Regional inequality in countries of the European Union

Bachelor thesis

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This Bachelor thesis tries to figure out the causes of regional inequality in general, by doing a literature review on literature about regional inequality and regional growth. Also it contains an analyses on which of these causes have contributed to the development of regional inequality within countries of the European Union over the period 2000-2011. The factors that influence regional inequality are the development process, human capital dispersion, physical capital dispersion, changes in openness to international trade, agglomeration economies and redistributive government policies. For the richer EU countries regional inequality turned out to be a stable from 2000 to 2011, excluding France and the United Kingdom. For France and the United Kingdom, a disproportionally big capital city turned out to be the cause for increasing regional inequality. For the poorer Eastern European countries, the development process and the EU accession followed by intensified trading turned out to be the major drivers behind increasing regional inequality.

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1. Introduction

In every country an inequality in richness between geographical areas exists. The reason for this is that growth is unlikely to occur at the same geographical area at the same time (Barrios & Strobl, 2009). These differences between regions are called spatial or regional inequality. This thesis will try to explain the causes of spatial inequality for regions in the countries of the European Union (EU). There are many examples of spatial inequality in Europe. For example, in the United Kingdom (UK), London and the South of England is richer than the rest of the country. In France the same holds for Paris while in the Netherlands the richest region is an area called the Randstad between Amsterdam, Rotterdam, The Hague and Utrecht. In Belgium Flanders is richer than Wallonia. In Italy the north is the richest while in Germany the West (the former BRD) is still richer than the east (the former DDR).

The causes of regional inequality in general will be analysed and these will be applied to countries of the EU from 2000-2011 to see which factors did have an effect on regional inequality for these countries over these years.

What are the causes of regional inequality in the countries of the European Union from 2000-2011?

When regional inequality becomes too big tensions between these regions can develop within the country. People in the poorer regions want attention for their problems and a bigger piece of the countries welfare while the richer regions are getting unwilling to pay for the poorer regions. In the end, this could lead to a country falling apart (Lessmann, 2014). The risks for this happening are even higher when people in some region in the country are not feeling culturally related to other regions in the country. In this situation is Scotland within the UK. Also this risk holds for Spain with some of its regions such as Catalonia and Basque Country and for Belgium who risks splitting the Flanders region and the Wallonia region apart.

Another negative effect of regional inequalities can be inefficiencies, as mega cities rise which is associated with congestion and pollution (Kanbur & Venables, 2005). In Europe, these risks are mainly present in countries as the UK and France, where the first and capital city (respectively London and Paris) is much bigger than other cities in the country. Also, there is much more economic activity and these cities are more internationally orientated than the second and other cities in the country.

As I will show in this thesis, previous literature has mainly focussed on what the causes are of regional growth and has not focussed at the consequence (which is regional inequality). Scholars that focus on regional inequality mainly look at the effect of the development process and do not analyse in detail the effect other factors can have (disturb the effect the development process has). As I cannot find any literature that has focussed on regional inequality including a lot of factors that can possibly influence it, I will try to find these factors by discussing the literature on regional growth and the literature that analyses the effect of the development process. Also, I will apply the factors that I found to countries of the European Union in an empirical analysis from 2000-2011 as I cannot find any literature that has done this yet.

To be able to answer the question what the causes are of regional inequality, you first need to know how to measure regional inequality. There are several measurements to measure regional inequality, mentioned in previous literature on this subject. I will go through them, analyse them and pick one I will use for my research. The first sub-question will be:

How to measure regional inequality?

Second, we need to know how regional inequalities have developed within EU countries over the past years with my particular measurement. The second sub-question will be:

How did regional inequality develop in EU countries over 2000-2011?

If we know how regional inequalities have developed in EU countries, I can answer the main question. From previous literature, some factors have been mentioned that should influence regional inequality. I will apply these factors to the current development of regional inequalities within EU country and see which factors have contributed to this development:

What factors explain the differences in regional inequality between EU countries?

The thesis continues as follows. First, I will give a literature review over literature that has discussed this topic and the topic of regional growth. Second, I will provide the data and methodology. Third, I will analyse the development of regional inequalities in EU countries over the past years and will analyse which factors have influenced this development in the results-section and end with the conclusion.

2. Literature review

In this section I will take a look at measurements of regional inequality. Also, I will look which factors have been influencing regional inequality in the literature.

Measurements of regional inequality

There are various ways to define regional inequality, depending on the discipline from which someone is studying the topic. In economics, regional inequality is generally considered as an inequality in income per capita between regions within a country (Dunford, 2007). The income is in almost any economic literature measure by the Gross Domestic Product (GDP). As regional income inequality gets larger the regions within a country are diverging. As they get smaller, regions are converging and the poorer regions (following regions) are catching up with the richer regions (leading regions).

The economic literature on regional inequality uses several measurements. At first, very simple measurement of regional inequality is taking the **standard deviation of the (logarithm of) relative GDP per capita** of the regions in a country. Barrios & Strobl (2009) use this measurement to identify the causes of regional inequalities in 12 EU countries between 1975-2000. They use the relative level of GDP compared to the EU average. Also is it possible to look the at the absolute and not the relative value so than you measure spatial inequality by **the standard deviation of GDP per capita**.

This standard deviation (of the logarithm) of (relative) GDP per capita weights every region within the country evenly. However, in reality there will always be differences in population between regions. According to Lessmann (2014) this can be problem if the differences in population between regions are large. Lessmann gives an example to illustrate this problem. In Canada, the northern regions are a lot poorer than the southern regions. However, in the regions in northern Canada are a lot less people living than in the regions in southern Canada. The inequality measure may give some level of regional inequality, but only a few people in those northern regions are actually poor compared to a lot of people in the south that are rich. If one would correct for these population differences the inequality measure will be lower. For this reason, Lessmann (2014) and Williamson (1965) are using a measure that does correct for differences in population between regions: **the weighted coefficient of variation (WCV)**. The WCV calculates the standard deviation of the GDP per capita in a country, weighted to the contribution of the regions' population to the total population of the country:

$$WCV = \frac{1}{\bar{y}} \sqrt{\left[\sum_{i=1}^{n} pi(\bar{y} - yi)^2\right]}$$

For this equation $\bar{y}$ = the country GDP per capita (or the average GDP per capita of all regions within the country), yi = the GDP per capita in region i, pi = share of population in region i of the country total population and n = the number of regions within the country.

It is also possible to not weight this measurement to differences in population sizes: than you measure regional inequality by **the coefficient of variation (CV)**. The difference between the WCV and the CV is large when the population differences between regions are large while the difference between the WCV and the CV are small when the population differences between regions are small. Lessmann (2014) gives some averages for the WCV for some countries between 2000-2009. Also, he gives a figure in which we can see the development of regional inequalities over 1980-2005 for some countries.

Figure 2.1
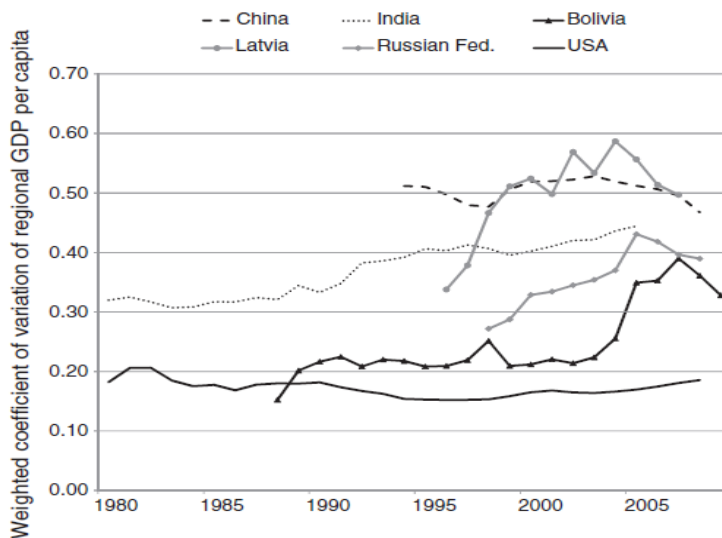
Source: (Lessmann, 2014).

In the figure you can see that for the developing countries (all countries except the USA) the WCV is varying a lot and over some years is increasing and decreasing heavily. On the other side, for the developed country the USA the WCV is quite stable over the years.

A last, sometimes the **Gini coefficient** is used to measure regional inequality. For example, Kanbur & Zhang (2005) use the Gini coefficient in their research of regional inequality in China. Fedorov (2002) uses it to measure regional inequality in Russia. However, this measure is mostly used to measure interpersonal income inequality and not to measure regional inequality (Lessmann, 2014).

The Gini coefficient varies, between 0 and 1, where going up in scale represents higher regional inequalities, according to (the World Bank). They try to explain the Gini coefficient with help of the Lorenz curve and a straight line (which is the line when the Gini coefficient is 0 so when everybody is earning exactly the same income), see figure 2.2. The Lorenz curve shows how much of the accumulated income share goes to which share of the people/regions within a country.

Figure 2.2

Lorenz Curve of Income Distribution
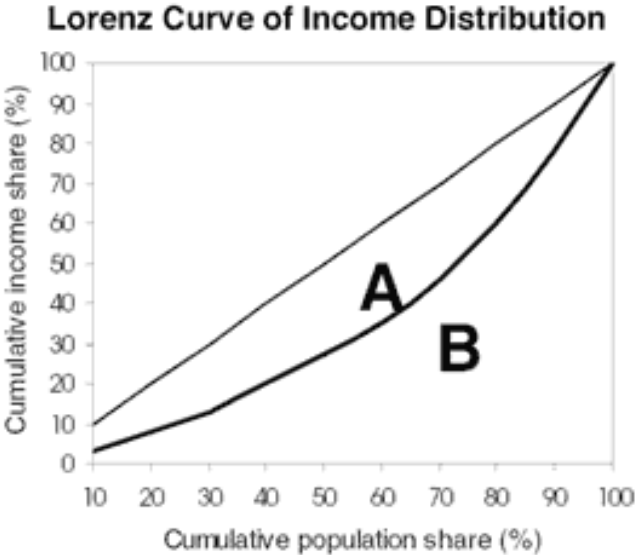
The Gini coefficient is the area, between the inequality line and the straight line, so the Gini coefficient is the area with the letter A.

Factors explaining regional inequality

Development Process

As a country develops in time the GDP per capita grows larger. As a country develops, regional inequalities follow a remarkable inverted U-pattern in general (see figure 2.3). Several studies such as Kuznets (1955), Williamson (1965), Lucas Jr. (2000), Barrios & Strobl (2009), Lessmann (2014) have examined this relationship.

Figure 2.3: The development of regional inequalities – The Kuznets Curve
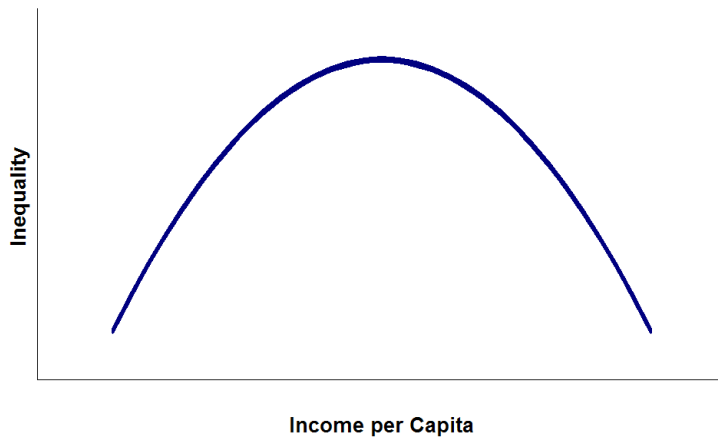
Description: as development continues the country becomes richer, so the income per capita gets higher. Initially, regional inequality increases. However, after a certain level of income per capita is reached, the regional inequality peaks and starts decreasing.

The first ever study that examined the relationship between inequality and development was Kuznets (1955). In his study, economic development occurs in the process of industrialisation[1]. As a country starts industrialising, initially a few people benefit and the income inequality increases. As development continues in time more people benefit as more people switch from agriculture to manufacturing and income inequality decreases. Inequalities develop in an inverted U-pattern. This curve has been called the Kuznets Curve.

Kuznets did his research on interpersonal income inequalities. Other scholars, such as Williamson (1965), argue that the Kuznets Curve can also be applied to regional inequalities. Williamson argued in the early stages of development wealth and income sources concentrate in one spatial place, leading to increasing spatial inequalities. As a country develops, these sources disperse across the country, leading to spatial inequalities decreasing. Williamson finds four reasons that determine the evolution of spatial inequalities. These reasons are natural resources, migration (labour mobility), capital mobility and government policies. These factors initially contribute to the clustering of natural resources, physical and human capital in one place. But as a country develops these factors contribute to the disperse of resources as knowledge spillovers occur, people with capital are looking for regions to invest in and government policies start focussing more on the periphery regions. Later on, I will examine this factors in more detail.

Kuznets and Williamson provide empirical evidence of (regional) income inequalities developing in an inverted U pattern as a country starts industrialising. Lucas Jr. (2000) has used this finding to provide a mathematical model that explains the development (real GDP per capita) of countries since the

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[1] In the process of industrialisation the share of people employed in agriculture declines and the share of people employed in industry increases.

start of the industrial revolution in 1800. Hereby, he focuses on inequalities between countries but Barrios & Strobl (2009) use his model to explain the development of inequalities within countries. Robert E. Lucas Jr. assumes that up to 1800 there has not been any economic growth at all in any country and that all countries are in a situation of stagnation**.**

The model Lucas Jr. (2000) has developed provides a theoretical explanation for the empirical observation between development and regional inequality. This theoretical explanation is in short as follows. Not every country has started industrialising and so growing in 1800. Because of this, differences in the real GDP per capita between countries are developing (in regional science these differences are called regional or spatial inequalities). As time passes more countries get out of their stagnation situation and start growing. Countries which start growing earlier in time have a higher real GDP per capita than countries which start growing later in time. The countries which start growing later have to catch up to compensate for the lower real GDP per capita so they have to have a higher growth rate of real GDP per capita. The later a country starts growing, the higher their growth rate needs to be, because the bigger the lag is compared to the country which has started growing in 1800. As world real GDP per capita gets larger (and time approaches), Lucas Jr. assumes that more countries get out of their stagnation situation in a year. This happens because of spillovers. For example, knowledge that is present in a country, can be used in another country. Also, countries that are in stagnation can adopt the institutions and policies of countries that are growing. At last, developing countries are building up capital that needs to be invested somewhere. Often, returns to investment are higher in high growth countries and as countries that have not developed so far have a higher growth rate once they develop, capital will flow to these countries.

All the literature described above, examined the relationship between regional inequality and development in which development occurs due to industrialisation and is a long-lasting process. In recent years, other scholars have also tried to prove the inverted U relationship between regional inequality and development. However, the leading countries today are not developing due to industrialisation anymore. In the leading countries a shift from people working in manufacturing to people working in services has happened or is happening. A process called tertiarization[2] (Lessmann, 2014). Due to tertiarization, innovation (and via innovations the sources of economic growth) also have to switch from manufacturing to services (Breitenfellner & Hildebrandt, 2006).

Besides the shift from working in industry to working in services, recent literature has also analysed the relationship between development and regional inequality over a shorter time horizon (Barrios & Strobl, 2009; Lessmann, 2014). In these situations, the inverted U is not triggered by industrialisation

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[2] The share of people employed in industry declines and the share of people employed in services increases.

or tertiarization but by other structural changes. Examples of such structural changes are technological shocks (innovations), free trade agreements (such as the NAFTA between Canada, the USA and Mexico) and an enlargement of a single market (such as the EU members expansion with eastern European countries in 2004 and afterwards). How these shocks influence regional inequality will be explained in more detail in what comes after this. Hereby, the question why there is regional inequality will be simplified to why one region grows faster than another region, which causes a higher income in one region than another region. I will go into detail on what the influence of the factors in this process is and how different endowments between regions cause different regional inequality between countries.

Human capital

Most scholars refer to human capital and education as important factors explaining economic growth. For developed countries, economic growth today is determined by technological improvements (innovations) (Breitenfellner & Hildebrandt, 2006). In these countries in the past the industrialisation process was the main driver behind economic growth, as has been mentioned before. The sources of economic growth have switched from physical capital and infrastructure to human capital.

On the regional level, the endowments of human capital is a vital factor for the ratio in which income inequality is between regions (Castelló & Doménech, 2002). If human capital is clustered around one region, innovation will be higher in this region and so will be economic growth. If human capital is dispersed around the country, income differences will be smaller. In countries that are in the process of tertiarization, human capital is often clustering in one region, through which that region grows faster than the other regions (Breitenfellner & Hildebrandt, 2006). As time passes, human capital often disperses to other regions due to spillovers. Modern resources such as internet have made it easy for knowledge spillovers to occur, by lowering the trade costs for transporting knowledge (Nocco, 2005).

In some countries (such as the UK) the endowments of human capital are not dispersing across the country (Duranton & Monastiriotis, 2002). Sometimes, the differences in these endowments get even larger because more human capital is going from the periphery to the leading region. Reasons for this happening can be for example agglomeration economies and government policies (both will be discussed) (Fleisher, Li, & Zhao, 2010).

Infrastructure and physical capital

Both infrastructure and physical capital are important determinants of spatial inequality in countries that are developing (Breitenfellner & Hildebrandt, 2006). Developing countries are building up their capital by getting Foreign Direct Investment (FDI) (Williamson, 1965). Investors in developed countries are looking for investment opportunities and as growth rates in developing countries are higher than in developing countries, return to investments are higher in developing countries. This is the reason that developing countries are often an attractive investment opportunity for investors. However, the resources for building up physical capital and infrastructure are initially going to one region or a few regions which will be the only part of the country growing initially (Fleisher, Li, & Zhao, 2010).

In time, these investments have to flow to other regions, as return to investments are higher in the following regions than in the leading regions (Fleisher, Li, & Zhao, 2010). If that does not happen, these regions will stay in stagnation and regional inequality will be enormous in the country. Sometimes (such as in China) some regions are developed and a big share of the employed people are working in services, while other regions are underdeveloped and still depending mainly on agriculture as their source of income.

In that situation, the economy is developing in clusters (Herrerias & Ordoñez, 2012). Within these clusters, regions are converging but between these clusters, regions disperse. The same factors that explained why human capital is not dispersing can explain why investments are not going to lagging regions (agglomeration economies and government policies) (Fleisher, Li, & Zhao, 2010).

Natural Resources

In underdeveloped countries, the exploration of natural resources may trigger development (Lessmann, 2014). Often, initially only the region in which the natural resource is explored will develop and latter other regions will follow, as they also profit from the exploration. Ways in which the following regions can benefit from the exploration are: investments from the leading region, government policies and knowledge spillovers (for example by labour migration) (Williamson, 1965).

Openness to international trade and investment

A lot of countries have started growing / developing once the country was opening up for international trade and investment. Think hereby of China in 1978, Russia and the Eastern European countries after the fall of the Berlin Wall in 1989. However, also countries that already reached a certain level of development, have seen a period of economic growth after opening up further for other countries.

Not always the positive effects are coming immediately (Rivas, 2007). Initially, opening the country for international trade and investment can be bad for the domestic economy if the economy is not able to compete with the other economies. In other words: if the economy is not competitive enough, opening the economy will destroy jobs and bring stagnation or declining growth. However, after a few years the country will benefit. The reason for this is that FDI flows to the country (as is mentioned in the section about infrastructure and physical capital) building up physical and infrastructural capital (Williamson, 1965). Also, being open for foreign trade allows the firms and people in the country to specialize. According to the comparative advantages theory of David Ricardo, trading allows a country to specialize in producing in what it is good in and trade that for something another country is good in producing (Krugman, 1993). In this way, the country is more productive than if it tries to make every product it needs on its own. For this reason, opening up the economy is not only beneficial for developing countries but also for developed countries.

Differences in specialisation

Regions in countries can have totally different industrial structures, especially as the country is larger. For example, In China the western regions depend on agriculture while the coastal regions are making their income in manufacturing and services (Fleisher, Li, & Zhao, 2010). Also, in Mexico the southern regions are still in traditional agriculture while the north is using more modern techniques which makes the north richer than the south (Chiquiar, 2005). At last, in the UK there is a bigger share of the total employment in London working in knowledge-intensive services (and in this way earning income in this sector) than in other parts of the country (Duranton & Monastiriotis, 2002).

Different industrial structures gives every region within the country a different source of income (Breitenfellner & Hildebrandt, 2006). Also, if still a lot of people are employed in agriculture you can conclude the region is not developed and in stagnation. If the share of people working in services is increasing in a region, the region is in the process of tertiarization. In that region, the industrial sector has become too productive (with the help of machinery) so not much people are working in the industrial sector anymore and are switching to services. Often if in a region a big share of people are working in agriculture the income is low, for industry it is a bit higher and in regions where a lot of people are working in services income is the highest (Kim & Margo, 2004).

Agglomeration effects

As people and firms cluster together in a city, they can achieve a few (cost) benefits above being with a larger distance from each other (Rosenthal & Strange, 2004). These benefits are known as agglomeration economies or external economies to scale. These sources of these benefits have been mentioned first by Marshall (Marshall, 1980). These sources are knowledge spillovers, specialisation

(input-sharing) and a larger labour pool (so that supply and demand of labour will be better matched to each other). Agglomeration economies are not leading to differences in incomes between regions as the population and the cities are spread evenly across the country. However, as the population (or: human capital) is mainly located in one city or a few cities the distribution of human capital is uneven across the country and agglomeration effects will contribute to the fact that in some regions (where the larger cities are in) the income will be higher than in other regions (where the countryside is and some of the smaller cities are in).

Government policies

At last, government policies can have a big influence in the way the income is distributed across the country. They can do it by trying to influence the GDP in regions, via policies that stimulate clustering in a region or dispersal across regions of human and physical capital, infrastructure and investment. Also they can do it by changing the income distribution, via policies (taxes and social benefits) that redistribute the income that is earned. As most developed countries, have a progressive tax system, taxes and social benefits often result in a redistribution of income from richer to poorer regions. A few examples of government policies that often affect the way income is distributed across regions will be mentioned here.

Fiscal decentralization

The fiscal system of a country can be set-up in many ways. An important feature of the fiscal system is the degree to which the system is decentralized (Lessmann, 2012). In a complete decentralized system, regions within the county can raise taxes themselves and are allowed to manage their own budgets freely. In a centralized system, the central government raises the taxes and manages the budget. Summarised, in a decentralised system regions do have control over their budgets while in a centralized system regions do not have control over their budgets or are not getting any budgets at all (than every single policy is made by the central government). Often, the system is set up in between these two extreme examples.

Lessmann (2012) argues that in rich, developed countries, fiscal decentralization results in a more equal income distribution. However, in developing countries fiscal decentralization, leads to higher regional income inequalities. Following this reasoning, one can expect a lower regional inequality in EU countries if there is more fiscal autonomy for the regions within the countries. However, as the Euro crisis has shown, fiscal decentralization can also result in problems if the differences in economic fundamentals between regions or countries (using the same currency) are too big (Arestis & Sawyer, 2011).

Ethnic (or regional) discrimination

In a centralised system, the government can play a big role in the allocation of income as mentioned in the introduction to government policies. One motive to stimulate or discourage a certain region can be ethnic discrimination (Kanbur & Venables, 2005). This happens if there are big differences by different ethnic groups in the country and the government is mainly representing one specific ethnic group (for example the one which is living in the city where the government is seated or the group that is in majority in the country). Although, this ethnic discrimination is a major problem in some developing countries as China, also in European countries a preference for certain regions by the government can affect their policies. Hereby you can think of the Spanish government being focused on the Madrid metropolitan area and less on Catalonia and Basque Country, The British government being focused on London and the German government being focused on making Berlin a rich, dynamic city again after the unification with East Germany in the 1990's.

Regional aid

Government can ignore lagging regions (for example by ethnic discrimination) but can also stimulate lagging regions by giving them aid. This aid can express itself in money to invest in for example infrastructure or education with the goal to improve the competitiveness position of the region. The EU is doing a lot to support lagging regions by providing several funds (Mendez, Wishlade, & Yuill, 2008). The EU is doing this to reduce the large disparities between its richest and its poorest regions, which is undermining the sustainability of the single market and currency area. In the period 2014-2020 the EU is investing €351 billion in Europe's lagging regions, divided between the European Regional Development Fund (ERDF), European Social Fund (ESF), Cohesion Fund (CF), European Agricultural Fund for Rural Development (EAFRD) and the European Maritime and Fisheries Fund (EMFF) (European Commission Regional Policy).

Summary

In this chapter, several factors have been mentioned that influence regional inequality, obtained from literature on regional inequality or growth. From the literature on regional inequality, the development process of countries has been mentioned as the most important factor causing regional inequality. As the country develops, the GDP of the country becomes larger, and regional inequalities are behaving in an inverted U pattern.

Literature on regional growth is mentioning human capital and physical capital dispersion. The first plays an important role in developed countries while the second is more important in developing countries. Natural resources can have influence on regional inequality in underdeveloped countries as the exploration of natural resources may trigger GDP growth. Openness to international trade and

investment affects regional inequality if a country is opening up its economy for foreign trade and investment. Differences in specialisation are another way to look at the development of countries instead of looking to the GDP level. As a country or a region develops people move from working in agriculture, to moving in industry and eventually to working in the services sector. Agglomeration economies influences regional inequality if one city is disproportionally bigger than the other cities. At last, government policies influence regional inequality by redistributing income from the richer to the poorer regions, by favouring one specific region above the others (ethnic discrimination) and by the way the government gives freedom to the regions to compose its own budgets (the degree of fiscal decentralization).

3. Data and Methodology

Data

The data for this research will be acquired from the Eurostat website. Eurostat is publishing data for European countries no matter if they are an EU-member or not (Eurostat). Also, it publishes data for the Eurozone as an entity and for the EU as an entity, taking into account the successive enlargements that have been in the past for both entities. The data that Eurostat publishes are acquired by the statistical agencies of the European countries. Eurostat adjust these data so that for every country the same concepts and definitions are used. In this way you can compare countries and regions within Europe by acquiring your data from Eurostat. If you acquire your data from each of the statistical agencies in Europe you take the risk that different concept and definitions are used through which the data are not comparable to each other.

This thesis will focus on EU countries, as the data for EU countries are the most complete data in the Eurostat database (for several non EU countries a lot of data that might be relevant for the study are missing). Every EU country that has more than one NUTS 2 region will be taken into analysis, because if a country has only one NUTS 2 region (so is very small in both size and population) there is no regional inequality.

Methodology

I will monitor the development of a particular measure chosen for regional inequality and the factors that tend to affect regional inequality from 2000-2011 (the years for which Eurostat has data for regional GDP levels). Besides that, I will look at the differences between regional inequality between countries and verify is that can be explained by differences in the levels of the measurements of the factors.

To be able to perform an analysis, there needs to be a manner to classify the regions. Also, a measure of regional inequalities needs to be chosen. Finally, there needs to be a measure for the factors that tend to affect regional inequalities. I will discuss shortly, in this section, the way in which regional inequalities will be measured and the way in which each of the factors that influence regional inequality will be measured. Hereby, I will use the same structure as I used in the literature review. First, I will start with the question how to classify the regions in the country.

How to classify regions?

The level of regional inequality in a country not only depends on the measurement tool that is chosen, but also on the scale level that is chosen. When measuring interpersonal inequality the scale level does not play a role since the scale is one person. For finding the scale level you need a tool to divide a country into several regions. In general, statisticians have two ways in which they divide a country into regions (Dunford, 2007):

- Functional regions:

  Regions are made up of areas that are independent. If you make up regions in this way you define a region as the area in which a person goes to his/her work and home (commuting area), shopping, relaxing etcetera (the area in which a person is living in mainly on a normal day). If you define regions in this way it is allowed to see the regions as a complete entity when looking from an economic point of view. However, the disadvantage of this is that these conditions are changing rapidly, so that the scope of these regions is not stable.

- Administrative regions:

  Regions established to manage certain activities. Regions are made up according to their population sizes so that in each region there is approximately an equal amount (or a range within the regions falls) of people. If you define regions in this way it can happen that areas within one region have nothing to do with each other in an economic way. However, population numbers are not changing very quick so the scope of these regions is stable.

Because of the last argument for administrative regions, most scholars use this method to classify regions. By defining regions according to their population, the scope of these regions is stable, and it is possible to compare what happens in these regions over a couple of years. Also Eurostat defines regions in an administrative way. They set up the Nomenclature of Units for Territorial Statistics (NUTS) system. There are four levels in this system. NUTS 0 divides the EU into its member states. On top of that, each member state is divided into regions from NUTS 1 (in which the regions are the largest), to NUTS 2 to NUTS 3 (in which the regions are the smallest). In general: the NUTS classification tries to correspond with the main regional (statistical) divisions in each European country. Also, it tries to set up a system that meets the functional classification as good as possible. However, this is not always possible as for example London is split in Inner and Outer London for NUTS 2 (as there are too much people living in London to count as one NUTS 2 region). The range in which the total population of a NUTS region has to be, for every NUTS level, is given in table 3.1.

Table 3.1: Population to NUTS levels

NUTS level	Minimum	Maximum
NUTS 1	3 million	7 million
NUTS 2	800000	3 million
NUTS 3	150000	800000

Source: Eurostat website, from:
http://epp.eurostat.ec.europa.eu/portal/page/portal/nuts_nomenclature/principles_characteristics

Because most of the regional statistics on Eurostat are published in NUTS 2 regions and because NUTS 2 corresponds for most countries to a main administrative areas division (for example provinces or smaller regional divisions), this study will use data on NUTS 2 regions to perform its analysis.

Regional inequality

First, the study needs a measurement of Gross Domestic Product (GDP). The GDP can be measured in several ways. Eurostat calculates (on the regional NUTS level and on the country level) the GDP in Euro's at current market prices (nominal value) and in purchasing power standards[3] (PPS, real value). Also Eurostat provides GDP both per inhabitant (per capita) and in total and provides it both absolute as relative compared to the EU-average value.

Obviously, the GDP per capita (instead of the total) will be taken, to avoid that differences in population numbers affect the level of regional inequality. Also, the **GDP per capita in Purchasing Power Standards (PPS)** will be acquired, so that differences in price levels do not influence the level of regional inequality. As differences in price levels are larger the difference between GDP in nominal value and in PPS becomes larger. The disadvantage of using PPS is that this variable is presented in an artificial unit. For this reason, the absolute value of this variable is difficult to interpret as is not for the nominal value of GDP per capita. However, the relative relationship between the regions' PPS do have a meaning.

Measurement

On the NUTS 2 level, the minimum number of people for a region is 800000 and the maximum is 3 million (see table 2.1), allowing for a lot of variation in population between regions. For this reason, it is better to use a measure that corrects for differences in population rather than to use a measure that does not correct for differences in population. Because of this, the Weighted Coefficient of

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[3] Presenting the GDP in purchasing power standards implies the value is corrected for differences in price levels.

Variation (WCV) and the Gini-coefficient seem to be the best measurement tools for regional inequality.

The formula to calculate the WCV is easier than the formula to calculate the Gini-coefficient. Therefore, I choose to measure regional inequality by the WCV. Besides this, the Gini-coefficient is often used to measure interpersonal income inequality but the WCV is used more often to measure regional income inequality (Lessmann, 2014). Recall, the formula for the WCV is as follows:

$$WCV = \frac{1}{\bar{y}}\sqrt{\left[\sum_{i=1}^{n} pi(\bar{y} - yi)^2\right]}$$

In which, $\bar{y}$ = the country GDP per capita, yi = the GDP per capita in region i, pi = share of population in region i of the country total population and n = the number of regions within the country.

As mentioned, the GDP per capita will be acquired from Eurostat as PPS per capita. The population for each NUTS 2 region is also from Eurostat, which publishes these data for each region and country per 1st January for each year. The number of regions is the number of NUTS 2 regions in the country.

Human capital

There is no clear definition for human capital. Burda & Wyplosz (2009) describe human capital as: ''the education, training and work experience acquired by individuals.'' This is a definition that seems to capture the way most scholars look at human capital. In general the reasoning is: if individuals devote time, energy and money to educate and train themselves, it makes them more productive so these individuals will earn a higher income. Also work experience will make individuals more productive in general.

A good, often used indicator to measure human capital is to look at the educational attainment[4] the people in the region, that are in working age (so contributing to the level of production), have had (OECDiLibrary, 2013). Eurostat and the OECD use the tertiary attainment (as % of the total population) in the age of 25-64 as the indicators to measure human capital. The tertiary attainment includes ''programmes, which are largely theoretically-based and designed to provide qualifications for entry to advanced research programmes and professions with high skill requirements'' plus programmes that are '' more occupationally-oriented and lead to direct labour market access.'' Someone first have to go through primary and secondary education before being in the category of

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[4] The highest level of education completed by a person.

tertiary education and doing tertiary education often leaves the person among the higher skilled in the society.

This variable will be acquired from Eurostat. The dispersion in human capital will be measured by looking at the standard deviation of the tertiary attainment (as % of the total population) endowments. If the standard deviation is relatively high compared to other countries the differences in human capital endowments between regions are bigger. If the standard deviation is relatively small compared to other countries differences in endowments are smaller. It is expected that more human capital in a region leads to a higher income per capita within the region so by a high standard deviation a high level of WCV is expected while by a low standard deviation a low level of WCV is expected.

Physical capital and infrastructure

The problem of no clear definition, is less pronounced for physical capital and infrastructure. Burda & Wyplosz (2009) describe this as: ''a factor of production consisting of durable inputs such as machines, buildings, computer hardware and software, and physical inventories.'' Also infrastructure is a durable input factor and so a part of the physical capital.

Physical capital can be analysed by looking at the gross fixed capital formation (GFCF) as a % of total GDP, acquired from Eurostat. This measurement shows how much is invested in fixed assets minus how much fixed assets are sold (disinvested) in the economy (OECD). It does not include investments in financial assets and inventories. Also, it does not include the depreciation of the assets that are present. If this depreciation would be included you would look at the net fixed capital formation (NFCF). In other words: the gross fixed capital formation shows how much fixed assets (or physical capital) is added and sold to and out of the economy but does not show how much fixed assets are depreciated from the economy.

Figure 3.1

Gross Capital Formation in 2011
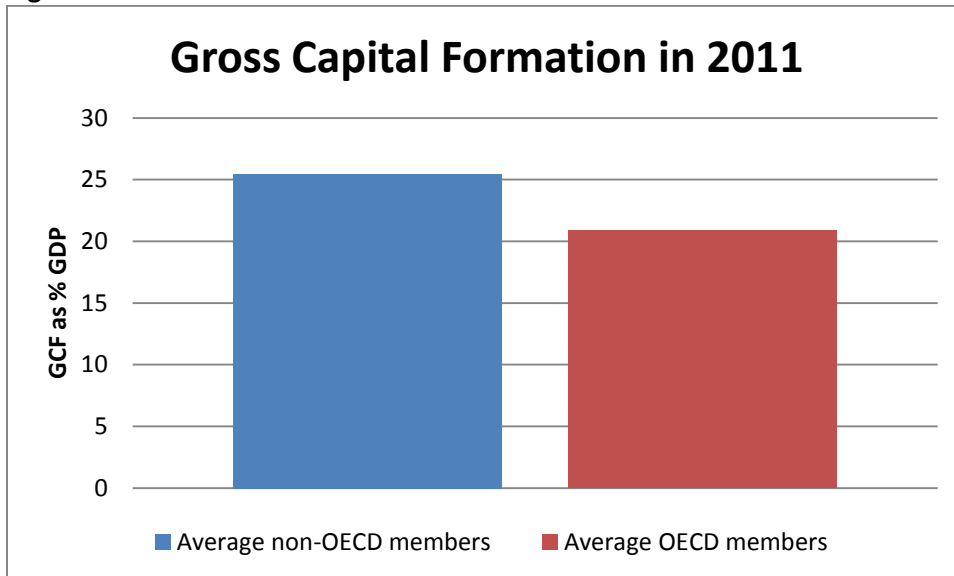
Source: the World Bank.

In figure 3.1, you can see that the GCF is contributing more to the GDP of non-OECD members than to the GDP of OECD members (which are generally considered as being the developed countries). The reason for this is that the developing countries are building up their physical capital stock, as has been mentioned in the literature review. This difference is statistically significant (P-value < 0,0005) (see appendix A).

Because you can see this (significant) distinction in the figures between the two groups of countries in different stages of development for GCF (and GFCF), I presume the GFCF is a good indicator to monitor the development of the level of physical capital within countries and regions. Several scholars who tried to estimate and model economic growth have used this indicator to analyse the development of the level of physical capital, such as Barro (1991). Also, Derbyshire, Gardiner, & Waights (2013) have used the GFCF as the main input variable to calculate the level of physical capital for NUTS 2 regions in the EU.

The dispersion of physical capital across the regions, will be measured by taking the standard deviation of the levels of GFCF between the different regions. As is mentioned in the literature review, this factor tends to have an influence on regional inequality in developing countries. On European levels, the developing countries are mainly the countries in Eastern Europe that have acceded the EU in 2004 or afterwards. A high standard deviation is associated with a small dispersion of physical capital (or clustering) and so a high level of the WCV is expected. A low standard deviation is associated with a large dispersion of physical capital which leads to the expectation of a low level of the WCV.

Openness to international trade and investment

Opening up the economy implies that a country is integrating its economy with another country or another group of countries (van Marrewijk, 2012). Trade barriers are thrown away as a country is opening up. This factor should be analysed before the moment a country opens the economy further up, at the moment the opening happens, and afterwards. We can analyse the impact of opening up the economy, by following the development of regional GDP per capita levels before, at and after the moment the country opened up. Economic literature specifies several stages of economic integration in which a country can be in trading with another country or a group of countries (see table 3.2):

Table 3.2: Stages of economic integration

	No internal tariffs	Common trade policy	Free movement of goods	Free movement of production factors	Harmonization of institutions and policy coordination	A single currency
Free trade area	✓					
Customs union	✓	✓	✓			
Common market	✓	✓	✓	✓		
Economic union	✓	✓	✓	✓	✓	
Monetary union	✓	✓	✓	✓	✓	✓

Source: based on (van Marrewijk, 2012)*.*

Of course several stages have to be completed before countries can go into economic partnerships with other countries (van Marrewijk, 2012). At first, a country needs to have an open economy (it has to be open for trade with other economies). Also, preferential free trade agreements can be implemented. Hereby, trade barriers are abolished for certain products or product group or trade barriers are partially reduced (and not abolished). To be able to successfully implement a further step in economic integration, a partnership between countries needs to have implemented previous stages successfully.

Another stage taken in economic integration can be noticed by free trade agreements, the implementation of laws or a particular event. Often, after a successive stage is implemented, the effects will be noticed by increasing imports and exports as a share of the GDP. So, if there are events

that can be seen as a further step of opening up the economy and so economic integration, I will check if this leads to increasing exports and imports as a share of GDP. If this happens, it is possible to analyse what happens to the GDP in regions and in this way to regional inequality.

Differences in specialisation

You can define the industrial structure by sector (agriculture, manufacturing and services) but within these sectors there can be a lot of subdivisions be made (Eurostat). For agriculture there is high-tech and low-tech agriculture for example. Also fishery is in the category of agriculture. Services include a lot as education, financial services, administrative services etcetera. Also for manufacturing a few subdivisions can be made, as high-tech and low-tech industry. However, the main differences between regions are caused by having a different sector that is the main source of income for the region (where the most of the people are employed in) (Kim & Margo, 2004).

The data on the share of people working in each of the sectors will be acquired from Eurostat. Unfortunately, Eurostat publishes these data only on national level and not on regional level. Therefore, I can use these data to analyse in which stage of development the country is (with help of the national GDP level as well). However, I cannot analyse differences between regions when it comes to the employment of those who are employed.

Agglomeration effects

One measurement to measure the distribution of population across a country that is often used is Zipf's law (Soo, 2005). Applying this law to the rank-size distribution of cities, it states that the rank-size distribution follows a Pareto distribution. In other words: on a log-scale the rank-size distribution of cities in a county follows approximately a straight line.

Applying this technique to the rank-size distribution of cities in some big European countries you can clearly see Zipf' law does not hold for the selected countries (see figure 3.2). The biggest cities in these countries are too big compared to the smaller cities.

Figure 3.2:

rank-size distribution (proportion to biggest city)
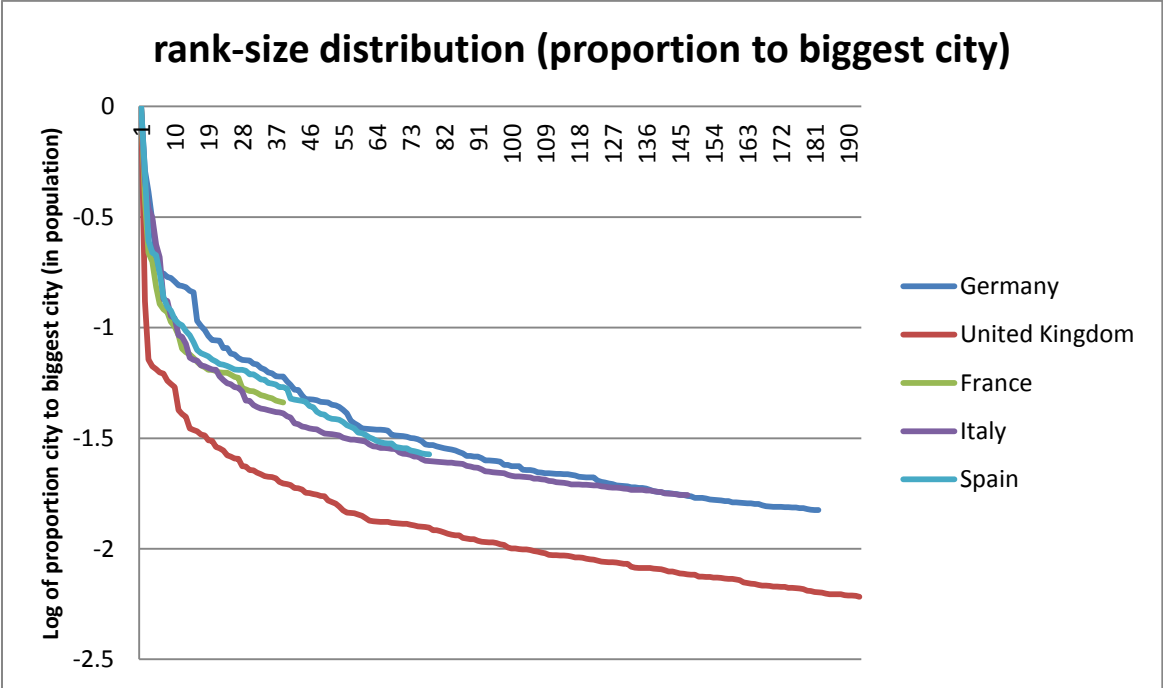
Source: www.citypopulation.de. Description: For each country I have ranked the cities according to their size in population[5], and measured how big each city is in population in proportion to the biggest city, after which I took the logarithm of that number.

Although Zipf's law does not hold for these European countries, the method can still be used to measure the size of cities compared to other cities. The lower a line is compared to the other lines in a figure like figure 3.2, the bigger the biggest city is compared to the other cities, and the more likely it is agglomeration or external economies will have an impact on regional inequality.

The data for population per city will be acquired from Eurostat. Eurostat publishes these data on the population in cities per 1st January of each year. Eurostat publishes these data for larger urban zones and for cities / greater cities. I prefer to use the larger urban zones, since these zones are more likely to come close to the functional classification (for example commuting zones) than the cities / greater cities. In a lot of cities / urban zones people are living in suburbs and work in the city centre. These people are less likely to be counted for the city / greater city category than for the larger urban zone category. They do have, however, an impact on the city (earn income in the city and spend their income in the city) so it is better to count them. I will use the data for the most recent year available. If there are no data for larger urban zones I will use the data for cities and greater cities. For which country I use which data can be found in appendix B.

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[5] Note that the way in which the scope of a city is measured can differ across countries. Also, for Germany, the UK and Spain every city that had more than 50.000 inhabitants was taken into analysis, while this barrier was 100.000 inhabitants for France and 85.000 inhabitants for Spain.

Government policies

Government policies that influence the GDP in regions will do this via the factors that have been mentioned above (see literature review). One way to analyse this is to watch if for example an increase in tertiary attainment or kilometres road in a region can partly be contributed to support the region has got from other regions or an institution.

Government policies that influence the income distribution can be analysed by monitoring the income distribution before and after taxes and social benefits. The income distribution before is called the primary distribution of income. This income is earned with the compensation for the production factors. The income distribution after is called the secondary distribution of income, or disposable income. The data will be obtained from Eurostat. To be able to perform a decent analysis, these variables will be analysed per capita.

First, the difference between the disposable income and primary income will be taken for the country and the region values (per capita). If this difference is positive, the disposable income per capita is higher than the primary income per capita. On average, the people in the region or country have a higher disposable income than they earn out of their production factors. In this situation, the region (or country) receives more support from the government (for example with social benefits) or the European Union (for example with regional aid) than the amount of income is deducted due to taxes. If the difference is negative, it is the other the other way around, so that the disposable income is smaller than the primary income.

I want to analyse the effect of the policies on the country levels so compare regions within the country instead of compare regions within the EU. To be able to do this, the difference between the regional values and the country value will be taken, for the variable which is obtained according to the method described in the previous paragraph. If this value is positive, the regional value is higher than the country value. In other words, you can say the people in the region receive money (via any policy instrument) from the government or another institution. If this value is negative, you can say the people in the region pay money to the national government. In the first situation I regard the region to be a net receiver and in the second situation I regard the region to be a net payer.

Summary

In this chapter, I have operationalised the factors that could affect regional inequality I have mentioned in the literature review. Also, I have chosen a measurement of regional inequality and chosen a manner to classify the regions within the countries I want to analyse. This thesis will continue now with the results section, in which the outcomes of the variables will be analysed.

4. Results

In the results section, the differences between the WCV for countries will be analysed and these differences will be tried to explain by looking at differences in the factors, of which the effects are discussed in the literature review and of which the operationalization in this thesis is discussed in the methodology section. I will try to group countries that have around the same level of WCV as have the same level of the factors discussed. Hereby I will use averages for the years analysed, and if there is a certain development I will analyse the year to year data.

The development of regional inequality
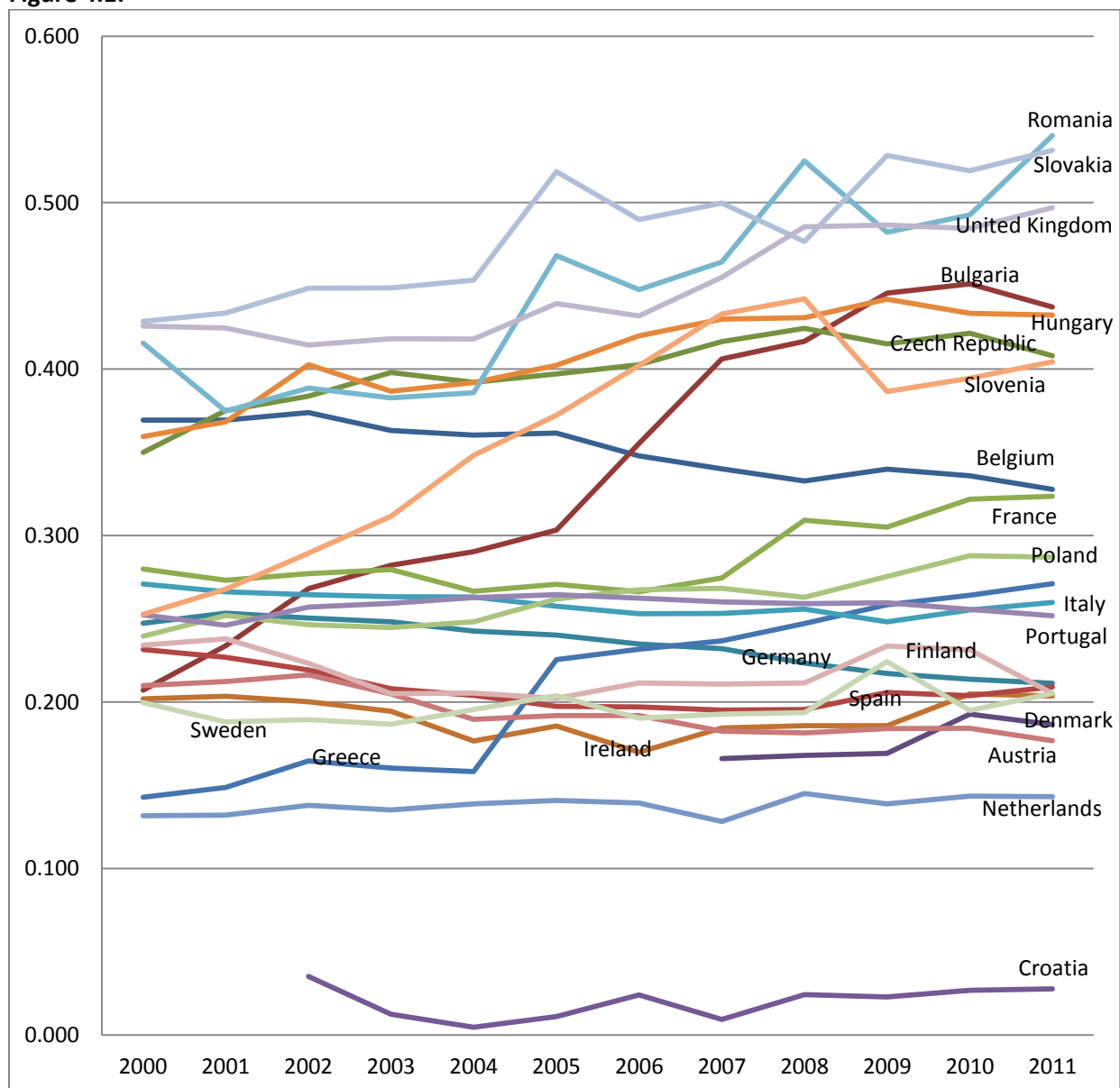
Figure 4.1:

Figure 4.1 shows the development of the WCV for EU countries between 2000 and 2011. The exact numbers can be found in appendix D. Remarkable is the extremely low level of regional inequality in Croatia. This is because Croatia has only two NUTS 2 regions whose GDP per capita are approximately the same. If there is barely any regional inequality in the country an analysis on regional inequality is not possible. Therefore, Croatia will not be analysed in this section anymore.

For Denmark are no regional GDP level data available for the years 2000-2006. Because of that, it is difficult to say anything about the manner in which the WCV for Denmark is moving. There are to less years for analysis available (5 years respectively 2007-2011) to recognize a trend. However, it is possible to notice that compared to the other countries be taken into analysis, Denmark has a relatively low level of the WCV (see figure 4.4).

Besides Croatia, the WCV ranges from around 0,15 to around 0,50 between the selected countries. Also, for some countries the WCV is quite stable (changing by less than 0,04) or declining (by more than 0,04) while for other countries the WCV is showing an increasing pattern (increasing by 0,04 or more). The countries for which the WCV is stable or declining are shown in figure 4.2.

Figure 4.2:
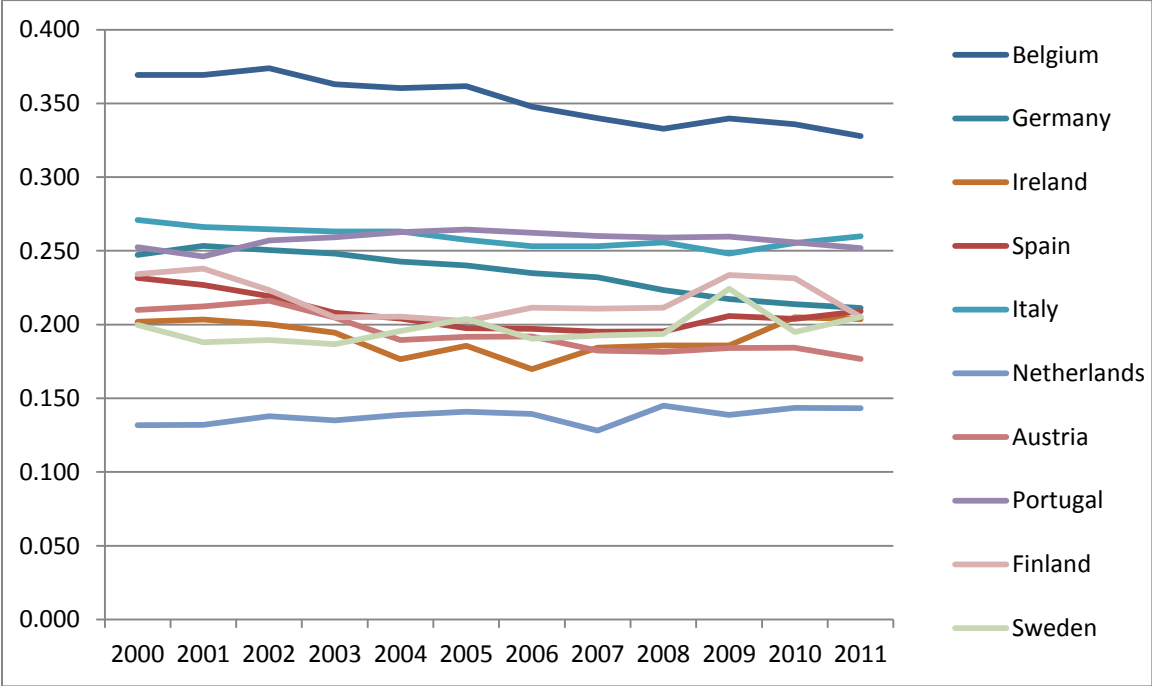
All countries in figure 4.2, have a WCV ranging from 0,15 to 0,30, expect for two countries. One is having a lower regional inequality (the Netherlands) and one is having a higher regional inequality (Belgium). For Belgium, the level of the WCV is however declining so if that trend continues it will fall below 0,30 in one of the years after 2011. Also Germany is showing this declining pattern. However, for Germany the WCV is decreasing at a low level of the WCV which is not for Belgium. Remarkable is

the fact that all these countries belong to the richer European countries and have acceded the EU in 1995 or before.

The other countries display a rising pattern (increasing by 0,04 or more) of the WCV, during 2000-2011 (see figure 4.3).

Figure 4.3:
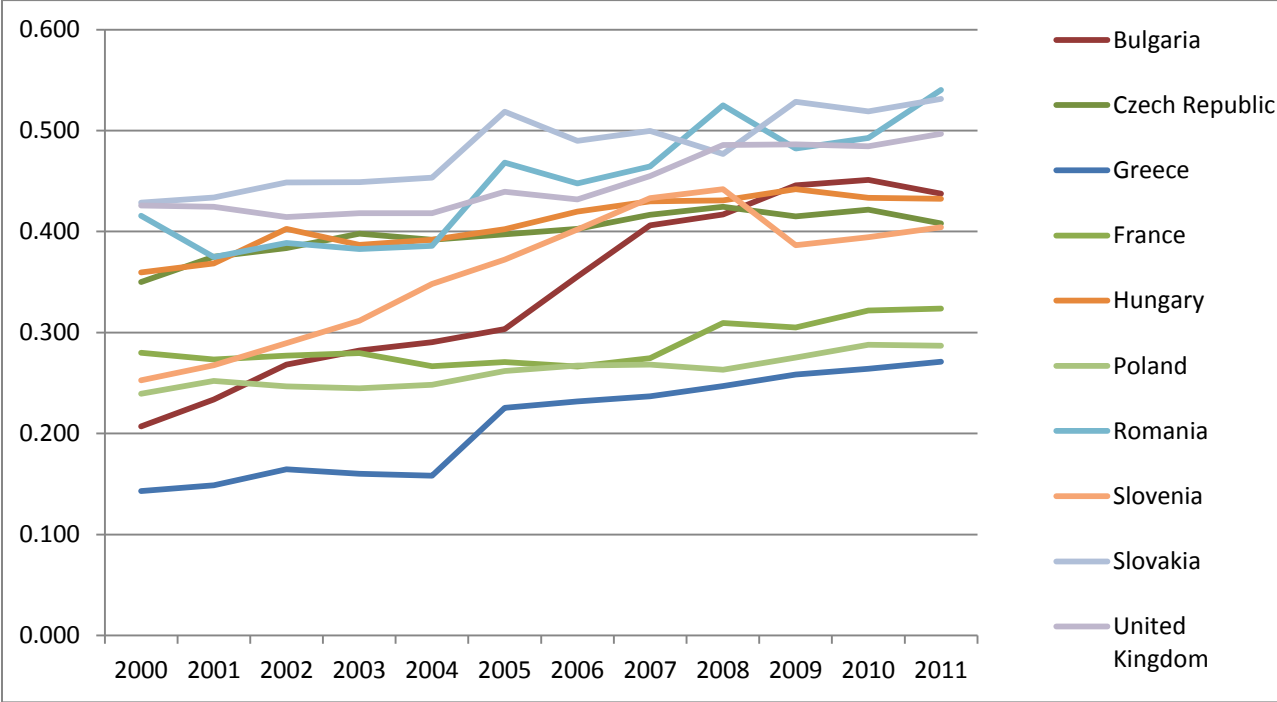
Most of these countries belong to the poorer European countries, and have acceded the EU in 2004 or afterwards. However, also some richer EU countries have shown a rising regional inequality pattern (Greece, France and the UK). it is remarkable that the countries that have a rising pattern on general have a higher (average) level of the WCV than the countries that show a flat pattern on general.

Summarised, Croatia is excluded because the country has only two NUTS 2 regions whose incomes are approximately the same due to which there is barely any regional inequality. There is a group of countries that have a stable or slightly declining WCV during 2000-2001. These are Belgium, Germany, Ireland, Spain, Italy, the Netherlands, Austria, Portugal, Finland and Sweden. Also there is a group that shows a rising WCV. These countries are Bulgaria, the Czech Republic, Greece, France, Hungary, Poland, Romania, Slovenia, Slovakia and the UK.

Average Regional Inequality

An analysis is easier to perform, by looking at the averages instead of the time series. Therefore, the average WCV over 2000 to 2011 will be taken, keeping in mind the development of the WCV for all of these countries. The exact average numbers can be found in appendix C.

Figure 4.4:
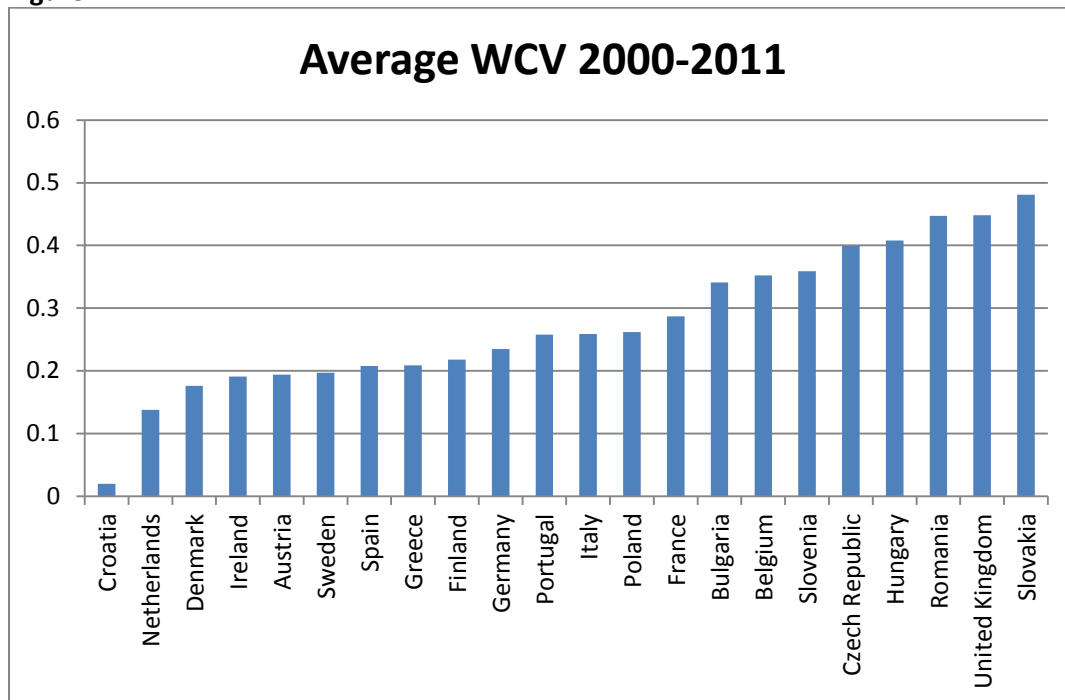
It is remarkable that the countries that have a rising pattern on general have a higher (average) level of the WCV than the countries that show a flat pattern on general. The exception for this observation is Greece, that shows a lower average level of WCV than the other countries that show a rising pattern. From the countries that show a declining pattern of the WCV, Belgium has a high average WCV and Germany is among those that show a relatively low level of the WCV.

Regional inequality and the causes

For analysing the causes, initially only the averages of the variables over the years will be analysed. The values of these variables can be found in appendix C. Per factor that tends to affect regional inequality the differences between countries will be analysed.

The Development of the country

I already wrote a bit on the development of the EU countries in the paragraph about the development of regional inequality. I will go into more detail in this section. It will be done by looking at the level of GDP per capita in PPS of the country and by looking at the employment into the different sectors of the economy of the country.

Looking at the GDP per capital in PPS, it is clear that some countries have made progress in development from 2000 to 2011 (see appendix E). In 2000 Romania, Bulgaria, Poland and Slovakia have an income per capita of less than 10.000 in PPS. Hungary is only 300 in PPS above the mark of 10.000. These countries are the poorest countries in the EU in 2000. Also, there is a group of countries having an income per capita between 15.000 and 20.000 in PPS. These countries are Slovenia, Portugal, Greece and Spain. They are around the average for this group of countries of 17.650 so these countries can be called the EU's middle income countries. The Czech Republic is with a PPS of 13.500 in between of these two groups. The other countries have an income of higher than 20.000 in PPS and can be regarded as the richest countries of the EU.

In 2011 this has changed. Romania and Bulgaria can still be regarded as the poorest EU countries. They have exceeded the 10.000 PPS mark, but are still around the same range below the average for this group of countries of 23.895 in PPS in 2011. In other words: these two countries were unable to catch up with the richer EU countries over these years. Poland, Slovakia and Hungary exceeded the 15.000 PPS mark, but only Slovakia was able to catch up with the average of the countries. These countries are in transition from low to middle income EU countries. Portugal, Greece, Czech Republic, Slovenia and Spain have a PPS of around the average of countries and belong to the middle income countries. The remaining countries still belong to the richer, leading EU countries.

Looking at the employment to agriculture, industry and services (see appendix H), in Romania and Bulgaria the share of people working in agriculture is way above the share in agriculture of other countries. In the European context, I will call these countries underdeveloped. To 2011, the share working in agriculture has dropped but is still way above the share in agriculture in other countries. Together with the fact that they were unable to catch up in GDP in PPS to the average of countries, you can conclude that Romania and Bulgaria have not made much progress in their development.

For Poland, Slovenia, Slovakia, Hungary and Portugal the share of people working in agriculture is lower and it is declining from 2000 to 2011. The share of people working in industry is quite high and declining a bit. So as both the share of agriculture and industry are declining, the share working in services is increasing. Both in 2000 to 2011, the share of people working in services are way behind the share in the rich, leading countries. However, as the share of people working in agriculture and industry is declining and the share working in services is increasing, you can say these countries are developing due to a process of tertiarization.

The Czech Republic shows already in 2000 a low share of the workforce working in agriculture. The share working in industry is high compared to the other countries and only declining a bit to 2011. While in 2000 the Czech Republic was in the share working in services ahead of the countries

mentioned in the above paragraph, in 2011 the Czech Republic was behind these countries. Out of these you can conclude the Czech Republic is not in a process of tertiarization and stagnating.

Spain has already low levels of share working in agriculture in 2000. From 2000 to 2011, the share working in industry is declining towards the numbers of the rich, leading EU countries while the share working in services follows the same pattern but the opposite direction. Spain is in a process of tertiarization and in a process of having an equal share of people working in services, as the rich EU on average countries have.

In Greece the share working in industry is low compared to the other countries. This does not imply, however, that Greece is a developed country, as the richest EU countries are, as the share working in agriculture is high, although declining a bit from 2000 to 2011. The share working in services is increasing from 2000 to 2011 quickly, close to the levels of the richer countries. Greece is in tertiarization but it seems that Greece has never industrialised completely.

The group of rich countries, all have a low and stable share of the workforce working in agriculture. The percentage of workforce working in industry is (almost for all) lower than for the poorer countries while the share in services is (almost for all) higher than in the poorer countries. The percentages are for both industry and services dispersed among the countries. They show, however, all a pattern of a declining share working in industry and an increasing share working in services, from 2000 to 2011. The rich EU countries are also in a process of tertiarization, you can conclude.

Effect on the WCV

As has been mentioned before, the poorer and middle income countries show, on average, a higher level of WCV than the richer countries (see figure 4.5). Also, the poorer countries show in general a rising pattern of the WCV while the rich countries show in general a flat pattern of the WCV from 2000 to 2011. From this the conclusion is that the development process does have an influence on regional inequality. A country that is richer and developed tends to have a lower regional inequality than a poorer and developing country. The effect of tertiarization is unclear. Almost all EU countries are in a process of tertiarization, although the poorer countries are doing this with a faster speed (also because they have to catch up) than the richer countries. However, the richer countries do not show in general a change in WCV during the years so from this you cannot conclude that tertiarization does have an influence on regional inequality.

Average WCV for selected countries 2000-2011
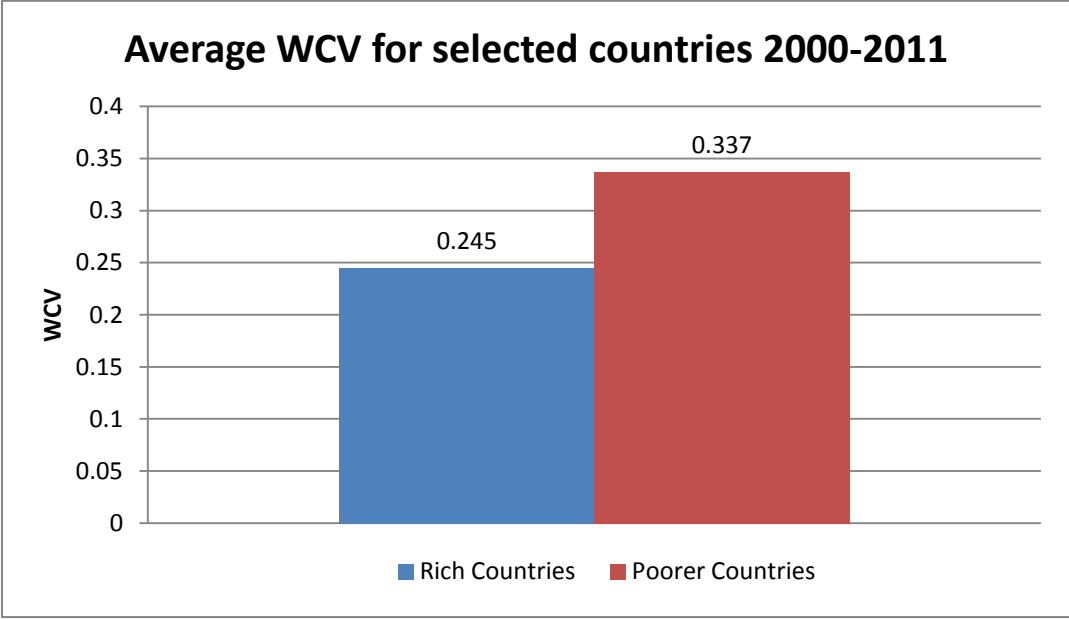
Note; Rich countries: the Netherlands, Denmark, Ireland, Austria, Sweden, Finland, Germany, Italy, France, Belgium and the UK ; Poorer countries: Spain, Greece, Portugal, Poland, Bulgaria, Slovenia, Czech Republic, Hungary, Romania and Slovakia.

Dispersion of Human Capital Endowments

Figure 4.6:

Average Human Capital Dispersion 2000-2011
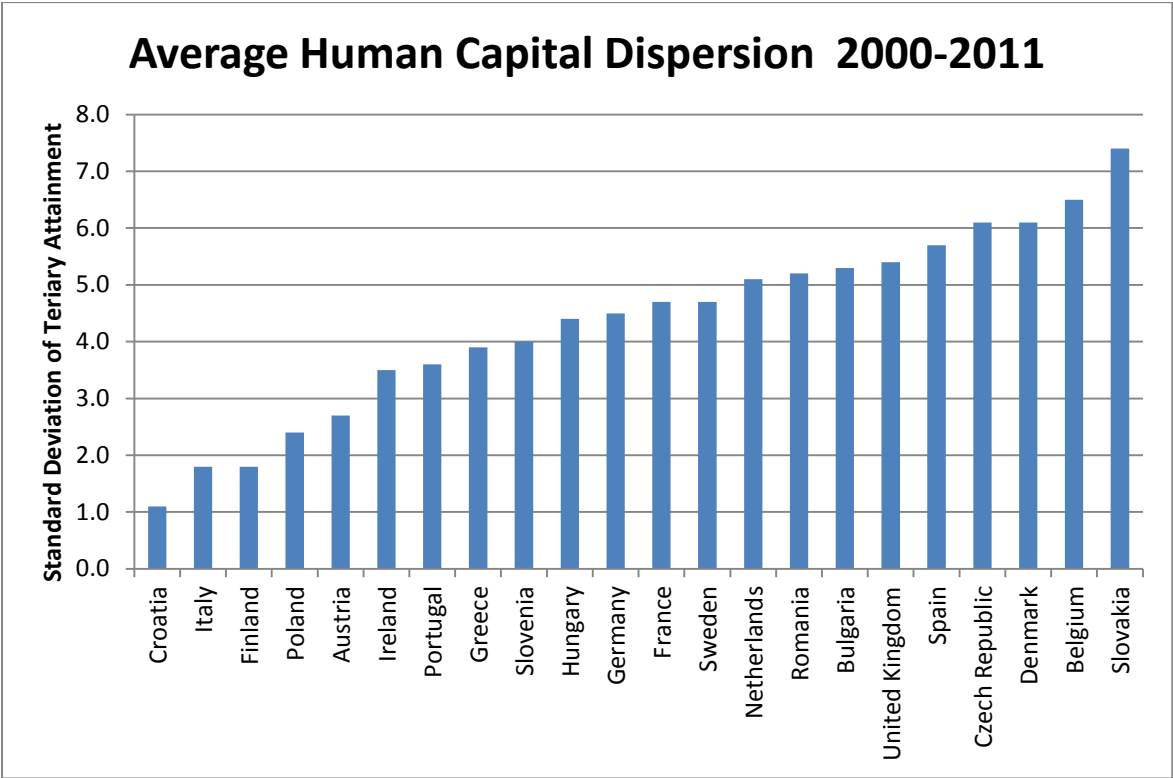
Monitoring the dispersion of the tertiary attainment endowments there is no clear relation to the levels of the WCV. Some countries with a higher level of the WCV also show a high standard deviation of tertiary attainment (Slovakia, Belgium, Czech Republic, UK, Bulgaria, Romania, France

and Hungary). Also some countries with a low level of the WCV also show a low standard deviation of tertiary attainment (Italy, Finland, Austria, Ireland, Portugal and Greece). Countries which do not display this observation are Poland, Slovenia, Germany, Sweden, the Netherlands, Spain and Denmark.

The number of countries not showing this relationship is too big to say differences in human capital endowments do have an influence on regional inequality. However, as differences in these endowments get too big these may play a role indirectly via agglomeration economies. More on this in the section about agglomeration economies.

Dispersion of Physical Capital Endowments

Figure 4.7:

Average Physical Capital Dispersion 2000-2010
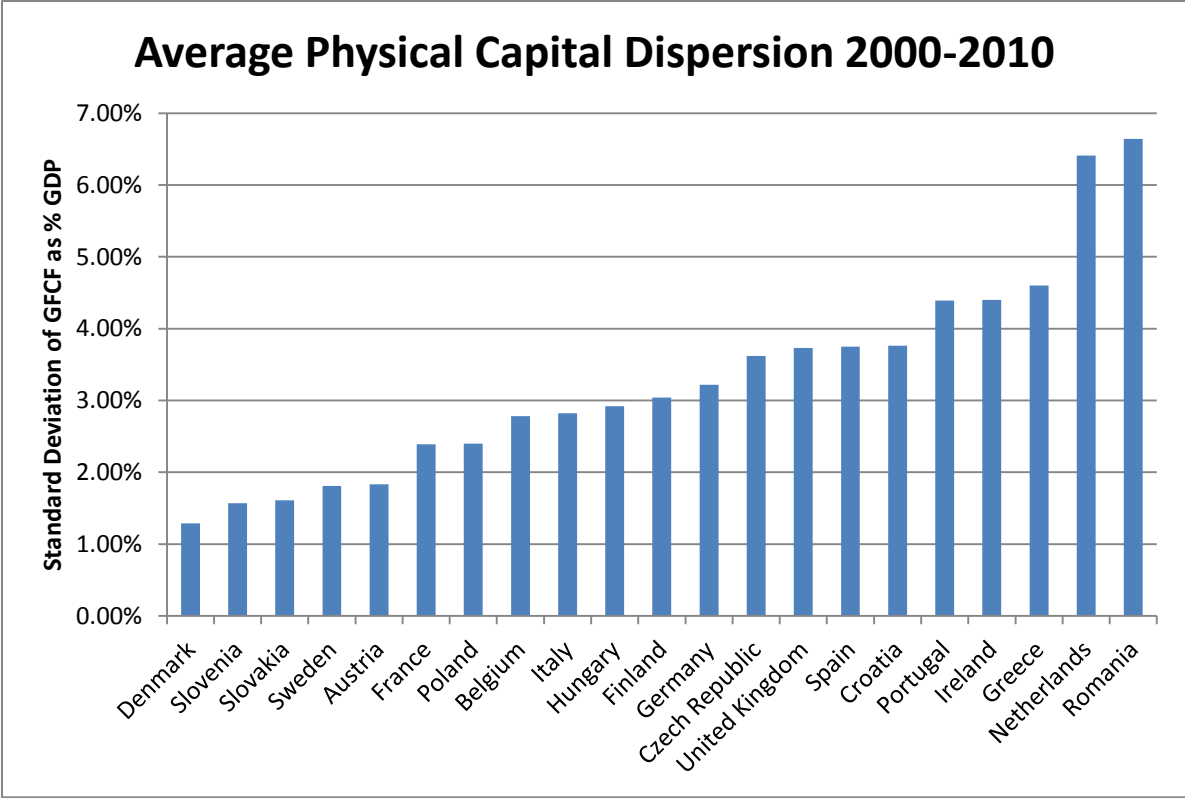
Countries that both show a low level of the WCV and a low standard deviation of physical capital are Denmark, Sweden, Austria, Italy, Finland and Germany. Countries that both show a high level of WCV and standard deviation of physical capital are Czech Republic, UK and Romania. As these are 9 countries together, the remaining 11 countries (in the figure) do not show this relationship. There does not seem to be a relationship between physical capital formation and the WCV.

As is mentioned before, this factor may play a part in developing countries. The standard deviation is extremely high for the Netherlands and Romania. For Romania, this is expected as Romania and Bulgaria (for Bulgaria there are no data available) are the poorest EU countries and the physical

capital initially will build up in the leading region[6]. For Romania this is the region in which the capital is; Bucharest. The high standard deviation for the Netherlands can be explained by an extremely high rate of GFCF as % GDP in the region of Flevoland. Besides Romania, there does not seem to be a high standard deviation of physical capital for other Eastern European developing countries. This may not be a surprise, as these countries are (although still poorer than the Western European countries) richer and further up in their development as Romania and Bulgaria are.

European Integration – Opening up of the European Economy

In the period of 2000-2011 several events occurred, in the context of European integration and enlargement, that could have affected regional inequality within some countries. These events are the consecutive EU enlargement with new (poorer) member countries in 2004 (Slovenia, Slovakia, Poland, Malta, Lithuania, Latvia, Hungary, Estonia, Czech Republic and Cyprus), 2007 (Romania and Bulgaria) and 2013 (Croatia). These new member states came into an economic union that was already in function (Moravcsik & Vachudova, 2002/2003).

All the countries (and that are part of the analysis) that have acceded the EU have seen increasing exports as a share of GDP from the moment on (or in some situations with one or two years delay) the country accessed to the EU (see appendix J and K). All but Romania also have seen increasing import as a share of GDP. In other words: from the moment on these countries joined the EU they have increased trading with other countries.

To see with regions have benefited from this trade the development of the regional GDP per capita in PPS have to be analysed. In the Czech Republic, the two regions that have benefited the most are the richest Praha region (makes the WCV increasing) and the poorest Moravskoslezsko region (makes the WCV decreasing). As these two offset each other, it explains why the level of WCV has been quite stable in the Czech Republic from 2004 on (it has been increasing but not as much as it did from 2000 to 2004).

In Hungary, the two regions that have benefited the most from EU accession and intensified trading are the two richest, leading, Közép-Magyarország and Közép-Dunántúl NUTS 2 regions. This explains the increasing WCV in Hungary from 2003 to 2009. More recently, other NUTS 2 regions in Hungary are benefiting as well, making the level of WCV stable from 2009 on.

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[6] Especially for Romania as Romania is de facto the only EU country where the share of the workforce working in industry is increasing from 2000 to 2011 and so you can say that Romania is the only EU country that is industrialising, wherefore it needs to build up physical capital.

In Poland, all regions made around the same progress since the country acceded to the EU. Poland has a low and (compared to the other Eastern European countries) a stable level of WCV. This can likely to be contributed to the fact that all regions were competitive enough to compete in the EU in 2004, so that all regions could benefit. This has kept the WCV low and relatively stable compared to other countries that acceded the EU.

In Slovenia, the two NUTS 2 regions have made equal progress since 2004. The fact that the WCV is so volatile can be contributed to the fact that the measurement is more sensitive to changes in income and population within regions, as there are only two NUTS 2 regions than when there are more of them.

In Slovakia, the leading Bratislavský kraj region has benefited the most, leading to a big increase in the WCV. So far, the poorer regions have been unable to catch up so that regional inequality continues to increase by every year.

In Bulgaria and Romania, the leading regions in which the capital is situated have benefited the most leading to a big increase in WCV.

Agglomeration

The graphs that calculated the log distribution of cities compared to the biggest city are in figure 4.8.

Figure 4.8:
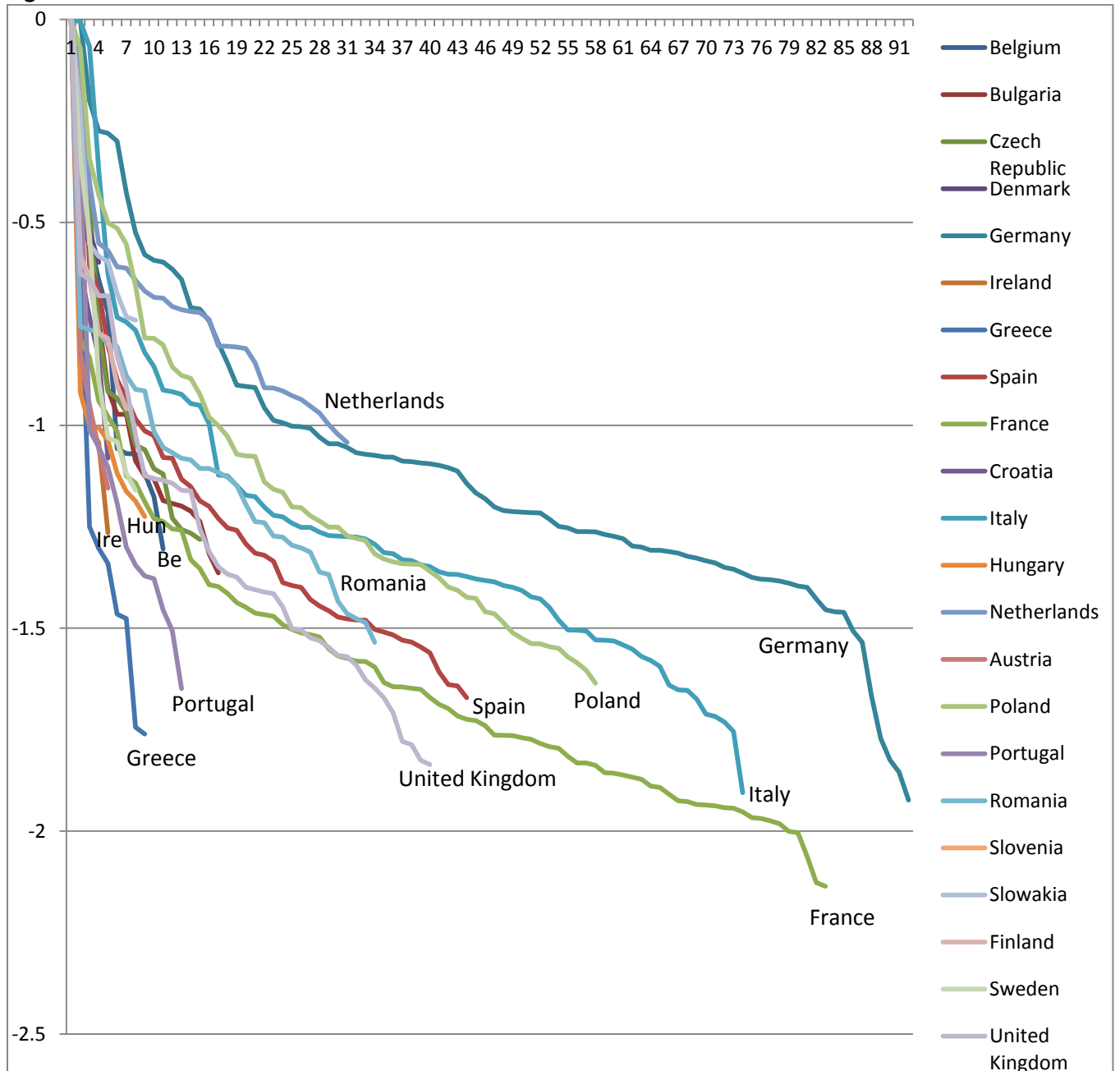
Description: Division of population over the cities and larger urban zones, for all selected countries. On the x-axis the number of cities, ranked to population and on the y-axis the logarithm of the relative size of cities and larger urban zones compared to the biggest city or largest urban zone.

The Netherlands and Germany have the most equal distribution of cities and agglomerations in population. Portugal and Greece have a very unequal distribution. Of the bigger countries, France and the UK seem to have an unequal distribution. To make the graph more comfortable to watch (a lot of lines are not visible as it is presented this way), it will be split up in a graph that shows the bigger countries (with a lot of cities) and a graph that shows the smaller countries (with fewer cities).

Figure 4.9:
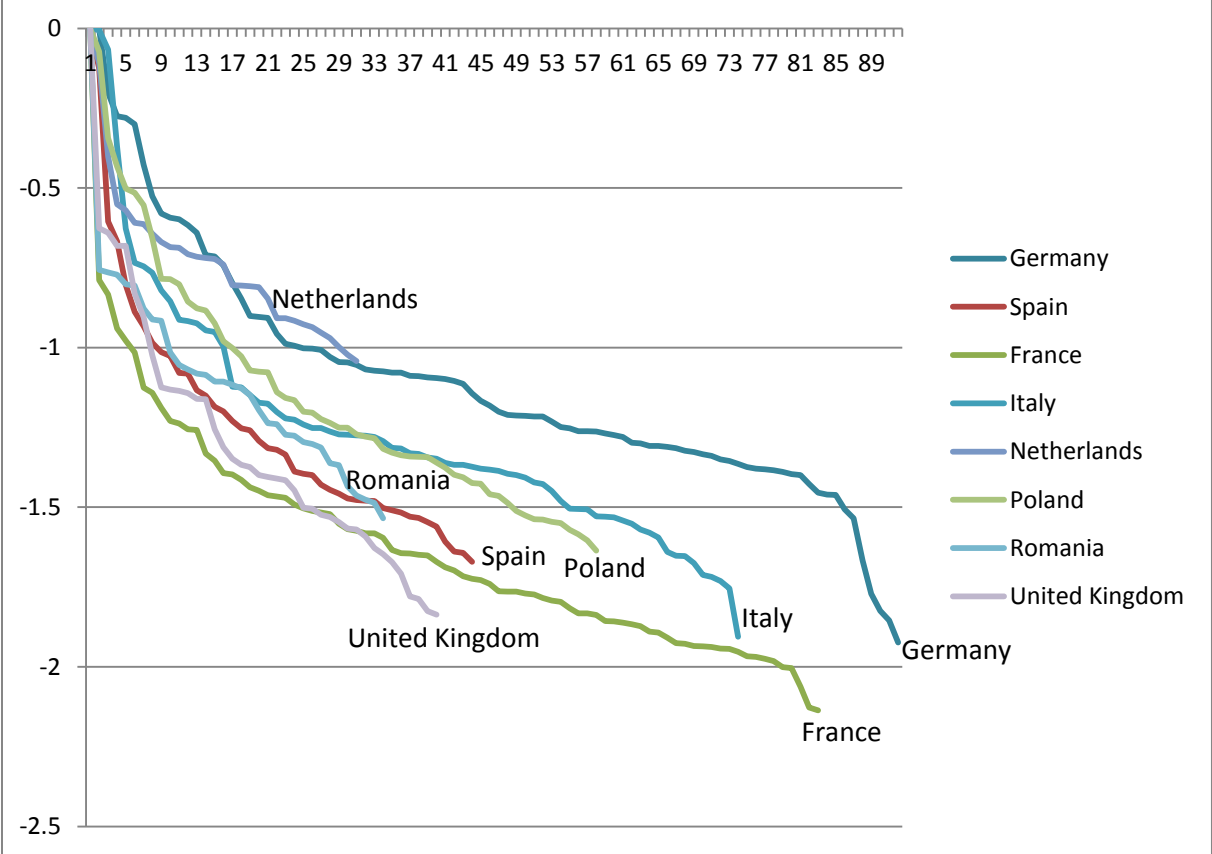
Watching the graph for the bigger countries, observations do not change much. The unequal distribution for France and the UK may have an impact on regional inequality. In these two countries the capital cities, Paris and London, are very big compared to the other cities in the countries. Literature on agglomeration economies and the effects have done research to the effects of the big size of Paris and London compared to other cities in France and the UK (Duranton & Monastiriotis, 2002; Combes, Lafourcade, Thisse, & Toutain, 2011).

Paris and London may be the main explanation for the relative big regional inequality in France and the UK. People and so human capital are clustering in these cities to profit from the benefits these cities have over other cities in the country. However as this is happening this cities benefit from external economies through which these cities will stay attractive for those who can afford it to live in these cities (earning a high salary and so, in many circumstances, have completed tertiary attainment). This is a vicious circle in which Paris and London become richer and regional inequality shows an increasing pattern.

Figure 4.10:

Dispersion of Human Capital France
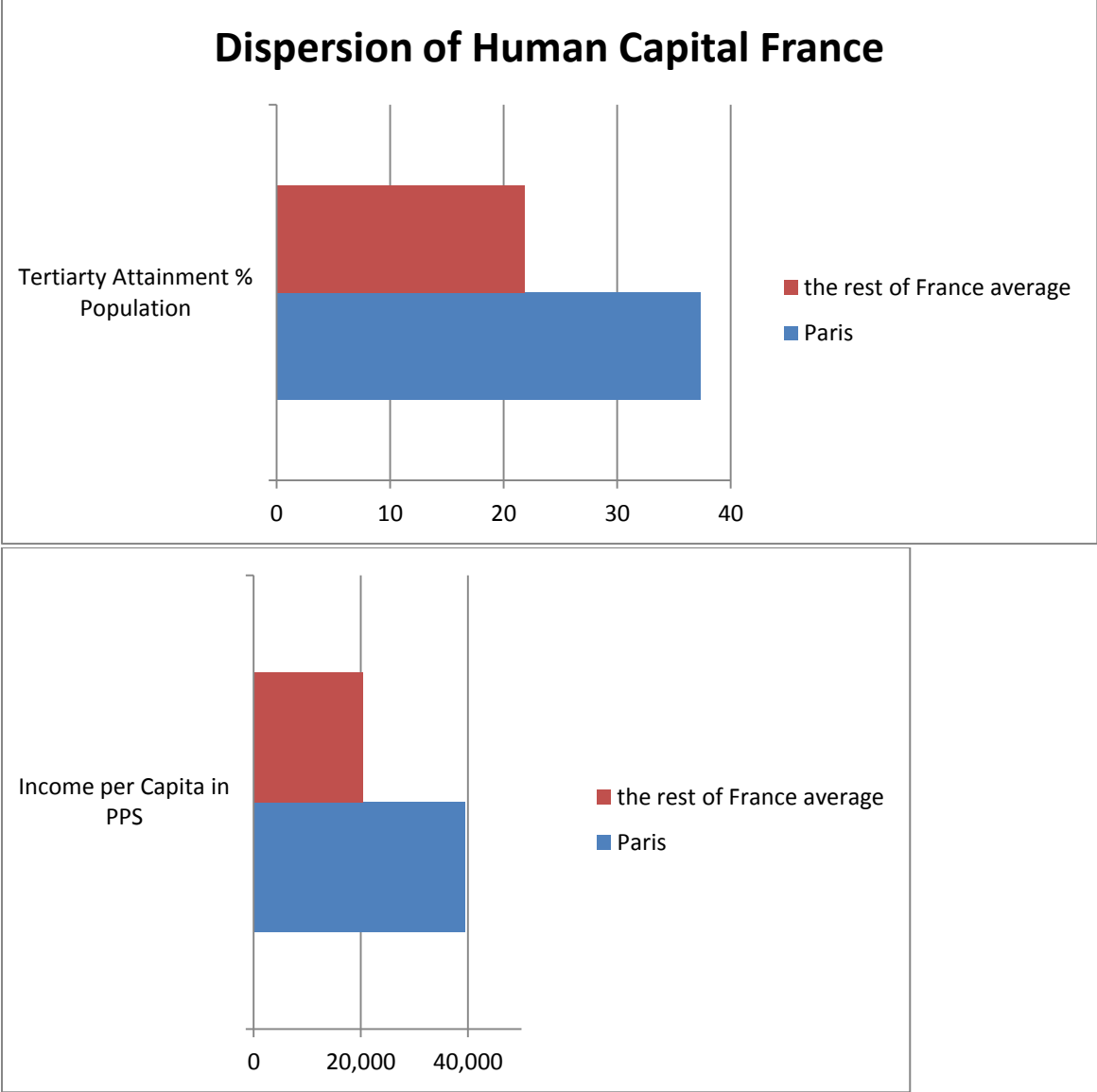
Paris is the city in France with the highest level of tertiary attainment % population and the city with the highest income per capita. The values are way above the France average.

Figure 4.11:

Dispersion of Human Capital United Kingdom

Tertiary Attainment % Population
- the rest of the UK average
- Inner London

(axis: 0, 10, 20, 30, 40, 50, 60)

Income per Capita in PPS
- the rest of the UK average
- Inner London

(axis: 0, 20,000, 40,000, 60,000, 80,000)
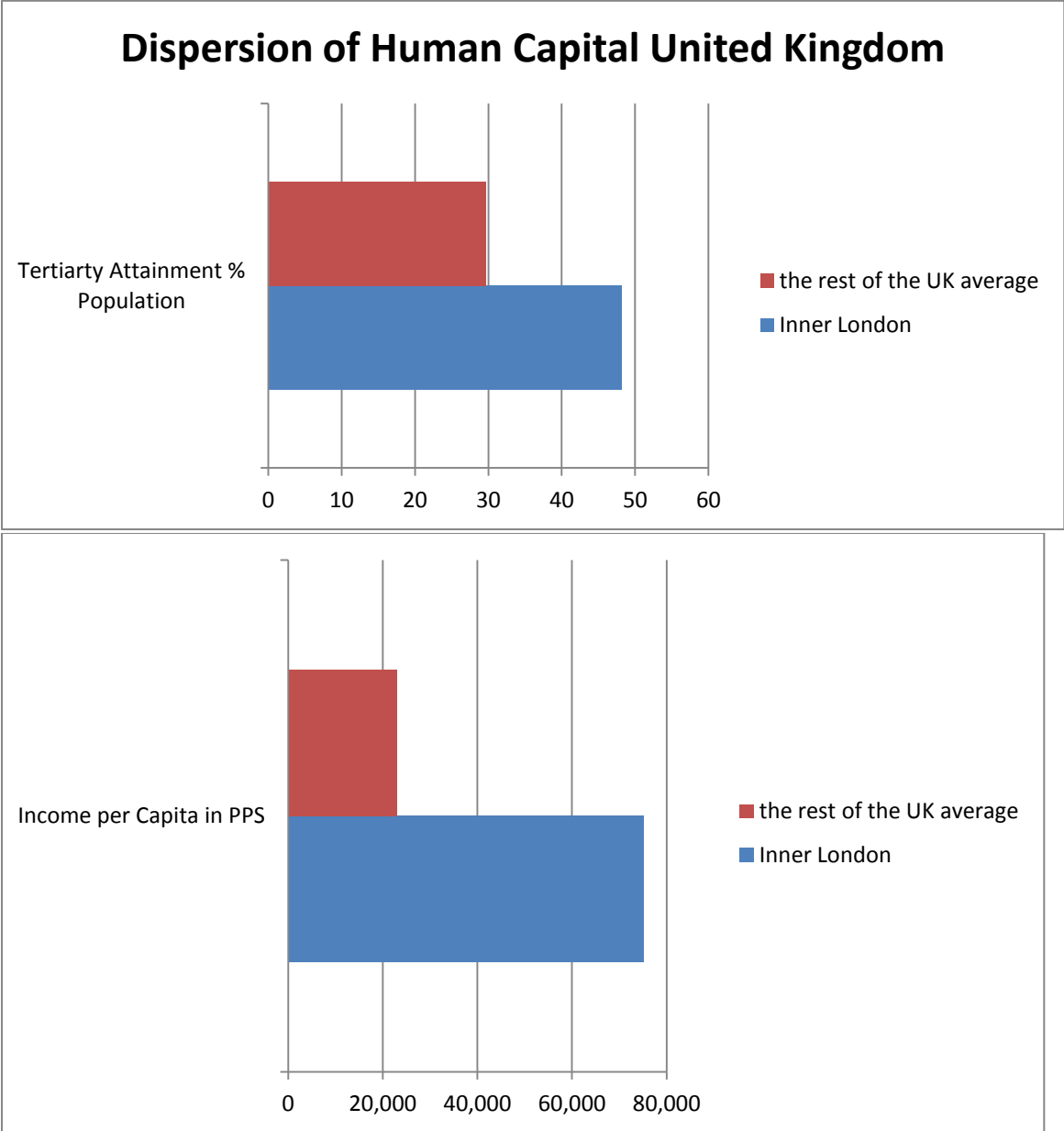
Inner London has the highest level of tertiary attainment % population within the UK. The income per capita is also the highest of the UK. The values are way above the UK average. The relative values of tertiary attainment are almost the same for Paris and the France average as for London and the UK average. The differences in income are however way higher between London and the rest of the UK than for Paris and the rest of France.

Concluded, external economies to scale have a big influence in the level of regional inequality in France and the UK. However, there have to be other factors playing a role as well as the same relative differences in tertiary attainment for France and the UK do not lead to the same relative differences in income in PPS.

Figure 4.12:
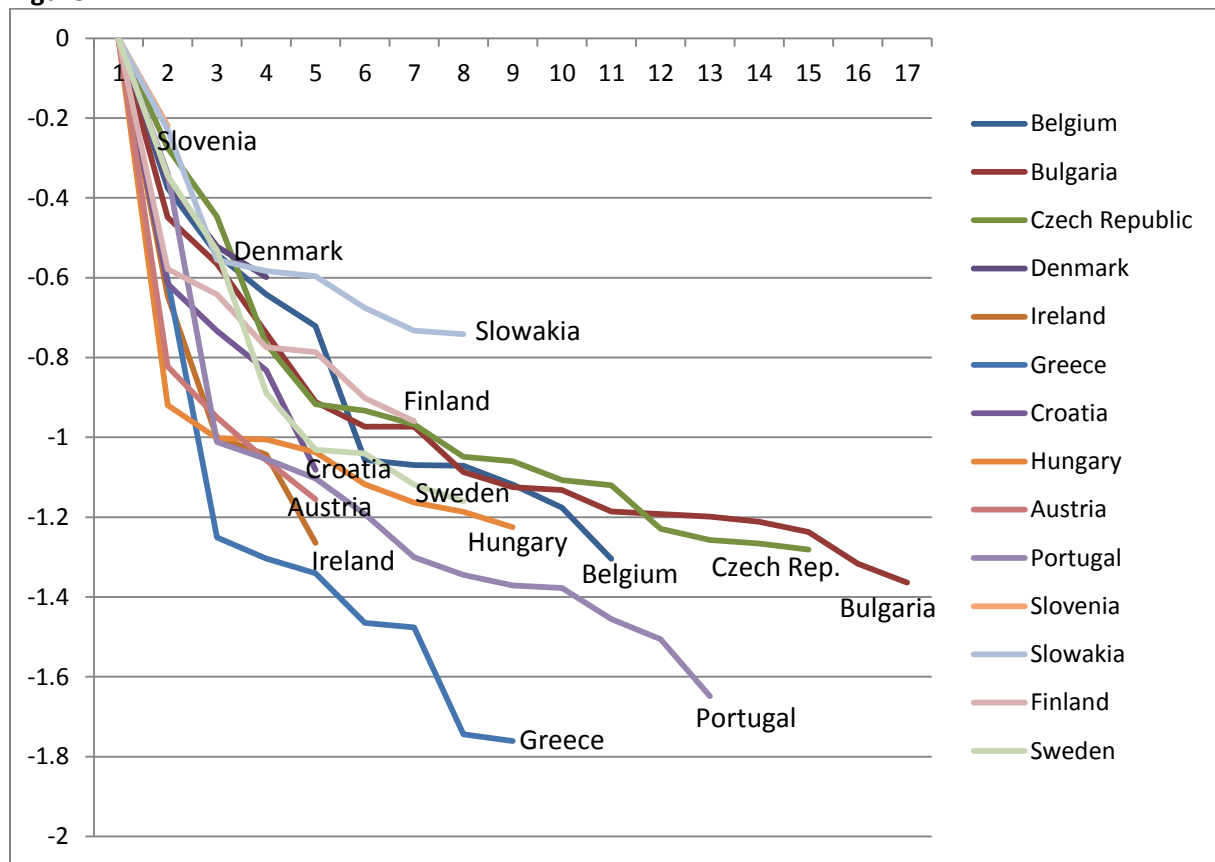
In this graph for smaller countries, you can see Greece and Portugal have an unequal distribution of cities in population. You can also see in figure 4.8 that this distribution is more unequal than the distribution of France and the UK. Also Ireland and Austria have an unequal distribution of cities. Al these small countries with an unequal city distribution have, however, a low level of regional inequality (although the WCV of Greece is increasing).

The explanation for the unequal distribution is for these countries likely to be different than the explanation for France and the UK. Paris and London are big internationally oriented metropolises attracting a lot of investment and people from within the country and abroad. In the countries in figure 4.12 are a lot fewer people living than in France and the UK and so these cities are smaller than in France and the UK.

Ireland has only two NUTS 2 regions. The two major, biggest cities Dublin and Cork belong both to the richer Southern and Eastern NUTS 2 region. There are no big cities in the other, poorer Border, Midland and Western region. This leads to the fact that more than 70% of the Irish people are living in the Southern and Eastern NUTS 2 region. So because less than 30% is living in the poorer region there is no big income inequality between these regions.

The city landscape of Greece (Athens and Thessaloniki) and Portugal (Lisbon and Porto) are mainly dominated by only two big cities. The rest of the cities are too small which leads to the unequal distribution to population of cities these countries have.

The capital city of Austria (Wien) is disproportionally big compared to the other cities. Only in Hungary the second city is smaller compared to the biggest city, however in Hungary smaller cities are relatively bigger compared to Austria's.

In the metropolis of London are (in 2011) more than 12 million people living and in the metropolis of Paris are (in 2011) more than 11 million people living. With this number, these cities belong to the biggest metropolises in the world. Inside the cities from the smaller countries, I mentioned, are a lot fewer people living. The biggest of these is Athens in which (in 2009) in the metropolitan area are around 4 million people living. Knowing this, it is unlikely agglomeration effects have a big influence in the level of regional inequality in these smaller countries.

Redistribution of Income

In appendix I, for each country, the regions that pay to the national government and the regions that receive from the government are given. In general, you can see that the richer NUTS 2 regions pay to the government and the poorer NUTS 2 regions receive from the government. Also, in general less regions are paying than there are regions receiving. At last, the regions that are paying have in general a larger population than the regions that are receiving.

All the factors mentioned in this chapter can have an influence in regional inequality. However, it turns out from the table in the appendix a lot of income is redistributed from the people in the richer regions to the people in the poorer regions, offsetting the effect the a factor has on regional inequality.

5. Summary and Conclusion

There are several forces having influence on regional inequality within the countries of the EU. From previous literature on regional growth and regional inequality several factors have been mentioned that could affect regional inequality. These factors are the development process, human capital dispersion, physical capital dispersion, changes in openness to international trade, agglomeration economies and redistributive government policies.

For the richer EU countries regional inequality turned out be a stable from 2000 to 2011, excluding France and the UK. For France and the UK, a disproportionally big capital city turned out to be the cause for increasing regional inequality. For the Eastern European countries, the development process and the EU accession followed by intensified trading turned out to be the major drivers behind increasing regional inequality.

As these Eastern European countries are developing, I expect that in the future these regional inequality will start decreasing to levels the most richer European countries have. As Bulgaria and Romania are behind the other Eastern Europeans in their development process, I expect that this will happen at a latter year for these countries. For the UK and France, regional inequality is not likely to decrease soon as London and Paris stay big international metropolises, profiting from external economies to scale.

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Appendix

A

Group	# of countries	Average GCF	Variance
non-OECD	133	25,45	110,12
OECD	34	20,90	15,10

t-statistic	4,04
Degrees of freedom	33
P-value	<0,0005

B

Belgium	Larger Urban Zones 2012
Bulgaria	Larger Urban Zones 2011
Czech Republic	Larger Urban Zones 2010
Denmark	Larger Urban Zones 2012
Germany	Larger Urban Zones 2012
Estonia	Larger Urban Zones 2012
Ireland	Larger Urban Zones 2010
Greece	Larger Urban Zones 2009
Spain	Larger Urban Zones 2012
France	Larger Urban Zones 2011
Italy	Larger Urban Zones 2012
Croatia	Cities and Greater Cities 2001
Hungary	Cities and Greater Cities 2009
Netherlands	Cities and Greater Cities 2009
Austria	Cities and Greater Cities 2009
Poland	Larger Urban Zones 2012
Portugal	Larger Urban Zones 2013
Romania	Larger Urban Zones 2012
Slovenia	Larger Urban Zones 2012
Slovakia	Larger Urban Zones 2012
Finland	Larger Urban Zones 2012
Sweden	Larger Urban Zones 2011
United Kingdom	Larger Urban Zones 2011

C

Averages for the 22 countries

Country	The Weighted Coefficient of Variation	Human Capital Dispersion	Physical Capital Dispersion	% working in agriculture	% working in industry	% working in services
Belgium	0,352	6,5	2,78%	1,7	20,9	77,4
Bulgaria	0,341	5,3	No Data	21,3	27,6	51,0
Czech Republic	0,399	6,1	3,62%	3,8	38,0	58,2
Denmark	0,176	6,1	1,29%	2,8	20,3	76,9
Germany	0,235	4,5	3,22%	1,7	26,2	72,1
Ireland	0,191	3,5	4,40%	5,8	25,3	68,9
Greece	0,209	3,9	4,60%	12,9	19,4	67,7
Spain	0,208	5,7	3,75%	4,8	26,7	68,5
France	0,287	4,7	2,39%	3,3	20,1	76,6
Croatia	0,020	1,1	3,76%	No Data	No Data	No Data
Italy	0,259	1,8	2,82%	4,2	28,4	67,4
Hungary	0,408	4,4	2,92%	8,8	31,1	60,2
Netherlands	0,138	5,1	6,41%	2,9	17,4	79,7
Austria	0,194	2,7	1,83%	5,5	24,6	69,9
Poland	0,262	2,4	2,40%	14,8	30,4	54,8
Portugal	0,258	3,6	4,39%	11,5	29,1	59,4
Romania	0,447	5,2	6,64%	34,1	30,4	35,6
Slovenia	0,359	4,0	1,57%	9,6	34,2	56,2
Slovakia	0,481	7,4	1,61%	4,4	33,6	62,0
Finland	0,218	1,8	3,04%	5,2	25,6	69,3
Sweden	0,197	4,7	1,81%	2,3	22,5	75,2
United Kingdom	0,448	5,4	3,73%	1,2	18,7	80,1

D

The weighted coefficient of variation throughout 2000-2011

Country / Year	2000	2001	2002	2003	2004	2005
Belgium	0,369	0,369	0,374	0,363	0,360	0,362
Bulgaria	0,207	0,234	0,268	0,282	0,290	0,303
Czech Republic	0,350	0,375	0,384	0,398	0,392	0,397
Denmark	no value	no value	no value	no value	no value	no value
Germany	0,247	0,253	0,250	0,248	0,243	0,240
Ireland	0,202	0,204	0,200	0,194	0,177	0,186
Greece	0,143	0,149	0,165	0,160	0,158	0,226
Spain	0,232	0,227	0,219	0,208	0,204	0,197
France	0,280	0,273	0,277	0,280	0,267	0,271
Croatia	no value	no value	0,035	0,012	0,005	0,011
Italy	0,271	0,266	0,265	0,263	0,263	0,257
Hungary	0,359	0,368	0,403	0,387	0,392	0,402
Netherlands	0,132	0,132	0,138	0,135	0,139	0,141
Austria	0,210	0,212	0,216	0,205	0,190	0,192

Poland	0,239	0,252	0,247	0,245	0,248	0,262
Portugal	0,252	0,246	0,257	0,259	0,263	0,265
Romania	0,416	0,375	0,389	0,383	0,386	0,468
Slovenia	0,253	0,268	0,289	0,312	0,348	0,372
Slovakia	0,429	0,434	0,449	0,449	0,453	0,519
Finland	0,234	0,238	0,223	0,205	0,205	0,202
Sweden	0,200	0,188	0,189	0,187	0,196	0,204
United Kingdom	0,426	0,425	0,414	0,418	0,418	0,439

Country / Year	2006	2007	2008	2009	2010	2011
Belgium	0,348	0,340	0,333	0,340	0,336	0,328
Bulgaria	0,355	0,406	0,417	0,446	0,451	0,437
Czech Republic	0,403	0,417	0,424	0,415	0,422	0,408
Denmark	no value	0,166	0,168	0,169	0,193	0,187
Germany	0,235	0,232	0,223	0,217	0,214	0,211
Ireland	0,170	0,184	0,186	0,186	0,205	0,204
Greece	0,232	0,237	0,247	0,258	0,264	0,271
Spain	0,197	0,195	0,195	0,206	0,204	0,209
France	0,266	0,275	0,309	0,305	0,322	0,324
Croatia	0,024	0,009	0,024	0,023	0,027	0,028
Italy	0,253	0,253	0,256	0,248	0,255	0,260
Hungary	0,420	0,430	0,431	0,442	0,434	0,432
Netherlands	0,139	0,128	0,145	0,139	0,144	0,143
Austria	0,192	0,182	0,181	0,184	0,184	0,177
Poland	0,267	0,268	0,263	0,275	0,288	0,287
Portugal	0,262	0,260	0,259	0,260	0,256	0,252
Romania	0,448	0,464	0,525	0,482	0,493	0,540
Slovenia	0,402	0,433	0,442	0,386	0,395	0,404
Slovakia	0,490	0,500	0,477	0,528	0,519	0,531
Finland	0,211	0,211	0,211	0,234	0,231	0,205
Sweden	0,190	0,193	0,194	0,224	0,195	0,205
United Kingdom	0,432	0,455	0,486	0,486	0,484	0,497

E

Country GDP in PPS

Country / Year	2000	2001	2002	2003	2004	2005
Bulgaria	5.400	5.900	6.500	6.900	7.500	8.200
Romania	5.000	5.500	6.000	6.500	7.400	7.800
Croatia	9.500	10.000	10.700	11.300	12.100	12.800
Poland	9.200	9.400	9.900	10.100	10.900	11.500
Hungary	10.300	11.500	12.500	12.900	13.600	14.200
Slovakia	9.500	10.300	11.100	11.500	12.300	13.500
Portugal	15.400	15.900	16.300	16.400	16.700	17.900
Greece	16.000	17.100	18.400	19.200	20.200	20.300
Czech Republic	13.500	14.400	15.000	15.800	16.900	17.800

Country / Year						
Slovenia	15.200	15.800	16.800	17.300	18.700	19.600
Spain	18.500	19.400	20.500	20.900	21.800	22.900
Italy	22.300	23.400	23.000	23.000	23.100	23.600
United Kingdom	22.900	23.900	24.800	25.400	26.900	27.800
France	21.900	22.800	23.600	23.000	23.700	24.700
Finland	22.300	22.700	23.500	23.300	25.100	25.700
Belgium	24.000	24.500	25.600	25.600	26.200	26.900
Germany	22.400	22.900	23.400	23.900	25.000	26.000
Sweden	24.300	24.200	25.000	25.700	27.300	27.300
Denmark	25.000	25.200	26.200	25.700	27.100	27.700
Ireland	25.100	26.200	28.200	29.300	30.800	32.400
Austria	25.100	24.900	26.000	26.400	27.600	28.100
Netherlands	25.500	26.400	27.200	26.700	27.900	29.300
Average	17.650	18.286	19.100	19.400	20.400	21.128

Country / Year	2006	2007	2008	2009	2010	2011
Bulgaria	9.000	10.000	10.900	10.300	10.800	11.700
Romania	9.100	10.400	11.700	11.100	11.700	12.200
Croatia	13.700	15.100	15.800	14.500	14.300	15.300
Poland	12.300	13.600	14.100	14.200	15.400	16.400
Hungary	14.900	15.300	15.900	15.300	16.100	16.900
Slovakia	14.900	16.900	18.100	17.000	18.100	18.900
Portugal	18.700	19.600	19.500	18.800	19.600	19.300
Greece	21.800	22.500	23.100	22.100	21.300	20.000
Czech Republic	18.900	20.600	20.200	19.400	19.700	20.300
Slovenia	20.700	22.100	22.700	20.200	20.600	21.200
Spain	24.700	26.100	25.900	24.100	24.100	24.200
Italy	24.700	26.000	26.000	24.300	25.100	25.500
United Kingdom	28.900	29.400	28.600	26.300	26.300	26.400
France	25.500	26.900	26.700	25.500	26.600	27.400
Finland	26.900	29.300	29.700	26.900	27.900	29.000
Belgium	27.800	28.900	28.900	27.600	29.400	30.200
Germany	27.300	28.800	29.000	26.900	29.200	30.800
Sweden	29.000	31.200	30.900	28.200	30.200	31.400
Denmark	29.300	30.600	31.100	28.900	31.200	31.500
Ireland	34.400	36.500	32.900	30.100	31.400	32.300
Austria	29.700	30.900	31.100	29.500	30.900	32.300
Netherlands	31.000	33.000	33.500	31.000	31.700	32.500
Average	22.418	23.805	23.923	22.373	23.255	23.895

F

Standard deviation of tertiary attainment % population in NUTS 2 regions

Country / Year	2000	2001	2002	2003	2004	2005	2006
Belgium	5,7	5,7	6,0	6,4	6,6	6,8	6,5
Bulgaria	no value	no value	no value	4,5	4,9	5,2	5,2
Czech Republic	5,5	5,5	6,0	5,7	5,7	5,6	5,6
Denmark	no value	no value	no value	no value	no value	no value	no value
Germany	5,0	4,5	4,2	4,5	4,7	4,9	4,7
Ireland	4,1	3,7	3,8	3,4	3,2	4,0	3,6
Greece	3,0	3,3	3,9	3,7	3,9	3,6	3,8
Spain	4,7	4,9	5,0	5,0	5,5	5,8	5,9
France	4,1	4,0	4,4	4,5	4,4	4,9	4,7
Croatia	no value	no value	no value	no value	no value	no value	no value
Italy	1,4	1,3	1,3	1,4	1,9	1,9	1,9
Hungary	4,2	3,4	3,5	3,9	4,4	4,6	4,6
Netherlands	4,8	4,6	5,0	5,4	5,1	4,9	5,0
Austria	2,4	2,4	2,2	2,4	3,1	2,8	2,6
Poland	1,7	1,7	1,7	1,6	1,9	2,2	2,8
Portugal	3,1	3,1	3,0	3,7	3,9	3,8	3,8
Romania	4,1	4,1	4,6	4,8	5,1	5,4	5,5
Slovenia	no value	2,9	3,1	3,6	3,2	4,1	4,7
Slovakia	7,8	6,7	6,6	7,0	7,2	7,1	6,7
Finland	2,1	1,8	1,8	2,0	1,8	1,5	1,4
Sweden	5,3	4,2	4,5	4,6	4,5	4,3	4,4
United Kingdom	5,9	5,8	5,6	4,7	4,8	4,9	5,1

Country / Year	2007	2008	2009	2010	2011
Belgium	6,6	6,4	7,1	6,5	7,9
Bulgaria	5,7	5,8	5,8	5,3	5,0
Czech Republic	5,7	6,6	6,0	7,2	7,7
Denmark	6,2	5,9	5,5	6,1	6,9
Germany	4,7	4,3	4,3	4,3	4,1
Ireland	4,0	3,2	3,1	2,8	3,1
Greece	4,1	4,2	4,5	4,6	4,5
Spain	6,5	5,9	5,9	6,7	6,8
France	4,8	5,1	5,2	4,8	5,0
Croatia	1,3	0,8	0,9	1,3	1,1
Italy	1,9	2,2	2,3	2,1	2,2
Hungary	4,7	4,8	4,7	4,7	5,0
Netherlands	5,1	5,4	5,4	5,1	5,5
Austria	2,4	2,6	3,1	3,6	3,3
Poland	3,1	2,7	3,0	3,1	3,1
Portugal	3,7	3,9	3,9	3,7	3,7
Romania	5,4	5,6	5,5	5,6	6,2
Slovenia	4,5	4,6	4,6	4,5	4,2

Country					
Slovakia	7,2	7,1	8,0	8,1	9,4
Finland	1,6	1,5	1,7	1,6	2,3
Sweden	4,6	4,7	4,9	4,9	5,1
United Kingdom	5,0	5,3	5,6	5,6	6,8

G

Standard deviation of gross fixed capital formation % GDP

Country / Year	2000	2001	2002	2003	2004	2005
Belgium	2,86%	2,77%	1,94%	2,33%	2,66%	3,08%
Czech Republic	3,66%	3,37%	2,34%	2,91%	3,00%	3,98%
Denmark	0,42%	0,72%	0,72%	0,79%	2,55%	1,49%
Germany	no value	no value	3,07%	3,32%	3,06%	2,88%
Ireland	4,72%	4,97%	3,28%	6,75%	3,83%	5,51%
Greece	3,24%	4,22%	4,91%	7,16%	4,99%	3,94%
Spain	3,35%	2,95%	3,16%	2,90%	3,65%	3,75%
France	1,53%	1,50%	1,95%	1,86%	6,32%	1,69%
Croatia	no value	no value	no value	no value	no value	no value
Italy	2,34%	2,65%	2,69%	2,39%	3,00%	3,24%
Hungary	2,98%	2,94%	1,92%	2,64%	2,50%	3,05%
Netherlands	8,91%	7,19%	6,55%	7,98%	5,04%	7,41%
Austria	1,46%	1,74%	1,10%	1,56%	1,75%	2,16%
Poland	4,26%	3,80%	1,99%	2,08%	1,67%	1,65%
Portugal	6,56%	4,65%	4,08%	5,29%	5,08%	6,31%
Romania	8,24%	6,95%	4,95%	4,91%	4,24%	5,97%
Slovenia	0,07%	1,61%	0,73%	1,54%	0,21%	2,35%
Slovakia	1,07%	2,77%	0,40%	1,66%	0,94%	1,85%
Finland	0,99%	1,88%	1,35%	2,82%	5,38%	6,21%
Sweden	1,31%	1,86%	1,26%	1,04%	1,27%	1,42%
United Kingdom	3,30%	3,56%	3,80%	3,80%	3,96%	4,03%

Country / Year	2006	2007	2008	2009	2010
Belgium	3,11%	3,05%	2,85%	3,11%	no value
Czech Republic	3,88%	4,51%	4,42%	3,46%	4,24%
Denmark	1,20%	1,41%	1,78%	1,10%	2,06%
Germany	3,50%	3,47%	3,22%	no value	no value
Ireland	5,12%	4,71%	4,66%	2,85%	1,99%
Greece	4,61%	4,91%	3,64%	5,23%	3,72%
Spain	4,88%	5,37%	no value	no value	no value
France	1,86%	no value	no value	no value	no value
Croatia	no value	2,37%	5,03%	4,17%	3,46%
Italy	3,19%	2,57%	3,39%	2,59%	2,95%
Hungary	2,96%	4,11%	2,82%	3,30%	2,96%
Netherlands	6,27%	6,35%	2,90%	3,96%	7,91%

Austria	2,34%	2,22%	2,24%	1,71%	1,90%
Poland	2,06%	1,95%	1,77%	2,39%	2,81%
Portugal	2,86%	4,77%	3,49%	2,80%	2,39%
Romania	5,87%	7,61%	9,89%	6,83%	7,56%
Slovenia	2,11%	1,85%	3,37%	1,48%	2,00%
Slovakia	1,65%	2,09%	1,27%	0,95%	3,04%
Finland	2,43%	0,98%	8,62%	1,76%	1,07%
Sweden	1,64%	3,19%	3,13%	1,35%	2,47%
United Kingdom	4,11%	4,30%	3,50%	3,04%	3,58%

Eurostat does not provide data for Bulgaria

H

% of employment in agriculture, industry and services per country

Country / Year	2000	2001	2002	2003	2004	2005
Austria						
% employed in agriculture	6,2	6,1	6,0	5,9	5,7	5,4
% employed in industry	26,4	25,9	25,4	25,1	24,7	24,4
% employed in services	67,4	68,0	68,6	69,0	69,5	70,2
Belgium						
% employed in agriculture	2,0	1,9	1,8	1,8	1,8	1,8
% employed in industry	22,9	22,9	22,2	21,6	21,1	20,7
% employed in services	75,1	75,2	76,0	76,5	77,1	77,5
Bulgaria						
% employed in agriculture	24,1	23,9	23,7	22,9	22,1	21,2
% employed in industry	27,8	27,4	27,5	27,0	27,0	27,4
% employed in services	48,1	48,7	48,7	50,1	50,9	51,4
Croatia						
% employed in agriculture	no value	no value	no value	no value	no value	no value
% employed in industry	no value	no value	no value	no value	no value	no value
% employed in services	no value	no value	no value	no value	no value	no value
Czech Republic						
% employed in agriculture	4,8	4,7	4,1	4,0	4,1	3,8
% employed in industry	39,0	38,8	38,7	38,2	38,7	38,8
% employed in services	56,2	56,5	57,2	57,8	57,2	57,5
Denmark						
% employed in agriculture	3,3	3,2	3,2	3,1	3,0	2,9
% employed in industry	22,3	22,1	21,5	21,0	20,5	20,4
% employed in services	74,4	74,7	75,3	75,9	76,5	76,7
Finland						
% employed in agriculture	6,0	5,7	5,4	5,3	5,2	5,2
% employed in industry	27,3	27,0	26,4	25,9	25,4	25,4
% employed in services	66,7	67,3	68,2	68,8	69,3	69,4
France						
% employed in agriculture	3,7	3,6	3,5	3,4	3,4	3,4
% employed in industry	21,2	21,2	20,9	20,7	20,3	20,1

% employed in services	75,0	75,2	75,6	75,9	76,3	76,5
Germany						
% employed in agriculture	1,9	1,8	1,8	1,8	1,8	1,7
% employed in industry	28,7	28,2	27,5	26,9	26,4	25,8
% employed in services	69,4	70,0	70,7	71,3	71,9	72,4
Greece						
% employed in agriculture	17,0	15,7	15,1	14,6	12,6	11,8
% employed in industry	19,8	20,4	20,2	20,2	19,8	19,7
% employed in services	63,2	63,9	64,7	65,2	67,5	68,4
Hungary						
% employed in agriculture	12,5	11,5	11,1	9,4	8,8	8,3
% employed in industry	31,8	32,2	32,3	32,0	31,5	31,0
% employed in services	55,8	56,3	56,6	58,5	59,7	60,7
Ireland						
% employed in agriculture	7,5	7,1	6,7	6,4	6,1	5,7
% employed in industry	28,3	28,3	27,3	26,7	26,8	27,0
% employed in services	64,2	64,7	66,0	66,9	67,1	67,3
Italy						
% employed in agriculture	4,8	4,7	4,5	4,2	4,2	4,1
% employed in industry	29,3	29,1	29,0	28,9	28,7	28,8
% employed in services	65,9	66,2	66,5	66,9	67,1	67,1
Netherlands						
% employed in agriculture	3,2	3,2	3,2	3,1	3,0	3,0
% employed in industry	19,1	18,9	18,5	18,0	17,7	17,4
% employed in services	77,6	77,9	78,3	78,9	79,2	79,7
Poland						
% employed in agriculture	no value	no value	no value	no value	17,9	17,3
% employed in industry	no value	no value	no value	no value	29,1	29,5
% employed in services	no value	no value	no value	no value	53,0	53,2
Portugal						
% employed in agriculture	12,1	12,3	11,9	12,1	11,6	11,4
% employed in industry	32,7	31,7	31,6	30,8	30,2	29,3
% employed in services	55,1	55,9	56,5	57,1	58,2	59,3
Romania						
% employed in agriculture	44,9	44,3	35,6	36,9	31,7	32,9
% employed in industry	26,9	27,0	31,7	30,7	33,2	32,0
% employed in services	28,2	28,7	32,8	32,3	35,1	35,1
Slovakia						
% employed in agriculture	6,2	5,9	5,4	4,9	4,7	4,5
% employed in industry	34,2	34,0	33,7	34,2	33,8	33,9
% employed in services	59,6	60,2	60,9	60,9	61,5	61,5
Slovenia						
% employed in agriculture	11,7	11,2	10,7	10,3	10,0	9,8
% employed in industry	36,8	36,7	35,7	35,2	34,7	34,6
% employed in services	51,4	52,1	53,7	54,5	55,3	55,6
Spain						
% employed in agriculture	6,0	5,8	5,6	5,4	5,1	4,8

% employed in industry	30,0	29,8	29,3	28,9	28,5	28,3
% employed in services	64,0	64,4	65,1	65,7	66,4	67,0
Sweden						
% employed in agriculture	2,8	2,6	2,5	2,4	2,3	2,2
% employed in industry	23,4	23,6	23,2	22,9	22,4	22,3
% employed in services	73,7	73,8	74,3	74,8	75,4	75,5
United Kingdom						
% employed in agriculture	1,3	1,2	1,2	1,2	1,2	1,2
% employed in industry	21,6	20,9	20,2	19,5	19,0	18,5
% employed in services	77,1	77,9	78,6	79,3	79,8	80,3

Country / Year	2006	2007	2008	2009	2010	2011
Austria						
% employed in agriculture	5,4	5,2	5,1	5,1	5,0	4,8
% employed in industry	24,1	24,3	24,3	23,8	23,5	23,4
% employed in services	70,5	70,5	70,7	71,1	71,5	71,7
Belgium						
% employed in agriculture	1,7	1,6	1,6	1,5	1,4	1,3
% employed in industry	20,7	20,5	20,3	19,8	19,3	19,1
% employed in services	77,6	77,9	78,1	78,7	79,3	79,6
Bulgaria						
% employed in agriculture	20,3	19,4	19,3	19,6	19,7	19,6
% employed in industry	28,3	29,2	30,1	27,9	26,2	25,9
% employed in services	51,4	51,4	50,6	52,5	54,1	54,6
Croatia						
% employed in agriculture	no value	no value	no value	no value	no value	no value
% employed in industry	no value	no value	no value	no value	no value	no value
% employed in services	no value	no value	no value	no value	no value	no value
Czech Republic						
% employed in agriculture	3,7	3,4	3,4	3,3	3,2	3,3
% employed in industry	38,3	38,2	38,0	36,6	36,0	36,4
% employed in services	58,0	58,4	58,6	60,1	60,8	60,2
Denmark						
% employed in agriculture	2,7	2,6	2,5	2,5	2,4	2,4
% employed in industry	20,4	20,5	20,5	18,9	17,8	17,8
% employed in services	76,9	76,9	77,0	78,6	79,8	79,8
Finland						
% employed in agriculture	5,0	4,9	4,8	4,9	4,9	4,7
% employed in industry	25,5	25,6	25,6	24,6	24,1	24,1
% employed in services	69,5	69,5	69,6	70,5	71,0	71,2
France						
% employed in agriculture	3,2	3,1	3,0	3,0	2,9	2,8
% employed in industry	20,0	19,8	19,8	19,5	19,0	18,7
% employed in services	76,8	77,0	77,2	77,5	78,1	78,5
Germany						
% employed in agriculture	1,6	1,7	1,7	1,7	1,6	1,6

% employed in industry	25,5	25,4	25,5	25,0	24,6	24,7
% employed in services	72,8	72,9	72,9	73,4	73,8	73,7
Greece						
% employed in agriculture	11,4	11,1	10,9	11,2	11,6	11,6
% employed in industry	19,4	19,7	19,9	19,2	18,2	16,6
% employed in services	69,1	69,2	69,2	69,6	70,3	71,7
Hungary						
% employed in agriculture	8,0	7,5	7,1	6,9	6,9	7,1
% employed in industry	31,0	31,0	31,0	30,1	29,3	29,7
% employed in services	61,0	61,6	61,9	63,0	63,8	63,2
Ireland						
% employed in agriculture	5,4	5,2	5,4	4,9	4,5	4,5
% employed in industry	27,3	26,7	25,0	21,5	19,6	19,0
% employed in services	67,3	68,1	69,6	73,6	75,8	76,5
Italy						
% employed in agriculture	4,1	4,0	3,9	3,9	4,0	3,9
% employed in industry	28,6	28,6	28,4	27,8	27,2	26,8
% employed in services	67,3	67,4	67,7	68,3	68,9	69,3
Netherlands						
% employed in agriculture	2,9	2,8	2,7	2,6	2,6	2,6
% employed in industry	17,1	16,8	16,8	16,6	16,2	15,9
% employed in services	80,0	80,4	80,5	80,8	81,1	81,5
Poland						
% employed in agriculture	15,7	14,6	14,0	13,3	13,0	12,9
% employed in industry	30,2	30,9	31,8	31,0	30,1	30,4
% employed in services	54,1	54,5	54,3	55,8	56,9	56,7
Portugal						
% employed in agriculture	11,4	11,2	11,0	11,1	10,8	10,6
% employed in industry	28,7	28,5	27,8	26,5	25,9	25,6
% employed in services	59,9	60,3	61,2	62,4	63,3	63,9
Romania						
% employed in agriculture	30,7	30,6	29,6	30,1	31,6	30,0
% employed in industry	32,3	31,5	31,5	29,8	28,8	29,1
% employed in services	37,0	37,9	38,9	40,1	39,6	41,0
Slovakia						
% employed in agriculture	4,0	3,8	3,6	3,5	3,4	3,3
% employed in industry	34,0	33,9	34,4	32,6	32,1	32,0
% employed in services	62,0	62,3	62,0	63,9	64,6	64,7
Slovenia						
% employed in agriculture	9,3	8,8	8,4	8,4	8,4	8,3
% employed in industry	34,1	34,2	34,2	32,6	31,0	30,6
% employed in services	56,6	57,0	57,4	59,0	60,5	61,1
Spain						
% employed in agriculture	4,3	4,1	3,9	4,0	4,2	4,1
% employed in industry	27,8	27,4	25,7	22,8	21,6	20,4
% employed in services	67,9	68,5	70,3	73,2	74,2	75,5
Sweden						

% employed in agriculture	2,1	2,0	2,0	2,1	2,2	2,3
% employed in industry	22,1	22,4	22,8	21,8	21,5	21,6
% employed in services	75,8	75,5	75,2	76,2	76,3	76,1
United Kingdom						
% employed in agriculture	1,2	1,2	1,2	1,3	1,3	1,3
% employed in industry	18,3	18,1	17,7	17,1	16,5	16,4
% employed in services	80,5	80,7	81,0	81,7	82,2	82,3

I

Net paying and net receiving NUTS 2 regions in 2011

Country	Regions which pay to government	Regions which receive from government
Belgium	• Prov. Antwerpen • Prov. Oost-Vlaanderen • Prov. Vlaams-Brabant • Prov. Brabant Wallon	• Région de Bruxelles-Capitale / Brussels Hoofdstedelijk Gewest • Prov. Limburg (BE) • Prov. West-Vlaanderen • Prov. Hainaut • Prov. Liège • Prov. Luxembourg (BE) • Prov. Namur
Bulgaria	• Severoiztochen • Yugoiztochen • Yugozapaden	• Severozapaden • Severen tsentralen • Yuzhen tsentralen
Czech Republic	• Praha • Strední Cechy	• Jihozápad • Severozápad • Severovýchod • Jihovýchod • Strední Morava • Moravskoslezsko
Denmark	• Hovedstaden	• Sjælland • Syddanmark • Midtjylland • Nordjylland
Germany	• Stuttgart • Karlsruhe • Freiburg • Tübingen • Oberbayern • Niederbayern • Oberfranken • Mittelfranken • Unterfranken • Schwaben • Hamburg • Darmstadt • Düsseldorf • Köln • Trier • Rheinhessen-Pfalz	• Oberfranken • Berlin • Brandenburg • Bremen • Gießen • Kassel • Mecklenburg-Vorpommern • Braunschweig • Hannover • Lüneburg • Weser-Ems • Münster • Detmold • Arnsberg • Koblenz • Saarland

		• Dresden • Chemnitz • Leipzig • Sachsen-Anhalt • Schleswig-Holstein • Thüringen
Ireland	• Southern and Eastern	• Border, Midland and Western
Greece	• Ionia Nisia • Attiki • Notio Aigaio • Kriti	• Anatoliki Makedonia, Thraki • Kentriki Makedonia • Dytiki Makedonia • Thessalia • Ipeiros • Dytiki Ellada • Sterea Ellada • Peloponnisos • Voreio Aigaio
Spain	• Comunidad Foral de Navarra • La Rioja • Aragón • Comunidad de Madrid • Cataluña • Illes Balears	• Galicia • Principado de Asturias • Cantabria • País Vasco • Castilla y León • Castilla-la Mancha • Extremadura • Comunidad Valenciana • Andalucía • Región de Murcia • Ciudad Autónoma de Ceuta (ES) • Ciudad Autónoma de Melilla (ES) • Canarias (ES)
France	• Île de France • Alsace • Rhône-Alpes	• Champagne-Ardenne • Picardie • Haute-Normandie • Centre (FR) • Basse-Normandie • Bourgogne • Nord - Pas-de-Calais • Lorraine • Franche-Comté • Pays de la Loire • Bretagne • Poitou-Charentes • Aquitaine • Midi-Pyrénées • Limousin • Auvergne • Languedoc-Roussillon • Provence-Alpes-Côte d'Azur • Corse • Guadeloupe (FR) • Martinique (FR) • Guyane (FR) • Réunion (FR)

Italy	• Piemonte • Valle d'Aosta/Vallée d'Aoste • Lombardia • Provincia Autonoma di Bolzano/Bozen • Provincia Autonoma di Trento • Veneto • Friuli-Venezia Giulia • Emilia-Romagna • Toscana • Lazio	• Liguria • Umbria • Marche • Abruzzo • Molise • Campania • Puglia • Basilicata • Calabria • Sicilia • Sardegna
Hungary	• Közép-Magyarország • Közép-Dunántúl	• Nyugat-Dunántúl • Dél-Dunántúl • Észak-Magyarország • Észak-Alföld • Dél-Alföld
Netherlands	• Flevoland • Utrecht • Noord-Holland • Zuid-Holland	• Groningen • Friesland (NL) • Drenthe • Overijssel • Gelderland • Zeeland • Noord-Brabant • Limburg (NL)
Austria	• Niederösterreich • Wien • Oberösterreich • Salzburg • Tirol • Vorarlberg	• Burgenland (AT) • Kärnten • Steiermark
Poland	• Mazowieckie • Wielkopolskie • Dolnoslaskie • Pomorskie	• Lódzkie • Malopolskie • Slaskie • Lubelskie • Podkarpackie • Swietokrzyskie • Podlaskie • Zachodniopomorskie • Lubuskie • Opolskie • Kujawsko-Pomorskie • Warminsko-Mazurskie
Portugal	• Algarve • Lisboa	• Norte • Centro (PT) • Alentejo • Região Autónoma dos Açores (PT) • Região Autónoma da Madeira (PT)
Romania	• Centru • Bucuresti - Ilfov • Vest	• Nord-Vest • Nord-Est • Sud-Est • Sud - Muntenia • Sud-Vest Oltenia
Slovenia	• Zahodna Slovenija	• Vzhodna Slovenija

Slovakia	• Bratislavský kraj	• Západné Slovensko • Stredné Slovensko • Východné Slovensko
Finland	• Helsinki-Uusimaa • Åland	• Länsi-Suomi • Etelä-Suomi • Pohjois- ja Itä-Suomi
Sweden	• Stockholm	• Östra Mellansverige • Småland med öarna • Sydsverige • Västsverige • Norra Mellansverige • Mellersta Norrland • Övre Norrland
United Kingdom	• Leicestershire, Rutland and Northamptonshire • Bedfordshire and Hertfordshire • Essex • Inner London • Outer London • Berkshire, Buckinghamshire and Oxfordshire • Surrey, East and West Sussex • Hampshire and Isle of Wight • Kent • Gloucestershire, Wiltshire and Bristol/Bath area • North Eastern Scotland	• Tees Valley and Durham • Northumberland and Tyne and Wear • Cumbria • Greater Manchester • Lancashire • Cheshire • Merseyside • East Yorkshire and Northern Lincolnshire • North Yorkshire • South Yorkshire • West Yorkshire • Derbyshire and Nottinghamshire • Lincolnshire • Herefordshire, Worcestershire and Warwickshire • Shropshire and Staffordshire • West Midlands • East Anglia • Dorset and Somerset • Cornwall and Isles of Scilly • Devon • West Wales and The Valleys • East Wales • Eastern Scotland • South Western Scotland • Highlands and Islands • Northern Ireland (UK)

Eurostat does not publish data for Croatia.

J

Exports as a % of GDP

Country / Year	2000	2001	2002	2003	2004	2005	2006
Belgium	78,1	77,8	76,7	73,9	75,9	78,7	80,8
Bulgaria	50,5	48,7	47,4	48,5	51,9	40,5	61,2

Czech Republic	60,9	62,6	57,6	59,1	63,0	64,4	67,0
Denmark	46,6	47,3	47,3	45,4	45,4	49,0	52,1
Germany	33,4	34,8	35,7	35,7	38,5	41,3	45,5
Ireland	97,5	99,6	93,8	83,3	83,5	81,4	79,2
Greece	24,9	24,0	21,1	20,0	22,4	23,2	23,2
Spain	29,1	28,5	27,3	26,3	25,9	25,7	26,3
France	28,8	28,4	27,5	25,9	26,1	26,4	27,0
Croatia	41,7	43,4	40,9	42,6	42,9	42,3	42,8
Italy	26,8	26,9	25,5	24,4	25,2	25,9	27,6
Hungary	74,6	72,0	63,3	61,4	63,3	65,9	77,7
Netherlands	70,1	67,3	64,2	63,0	66,4	69,6	72,8
Austria	46,2	48,1	48,7	48,2	51,5	53,8	56,4
Poland	27,1	27,1	28,6	33,3	37,5	37,1	40,4
Portugal	28,9	28,1	27,6	27,6	28,0	27,7	30,9
Romania	32,8	33,1	35,4	34,8	35,8	33,1	32,3
Slovenia	53,7	55,2	55,1	53,8	57,8	62,2	66,5
Slovakia	70,4	72,7	71,1	75,8	74,5	76,3	84,5
Finland	43,6	41,5	40,5	38,7	39,9	41,8	45,5
Sweden	46,5	46,3	44,4	43,5	46,0	48,4	51,1
United Kingdom	27,3	26,9	25,9	25,5	25,2	26,6	28,7

Country / Year	2007	2008	2009	2010	2011	2012	2013	Average 2000-2013
Belgium	82,5	84,4	73,7	79,8	85,0	86,1	85,9	80,0
Bulgaria	59,5	58,2	47,5	57,4	66,5	66,7	70,2	55,3
Czech Republic	68,2	64,4	59,0	66,6	72,9	78,0	78,6	65,9
Denmark	52,2	54,7	47,6	50,4	53,7	54,8	54,9	50,1
Germany	47,2	48,2	42,5	47,6	50,6	51,8	50,7	43,1
Ireland	80,4	83,3	90,2	99,8	102,7	107,8	no value	91,0
Greece	23,8	24,1	19,3	22,2	25,1	27,3	29,1	23,6
Spain	26,9	26,5	23,9	27,4	30,8	32,7	34,1	28,0
France	26,9	26,9	23,4	25,5	26,9	27,4	27,2	26,7
Croatia	42,3	42,1	36,6	39,7	42,3	43,7	43,3	41,9
Italy	28,9	28,5	23,7	26,6	28,8	30,2	30,4	27,1
Hungary	81,3	81,7	77,6	85,1	91,6	94,7	96,2	77,6
Netherlands	74,2	76,3	68,6	78,7	83,9	88,0	88,3	73,7
Austria	58,9	59,3	50,1	54,4	57,3	57,2	57,4	53,4
Poland	40,8	39,9	39,4	42,2	45,1	46,7	47,8	38,1
Portugal	32,2	32,4	28,0	31,3	35,7	38,7	40,7	31,3
Romania	29,3	30,4	30,6	35,4	40,0	40,6	42,2	34,7
Slovenia	69,5	67,9	59,4	66,8	73,0	76,1	78,1	63,9
Slovakia	86,9	83,5	70,6	80,4	89,5	96,6	97,6	80,7
Finland	45,8	46,8	37,3	40,4	41,0	40,6	40,1	41,7
Sweden	51,9	53,5	48,0	49,5	49,9	48,5	45,8	48,1
United Kingdom	26,6	29,4	28,4	30,1	32,1	31,8	31,4	28,3

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Imports as a % of GDP

Country / Year	2000	2001	2002	2003	2004	2005	2006
Belgium	75,2	74,2	71,0	68,5	71,0	74,7	77,0
Bulgaria	55,8	58,1	55,5	58,9	63,4	55,6	78,8
Czech Republic	63,1	64,1	58,8	60,3	62,1	61,7	64,0
Denmark	40,6	40,6	41,4	39,1	40,5	44,1	48,9
Germany	33,1	32,8	31,2	31,8	33,5	36,1	39,9
Ireland	84,2	84,2	76,6	67,3	68,6	69,6	69,6
Greece	38,4	37,2	34,6	32,3	32,4	32,5	34,6
Spain	32,2	31,1	29,4	28,7	29,9	30,9	32,7
France	27,8	27,2	26,0	25,0	25,7	27,0	28,1
Croatia	44,8	47,2	49,1	50,3	49,1	48,6	49,6
Italy	25,8	25,5	24,5	23,9	24,5	25,9	28,4
Hungary	78,1	73,0	65,1	65,2	66,9	68,1	78,7
Netherlands	64,5	61,5	57,6	56,7	59,0	61,1	65,1
Austria	44,5	45,9	43,9	44,7	47,7	49,9	51,3
Poland	33,5	30,7	32,1	36,0	39,8	37,8	42,2
Portugal	39,9	38,3	35,9	34,4	36,4	37,1	39,6
Romania	38,1	40,7	41,0	42,3	44,8	43,2	44,3
Slovenia	57,2	56,0	53,9	54,0	59,1	62,6	67,1
Slovakia	73,0	80,8	78,4	77,8	77,3	80,9	88,5
Finland	34,4	32,1	31,3	31,9	33,3	37,7	40,8
Sweden	40,2	39,6	37,6	36,7	37,8	40,6	43,0
United Kingdom	29,2	29,2	28,6	27,8	27,9	29,4	31,3

Country / Year	2007	2008	2009	2010	2011	2012	2013	Average 2000-2013
Belgium	78,7	83,6	71,0	77,7	84,2	85,0	84,1	76,9
Bulgaria	79,2	78,7	56,3	59,3	66,5	69,7	71,2	64,8
Czech Republic	65,6	62,1	54,9	63,2	68,7	72,4	72,2	63,8
Denmark	49,9	51,6	43,7	44,9	48,4	49,7	49,2	45,2
Germany	40,2	41,9	37,5	42,0	45,4	45,9	44,5	38,3
Ireland	71,4	74,3	74,2	81,2	81,1	83,6	no value	75,8
Greece	37,9	38,6	30,7	31,5	33,1	32,1	31,8	34,1
Spain	33,6	32,3	25,8	29,5	31,9	31,9	31,7	30,8
France	28,4	29,1	25,2	27,8	29,9	29,7	29,2	27,6
Croatia	49,5	49,8	40,1	40,2	42,8	43,3	42,4	46,2
Italy	29,1	29,3	24,3	28,5	30,2	29,2	28,0	26,9
Hungary	80,4	81,2	72,7	79,4	85,2	87,3	88,2	76,4
Netherlands	66,0	68,0	61,6	70,6	75,3	79,6	78,2	66,1
Austria	53,2	53,5	45,6	50,0	54,3	54,0	52,7	49,4
Poland	43,6	43,9	39,4	43,4	46,2	46,4	45,4	40,0
Portugal	40,2	42,5	35,4	39,0	40,1	39,3	39,6	38,4
Romania	43,2	43,5	36,6	41,2	45,3	45,4	42,7	42,3
Slovenia	71,2	70,4	57,2	65,3	71,5	71,3	71,5	63,5

Slovakia	88,0	85,9	71,1	80,6	89,0	91,4	91,3	82,4
Finland	40,7	43,1	35,7	39,0	41,7	41,6	40,2	37,4
Sweden	44,4	46,8	41,5	43,3	44,3	42,7	40,1	41,3
United Kingdom	29,2	31,6	30,0	32,3	33,6	33,9	33,1	30,5