THE IMPACT OF COHESION POLICY ON REGIONAL DEVELOPMENT IN ESTONIA: EXPERIENCE FROM 2007-2013

by

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Abstract

The research examines the impact of the Cohesion Policy 2007-2013 on GDP per capita in county level in Estonia. The policy implemented under three operational programs- first Development of Economic Environment, second Development of Living Environment and finally Human Resource Development with the support of European Regional Development Fund (ERDF), Cohesion Fund and country contribution by 17%. The total allocated EU funding was EUR 3.4 billion and country contribution is equivalent to EUR 0.7 billion. The Different priority areas under all three programs, mainly, served to develop a knowledge-based economy; improve infrastructure of educational and health-care facilities; construction of roads, ensuring environmental protection and enhancing renewable energy sector. Econometric Models Fixed Effect OLS and the Difference GMM Dynamic Panel Estimator are used to analyze the effect. The results show there is a positive impact of the policy on economic development. Moreover, the analysis reveals that the Cohesion Policy 2007-2013 contributed to the convergence of regions.

Key words: Cohesion Policy, regional development, economic growth.

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List of abbreviations.

CF	Cohesion Policy
DEE	Development of Economic Environment
DLE	Development of Living Environment
ERDF	European Regional Development Fund
ESF	European Social Fund
EU	European Union
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
GMM	Generalized Method of Moments
HRD	Human Resource Development
NSRF	National Strategic Reference Framework
R&D	Research and Development
VET	Vocational Education and Training

Introduction.

Upon accession to the European Union in 2004, Estonia became the beneficiary of Cohesion Policy. Within policy frameworks, Estonia has been receiving funds from the European Regional Development Fund (ERDF), the European Social Fund (ESF) and the Cohesion Fund for development projects within 2004-2006, 2007-2013 and 2014-2020 programs for *reducing disparities between the various regions and the backwardness of the least-favored regions* as declared in the 1986 Single European Act. Although Cohesion Policy covers all 28 European Union member states, to fulfill the aim of encouraging balanced and sustainable development, priority has been given to those countries that lag behind the EU average (The EU's main investment policy, n.d.). The program is funded by 17 % of contribution from Estonian public and private sector and 83% from foreign aid from the European Regional Development Fund (ERDF), and Cohesion Fund (CF).

This study focuses on evaluating the impact of the Cohesion Policy (2007-2013) on regional economic growth in Estonia. The Operational Programs such as Development of Economic Environment (DEE), Human Resource Development (HRD), and Development of Living Environment (DLE) have been designed within the Cohesion Policy framework. Different priority areas under all three programs, mainly, served to develop a knowledge-based economy, improve infrastructure of educational and health-care facilities, construction of roads, ensuring environmental protection and enhancement of renewable energy sector.

The structure of the paper as follows: Chapter I contains the relevant theoretical and empirical literature review. Chapter II focuses more on the evaluation of country context and inequality among regions in Estonia. It is followed with understanding of the priority areas and

objectives of the DEE, DLE and HRD. In Chapter III the OLS Fixed Effect and the Difference Generalized Method of Moments (GMM) dynamic panel data estimator are used to assess the impact of programs separately and overall impact on regional GDP per capita, by using data from 2008 to 2015, covering 15 counties of Estonia. The paper concludes by interpretation of results and policy recommendation. The results and policy recommendations could add values for future policy designing and lesson learned for other member countries.

1. LITERATURE REVIEW

This chapter highlights the most relevant literatures related to the program's policies, structure, and implementation. The aim of the program is to stimulate balanced development. Development is a complex process with diversified mixed theories and factors that produces different outcome within particular context.

History of thought in Development Economics is rich with many ideological contradictions. Since, 16th century, it has been started with mercantilist dominated thoughts, continued with classical liberal political economy, where the role of individual incentives were praised. Later, the importance of population growth, market, the concept of the comparative advantage in trade considered main discussion topics in 18th century (De Janvry & Sadoulet, 2016). World War I followed by the period of economic depression (1914-45) pushed governments to implement more conservative policies, such as restricting import through tariffs and quotas contributing to development of theories pertaining to structuralism, and central planning. Later, development models such as *Harror-Domar, Solow growth models,* and employment strategies emerged and integrated to rural development models came into scenes (De Janvry & Sadoulet, 2016).

One of the widely discussed topics in development economics literature is the role of capital accumulation as a driving factor of growth. For instance, Harrod-Domar model identifies the rate of savings and the technological changes as two main drivers of capital accumulation, where capital accumulation contributes to the growth rate (De Janvry & Sadoulet, 2016, p. 330). At the same time, foreign aid would be considered additional to savings, and it plays the role of

"Big Push" in poor countries. The Solow model builds on Harrod-Domar model and explains growth on the relative roles of Total Factor of Productivity (TFP), which can be achieved by technological change and factor deepening (Solow, 1956).

Beside capital accumulation, human resources were discussed as an essential factor in the development process. For example, Etzkowitz and Klofsten (2005) describe the Triple Helix model - university, industry and government – as a precondition of knowledge-based regional development. Moreover, Malecki (1991) appraises human element as an ultimate determinant of economic outcomes in all settings, such as learning new skills, improving technology, and producing new knowledge either in low or high-tech circumstances.

While each economy's development process is different and affected by its respective institutional settings, development objectives take new shapes. De Janvry & Sadoulet (2016) describe the modern objectives of development economics where main focuses are country specific analysis to reduce vulnerability, good governance and institution building, sustainable development that can be achieved by implementations of development policies such as improving business climate for private investment, human resource development and empowerment, social-safety nets rather than following "Big Ideas".

There are many empirical studies that have been carried out to assess the policy tools and measures for the economic development such as investments in infrastructure and transportation, R&D, improving education, the role of FDI etc. Demurger (2001) examines the economic disparities in the availability of infrastructure and economic growth in China by examining panel data from 1985 to 1998. The findings of this study show that economic policy actions that can develop regional infrastructure are mostly contributing to growth, more so in rural areas.

Additionally, it shows improving transportation system appears to be the crucial point for the development.

In his paper, "Heading for Divergence? Regional Growth in Europe Reconsidered", Farenberg (1996) analyzes driving factors of growth in Europe. By examining 70 regions, covering 6 EU countries- Germany, UK, Italy, France, Netherlands, and Belgium- he questions converging and diverging factors in the post-war EU. The results show slow but steady growth in income level and productivity across European countries over time. However, specific policies such as R&D and investment have positive impact only in the regions where unemployment rate is very low. On the other hand, R&D and direct credit tools seem inefficient, and have diverging impact for the poorer regions.

For examining the human resources component, Barro (1991) shows empirical evidence of neoclassical convergence theories with the use of school enrollment rates as proxies for human capital and GDP per capita in 98 countries covering period from 1960-85. The research results illustrate positive impact of human capital on GDP growth. Specifically, he proves that growth process is faster and larger in poor countries than in richer countries.

Tondale and Vuksic (2008) investigate 36 regions in Czech Republic, Slovakia, Hungary, Poland, and Slovenia for the period of 1995-2000 a time when those countries had left transition behind. The aim of study is to analyze the main growth drives and geographical factors. Results show that foreign direct investment (FDI) and the high education are more important elements for regional growth in the Eastern Europe with capital cities outperforming in all factors of growth.

One of the studies that evaluate impact of Cohesion Policy in mitigating regional disparities is by Basile, Nardis, and Girardi (2001). They employed two classical converging methods, where σ convergence method to examine the process between countries and measures standard deviation of the natural logarithm of per capita income from EU-12 average, and β convergence method for analyzing within country process. The results of study show that distribution of the structural funds as the public aids to poor regions through Cohesion policy framework does not mitigate regional disparities in country level but rather it widens the gap in employment rate and productivity levels.

The main aim of the Cohesion policy is to reduce regional disparities and support member countries that have GDP per capita under 90% of EU average.

This paper contributes to measuring the impact of Cohesion Policy and examines whether it has achieved its goals in reducing regional disparities by examining the case of Estonia as one of the countries that adopted and benefited from ESIF and Cohesion Fund.

2. COUNTRY CONTEXT AND POLICY MEASURES

The Chapter 2. elaborates on the country context and discusses the implemented operational programs of DEE, DLE and HRD within Cohesion Policy 2007-2013 framework in Estonia.

2.1.Economy of Estonia

Estonian economy faces regional inequality issues, which are linked with high unemployment rates in counties, overconcentration in capital city Tallinn and Tartu, emigration, and underusage of the infrastructure in less developed part of the country (Kalvet, 2013, p. 5). Estonian National Strategic Reference Framework (NSRF) 2007-2013 is generated to address social economic issues. The main idea behind NSRF of Estonia is to develop human resources, create knowledge-based economy, improve basic infrastructure and increase national administrative capacity. On top of that, the "headline objective" for the NSRF is set as follows: "fast, socially and regionally balanced sustainable economic development".

Estonia has 15 counties, and they are divided into 5 groups at NUTS-3 levels;Northern Estonia (Harju county)Western Estonia (Hiiu, Lääne, Pärnu and Saare county), Central Estonia (Järve, Lääne-Viru and Rapla county), Northeastern Estonia (Ida-Viru county), Southern Estonia (Jõgeva, Põlva, Tartu, Valga, Viljandi and Võru county) (Statistics Estonia, n.d.).

Malecki (1991) recalls "neoclassical conventional wisdom" where regional growth is expected to be accompanied with a convergence in regional per capita incomes (p. 75).

The vast economic difference between regions is shown in the Figure 1. In Estonia, the economic condition is highly unequal among counties. While the capital city Tallinn has 1.65 times

higher GDP per capita than country average, most of the counties fall under 70% according to the 2016 indicators. Over nine years, the share of in GDP per capita experienced in Estonia.

Figure 1. GDP per capita of cities/counties as a percentage of whole country average.

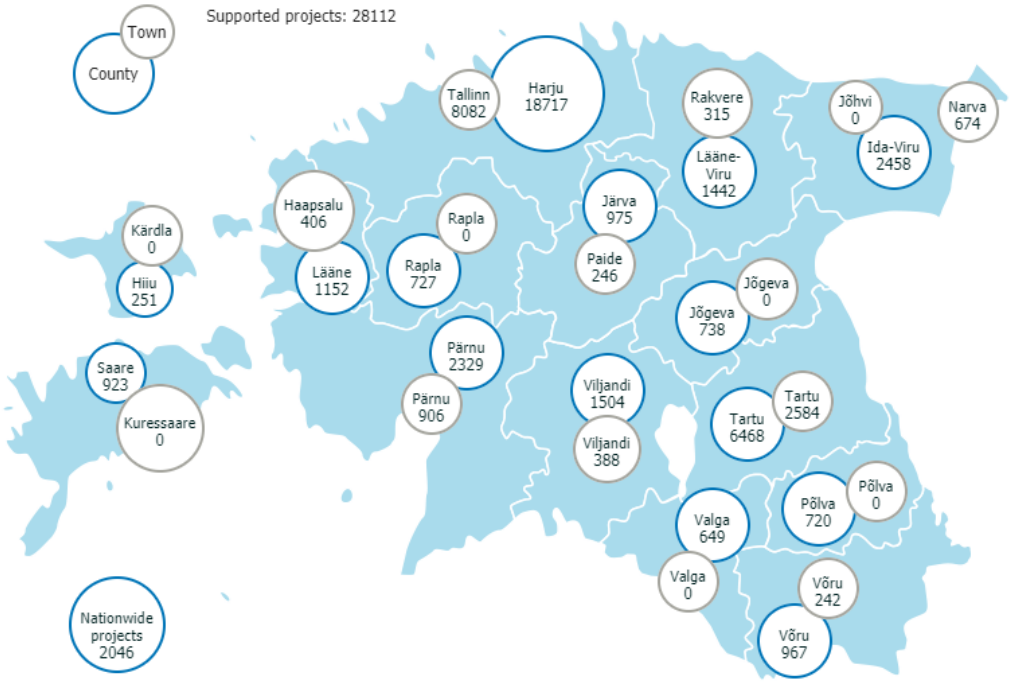
County/Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Tallinn city	167	165	171	163	163	164	167	168	166	165
Harju	146	144	147	142	143	144	144	144	145	145
Tartu city	108	111	101	101	99	104	104	108	110	115
Tartu	89	98	89	88	85	85	86	88	91	94
Pärnu	77	72	69	68	68	66	64	63	66	67
Viljandi	59	57	57	64	65	65	65	66	65	64
Lääne-Viru	70	69	67	72	71	72	65	65	64	63
Saare	75	80	72	93	72	70	64	62	63	61
Järva	68	61	59	65	68	68	64	63	60	58
Ida-Viru	62	66	63	69	71	66	69	65	58	57
Hiiu	67	66	69	64	61	59	59	54	57	56
Lääne	63	62	63	64	63	63	60	56	54	53
Rapla	54	49	51	51	50	50	51	51	53	53
Võru	58	56	58	57	57	55	57	55	54	53
Valga	51	51	51	52	53	51	50	51	51	50
Jõgeva	46	44	47	49	52	51	51	48	49	46
Põlva	51	51	51	48	49	48	44	43	43	41

Source: Statistics Estonia, Author's own work.

Nine out of 15 counties have GDP per capita under 60% of whole country average.

Figure 2. illustrates the number of projects implemented within Cohesion Policy 2004-2006, 2007-2013, and 2014-2020 in Estonia under all priorities such as Energetics, Integration, Education, Transportation, Entrepreneurship and innovation, Administrative capacity, Information society, Environment, Regional development, Social protection & health, and Research.

Figure 2. Implemented projects within Cohesion Policy



Source: Statistics Estonia

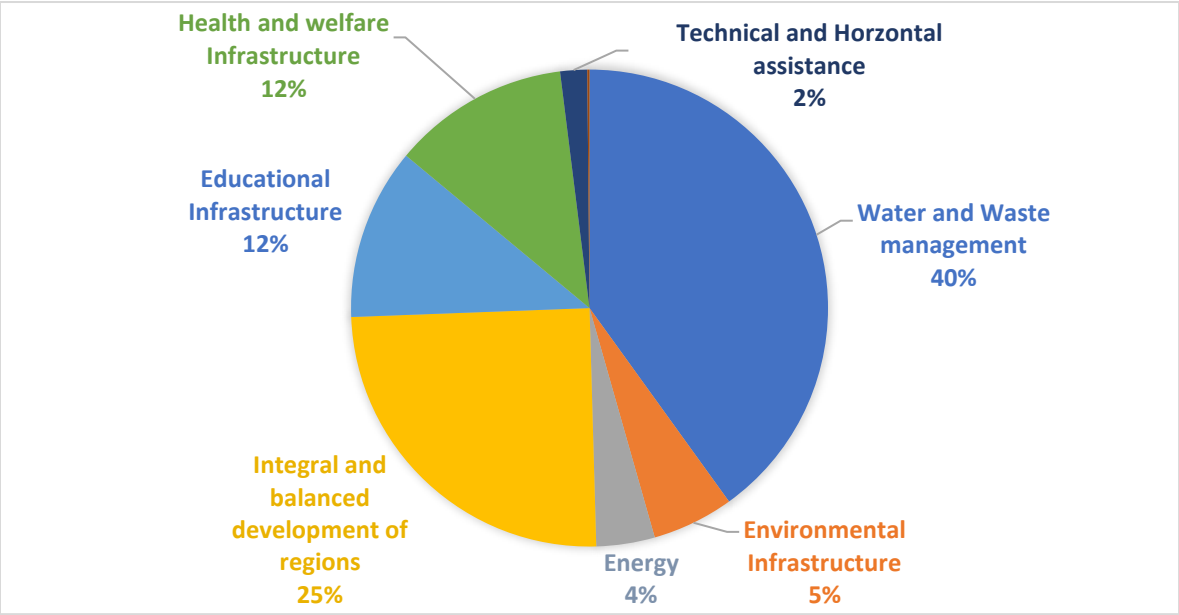
2.2. Operational Programs within Cohesion Policy 2007-2013

Operational Programs of the Developing Economic Environment, Developing Living Environment and Human Resource development have several priority axes. Main purpose of all programs was to built knowledge-based sustainable and balanced economy. To achieve this goal, projects implemented to improve environmental condition, research and development, health care system, energy and public service. The budget of all three programs was EUR 4.01 billion, with EUR 3.4 billion ESDF and Cohesion Fund contributions.

2.2.1 Development of Living Environment

Wide scope of projects to improve environmental condition, and infrastructure, develop renewable energy sector, improve the quality of public services in the regions, educational infrastructure, healthcare facilities in the least developed parts of Estonia were implemented under The Development of Living Environment program. The overall program budget is 1.83 billion euro, and was allocated among 8 priority axis (Statistics Estonia, n.d.).

Figure 3. DLE budget allocation



Source: Statistics Estonia, Author's own work

2.2.1.1 Development of Water and Waste Management infrastructure.

Main environmental concerns about abandoned industrial waste depositories is being addressed by implementing projects under water and waste management infrastructure priority axis. projects (European Investment in Estonia – 2007–13). The first priority axis of the program has the largest share (40%) in the allocated funds, in the amount of EUR 736.8 million (European

Comission). Projects are designed in two dimensions. The first one is construction and reconstruction of drinking water supply systems. The second is the construction, and upgrading of the waste water collection system, sewage treatment plants in order to mitigate the risk of contamination of oil shale waste dumps. Moreover, the contaminated ground water sites as a result of past military or industrial activities also cleaned up (DLE, 2010, p. 72).

Within the program, projects were implemented in different parts of Estonia. For instance, Põltsamaa and Pedja rivers catchments are reconstructed and developed water and waste systems (Uuemõisa, 2011). Similarly, in reconstruction and development projects of water and waste system have been realized in East Harju and Keila-Vasalemma, Viljandi County, Lääne-Viru, Pärnu, Valga, Ida-Viru, Narva, Narva-Jõesuu, Sillamäe.

2.2.1.2 Development of infrastructures and support system for sustainable use of the environment.

To fulfill the aspired goals of this priority axis, 5% of the program budget equals EUR 101.8 million was allocated to projects.The main operational direction were 1) Establishment and maintenance of nature conservation infrastructure, restoring natural habitat for the endangered species and landscape. Furthermore, two educational support centers for sustainability and environment, also was part of implemented projects. (DLE, 2010, p. 7)

2.2.1.3 Development of Energy sector.

Despite that only 4 % (EUR 72.9 million) of the funds were allocated for the energy sector, the goals were quite ambitious. Figure 4. illustrates the planned targets for 2015 and achieved results according to the Statistics Estonia by the end of 2016.

Figure 4. Target and Recorded Energy industry indicators.

Plan	Target for 2015	Recorded in 2016
Capacity of electricity production from renewable energy sources GWh	491	1952
Capacity of heat generation in CHP and boiler houses from renewable energy sources GWh	3680	2619
Share of biofuels in transportation fuel consumption (based on the energy value)	8%	3%

Source: Statistics Estonia & DLE

The share of energy generated from renewable energy sources was 1.5%, which was equal to 182 GWh in 2007. This indicator increased to 16.2% in 2016, equaling energy production from the renewable sources to 1952 GWh. It is also worth to mention that total production level of the energy did not face change over time. While it was 12050 GWh in 2007, the volume of the energy production recorded as 12138 GWh (Statistics Estonia).

The capacity of heat generation and boiler houses was 2048 in 2007 and the target set for reaching 3680 GWh using peat, wood and vegetable biomass by 2015 (DLE, 2010). According to the statistical office of Estonia the share of renewables in the heat generation was 2610 GWh. Apparently, there is an increase by 562 GWh comparing 2007 and 2016. While target of electricity production was achieved about 4 times higher, the project target to increase capacity of boiler houses was not met.

The wide range of projects were supported for the establishing heat and/or power plants and boiler plants using renewable energy sources, awareness raising activities for consumers about

the alternative energy usage, and reconstruction works of the buildings that were built before 1993 to improve energy efficiency.

2.2.1.4 Integral and Balanced Development of Regions.

Several objectives were set in order to address issues in both rural and urban areas in Estonia. One of the objectives is to reconstruct public service infrastructure objects to provide high standard service for citizens. In order to achieve it, schools, sports and recreation facilities, child care institutions, rehabilitation centers, passenger service centers, public transport stops construction and renovation projects were implemented within program (DLE, 2010). Secondly, regional economic development was targeted over improving the local business environment with using region-specific competitive advantages. To boost the business potential and to promote local employment, regional industrial parks and logistic centers were developed, conditions were created for the local employment. Furthermore, cultural sites and tourism facilities were developed to boost tourism sector in Estonia.

2.2.1.5 Development of Educational Infrastructure.

One of the aspects of the projects under 5th priority axis was to upgrade technology, renovation of the existing rooms in the vocational education institutions, or the construction of new study buildings and ensuring the accessibility of vocational education (DLE, 2010, p. 119). The countrywide implemented projects aimed to modernize the infrastructure of the educational institutions and strengthen vocational education. 31 Vocational Education and Training (VET) schools, 9 schools of special educational needs (SEN), 45 open youth centers, information and 20

counselling centers and 300 hobby schools, were supported by developing infrastructure and equipment within the project (DLE, 2010). In total, EUR 214 million, 12% of the Operational Program of the Development of Living Environment were spend on this particular priority axis (The EU's main investment policy, n.d.)

2.2.1.6 Development of Health and Welfare Infrastructure.

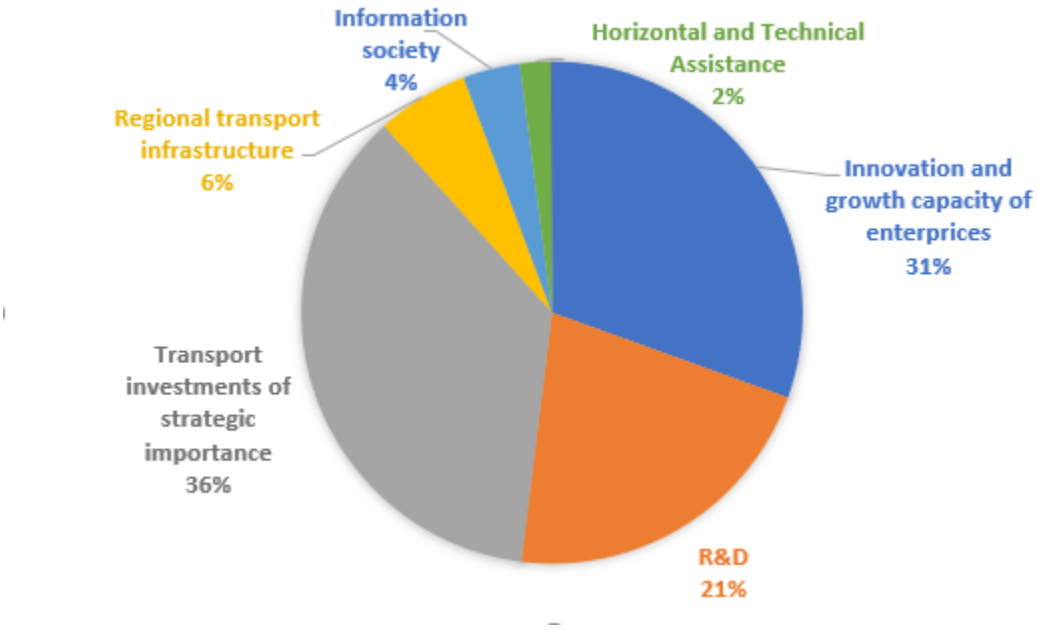
For better quality of health care and accessibility, EUR 220.6 million which is 12% of the program budget were spent on construction or renovation of health care facilities (The EU's main investment policy, n.d.). According to the DLE the equal access to health care was prioritized and in order to ensure balanced regional development, the least developed parts of Estonia were main target regions (Eastern and Southern part of the country).

2.2.2 Development of Economic Environment.

Within the program various projects were realized to improve innovation, research and development, to make financial resources available for start-ups, modernization of educational institutions, developing transportation system both in urban and regional level, improve accessibility of information society and etc. The total budget -1.7 billion euro – was distributed in the 6 priority axis.

Figure 5. depicts the overall spending under priority axes. However, each subcategory has budget for construction works to improve infrastructure of the respective areas.

Figure 5. Budget allocation under DEE



Source: Statistics Estonia, Author's own work

2.2.2.1 Innovation and growth capacity of enterprises

One of the priorities of the program is to improve efficiency and boost the productivity of private sector participants by supporting their research and development and innovation capacity in different sectors of the economy. The distributed funds for this particular axis reached EUR 518.6 million, equaling 31% of the total program budget (The EU's main investment policy, n.d.). The purpose is to achieve knowledge-based economy for the long-term economic growth and competitiveness of firms in Estonia. In order to improve access to capital of market players, start-up aid, credit guarantees, and equity loans were used as means. Moreover, export marketing support, and export guarantees are given to companies. To develop tourism sector in the regions projects were implemented, such as tourism marketing support, product development, creating tourism network and information centers. Furthermore, increasing the number of new innovative

start-ups and survival rate, was also on agenda. Technology parks and incubators, as well as competence centers were established within the program (DEE, 2010, p. 66).

2.2.2.2 Improving the competitiveness of Estonian R&D through the research programs and modernization of higher education and R&D institutions

The target areas of the priority axis 2 are mainly Tallinn and Tartu, these cities have the highest R&D potential in Estonia. The goal was to develop research, higher education environment, improve the infrastructure of research labs, libraries, schools. 21% of the program budget, which is EUR 364.97 million, was spent to realize projects in the field (DEE, 2010).

2.2.2.3 Transport investments of strategic importance.

In 2004, when the country joined the EU, the trade flow on Estonian roads extremely increased. There was a need to improve transportation infrastructure to ensure international flow of goods on Trans-European Networks. Moreover, for the safety and environmental issues the public transportation for the urban areas had to be improved (DEE, 2010, p. 42). Major infrastructure investments were realized in two big cities, Tallinn and Tartu. The allocated fund of the programs was 36% of overall program budget which is EUR 618.1 million (DEE, 2010).

2.2.2.4 Development of regional transport infrastructure.

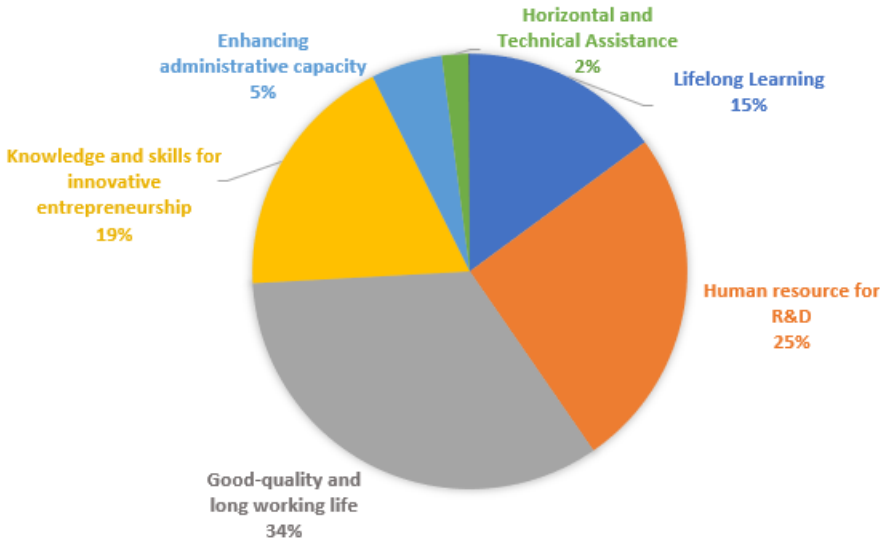
Improvement of the accessibility of Estonian regions was one of the priorities of the program. The 6% of the budget of the program, EUR 110.5 million was allocated for the developing regional transportation infrastructure (DEE, 2010).

2.2.2.5 Development of information society

Under the priority axis 5, the goal was to improve accessibility of the IT network, specifically for people with special needs. As stated in the program description: "The accessibility of public services in Estonia's rural regions and offering possibilities for enterprise and participation in public life regardless of a person's geographical location" was set as main objective of the 5th priority axis (DEE, 2010, p. 119).

2.2.3 Human Resource Development

Figure 6. Budget allocation of HRD



Source: Statistics Estonia, Author's own work

2.2.3.1 Lifelong learning

To ensure accessibility of education to all people in different age and ethnic groups, to meet changing labor market requirements, thus to build knowledge-based economy are purposes that

mainly targeted under this priority axis (HRD, 2010, p. 79). Several projects were supported for developing curriculum for vocational education institutions, and providing training for the Vocational Education and Training (VET) teachers, improving competencies of pedagogues through ICT training and etc. (HRD, 2010, p. 84). Inclusiveness, accessibility for non-Estonian ethnics were taken into consideration. Moreover, projects implemented for supporting adults with low skills to adjust changing labor market requirements and bring back to education system.

2.2.3.2 Developing the human resource for R&D

Besides support to return dropouts of higher education to studies, e-learning projects were also initiated to provide flexible opportunities for acquiring knowledge, both in international and national level. The priority axis is linked within the Operational Program for the Development of Economic Environment priority axis increasing the capacity of a modern R&D system and updating the higher education learning (HRD, 2010, p. 107).

2.2.3.3 Good-quality and long working life

Under this priority axis, there are several numerical objectives; 1. 72% employment rate in 2014, 2. female employment rate 68.3% , 3. employment rate for older people 63.4% are set (HRD, 2010). Figure 7. shows 2017- data of total employment rate, employment rate of female and labor participation rate of older people (50-74) for whole country and by county. Obviously, targets are not achieved in all counties except Tallinn and Tartu city.

This priority axis is linked to Operational Program for the Development of Living Environment, priority axis are also supported by the activities of the Integral and balanced development of regions priority axis which create conditions for stimulating local employment (HRD, 2010, p. 121).

Figure 7. Employment rate (2017)

County/City	Total	Older	Female
Average	71.6	60.5	63.6
Tallinn city	78.2	65.8	70.2
Harju	77.9	66.9	70
Tartu city	74.4	67.4	66.5
Parnu	69.4	59.6	63.8
Saare	68.8	59.9	61.4
Rapla	68.5	59.7	63.7
Viljandi	67.3	61.9	60.2
Hiiu	67.1	64	67
Jarva	66.7	61.4	59.2
Lääne	66.7	59.6	64.6
Lääne-Viru	65.7	57.5	59
Valga	62	50.5	58.2
Ida-Viru	61.6	47.9	46.8
Võru	59.9	50.1	52.1
Põlva	59.9	47.3	56.4
Jõgeva	59.5	55.2	53.7

Source: Statistics Estonia, Author's own work

2.2.3.4 Knowledge and skills for innovative entrepreneurship

Strategic management training was conducted for managers to support enterprises in their growing phase. Moreover, entrepreneurs were trained in the areas of good management, technological advancements, knowledge about the inclusion of investments etc. (HRD, 2010, p. 129). This specific axis also linked with the priority axis in the DEE to boost the private sector player's competitiveness and productivity.

2.2.3.5 Enhancing administrative capacity.

The next focus point of the HRD is increasing public service quality by raising the capability of independent policy analysis, quality of strategic decision making that addresses

regional and local development. This part of the paper is in line with the Operational Program for the Development of Living Environment, with the similar goal of delivering high standard public service (HRD, 2010, p. 136). The general objective of the priority axis is to ensure an increase in administrative capacity for the Estonian public sector and its partners

Figure 8. demonstrates the indicators of the final achievements of 2007-2013 ERDF-CF by the end of 2015 and 2014 (ERDF-CF final achievements). The overall 20,070 full-time equivalent jobs were created. Number of research and technological development projects reached to 2336 by the end of 2015. Both in big cities, and in rural areas, overall 88 km new roads constructed, and 205 km existing roads restored. 13,695 people benefited from water projects while waste management projects served to 15,804 people.

Figure 8. Final achievements of 2007-2013 ERDF-CF

Code	Indicator	Year	Value	Measurement Unit
1	Aggregate jobs	2015	20,070	FTE
4	Number of RTD projects	2015	2,336	Projects
14	km of new roads	2015	88	km
16	km of reconstructed roads	2015	205	km
24	Additional capacity of renewable energy production	2015	19	MW
25	Additional population served by water projects	2014	13,695	People
26	Additional population served by waste water projects	2014	15,804	People

Source: ESIF data

3. DATA AND METHODOLOGY

The study explores the impact of operational programs of the Development of Economic Environment (DEE); Human Resource Development (HDR); and Developing Living Environment(DLE) on the GDP growth in county level in Estonia. The study employs OLS fixed panel regression analysis, and The Difference GMM dynamic panel estimation- Arellano and Bond Model.

3.1 Data.

Data is collected from the database of Statistics Estonia and the Ministry of Finance of Estonia. It covers an unbalanced panel of 15 counties of Estonia for the period from 2008-2015. The programs are implemented in all regions and funds transferred within the above-mentioned period. The reason why the panel data is unbalanced is that some counties received funds from 2009, and in few of them the implementation of the projects finished in 2014. The next table gives explanation for the used variables.

Figure 9. Definition of variables.

Variable	Log	Indicator	Source
region		NUTS-3 level 5 regions	Statistics Estonia
County		15 counties of Estonia	Statistics Estonia
r_gdppc	ln_gdppc	Real GDP per capita in county level	Stat.ee
econ_p	ln_econ_p	Allocated funds of OP Development of Economic Environment per capita	MFE
edu_p	ln_edu_p	Allocated funds of OP Development of Human Resource per capita	MFE
living_p	ln_living_p	Allocated funds of OP of the Development of Living Environment per capita	MFE
allp	ln_allp	The Allocated total funds	MFE
ind		The share if industry in GDP by county	Statistics Estonia

There is a huge standard deviation of allocated funds as it is demonstrated in Table 10. Moreover, similar feature can be seen in the population variable, therefore, all three program funds will be estimated in per capita.

Figure 10. Descriptive statistics.

Variable	Obs	Mean	Std. Dev.	Min	Max
edu	116	1045986	3288757	6341.75	2.29E+07
econ_d	108	1.24E+07	3.14E+07	541.06	1.71E+08
ind	120	34.32667	7.302972	22.7	59.9
living	119	1.33E+07	1.84E+07	1359.529	9.98E+07
r_gdppc	120	8547.868	3179.684	4963.404	22542.62
pop	120	88430.09	134327.2	8582	575601
living_p	119	180.2747	129.5327	0.041449	657.2855
econ_p	108	79.69181	96.75164	0.0164957	476.3063
edu_p	116	6.292806	6.381639	0.3172229	40.6626
ln_gdppc	120	9.00	0.30	8.51	10.02
ln_econ_p	108	3.291626	1.982612	-4.104654	6.166061
ln_edu_p	116	1.398619	1.00612	-1.148151	3.705309
ln_living_p	119	4.627392	1.625787	-3.18329	6.488119
ln_allp	104	5.327908	1.123996	0.7349287	6.66014

3.2 Estimation Model Specification

3.2.1 OLS Fixed Effect Estimation in county Level.

Decision of the allocation of funds is likely to bring endogeneity problem, where the less developed counties receive more funds. Using OLS Fixed Effect in panel data helps to control for individual heterogeneity, and will help to measure the effects that is hard to see with cross-section or time-series data (Baltagi, 2015)

The equation of the Model 1. is following:

$$ln\_gdppc_{it} = \beta_o + \beta_1 * ln\_allp_{it} + \beta_2 * ind_{it} + \varepsilon_{it} \qquad (1)$$

where Єit= μi + νit Error term. μi denotes the unobservable time invariant county-specific effect, and νit denotes the remainder disturbance (Baltagi, 2015). Variables are in the log form in order to check the percentage effect.

In Model 1., Confidence Interval of ln_allp contains zero, so the coefficient depicts positive but insignificant impact of the program in the county level (Figure 2. of the Appendix). This implies that, on average, the overall impact of Cohesion Policy (2007-2013) funds per capita on GDP per capita is sufficiently small that the model could not capture it with confidence.

3.2.2 OLS Fixed effect by programs in county level.

Following Model 2. OLS Fixed effect evaluates programs separately with the following equation:

$$ln\_gdppc_{it}=\beta_o + \beta_1 *ln\_econ\_p_{it}+ \beta_3*ln\_edu\_p_{it} + \beta_3\, ln\_living_{it} + \beta_4\, ind_{it} +Є_{it} \qquad (2)$$

in which:

- $ln\_econ\_p_{it}$ is the funds spent per capita under DEE program in the logarithmic form in the county i, at the time t.
- $ln\_edu\_p_{it}$ is the funds spent per capita under HRD program in the logarithmic form in the county i, at the time t.
- ln_living_p is the funds spent per capita under DLE program in the logarithmic form in the county i, at the time t.
- ind_{it} is the share of industry in the value added in the county i and at the time t.
- Єit= μi + νit Error term

The results of the Model 2. is very similar to previous one (Figure 3. of the Appendix). The coefficient of ln_econ_p and ln_edu_p variables shows positive but insignificant effect too, as previously explained in the first model. However, the coefficient of the variable that represents the operation program of the Developing Living Environment illustrates negative, statistically significant impact on GDP per capita. This implies that, on average, GDP per capita was lower by 0.06%, when DLE funds allocation was higher by 1%. In the counties where industry share is higher by 1% among other economic sectors, such as agriculture and services, GDP per capita is expected to be higher by 0.022%. The estimation with NUTS3 regions also shows insignificant values.

3.2.3 Inequality test with OLS Fixed effect.

The next Model 3 and 4 tests the inequality and convergence process in Estonia.

$$rel\_gdppc_{it} = \beta_o + \beta_1 * s\_econ\_p_{it} + \beta_2 * s\_living\_p_{it} + \beta_3 * s\_edu\_p_{it} + \varepsilon_{it} \quad (3)$$

$$rel\_gdppc_{it} = \beta_o + \beta_1 * ln\_allp_{it} + \varepsilon_{it} \quad (4)$$

Figure 11. Model 3 and 4 results.

	3	4
s_econ_p	0.045	
	(0.046)	
s_living_p	0.079	
	(0.094)	
s_edu_p	0.034	
	(0.085)	
s_allp		0.149
		(0.066)*
_cons	0.470	0.470
	(0.010)**	(0.006)**
R^2	0.02	0.06
N	104	104

* $p<0.05$; ** $p<0.01$ *Author's own work*

- rel_gdppc$_{it}$ is GDP per capita relative to Harju county, at the time t, in county i
- s_econ_p$_{it}$, s_living_p$_{it}$ and s_edu_p$_{it}$ are the share of total funds per capita in country level received within DEE, DLE and HRD programs respectively, at the time t, in the county i.
- s_allp$_{it}$ is the share of aggregate funds per capita received within Cohesion Policy 2007-2013, at the time t, in the county i.

The Model 3. shows that independently DEE, DLE and HRD programs have insignificant impact on convergence process in Estonia. On the other hand, Model 4 proves that, in the counties i and at the years t, when allocated funds were 1% higher, the relative GDP per capita increased by 0.15%, with the 5% significance level. This implies that, there is an evidence for regional convergence in Estonia as a result of Cohesion Policy 2007-2013.

3.2.4 The Difference GMM dynamic panel estimation- Arellano and Bond Model.

The Estimation of Vector Autoregression techniques for panel data is developed by Holtz-Eakin, Newey, and Rosen (1988). Arellano and Bond contribute with the autocorrelation test for the difference GMM dynamic panel estimation model.

The Arellano and Bond model manages important modelling concerns of fixed effects and endogeneity of regressors, while evading Nickell dynamic panel bias (Roodman, 2009, p. 136).

Nickell (1981) presented the bias that arises in first- order autoregressive models estimated by OLS using panel data and including individual fixed effect. A large negative shock in the variable performs in the error term. The coefficient will be downward biased as if exogenous variable is negatively related to y_{t-1} (lagged dependent variable) (Nickell, 1981, p. 1424). The sharp

decline experienced in overall EU economy was about -4.361% (-3.6% in 2008, -13.9 in 2009 in Estonia) in 2008(World Bank). The European Commission considered the risk of the pressure on national budgets and augmented the implementation of structural funds (European Comission, 2008, p. 13). In this case, negative correlation between a regressor and exogenous variable the error interrupts an assumption that is very crucial for the consistency of OLS (Nickell, 1981). If data would cover long years, the influence of one-year shock on the fixed effect would be mitigated (Roodman, 2009), which isn't the case in this situation.

Roodman (2009) clarifies the main underlying assumptions of Difference and System GMM estimators. One of them is the dynamic nature of dependent variable where the current variable is influenced by past ones. Secondly, the unobservable, and idiosyncratic disturbances are not correlated across individuals, but may have serial correlation. Moreover, some regressors can be endogenous (p. 15). For small T and large N, Arellano and Bond estimator is differences the model to free the individual-specific effects and any time-invariant regressor (Baltagi, 2015, p. 159). The dynamic panel data regression model with first difference is given in by this equation:

$$ln\_gdppc_{it}=\alpha_1 ln\_gdppc_{i,t-1}+\alpha_2 ln\_econ\_p_{it}+\alpha_3 ln\_living\_p_{it}+\alpha_4 ln\_edu\_p_{it} \quad (5)$$

In the equation (5), $ln\_gdppc_{i,t-1}$ is the one year lagged of GDP per capita and all the feasible lags thereafter in logarithmic form. The number of instruments is 10, which was automatically generated. To avoid bias in two-step GMM estimator estimator, bias-corrected (WC) robust estimator that developed by Windmeijer (2005) is used.

According to the results of the Figure 12, two major implemented programs within the framework of Cohesion policy 2007-2013, namely Operation Programs of the DEE, and the DLE have positive and significant impact on GDP per capita. The model concludes that funds per capita

of the Human Resource Development has positive impact in 10% significance level in Estonia. Arellano - Bond test for zero autocorrelation in first differenced errors shows that in the 1st and in the 2nd order we can reject null hypothesis. So, the Arellano–Bond model assumptions are satisfied.

Figure 12. Model 5 results.

Arellano-Bond dynamic panel-data estimation				Number of obs =	83	
Group variable: county				Number of groups =	15	
Time variable: year				Obs per group: min =	4	
				avg =	5.5333	
				max =	6	
Number of instruments = 11				Wald chi2(3) =	158.37	
Two-step results				Prob > chi2 =	0.0000	
				(Std. Err. adjusted for clustering on county)		
ln_gdppc	**Coef.**	**WC-Robust Std. Err.**	**t**	**P>|t|**	**[95% Conf.**	**Interval]**
Ln_gdppc L1.	1.236***	.118	10.51	0.000	1.006	1.466
ln_econ_p	.014**	.007	1.97	0.049	.0001	.028
ln_living_p	.031**	.010	3.12	0.002	.012	.050
ln_edu_p	.049*	.028	1.78	0.075	-.005	.103
_cons	-2.368**	1.100	-2.15	0.031	-4.522	-.214
Arellano-Bond test for AR (1) in first differences:				z = -1.6722		
H_0: no autocorrelation				Pr >z = 0.0945		
Arellano-Bond test for AR (2) in first differences:				z = 0.8954		
				Pr >z = 0.3706		

*P<0.1; **P<0.05; ***P<0.01

Author's own work

Similarly,

$$ln\_gdppc_{it}=\alpha_1 ln\_gdppc_{i,\,t-1}+\alpha_2 ln\_allp_{it} \quad (6)$$

Model (6) estimates the overall effect of summed program funds per capita on GDP per capita. The model shows two-step results. Coefficient is different from zero and two-tailed P- value shows significance. Number of instruments are equal to 8, which is automatically generated. Standard error adjusted for clustering on county as in the third model.

Figure 13. Model 6. results.

Arellano-Bond dynamic panel-data estimation				Number of obs =	83	
Group variable: county				Number of groups =	15	
Time variable: year						
Wald chi2(3) = 116.21				Obs per group: min =	4	
Prob > chi2 = 0.0000				avg =	5.5333	
				max =	6	
Number of instruments = 8						
Two step results				(Std. Err. adjusted for clustering on county)		
ln_gdppc	**Coef.**	**WC-Robust Std. Err.**	**t**	**P>|t|**	**[95% Conf.**	**Interval]**
Ln_gdppc						
L1.	1.055***	.115	9.16	0.000	.829	1.280
ln_allp	.058***	.021	2.69	0.007	.016	.101
_cons	-.774	1.006	-0.77	0.442	-2.746	1.199
Arellano-Bond test for AR (1) in first differences:				z = -1.7023		
H_0: no autocorrelation				Pr >z = 0.0887		
Arellano-Bond test for AR (2) in first differences:				z = 0.64604		
				Pr >z = 0.5183		

*P<0.1; **P<0.05; ***P<0.01

Author's own work

4. Conclusion and Policy recommendations

The paper evaluates the Cohesion policy 2007-2013 in Estonia. Results of the analysis show that overall impact of policy on GDP per capita in the county level was 0.06% with [0.015; 0.100] Confidence Interval. While assessing operational programs separately, the analysis shows that the Human Resource Development program has a higher impact by 0.05% on GDP per capita with 10% significance level. Then it appears that the Development of Living Environment program has the second highest impact on economic growth of counties. The DLE program has a impact by 0.3% on GDP per capita. The third program for its effectiveness is the Development of Economic Environment which has the impact by 0.014%. Generally, the results show small positive outcome of Cohesion Policy 2007-2013. Furthermore, the inequality level stays high, but results show that overall policy have positive and significant effect on economic convergence process.

The study has several limitations. First of all, it does not estimate the impact of what would have happened in the absence of policy measures. Secondly, despite the fact that programs had three main direction, sub-priorities of the programs show overlapping. The nature of spending in the sub-categories in the priority axis are not clear enough. For instance, investments for constructing and reconstructing of educational and health care facilities have been shown under different priority axis, but they are simply investment to infrastructure. Likewise, funds for the integral and balanced growth priority axis, construction and reconstruction of public service facilities and the projects of improving quality of public services are shown in aggregate form. Therefore, it is difficult to evaluate every factor of growth separately, in order to check the scope of impact.

Taking into consideration the social and environmental impact of the policy, obviously, the living condition in terms of access to clean water, education and health care facilities, the opportunities for research and development is improved. Therefore, it is worth to reevaluate the long term overall positive impact of programs years after. However, the expectation of mitigation of regional disparities does not seem achievable. As Farenberg (1996) remarked, it might be the "diverging impact" of R&D investments, considering that innovation and research projects largely implemented in urban areas.

Despite the limitations and based on econometric and qualitative results of the study, it suggests to increase support for improving business climate specifically in regional level, in order to achieve the goal of balanced economic growth. This has been stressed by Martin (2005), where he argues that main reason for regional inequalities is individual inequalities, which comes from differences in education level. Main innovation and research projects largely implemented in urban areas. Therefore, regional policies that support research and development programs, improving education in the less developed parts of the country may increase labors' qualifications in poorer areas and bring economic development.

References

European Investment in Estonia – 2007–13. (n.d.). Retrieved from European Comission: http://ec.europa.eu/regional_policy/sources/docgener/informat/country2009/et_en.pdf

2007-2013 ERDF-CF final achievements, European Structural and Investment Funds, Data. (n.d.). Retrieved from https://cohesiondata.ec.europa.eu/dataset/2007-2013-ERDF-CF-final-achievements-Select-desele/p7rb-p5tk

Arellano, M., & Bond, S. (1991). Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application toEmployment Equations. *The Review of Economic Studies, 58*(2), 277-297. Retrieved from http://www.jstor.org/stable/2297968

Baltagi, H. B. (2015). *Econometric Analysis of Panel Data* (5th ed.). West Sussex: John Wiley & Sons Ltd.

Barro, R. J. (1991). Economic Growth in a Cross Section of Countries. *The Quarterly Journal of Economics, 106*(2), 407-443. Retrieved from http://www.jstor.org/stable/2937943

Basile, R., Nardis, S., & Girardi, A. (2001). Regional inequalities and Cohesion Policies in the European Union. *ISAE Working Paper*(23). Retrieved from Basile, Roberto and de Nardis, Sergio and Girardi, Alessandro, Regional Inequalities and Cohesion Policies in the European Union (Sptehttps://ssrn.com/abstract=936319 or http://dx.doi.org/10.2139/s

De Janvry, A., & Sadoulet, E. (2016). *Development Economics Theory and Practice.* New York: Taylor & Francis Group.

Demurger, S. (2001). Infrastructure Development and Economic Growth:An Explanation for Regional Disparities in China? *Journal of Comparative Economics, 29*, 95-117. doi:10.1006/jcec.2000.1693

Etzkowitz, H., & Klofsten, M. (2005). The innovating region: toward a theory of knowledge-based regional development. *R&D Management*, 243-255. Retrieved from https://doi.org/10.1111/j.1467-9310.2005.00387.x

European Comission. (2008). Retrieved from A European Economic Recovery Plan: http://ec.europa.eu/economy_finance/articles/eu_economic_situation/article13502_en.htm

European Comission, R. P. (n.d.). Operational Programme "Development of Living Environment". Retrieved from http://ec.europa.eu/regional_policy/en/atlas/programmes/2007-2013/estonia/operational-programme-development-of-living-environment

European Commission approves Estonian Rural Development Programme 2014-2020. (n.d.). Retrieved from https://ec.europa.eu/agriculture/sites/agriculture/files/rural-development-2014-2020/country-files/ee/press-summary-13-02-2015_en.pdf

European Structural & Investment Funds. (n.d.). *National website*. Retrieved from http://www.struktuurifondid.ee/eng

Fagerberg, J. (1996). Heading for Divergence? Regional Growth in Europe Reconsidered. *Journal of Common Market Studies, 34*(3). Retrieved from https://doi.org/10.1111/j.1468-5965.1996.tb00580.x

Kalvet, T. (2013). *Country Report on Achievements of Cohesion Policy.* Retrieved from http://ec.europa.eu/regional_policy/en/information/publications/reports/2014/expert-evaluation-network-on-the-performance-of-cohesion-policy-2007-2013-synthesis-of-national-reports-2013

Malecki, E. (1991). *Thecnology and Economic Development.* Essex, UK: Longman Scientific & Technical.

Martin, P. (2005). The Geography of Inequalities in Europe. *Swedish Economic Policy Review, 12*, 83-108. Retrieved from https://spire.sciencespo.fr/hdl:/2441/9283/resources/ebe4c456.pdf

Nickell, S. (1981). Biases in Dynamic Models with Fixed Effects. *Econometrica, 49*(6), 1417-1426. Retrieved from http://www.jstor.org/stable/1911408

Operational Programme for Human Resource Development. (2010). Retrieved from https://www.struktuurifondid.ee/sites/default/files/modified_op_human_resources_may_2010_080311.pdf

Operational Programme for the Development of Economic Environment. 2010). Retrieved from https://www.struktuurifondid.ee/sites/default/files/modified_economic_environment_op_070311.pdf

Operational Programme for the Development of Living Environment. (2010). Retrieved from https://www.struktuurifondid.ee/sites/.../modified_living_environment_op_070311.pdf

Roodman, D. (2009). A Note on the Theme of Too Many Instruments. *Oxford Bulletin of Economics and Statistics, 71*(1), 135-158. Retrieved from https://onlinelibrary.wiley.com/doi/epdf/10.1111/j.1468-0084.2008.00542.x

Solow, R. M. (1956). A Contribution to the Theory of Economic Growth. *The Quarterly Journal of Economics, 70*(1), 65-94. Retrieved from https://doi.org/10.2307/1884513

Statistics Estonia. (n.d.). Retrieved from https://www.stat.ee/en

The EU's main investment policy. (n.d.). Retrieved from European Comission: http://ec.europa.eu/regional_policy/en/

Uuemõisa, K. (2011). Innovation and Environment: Water Management in Estonia. Retrieved from http://web.cor.europa.eu/ea/Events/Documents/SledeShowEstonia2011.pdf

APPENDIX

Figure 1.Budget of DLE, DEE and HRD (Hundred euro per capita)

Source: Statistics Estonia, Author's own work

Figure 2. Model 1. results

Fixed-effects (within) regression					Number of obs	= 104
Group variable: county					Number of groups	= 15
R-sq: within = 0.868					Obs per group: min	= 5
between = 0.194					avg	= 6.9
overall = 0.227					max	= 8
					F(9,80)	= 58.33
corr(u_i, Xb) = 0.084					Prob > F	= 0.0000
ln_gdppc	**Coef.**	**Std. Err.**	**t**	**P>|t|**	**[95% Conf.**	**Interval]**
ln_allp	.0128	.010	1.20	0.234	-.008	.033
ind	-.003	.002	-1.17	0.247	-.009	.002
year						
2009	-.163***	.049	-3.29	0.001	-.261	-.064
2010	-.124**	.053	-2.34	0.022	-.230	-.019
2011	-.027	.057	-0.49	0.628	-.140	.085
2012	.040	.058	0.70	0.488	-.074	.154
2013	.092	.055	1.65	0.103	-.018	.202
2014	.157 ***	.050	3.14	0.002	.057	.257
2015	.198***	.053	3.71	0.000	.092	.305
_cons	9.07***	.100	90.39	0.000	8.867	9.267
sigma_u	.266					
sigma_e	.053					
rho	.962 (fraction of variance due to u_i)					
F test that all u_i=0:			F(14, 80) = 148.58			Prob > F = 0.0000

*P<0.1; **P<0.05; ***P<0.01

Author's own work

Figure 3. Model 2 results.

Fixed-effects (within) regression					Number of obs =	104
Group variable: county					Number of groups =	15
R-sq: within = 0.260					Obs per group: min =	5
between = 0.123					avg =	6.9
overall = 0.072					max =	8
Prob > F = 0.000						
corr(u_i, Xb) = -0.703					F(4,85) =	7.48
ln_gdppc	**Coef.**	**Std. Err.**	**t**	**P>|t|**	**[95% Conf.**	**Interval]**
Ln_econ_p	.005	.009	0.58	0.566	-.013	.024
Ln_edu_p	.017	.012	1.39	0.167	-.007	.042
Ln_living_p	-.061***	.019	-3.15	0.002	-.099	-.022
ind	.022***	.006	3.93	0.000	.011	.033
_cons	8.259	.195	42.43	0.000	7.871	8.645
sigma_u	. .37340894					
sigma_e	.12168014					
rho	.90400655	(fraction of variance due to u_i)				
F test that all u_i=0:		F(4,85) = 28.22			Prob > F = 0.000	

*P<0.1; **P<0.05; ***P<0.01

Author's own work

Figure 4. GDP growth rate by county.

Figure 5. Employment rate