1 032,88	1 190,13	1 308,18	1 432,01	1 639,34	1 802,47	1 400,84	1,117799	0,048364	3,014050	3,075594	3,116668	3,155946	3,214669	3,255868	74,51	5
31	MALUKU	836,63	952,31	1 079,29	1 196,51	1 336,86	1 425,51	1 137,85	1,112468	0,046287	2,922533	2,978778	3,033138	3,077916	3,126086	3,153970	70,39	6
32	NORTH MALUKU	1 005,31	1 120,18	1 240,82	1 345,10	1 478,27	1 603,91	1 298,93	1,097933	0,040576	3,002300	3,049288	3,093709	3,128755	3,169754	3,205180	59,54	14
33	WEST PAPUA	3 783,45	3 941,36	4 113,38	4 478,89	4 794,92	5 050,77	4 360,46	1,059483	0,025094	3,577888	3,595646	3,614199	3,651170	3,680781	3,703358	33,50	30
34	PAPUA	2 714,96	2 597,78	2 655,45	2 835,96	3 024,14	3 381,22	2 868,25	1,044889	0,019062	3,433763	3,414602	3,424138	3,452700	3,480602	3,529073	24,54	32
	Standard deviation									**0,009748**	**0,225891**	**0,230470**	**0,228049**	**0,236263**	**0,229940**	**0,215040**		

Table 10 - Initial Data - GRDP (Source: Statistics Indonesia; own work)

HUMAN DEVELOPMENT INDEX IN PERIOD 2010 - 2015

	PROVINCE	2010	2011	2012	2013	2014	2015	Mean	Geomean	log_Geomean	log_2010	log_2011	log_2012	log_2013	log_2014	log_2015	speed (%)	rank
1	ACEH	0,6709	0,6745	0,6781	0,6830	0,6881	0,6945	0,6815	1,006938	0,003003	-0,173342	-0,171018	-0,168706	-0,165579	-0,162348	-0,158328	3,5	30
2	NORTH SUMATRA	0,6709	0,6734	0,6774	0,6836	0,6887	0,6951	0,6815	1,007112	0,003078	-0,173342	-0,171727	-0,169155	-0,165198	-0,161970	-0,157953	3,6	28
3	WEST SUMATRA	0,6725	0,6781	0,6836	0,6891	0,6936	0,6998	0,6861	1,007990	0,003456	-0,172308	-0,168706	-0,165198	-0,161718	-0,158891	-0,155026	4,1	22
4	RIAU	0,6865	0,6890	0,6915	0,6991	0,7033	0,7084	0,6963	1,006300	0,002728	-0,163359	-0,161781	-0,160208	-0,155461	-0,152859	-0,149721	3,2	32
5	JAMBI	0,6539	0,6614	0,6694	0,6776	0,6824	0,6889	0,6723	1,010483	0,004529	-0,184489	-0,179536	-0,174314	-0,169027	-0,165961	-0,161844	5,4	7
6	SOUTH SUMATRA	0,6444	0,6512	0,6579	0,6616	0,6675	0,6746	0,6595	1,009202	0,003978	-0,190844	-0,186286	-0,181840	-0,179405	-0,175549	-0,170954	4,7	17
7	BENGKULU	0,6535	0,6596	0,6661	0,6750	0,6806	0,6859	0,6701	1,009725	0,004203	-0,184754	-0,180719	-0,176461	-0,170696	-0,167108	-0,163739	5,0	14
8	LAMPUNG	0,6371	0,6420	0,6487	0,6573	0,6642	0,6695	0,6531	1,009970	0,004309	-0,195792	-0,192465	-0,187956	-0,182236	-0,177701	-0,174249	5,1	11
9	BANGKA BELITUNG	0,6602	0,6659	0,6721	0,6792	0,6827	0,6905	0,6751	1,009015	0,003898	-0,180324	-0,176591	-0,172566	-0,168002	-0,165770	-0,160836	4,6	18
10	RIAU ISLANDS	0,7113	0,7161	0,7236	0,7302	0,7340	0,7375	0,7255	1,007261	0,003142	-0,147947	-0,145026	-0,140501	-0,136558	-0,134304	-0,132238	3,7	27
11	DKI JAKARTA	0,7631	0,7698	0,7753	0,7808	0,7839	0,7899	0,7771	1,006927	0,002998	-0,117419	-0,113622	-0,110530	-0,107460	-0,105739	-0,102428	3,5	31
12	WEST JAVA	0,6615	0,6667	0,6732	0,6825	0,6880	0,6950	0,6778	1,009929	0,004291	-0,179470	-0,176070	-0,171856	-0,165897	-0,162412	-0,158015	5,1	12
13	CENTRAL JAVA	0,6608	0,6664	0,6721	0,6802	0,6878	0,6949	0,6770	1,010114	0,004370	-0,179930	-0,176266	-0,172566	-0,167363	-0,162538	-0,158078	5,2	8
14	DI YOGYAKARTA	0,7537	0,7593	0,7615	0,7644	0,7681	0,7759	0,7638	1,005823	0,002521	-0,122801	-0,119587	-0,118330	-0,116679	-0,114582	-0,110194	2,9	33
15	EAST JAVA	0,6536	0,6606	0,6674	0,6755	0,6814	0,6895	0,6713	1,010752	0,004644	-0,184688	-0,180061	-0,175614	-0,170375	-0,166598	-0,161466	5,5	4
16	BANTEN	0,6754	0,6822	0,6892	0,6947	0,6989	0,7027	0,6905	1,007956	0,003442	-0,170439	-0,166088	-0,161655	-0,158203	-0,155585	-0,153230	4,0	23
17	BALI	0,7010	0,7087	0,7162	0,7209	0,7248	0,7327	0,7174	1,008885	0,003842	-0,154282	-0,149538	-0,144986	-0,142125	-0,139782	-0,135074	4,5	19
18	WEST NUSA TENGGARA	0,6116	0,6214	0,6298	0,6376	0,6431	0,6519	0,6326	1,012844	0,005543	-0,213533	-0,206629	-0,200797	-0,195452	-0,191721	-0,185819	6,6	1
19	EAST NUSA TENGGARA	0,5921	0,6024	0,6081	0,6168	0,6226	0,6267	0,6115	1,011423	0,004933	-0,227605	-0,220115	-0,216025	-0,209856	-0,205791	-0,202940	5,8	2
20	WEST KALIMANTAN	0,6197	0,6235	0,6341	0,6430	0,6489	0,6559	0,6375	1,011419	0,004931	-0,207819	-0,205164	-0,197842	-0,191789	-0,187822	-0,183162	5,8	3
21	CENTRAL KALIMANTAN	0,6596	0,6638	0,6666	0,6741	0,6777	0,6853	0,6712	1,007674	0,003320	-0,180719	-0,177963	-0,176135	-0,171276	-0,168963	-0,164119	3,9	25
22	SOUTH KALIMANTAN	0,6520	0,6589	0,6668	0,6717	0,6783	0,6838	0,6683	1,009570	0,004136	-0,185752	-0,181180	-0,176004	-0,172825	-0,169861	-0,165071	4,9	15
23	EAST KALIMANTAN	0,7131	0,7202	0,7262	0,7321	0,7382	0,7417	0,7286	1,007896	0,003416	-0,146850	-0,142547	-0,138944	-0,135430	-0,131826	-0,129772	4,0	24
24	NORTH KALIMANTAN	N/A	N/A	N/A	0,6799	0,6864	0,6876	0,6846	1,005647	0,002445	N/A	N/A	N/A	-0,167555	-0,163423	-0,162664	1,1	34
25	NORTH SULAWESI	0,6783	0,6831	0,6904	0,6949	0,6996	0,7039	0,6917	1,007437	0,003218	-0,168578	-0,165516	-0,160899	-0,158078	-0,155150	-0,152489	3,8	26
26	CENTRAL SULAWESI	0,6329	0,6427	0,6500	0,6579	0,6643	0,6676	0,6526	1,010733	0,004636	-0,198665	-0,191992	-0,187087	-0,181840	-0,177636	-0,175484	5,5	5
27	SOUTH SULAWESI	0,6600	0,6665	0,6726	0,6792	0,6849	0,6915	0,6758	1,009368	0,004050	-0,180456	-0,176200	-0,172243	-0,168002	-0,164373	-0,160208	4,8	16
28	SOUTHEAST SULAWESI	0,6599	0,6652	0,6707	0,6755	0,6807	0,6875	0,6733	1,008228	0,003559	-0,180522	-0,177048	-0,173472	-0,170375	-0,167044	-0,162727	4,2	21
29	GORONTALO	0,6265	0,6348	0,6416	0,6470	0,6517	0,6586	0,6434	1,010044	0,004340	-0,203079	-0,197363	-0,192736	-0,189096	-0,185952	-0,181378	5,1	10
30	WEST SULAWESI	0,5974	0,6083	0,6101	0,6153	0,6224	0,6296	0,6135	1,010555	0,004560	-0,223735	-0,217312	-0,214599	-0,210913	-0,206930	-0,200935	5,4	6
31	MALUKU	0,6427	0,6475	0,6543	0,6609	0,6674	0,6705	0,6572	1,008505	0,003678	-0,191992	-0,188760	-0,184223	-0,179864	-0,175614	-0,173601	4,3	20
32	NORTH MALUKU	0,6279	0,6319	0,6393	0,6478	0,6518	0,6591	0,6430	1,009746	0,004212	-0,202110	-0,199352	-0,194295	-0,188559	-0,185886	-0,181049	5,0	13
33	WEST PAPUA	0,5960	0,5990	0,6030	0,6091	0,6128	0,6173	0,6062	1,007048	0,003050	-0,224754	-0,222573	-0,219683	-0,215311	-0,212681	-0,209504	3,6	29
34	PAPUA	0,5445	0,5501	0,5555	0,5625	0,5675	0,5725	0,5588	1,010079	0,004356	-0,264002	-0,259558	-0,255316	-0,249877	-0,246034	-0,242225	5,1	9
	Standard deviation									**0,000737**	**0,028699**	**0,028214**	**0,027819**	**0,026790**	**0,026362**	**0,026171**		

Table 11 - Initial Data - HDI (Source: Statistics Indonesia; own work)

POVERTY GAP INDEX (%) IN PERIOD 2010 - 2015

	PROVINCE	2010	2011	2012	2013	2014	2015	Mean	Geomean	log_Geomean	log_2010	log_2011	log_2012	log_2013	log_2014	log_2015	speed (%)	rank
1	ACEH	4,11	3,50	3,07	1,96	1,71	1,84	2,70	0,851521	-0,069805	0,613842	0,544068	0,487138	0,292256	0,232998	0,264818	-55	9
2	NORTH SUMATRA	2,04	1,84	1,82	1,63	1,56	1,57	1,74	0,948973	-0,022746	0,309630	0,264818	0,260071	0,212188	0,193125	0,195900	-23	26
3	WEST SUMATRA	1,49	1,36	1,24	1,12	0,54	1,06	1,14	0,934166	-0,029576	0,173186	0,133539	0,093422	0,049218	-0,267606	0,025306	-29	22
4	RIAU	1,38	1,21	1,13	0,99	0,73	0,83	1,05	0,903316	-0,044160	0,139879	0,082785	0,053078	-0,004365	-0,136677	-0,080922	-40	18
5	JAMBI	1,05	0,96	1,37	1,22	1,19	1,61	1,23	1,089249	0,037127	0,021189	-0,017729	0,136721	0,086360	0,075547	0,206826	53	31
6	SOUTH SUMATRA	2,63	2,54	1,85	2,13	2,34	1,27	2,13	0,864509	-0,063230	0,419956	0,404834	0,267172	0,328380	0,369216	0,103804	-52	11
7	BENGKULU	2,75	2,60	3,05	3,11	2,69	4,19	3,07	1,087868	0,036576	0,439333	0,414973	0,484300	0,492760	0,429752	0,622214	52	30
8	LAMPUNG	2,98	2,77	2,53	1,67	1,9	1,54	2,23	0,876316	-0,057339	0,474216	0,442480	0,403121	0,222716	0,278754	0,187521	-48	12
9	BANGKA BELITUNG	0,93	0,66	0,66	0,35	0,48	0,57	0,61	0,906731	-0,042522	-0,031517	-0,180456	-0,180456	-0,455932	-0,318759	-0,244125	-39	19
10	RIAU ISLANDS	1,05	1,01	0,85	1,04	0,67	0,8	0,90	0,947066	-0,023620	0,021189	0,004321	-0,070581	0,017033	-0,173925	-0,096910	-24	24
11	DKI JAKARTA	0,45	0,60	0,56	0,39	0,6	0,27	0,48	0,902880	-0,044370	-0,346787	-0,221849	-0,251812	-0,408935	-0,221849	-0,568636	-40	17
12	WEST JAVA	1,93	1,72	1,62	1,53	1,31	1,4	1,59	0,937808	-0,027886	0,285557	0,235528	0,209515	0,184691	0,117271	0,146128	-27	23
13	CENTRAL JAVA	2,49	2,56	2,39	2,06	1,69	2,03	2,20	0,959974	-0,017741	0,396199	0,408240	0,378398	0,313867	0,227887	0,307496	-18	27
14	DI YOGYAKARTA	2,85	2,51	2,89	2,18	2,03	2,19	2,44	0,948680	-0,022880	0,454845	0,399674	0,460898	0,338456	0,307496	0,340444	-23	25
15	EAST JAVA	2,38	2,27	1,93	1,42	1,24	1,28	1,75	0,883337	-0,053873	0,376577	0,356026	0,285557	0,152288	0,093422	0,107210	-46	14
16	BANTEN	1,00	0,90	0,95	1,14	0,65	0,82	0,91	0,961087	-0,017237	0,000000	-0,045757	-0,022276	0,056905	-0,187087	-0,086186	-18	28
17	BALI	0,71	0,66	0,39	0,8	0,68	1,09	0,72	1,089516	0,037234	-0,148742	-0,180456	-0,408935	-0,096910	-0,167491	0,037426	54	32
18	WEST NUSA TENGGARA	3,77	3,54	3,20	3,6	3,9	2,68	3,45	0,934025	-0,029641	0,576341	0,549003	0,505150	0,556303	0,591065	0,428135	-29	21
19	EAST NUSA TENGGARA	4,74	4,20	3,47	1,91	1,66	1,78	2,96	0,822107	-0,085072	0,675778	0,623249	0,540329	0,281033	0,220108	0,250420	-62	6
20	WEST KALIMANTAN	1,18	1,24	1,24	0,8	0,85	0,77	1,01	0,918167	-0,037078	0,071882	0,093422	0,093422	-0,096910	-0,070581	-0,113509	-35	20
21	CENTRAL KALIMANTAN	1,02	0,99	1,08	0,38	0,44	1,05	0,83	1,005814	0,002518	0,008600	-0,004385	0,033424	-0,420216	-0,356547	0,021189	3	29
22	SOUTH KALIMANTAN	0,69	0,81	0,76	0,47	0,41	1,13	0,71	1,103687	0,042846	-0,161151	-0,091515	-0,119186	-0,327902	-0,387216	0,053078	64	33
23	EAST KALIMANTAN	1,27	0,92	0,99	0,8	0,55	0,29	0,80	0,744250	-0,128281	0,103804	-0,036212	-0,004365	-0,096910	-0,259637	-0,537602	-77	4
24	NORTH KALIMANTAN	N/A	N/A	N/A	N/A	N/A	0,41	0,41	1,000000	0,000000	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
25	NORTH SULAWESI	1,14	1,10	1,18	0,96	0,98	0,63	1,00	0,888152	-0,051513	0,056905	0,041393	0,071882	-0,017729	-0,008774	-0,200659	-45	15
26	CENTRAL SULAWESI	3,09	2,76	2,82	1,32	2,18	1,41	2,26	0,854776	-0,068148	0,489958	0,440909	0,450249	0,120574	0,338456	0,149219	-54	10
27	SOUTH SULAWESI	1,91	1,65	1,68	0,88	0,75	0,41	1,21	0,735106	-0,133650	0,281033	0,217484	0,225309	-0,055517	-0,124939	-0,387216	-79	3
28	SOUTHEAST SULAWESI	3,18	2,61	1,92	0,6	0,96	1,71	1,83	0,883311	-0,053886	0,502427	0,416641	0,283301	-0,221849	-0,017729	0,232996	-46	13
29	GORONTALO	4,14	3,72	3,21	0,65	1,09	1,32	2,36	0,795637	-0,099285	0,617000	0,570543	0,506505	-0,187087	0,037426	0,120574	-68	5
30	WEST SULAWESI	1,55	2,32	1,74	0,48	2,21	0,9	1,53	0,896979	-0,047218	0,190332	0,365488	0,240549	-0,318759	0,344392	-0,045757	-42	16
31	MALUKU	5,23	4,99	4,38	1,13	1,14	1,98	3,14	0,823441	-0,084367	0,718502	0,698101	0,641474	0,053078	0,056905	0,296665	-62	7
32	NORTH MALUKU	1,47	1,13	0,85	0,27	0,4	0,61	0,79	0,838692	-0,076397	0,167317	0,053078	-0,070581	-0,568636	-0,397940	-0,214670	-59	8
33	WEST PAPUA	10,47	8,78	5,71	0,63	1	0,82	4,57	0,600860	-0,221227	1,019947	0,943495	0,756636	-0,200659	0,000000	-0,086186	-92	2
34	PAPUA	9,36	7,86	7,35	0,48	0,48	0,18	4,29	0,453732	-0,343201	0,971276	0,895423	0,866287	-0,318759	-0,318759	-0,744727	-98	1
	Standard deviation									**0,072119**	**0,313109**	**0,299324**	**0,289428**	**0,278636**	**0,261284**	**0,288795**		

Table 12 - Initial Data - Poverty Gap Index (Source: Statistics Indonesia; own work)

UNEMPLOYMENT (%) IN PERIOD 2010 - 2015

	PROVINCE	2010	2011	2012	2013	2014	2015	Mean	Geomean	log_Geomean	log_2010	log_2011	log_2012	log_2013	log_2014	log_2015	speed (%)	rank
1	ACEH	8,37	9,00	9,06	10,12	9,02	9,93	9,25	1,034807	0,014860	0,922755	0,954183	0,957055	1,005049	0,955130	0,997053	19	32
2	NORTH SUMATRA	7,43	8,18	6,28	6,45	6,23	6,71	6,88	0,979745	-0,008887	0,871108	0,912862	0,797879	0,809716	0,794445	0,826673	-10	14
3	WEST SUMATRA	6,95	8,02	6,65	7,02	6,50	6,89	7,01	0,998029	-0,000857	0,842270	0,904247	0,822712	0,846244	0,813135	0,837986	-1	19
4	RIAU	8,72	6,09	4,37	5,48	6,56	7,83	6,51	0,978816	-0,009299	0,940369	0,784789	0,640421	0,738961	0,816790	0,893875	-10	11
5	JAMBI	5,39	4,63	3,20	4,76	5,08	4,34	4,57	0,957693	-0,018774	0,731410	0,665812	0,505305	0,677174	0,705789	0,637541	-19	8
6	SOUTH SUMATRA	6,65	6,60	5,66	4,84	4,96	6,07	5,80	0,981878	-0,007942	0,823045	0,819699	0,752472	0,684770	0,695794	0,783333	-9	15
7	BENGKULU	4,59	3,46	3,62	4,61	3,47	4,91	4,11	1,013348	0,005759	0,662247	0,539114	0,558227	0,663431	0,540720	0,691040	7	25
8	LAMPUNG	5,57	6,38	5,20	5,69	4,79	5,14	5,46	0,983783	-0,007101	0,746200	0,804907	0,715652	0,755171	0,680295	0,710698	-8	16
9	BANGKA BELITUNG	5,63	3,86	3,43	3,65	5,14	6,29	4,67	1,022372	0,009609	0,750725	0,586353	0,535482	0,562622	0,710914	0,798770	12	29
10	RIAU ISLANDS	6,90	5,38	5,08	5,63	6,69	6,20	5,98	0,978823	-0,009296	0,838987	0,730391	0,705894	0,750403	0,825375	0,792507	-10	12
11	DKI JAKARTA	11,05	11,69	9,67	8,63	8,47	7,23	9,46	0,918603	-0,036872	1,043526	1,067843	0,985223	0,935816	0,928120	0,859165	-35	2
12	WEST JAVA	10,33	9,96	9,08	9,16	8,45	8,72	9,28	0,966687	-0,014714	1,014024	0,998454	0,958091	0,961854	0,926900	0,940454	-16	9
13	CENTRAL JAVA	6,21	7,07	5,61	6,01	5,68	4,99	5,93	0,957304	-0,018950	0,793135	0,849274	0,748780	0,779232	0,754206	0,698386	-20	7
14	DI YOGYAKARTA	5,69	4,39	3,90	3,24	3,33	4,07	4,10	0,935118	-0,029133	0,755296	0,642549	0,591283	0,510659	0,522681	0,609629	-28	5
15	EAST JAVA	4,25	5,38	4,11	4,30	4,19	4,47	4,45	1,010518	0,004544	0,627888	0,730982	0,613700	0,633443	0,621805	0,650607	5	24
16	BANTEN	13,68	13,74	9,94	9,54	9,07	9,55	10,92	0,930598	-0,031238	1,136112	1,137857	0,997533	0,979396	0,957511	0,979923	-30	3
17	BALI	3,06	2,95	2,10	1,83	1,90	1,99	2,31	0,917413	-0,037435							-35	1
18	WEST NUSA TENGGARA	5,29	5,25	5,23	5,30	5,75	5,69	5,42	1,014697	0,006337	0,723485	0,720045	0,718173	0,724207	0,759518	0,755168	8	26
19	EAST NUSA TENGGARA	3,34	3,11	3,04	3,25	3,26	3,83	3,30	1,028097	0,012034	0,523322	0,493255	0,482795	0,511705	0,512883	0,583492	15	31
20	WEST KALIMANTAN	4,62	4,60	3,54	3,99	4,04	5,15	4,32	1,021648	0,009302	0,665085	0,662843	0,548546	0,601511	0,606297	0,711592	11	28
21	CENTRAL KALIMANTAN	4,14	3,54	3,14	3,00	3,24	4,54	3,60	1,018699	0,008046	0,616904	0,549091	0,496534	0,477770	0,510806	0,657133	10	27
22	SOUTH KALIMANTAN	5,25	6,29	5,19	3,66	3,80	4,92	4,85	0,986931	-0,005713	0,720422	0,798563	0,715285	0,563382	0,579785	0,691855	-6	17
23	EAST KALIMANTAN	10,10	11,43	9,02	7,95	7,38	7,50	8,90	0,942257	-0,025831	1,004486	1,058165	0,955206	0,900197	0,868062	0,875333	-26	6
24	NORTH KALIMANTAN	N/A	N/A	N/A	N/A	N/A	5,68	5,68	1,000000	0,000000	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
25	NORTH SULAWESI	9,61	10,10	7,98	6,79	7,54	9,03	8,51	0,987538	-0,005446	0,982812	1,004525	0,901999	0,831784	0,877454	0,955582	-6	18
26	CENTRAL SULAWESI	4,61	6,78	3,95	4,19	3,68	4,10	4,55	0,977164	-0,010033	0,663431	0,831034	0,596803	0,622369	0,565679	0,613268	-11	10
27	SOUTH SULAWESI	8,37	8,13	6,01	5,10	5,08	5,95	6,44	0,934107	-0,029603	0,922773	0,910261	0,778808	0,707969	0,705889	0,774756	-29	4
28	SOUTHEAST SULAWESI	4,61	4,69	4,14	4,38	4,43	5,55	4,63	1,037683	0,016065	0,663746	0,671256	0,617065	0,641806	0,646421	0,744069	20	33
29	GORONTALO	5,16	6,74	4,47	4,15	4,18	4,65	4,89	0,979449	-0,009018	0,712975	0,828658	0,650439	0,618316	0,621522	0,667883	-10	13
30	WEST SULAWESI	3,25	3,35	2,16	2,35	2,08	3,35	2,76	1,005880	0,002546	0,512095	0,525244	0,333890	0,371382	0,317834	0,524826	3	22
31	MALUKU	9,97	10,81	7,71	9,91	10,51	9,93	9,81	0,999229	-0,000335	0,998498	1,033935	0,887129	0,996216	1,021565	0,996824	0	20
32	NORTH MALUKU	6,03	5,34	4,82	3,80	5,29	6,05	5,22	1,000565	0,000245	0,780320	0,727798	0,683342	0,580130	0,723719	0,781548	0	21
33	WEST PAPUA	7,68	6,73	5,42	4,40	5,02	8,08	6,22	1,010074	0,004353	0,885480	0,827920	0,734345	0,643622	0,700424	0,907246	5	23
34	PAPUA	3,55	5,02	3,71	3,15	3,44	3,99	3,81	1,023455	0,010069	0,550388	0,700736	0,568826	0,498984	0,536951	0,600732	12	30
	Standard deviation									**0,014778**	**0,157055**	**0,168513**	**0,165046**	**0,162341**	**0,158936**	**0,128346**		

Table 13 - Initial Data - Unemployment (Source: Statistics Indonesia; own work)

	IN-MIGRATION IN PERIOD 2010 - 2015										
	PROVINCE	2010	2015	Mean	Median	Geomean	log_Geomean	log_2010	log_2015	speed (%)	rank
1	ACEH	63 987	40 616	52 301,50	52 301,50	0,913106	-0,039479	4,806092	4,608697	-36,52	29
2	NORTH SUMATRA	123 962	142 774	133 368,00	133 368,00	1,028661	0,012272	5,093289	5,154649	15,18	6
3	WEST SUMATRA	130 180	138 826	134 503,00	134 503,00	1,012944	0,005585	5,114544	5,142471	6,64	9
4	RIAU	294 957	215 350	255 153,50	255 153,50	0,939025	-0,027323	5,469759	5,333145	-26,99	23
5	JAMBI	110 114	67 574	88 844,00	88 844,00	0,906959	-0,042413	5,041843	4,829780	-38,63	30
6	SOUTH SUMATRA	117 396	75 760	96 578,00	96 578,00	0,916130	-0,038043	5,069653	4,879440	-35,47	27
7	BENGKULU	47 827	38 574	43 200,50	43 200,50	0,957909	-0,018676	4,679873	4,586295	-19,35	21
8	LAMPUNG	92 439	81 200	86 819,50	86 819,50	0,974406	-0,011260	4,965855	4,909556	-12,16	16
9	BANGKA BELITUNG	60 808	32 417	46 612,50	46 612,50	0,881784	-0,054638	4,783961	4,510773	-46,69	33
10	RIAU ISLANDS	210 056	189 498	199 777,00	199 777,00	0,979612	-0,008946	5,322335	5,277605	-9,79	14
11	DKI JAKARTA	643 959	499 101	571 530,00	571 530,00	0,950312	-0,022134	5,808858	5,698188	-22,49	22
12	WEST JAVA	1 048 964	750 999	899 981,50	899 981,50	0,935353	-0,029024	6,020761	5,875639	-28,41	24
13	CENTRAL JAVA	301 417	518 103	409 760,00	409 760,00	1,114422	0,047050	5,479168	5,714416	71,89	2
14	DI YOGYAKARTA	227 364	208 257	217 810,50	217 810,50	0,982597	-0,007624	5,356722	5,318600	-8,40	12
15	EAST JAVA	243 061	315 543	279 302,00	279 302,00	1,053583	0,022669	5,385715	5,499059	29,82	5
16	BANTEN	465 080	324 472	394 776,00	394 776,00	0,930529	-0,031270	5,667528	5,511177	-30,23	26
17	BALI	102 425	139 849	121 137,00	121 137,00	1,064267	0,027051	5,010406	5,145659	36,54	3
18	WEST NUSA TENGGARA	47 648	105 470	76 559,00	76 559,00	1,172241	0,069017	4,678045	5,023129	121,35	1
19	EAST NUSA TENGGARA	49 339	66 123	57 731,00	57 731,00	1,060309	0,025432	4,693190	4,820353	34,02	4
20	WEST KALIMANTAN	42 650	37 359	40 004,50	40 004,50	0,973857	-0,011505	4,629919	4,572395	-12,41	17
21	CENTRAL KALIMANTAN	122 969	78 396	100 682,50	100 682,50	0,913902	-0,039100	5,089796	4,894294	-36,25	28
22	SOUTH KALIMANTAN	103 455	86 621	95 038,00	95 038,00	0,965105	-0,015426	5,014751	4,937623	-16,27	19
23	EAST KALIMANTAN	213 558	120 005	166 781,50	166 781,50	0,891121	-0,050063	5,329516	5,079199	-43,81	32
24	NORTH KALIMANTAN	N/A	34 691	34 691,00	34 691,00	N/A	N/A	N/A	N/A	N/A	N/A
25	NORTH SULAWESI	48 042	33 559	40 800,50	40 800,50	0,930760	-0,031162	4,681621	4,525809	-30,15	25
26	CENTRAL SULAWESI	61 961	62 862	62 411,50	62 411,50	1,002892	0,001254	4,792118	4,798388	1,45	10
27	SOUTH SULAWESI	120 638	136 430	128 534,00	128 534,00	1,024909	0,010685	5,081484	5,134910	13,09	7
28	SOUTHEAST SULAWESI	64 097	57 523	60 810,00	60 810,00	0,978590	-0,009399	4,806838	4,759842	-10,26	15
29	GORONTALO	26 695	15 034	20 864,50	20 864,50	0,891516	-0,049871	4,426430	4,177075	-43,68	31
30	WEST SULAWESI	37 206	33 941	35 573,50	35 573,50	0,981798	-0,007978	4,570613	4,530725	-8,78	13
31	MALUKU	29 236	25 317	27 276,50	27 276,50	0,971625	-0,012501	4,465918	4,403412	-13,40	18
32	NORTH MALUKU	24 462	20 173	22 317,50	22 317,50	0,962179	-0,016744	4,388492	4,304770	-17,53	20
33	WEST PAPUA	53 905	59 777	56 841,00	56 841,00	1,020895	0,008981	4,731629	4,776534	10,89	8
34	PAPUA	66 562	61 203	63 882,50	63 882,50	0,983353	-0,007291	4,823226	4,786773	-8,05	11
	Standard deviation						**0,027777**	**0,393206**	**0,411552**		

Table 14 - Initial Data - IN-migration (Source: Statistics Indonesia; own work)

	OUT-MIGRATION IN PERIOD 2010 - 2015										
	PROVINCE	2010	2015	Mean	Median	Geomean	log_Geomean	log_2010	log_2015	speed (%)	rank
1	ACEH	38 802	39 649	39 225,50	39 225,50	1,004328	0,001876	4,588854	4,598232	2,18	19
2	NORTH SUMATRA	372 644	270 157	321 400,50	321 400,50	0,937701	-0,027936	5,571294	5,431616	-27,50	2
3	WEST SUMATRA	150 709	139 548	145 128,50	145 128,50	0,984729	-0,006683	5,178139	5,144724	-7,41	12
4	RIAU	125 814	131 711	128 762,50	128 762,50	1,009203	0,003979	5,099729	5,119622	4,69	20
5	JAMBI	52 689	66 794	59 741,50	59 741,50	1,048585	0,020603	4,721720	4,824737	26,77	30
6	SOUTH SUMATRA	129 814	110 308	120 061,00	120 061,00	0,967959	-0,014143	5,113322	5,042607	-15,03	9
7	BENGKULU	26 910	27 477	27 193,50	27 193,50	1,004179	0,001811	4,429914	4,438969	2,11	18
8	LAMPUNG	154 420	124 478	139 449,00	139 449,00	0,957807	-0,018722	5,188704	5,095093	-19,39	6
9	BANGKA BELITUNG	17 054	21 554	19 304,00	19 304,00	1,047949	0,020340	4,231826	4,333528	26,39	29
10	RIAU ISLANDS	54 847	67 520	61 183,50	61 183,50	1,042452	0,018056	4,739153	4,829432	23,11	25
11	DKI JAKARTA	883 423	706 353	794 888,00	794 888,00	0,956248	-0,019429	5,946169	5,849022	-20,04	5
12	WEST JAVA	595 877	506 573	551 225,00	551 225,00	0,968048	-0,014103	5,775157	5,704642	-14,99	10
13	CENTRAL JAVA	979 860	647 482	813 671,00	813 671,00	0,920477	-0,035987	5,991164	5,811228	-33,92	1
14	DI YOGYAKARTA	103 492	84 915	94 203,50	94 203,50	0,981204	-0,017184	5,014907	4,928984	-17,95	7
15	EAST JAVA	528 370	421 349	474 859,50	474 859,50	0,955742	-0,019659	5,722938	5,624642	-20,25	4
16	BANTEN	192 983	207 385	200 184,00	200 184,00	1,014499	0,006252	5,285519	5,316777	7,46	21
17	BALI	41 216	50 887	46 051,50	46 051,50	1,043057	0,018308	4,615066	4,706607	23,46	28
18	WEST NUSA TENGGARA	40 982	46 504	43 743,00	43 743,00	1,025603	0,010979	4,612593	4,667490	13,47	23
19	EAST NUSA TENGGARA	67 484	66 115	66 799,50	66 799,50	0,995909	-0,001780	4,829201	4,820300	-2,03	14
20	WEST KALIMANTAN	42 144	34 994	38 569,00	38 569,00	0,963500	-0,016148	4,624736	4,543994	-16,97	8
21	CENTRAL KALIMANTAN	34 506	52 463	43 484,50	43 484,50	1,087406	0,036392	4,537895	4,719853	52,04	33
22	SOUTH KALIMANTAN	55 292	55 117	55 204,50	55 204,50	0,999366	-0,000275	4,742662	4,741286	-0,32	16
23	EAST KALIMANTAN	73 039	101 169	87 104,00	87 104,00	1,067330	0,028299	4,863555	5,005047	38,51	32
24	NORTH KALIMANTAN	N/A	18 478	18 478,00	18 478,00	N/A	N/A	N/A	N/A		
25	NORTH SULAWESI	45 473	35 851	40 662,00	40 662,00	0,953563	-0,020650	4,657754	4,554501	-21,16	3
26	CENTRAL SULAWESI	39 174	37 416	38 295,00	38 295,00	0,990859	-0,003988	4,592998	4,573057	-4,49	13
27	SOUTH SULAWESI	208 570	177 336	192 953,00	192 953,00	0,968075	-0,014091	5,319252	5,248797	-14,98	11
28	SOUTHEAST SULAWESI	42 613	46 234	44 423,50	44 423,50	1,016445	0,007084	4,629542	4,664961	8,50	22
29	GORONTALO	16 820	17 110	16 965,00	16 965,00	1,003425	0,001485	4,225826	4,233250	1,72	17
30	WEST SULAWESI	20 053	27 439	23 746,00	23 746,00	1,064726	0,027238	4,302179	4,438368	36,83	31
31	MALUKU	30 179	37 157	33 668,00	33 668,00	1,042479	0,018067	4,479705	4,570041	23,12	26
32	NORTH MALUKU	14 887	14 617	14 752,00	14 752,00	0,996346	-0,001590	4,172807	4,164858	-1,81	15
33	WEST PAPUA	16 835	20 188	18 511,50	18 511,50	1,036994	0,015776	4,226213	4,305093	19,92	24
34	PAPUA	38 803	47 849	43 326,00	43 326,00	1,042801	0,018202	4,588865	4,679873	23,31	27
	Standard deviation						**0,017692**	**0,499852**	**0,445164**		

Table 15 - Initial Data - OUT-migration (Source: Statistics Indonesia; own work)

	FOREIGN DIRECT INVESTMENT (milion USD) IN PERIOD 2010 - 2015																
	PROVINCE	2010	2011	2012	2013	2014	2015	Mean	Geomean	log_Geomean	log_2010	log_2011	log_2012	log_2013	log_2014	log_2015		
1	ACEH	4,60	22,50	172,30	94,20	31,10	21	58	1,357285	0,132671	0,662758	1,352183	2,236285	1,974051	1,492760	1,326113	361	16
2	NORTH SUMATRA	181,10	753,70	645,30	887,50	550,80	1 246	711	1,470709	0,167527	2,257918	2,877199	2,809762	2,948168	2,740994	3,095552	588	13
3	WEST SUMATRA	7,90	22,90	75,00	91,40	112,10	57	61	1,485431	0,171853	0,897627	1,359835	1,875061	1,960948	2,049606	1,756890	623	12
4	RIAU	86,60	212,30	1 152,90	1 304,90	1 369,50	653	797	1,498068	0,175532	1,937518	2,326950	3,061792	3,115577	3,136562	2,815176	654	11
5	JAMBI	37,20	19,50	156,30	34,30	51,40	108	68	1,236973	0,092360	1,570543	1,290035	2,193959	1,535294	1,710963	2,032344	190	22
6	SOUTH SUMATRA	186,30	557,30	786,40	485,90	1 056,50	646	620	1,282271	0,107980	2,270213	2,746089	2,895644	2,686547	3,023870	2,810113	247	19
7	BENGKULU	25,10	43,10	30,40	22,30	19,30	21	27	0,961054	-0,017252	1,399674	1,634477	1,482874	1,348305	1,285557	1,313412	-18	30
8	LAMPUNG	30,70	79,50	114,30	46,80	156,50	258	114	1,530397	0,184804	1,487138	1,900367	2,058046	1,670246	2,194514	2,411159	739	8
9	BANGKA BELITUNG ISLANDS	22,00	146,00	59,20	112,40	105,00	83	88	1,303100	0,114978	1,342423	2,164353	1,772322	2,050766	2,021189	1,917312	276	18
10	RIAU ISLANDS	165,70	219,70	537,10	315,70	392,10	640	378	1,310475	0,117429	2,219323	2,341830	2,730055	2,499275	2,593397	2,806466	286	17
11	DKI JAKARTA	6 429,30	4 824,10	4 107,70	2 591,10	4 509,40	3 619	4 347	0,891445	-0,049906	3,808164	3,683416	3,613599	3,413484	3,654119	3,558636	-44	31
12	WEST JAVA	1 692,00	3 839,40	4 210,70	7 124,90	6 562,00	5 739	4 861	1,276682	0,106083	3,228400	3,584263	3,624354	3,852779	3,817036	3,758815	239	20
13	CENTRAL JAVA	59,10	175,00	241,50	464,30	463,40	850	376	1,704539	0,231607	1,771587	2,243038	2,382917	2,666799	2,665956	2,929622	1339	5
14	DI YOGYAKARTA	4,90	2,40	84,90	29,60	64,90	89	46	1,788249	0,251942	0,690196	0,380211	1,928908	1,471292	1,812245	1,949906	1718	3
15	EAST JAVA	1 769,20	1 312,00	2 298,80	3 396,30	1 802,50	2 593	2 195	1,079488	0,033218	3,247777	3,117934	3,361501	3,531006	3,255875	3,413866	47	28
16	BANTEN	1 544,20	2 171,70	2 716,30	3 720,20	2 034,60	2 542	2 455	1,104825	0,043293	3,188704	3,336800	3,433978	3,570566	3,308479	3,405170	65	27
17	BALI	278,30	482,10	482,00	390,90	427,10	496	426	1,122450	0,050167	2,444513	2,683137	2,683047	2,592066	2,630530	2,695347	78	25
18	WEST NUSA TENGGARA	220,50	465,10	635,80	488,20	551,10	699	510	1,259681	0,100261	2,343409	2,667546	2,803321	2,688598	2,741230	2,844711	217	21
19	EAST NUSA TENGGARA	3,80	5,50	8,70	9,90	15,10	70	19	1,790112	0,252880	0,579784	0,740363	0,939519	0,995635	1,178977	1,844184	1738	2
20	WEST KALIMANTAN	170,40	500,70	397,50	650,00	966,10	1 336	670	1,509555	0,178849	2,231470	2,699578	2,599337	2,812913	2,985022	3,125714	684	9
21	CENTRAL KALIMANTAN	546,60	543,70	524,70	481,60	951,00	934	664	1,113001	0,046495	2,737670	2,735359	2,719911	2,682686	2,978181	2,970147	71	26
22	SOUTH KALIMANTAN	202,20	272,10	272,30	260,60	502,50	961	412	1,365863	0,135407	2,305781	2,434729	2,435048	2,415974	2,701136	2,982816	375	15
23	EAST KALIMANTAN	1 092,20	602,40	2 014,10	1 335,40	2 145,70	2 381	1 595	1,168712	0,067708	3,038302	2,779685	3,304081	3,125611	3,331569	3,376840	118	24
24	NORTH KALIMANTAN	N/A	N/A	N/A	45,90	108,30	231	128	2,242973	0,350824	1,661813	N/A	N/A	1,661813	2,034628	2,363461	403	14
25	NORTH SULAWESI	226,80	220,20	46,70	65,70	98,40	88	124	0,827415	-0,082277	2,355643	2,342817	1,669317	1,817565	1,992995	1,944261	-61	33
26	CENTRAL SULAWESI	138,50	370,40	806,50	855,00	1 494,20	1 085	792	1,509417	0,178809	2,141450	2,568671	2,906604	2,931966	3,174409	3,035495	684	10
27	SOUTH SULAWESI	441,80	89,60	582,60	462,80	280,90	233	349	0,880147	-0,055445	2,645226	1,952308	2,765370	2,665393	2,448552	2,368001	-47	32
28	SOUTHEAST SULAWESI	14,00	17,00	35,70	88,40	161,80	145	77	1,596076	0,203054	1,146128	1,230449	1,552668	1,936514	2,208979	2,161396	936	6
29	GORONTALO	0,80	12,50	35,30	25,70	4,10	7	14	1,539641	0,187420	-0,096910	1,096910	1,547775	1,409933	0,612784	0,840188	765	7
30	WEST SULAWESI	37,30	5,60	0,20	2,50	16,30	2	11	0,558485	-0,252988	1,571709	0,748188	-0,698970	0,397940	1,212188	0,306768	-95	34
31	MALUKU	2,90	11,70	8,50	52,80	13,10	82	29	1,952973	0,290696	0,462398	1,068186	0,929419	1,722634	1,117271	1,915879	2741	1
32	NORTH MALUKU	246,00	129,80	90,30	266,50	98,70	204	173	0,963087	-0,016334	2,390935	2,113275	1,955688	2,428944	1,994317	2,309264	-17	29
33	WEST PAPUA	17,20	33,10	32,00	54,20	153,40	259	91	1,719581	0,235423	1,235528	1,519828	1,505150	1,733999	2,185825	2,412641	1404	4
34	PAPUA	329,60	1 312,00	1 202,40	2 360,00	1 260,60	897	1 227	1,221703	0,086966	2,517987	3,117934	3,080049	3,372912	3,100577	2,952816	172	23
	Standard deviation									**0,118626**	**0,895301**	**0,844120**	**0,896057**	**0,796325**	**0,779748**	**0,775601**		

Table 16 - Initial Data - FDI (Source: Statistics Indonesia; own work)

APPENDIX 3: Sigma-convergence Graphs

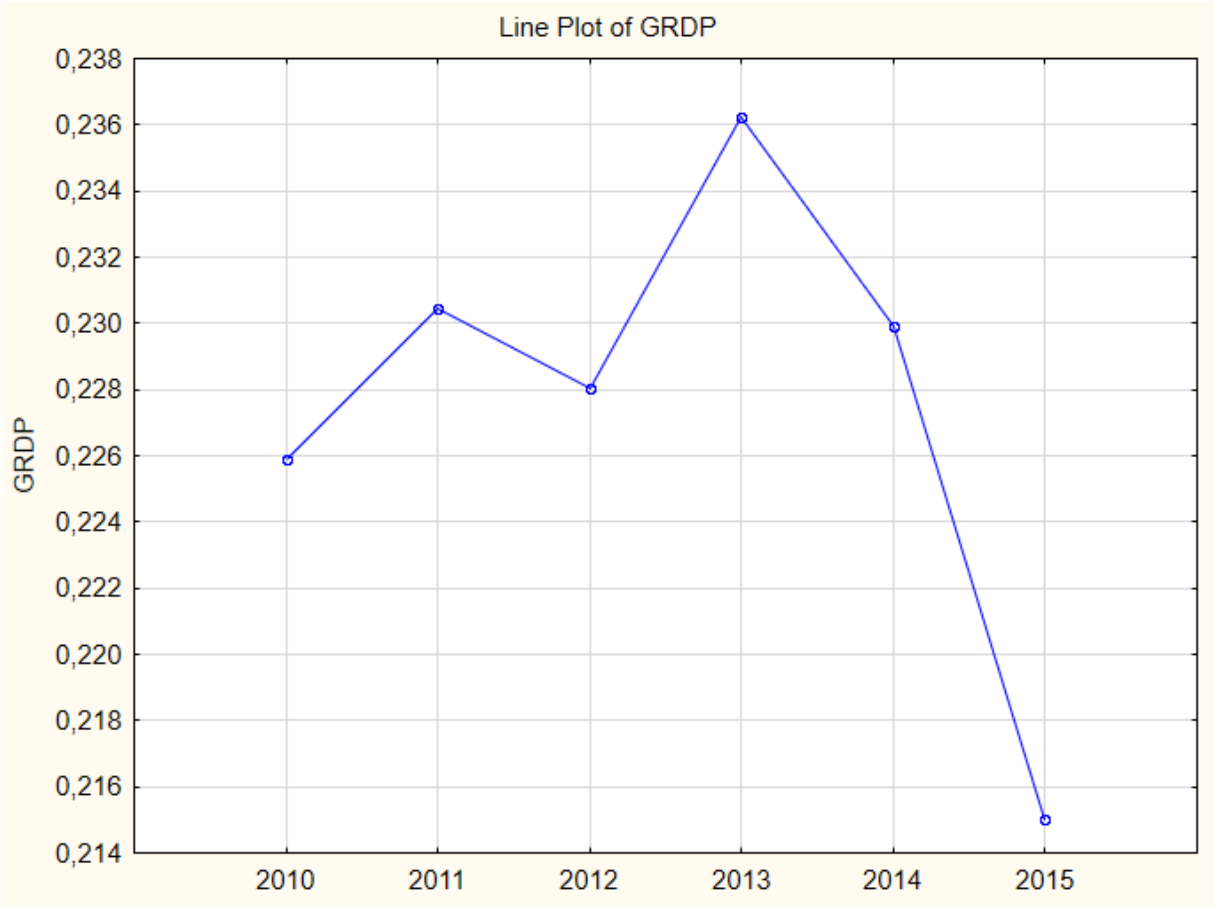

Figure 11 - Sigma-convergence plot - GRDP (Source: Statistics Indonesia; own work)

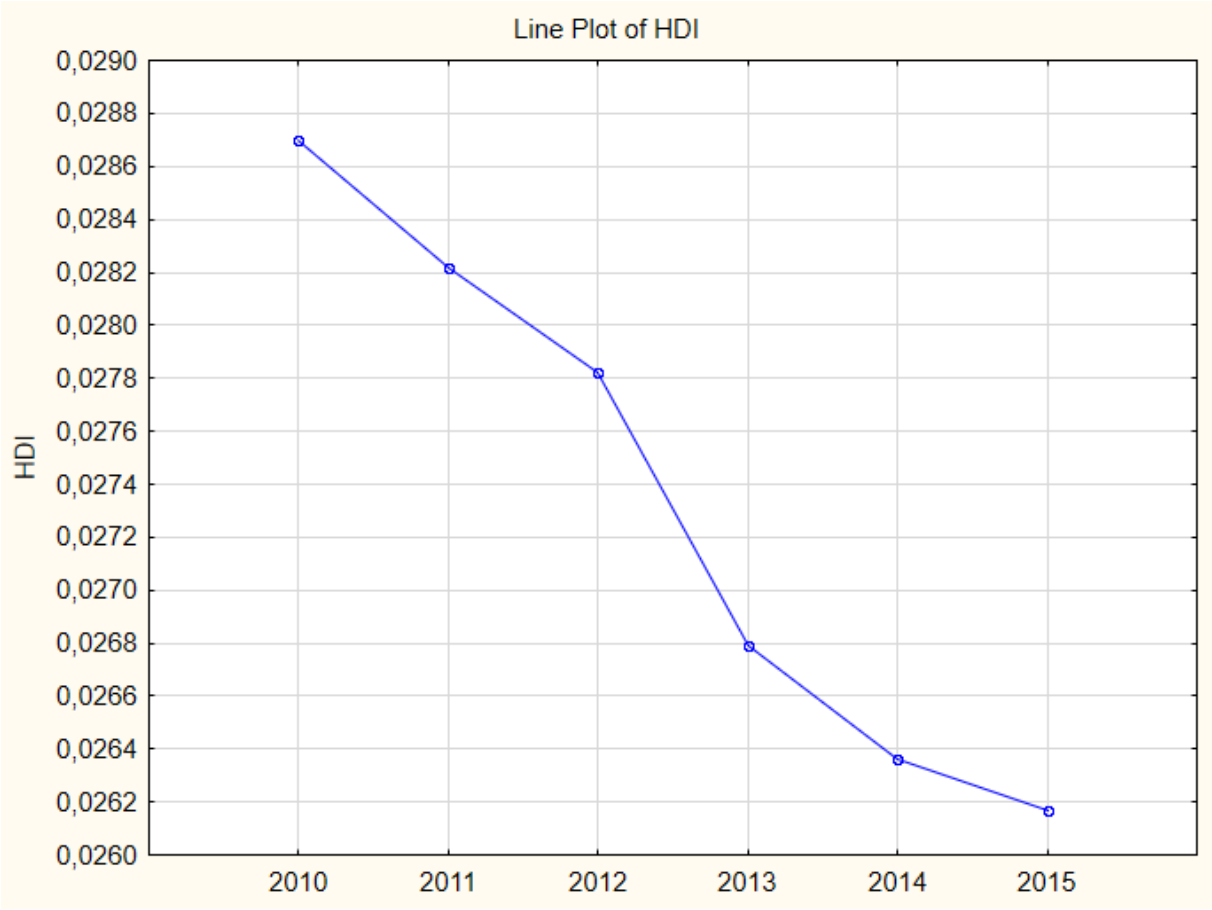

Figure 12 - Sigma-convergence plot - HDI (Source: Statistics Indonesia; own work)

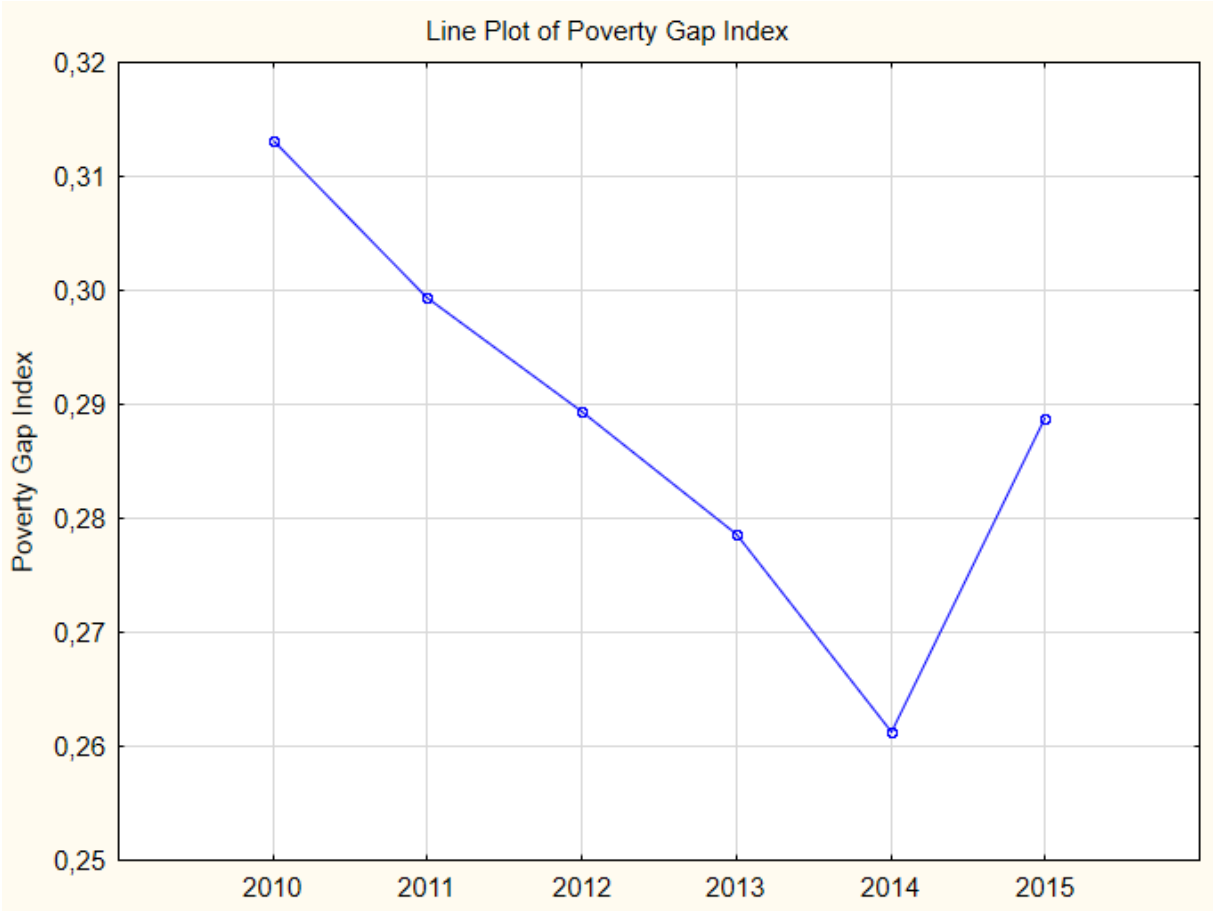

Figure 13 - Sigma-convergence plot - Poverty Gap Index (Source: Statistics Indonesia; own work)

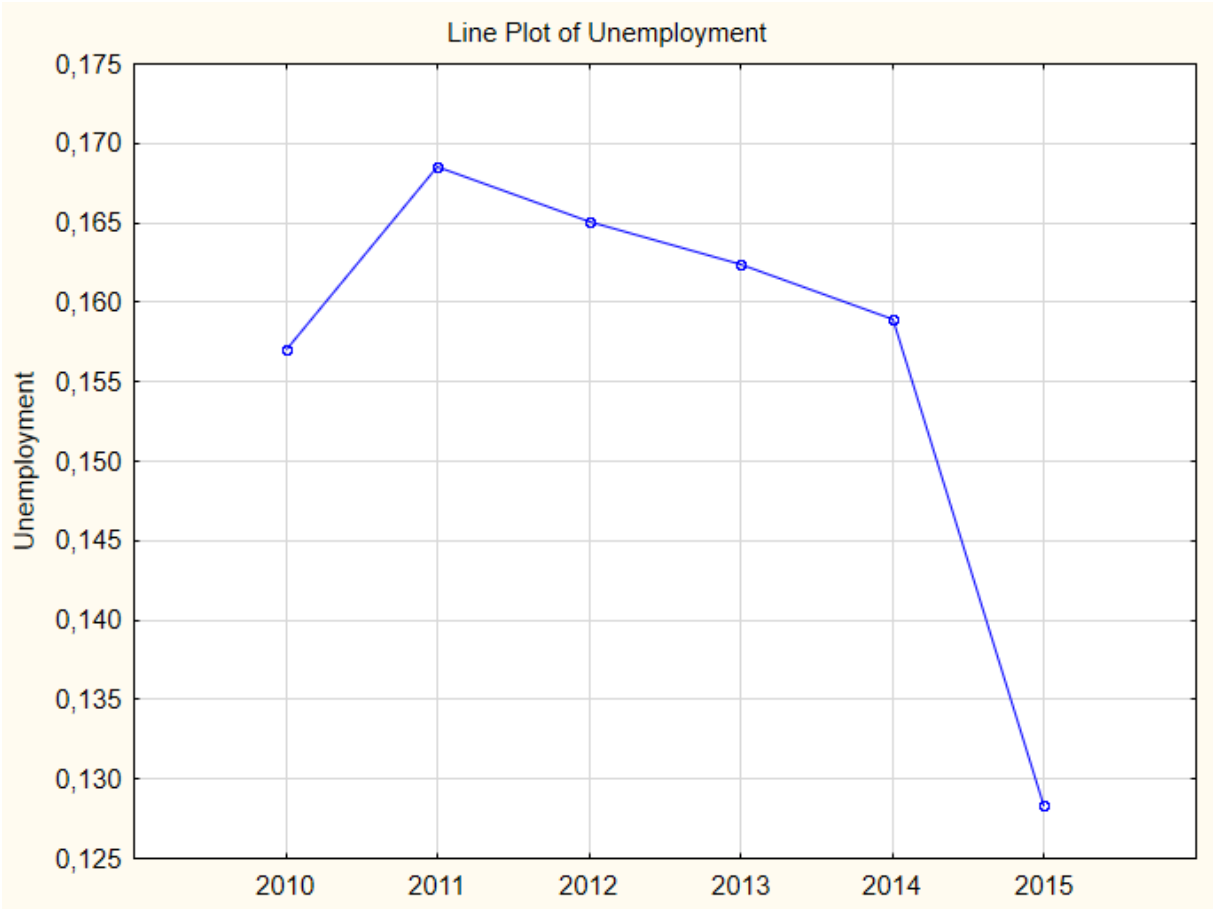

Figure 14 - Sigma-convergence plot - Unemployment (Source: Statistics Indonesia; own work)

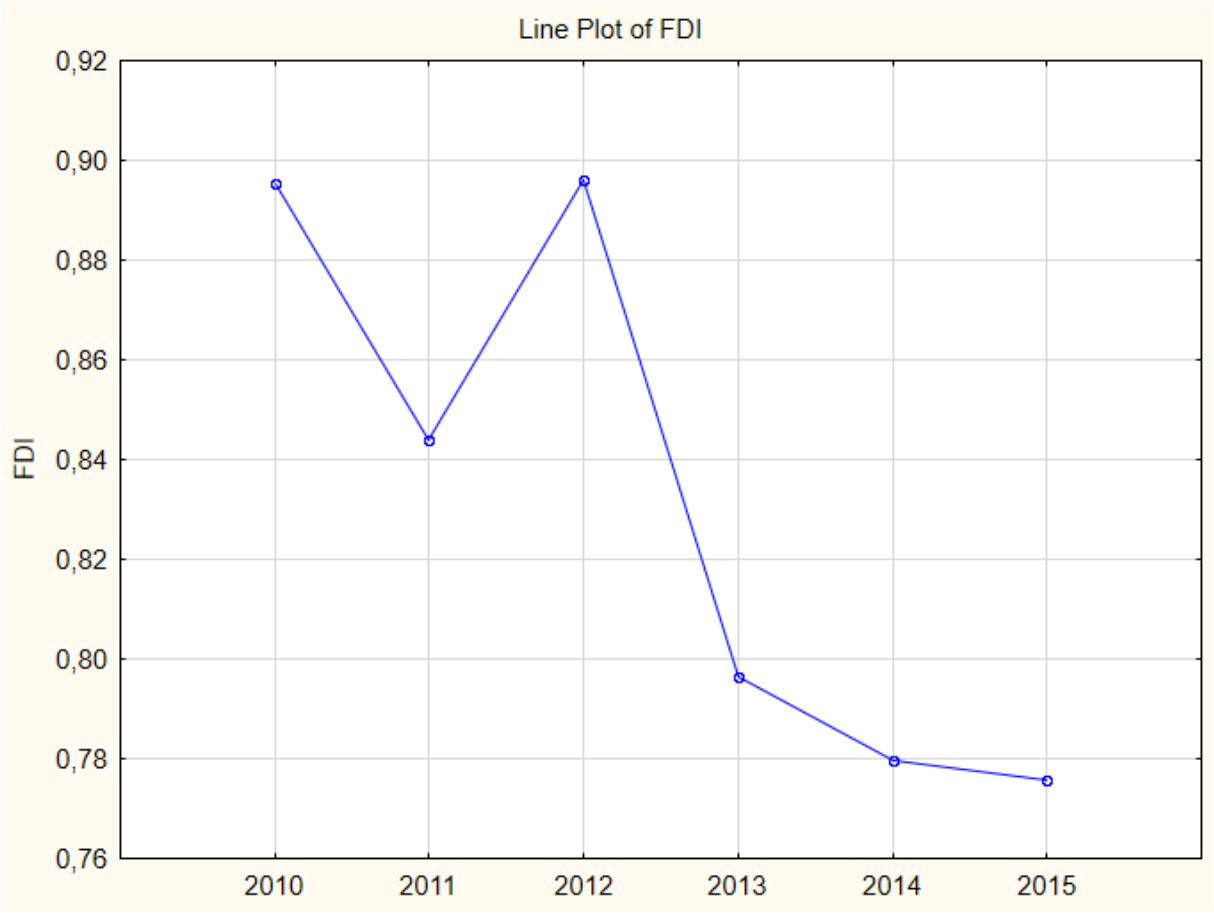

Figure 15 - Sigma-convergence plot - FDI (Source: Statistics Indonesia; own work)