Some Animals Are More Equal Than Others: An Inquiry into the Mechanisms Linking Interjurisdictional Inequality and Decentralization

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Absract

This paper explores the relationship between Poland's system of decentralization and the observed increases in interjurisdictional inequality between 1999 and 2006. The methodology employed in this analysis is a case study focusing on the most salient features of the Polish system of decentralization and regional development, followed by multiple linear regressions. The latter are used to establish links between specific features of regional development, agglomerative processes and subnational finances, and a given region's development, measured by the unit's contribution to one of the three indexes used to measure spatial inequality. In order to determine the relationship between the Polish system of decentralization the study focuses on education expenditure (as an example of public good provided by subnational governments), and aggregate intergovernmental grants (used to charaterize the nature of the devolution in Poland). The study finds that Poland's development during the period of analysis suffers from an 'urban bias', agglomerative growth around major centers leading to a rise in interjurisdicational inequality. Regarding the system of decentralization, the study finds that while the revenue side is organized in an equalizing, manner, particularly through compensating grants and subsidies to subnational governments, the financing of educational expenses is highly unequal, and threatens the cohesive growth of the country in years to come.

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Table of Contents

Absract	i
Acknowledgments	ii
Table of Contents	iii
List of Tables	iv
List of Abreviations	v
1. Introduction	1
2. Origins of Spatial Inequality	6
2.1 Spatial Inequality and Economic Geography	6
2.2 The Impact of Economic Transition on Interjurisdictional Inequality	. 13
2.3 Fiscal Federalism and Inequality	. 15
3. Inequality, Decentralization and Regional Development in Poland Between 1999 and 2006	. 22
3.1 Inequality in Poland	. 22
3.2 Decentralization in Poland	. 27
3.2.1 General Aspects of Decentralization in Poland	. 28
3.2.2 The Decentralization of Education in Poland	. 35
3.3 Disparities in Poland's Regional Development	. 37
3.3.1 Historical Explanation of Differences between Poland's Regions	. 37
3.3.2 Overview of Polish Voivodships	. 39
4. Analysis of Determinants of Interjurisdictional Inequality in Poland between 1999 and 2000	642
4.1 Dependent Variables	. 42
4.2 Independent Variables	. 48
4.3 Limitations of the Data	. 53
4.4 Analysis of Results	. 54
5. Conclusion	. 59
Appendix A: Polish Electoral Map	. 64
Appendix B: Evolution of Interjurisdictional Inequality in Poland	. 65
Appendix C: Administrative Division of Poland	. 66
Appendix D: Changes In Railway Infrastructure in Poland	. 67
Appendix E:Overview of Polish Voivodships	. 68
Annex F: Description of Data	. 72
Appendix G: Results of Regression Analyses	.73
Appendix H: Polish Macroeconomic Indicators	. 84
References	. 85

List of Tables

Table 1: Inequality in Poland Between 1990 and 1998	24
Table 2: Inequality in Poland Between 1999 and 2006	25
Table 3: Lorenz Curves of the Hoover Index in Poland 1999-2006	27
Table 4: Division of Competencies According to Level of Government in Poland	30
Table 5: Public Finance by Level of Expenditure in Poland Selected Years (mln pln)	31
Table 6: Budgetary Composition of Polish Subnational Government Units*	33
Table 4: Overview of Chosen Features of Polish Voivodships 2006	40
Table 5: Summary of Significant Dependent Variables	55
Table 6: Description of Data	72
Table 7: Regression Analysis 1999	73
Table 8: Regression Analysis 2000	75
Table 9: Regression Analysis 2001	76
Table 10: Regression Analysis 2002	77
Table 11: Regression Analysis 2003	79
Table 12: Regression Analysis 2004	80
Table 13: Regression Analysis 2005	81
Table 14: Regression Analysis 2006	82
Table 15: Polish Growth 1993-2006	84
Table 16: Unemployment in Poland 1997-2006	84

List of Abreviations

- **BPO** Business Process Outsourcing
- GCI Geographic Concentration Index
- $\mathbf{E}\mathbf{U}$ European Union
- FGT First Generation Fiscal Federalism
- **GDP** Gross Domestic Product
- $\boldsymbol{GRP}-\boldsymbol{Gross}\;\boldsymbol{Regional}\;\boldsymbol{Product}$
- PLN Currency code for Polish Złoty
- \mathbf{SGT} Second Generation Fiscal Federalism

1. Introduction

The fall of communist governments in Central and Eastern Europe brought about the end of a highly centralized system. Indeed, in many of the countries of the former Eastern Bloc the inherent socialist pressure for high levels of centralization has been replaced by the natural 'genetic program' of society (Kornai, 2008), which in many cases meant a more decentralized system. Similarly the slow decay and abandonment of the Developmental State in East Asia (including South-East Asia), showed that the central coordination of capital allocation and significant interventionism in the economy was unsustainable. These two events can be viewed as having contributed to the spread of fiscal federalism (Shah, 2004). Decentralization has been championed by a number of authors, notably as a means to increase accountability (Hindricks & Lockwood, 2005), improve the provision of public goods (Tiebout, 1956), and increasing the competitiveness of the economy (Hayek, 1948). However, it also carries a number of threats, including the increase of regional inequalities (possibly leading to fragmentation or outright disintegration of the State) (Spahn, 2007), a proliferation of pork-barrel politics, or increased macroeconomic instability (Matinez-Vazquez & McNab, 2005).

In Poland, one of the post-communist states of Eastern Europe, the matter of interregional inequality has been particularly important. The past two elections have demonstrated the political saliance of what is often referred to as Poland A and Poland B, with the pro-European Civic Platform dominating in the West and the nationalist Law and Justice party winning the East (see Appendix A). This represents a growing political issue, as citizens of the West feel increasingly that their development is hindered by the eastern regions, while the people in the east feel disregarded. This inequality is often said to be historically contigent and can be traced back to the partitions of Poland, when the Eastern regions were under Russian governance and the West was part of Germany (a third and smaller part, composed primarily of Lesser Poland and Galicia was incorporated into the Habsburg Empire). This led to significant differences in the development of infrastructure and the types of predominant economic activities, which later affected industry location (Davies, 1981).

However, these historical conditions are not a sufficient explanation for the current regional inequalities. Indeed, since the beginning of transition, a number of factors have affected the regions assymetrically. One of the factors which affected regional development in Poland assymmetrically was the unevenly carried out transition in various industries. Indeed, several types of industries, such as electromechanical, could fairly easily be upgraded to a level that would allow for competition on a capitalist market, while others required long and difficult restructurizing. To complicate things further, certain industries had a strong political clout due to their national symbolic values (such as the shipbuilding industry around Gdansk, or the Silesian coal mining industry), guaranteeing government support which in most cases only prolonged their demise.

A further group of factors influencing interjurisidctional inequalities stems from economic geography. Indeed, agglomerative processes as well as the spatial location of economic centers affect the distribution of resources and regional growth potential in a country (Krugman, 1995). This implied that areas surrounding major cities, as well as the cities themselves, should develop much faster. Thus post-communist Poland is likely to be significantly affected by mechanisms concentrating economic development on a network of regional centers, from which growth 'trickles down' to the countryside.

A final set of forces which may affect spatial inequality in Poland is linked to

decentralization and fiscal federalism. Indeed, in a decentralized system, the increased autonomy also results in greater local responsability for public good provision and regional development. As local governments vary in competency, the results of their governance are likely to vary as well. This can further encourage disparities by stimulating migration trends. In this study I will focus on two pariticular aspects of decentralization, namely the policy towards education (as an example of public good provision), and the financing of subnational governments through the usage of intergovernmental grants (being an important characteristic of the financial structure of a decentralized political unit).

Some level of inter-regional disparity may be regarded as non-detrimental, indeed, it may even be seen as a potential motor for growth. Short term fluctuations will always maintain some level of inequality, both between regions as between people. Nevertheless, high and rising levels of inter-regional inequality can have severe social and economic costs: fostering migration which exacerbates inequalities and leaves old and stagnating regions; provides the basis for social conflict and separatist movements, and increasing unemployment and thus the amount of untapped resources.

While little can be done to prevent agglomerative processes from taking their course, and the only way to remedy the uneven heritage of socialism is to address it headfront (through reform rather than respite), the system of decentralization chosen in a given country is subject to change. The aim of my thesis is precisely to address the linkage between the system of decentralization and regional inequalityConsequently, the main research question of my thesis concerns *the relationship between the Polish system of decentralization and interjurisdictional inequality in Poland from 1999 to 2006.* In order to understand this relationship I will test the following hypothesis: *the specific features of the system of decentralization in Poland have led to* an increase in the level of inequality.

As the aim of the this research is to identify the potential linkages between decentralization and interjurisdictional inequality in Poland, a first chapter will be devoted into exploring the different factors which have been found, theoretically and empirically, to influence disparities in regional growth¹. A second chapter will focus on a case study of Poland, focusing on the aspects relevant to the present analysis. This will include an assessment of the changes in interjurisdictional inequality in Poland, an presentation of the Polish system of decentralization (with a special emphasis on the construction of decentralized primary and secondary education provision, and the structure of public finances), and an overview of regional specificities which may have an important impact on assymetrical development of the Polish regions. A final chapter will encompass the statistical research, which explores the relationship between a number of variables (related to historical, agglomerative or devolutionary forces which can affect interjurisdictional inequality), and three measures of spatial inequality. This will done through the use of multiple regression analysis for each of the years in the study². The unit of analysis in this study, are the NUTS-3 regions of Poland, referred to as *podregiony*.

The period of analysis will range from 1999 to 2006. This period is chosen for five reasons. Firstly, 1999 marks the first year of a newly adopted decentralized system in Poland, including a new administrative division of the Polish territory (notably the passage from 49 voivodeships to 16), a new separation of power between central government and subnational

¹ Though interjurisdictional inequality, disparities in regional growth and differences in the level of development, can refer to different concepts *senso stricto*, I here use them interchangeably. This is justified on the assumption that inequality, when measured by relative differences in income, stems from different levels of development (when understand as a linear process of increasing material welfare). In this sense I refrain from using development as referring to accumulated moral, social or political values.

² The three measures of inequality chosen in this study are the Hoover Index, the Theil Index and the Geographic Concentration Index (GCI). The advantages and problems related to the use of these measures are discussed in section 4.1

authorities. A second reason lies in the fact that the education system (an important feature in Poland's system of decentralization), was significantly altered after January the 1st 1999, with new legislation (which was kept fairly constant during the period of analysis). This moment also coincides with the adoption of a more rigourous statistical methodology (increasing the reliability of the data). The beginning of the period of analysis also marks a significant change in Poland's international position. Indeed, in 1998 Poland began negotiations for membership in the EU, while 1999 marked the country's entry into NATO. This not only affected the Poland's international relations but also the standards and methods of works used internally. Finally, the aim of the study is to focus on the relationship between the *current* system of decentralization and spatial inequality in Poland. I believe that this can be done more aptly by omitting the period before 1999, during which the numerous radical changes would obstruct the observation of the finer aspects. The analysis is limited by the availability of statistical data, as 2006 is the last year for which all the variables are attainable. The results of the multiple regression analyses are then analyzed so as to indentify which factors can be seen as influencing interjurisdictional inequality in Poland. This may improve the understanding the different aspects of the relationship between the Polish system of decentralization and disparities in regional development.

2. Origins of Spatial Inequality

Inequality is a much studied concept both in economics and political science. The disparities between the living standards of people around the world are both troubling on a moral level (with cases of extreme poverty and exuberant affluence existing not only across the globe but also often in the same country), and puzzling on an economic one (regarding the question of why certain countries have developed, increasing the welfare of their citizens, while others have not). Inequality can be measured, and understood, in different ways. On the one hand we have interpersonal inequality, understood as the differences between the incomes of households in a given area. A common measure of such inequality is the Gini coefficient. On the other hand we find inequality between countries and regions, which can be referred to as spatial inequality. The measurement of such inequality is more complex. One can understand it as the difference in output of the given regions (measured in terms of regional GDP). This however, does not take into account the differences between the size of the area and population of a given area. Further measures include the Theil index, comparing regional Gini coefficients and the geographic concentration index. The following chapters explores the different views on spatial inequality in an attempt at discerning its most salient aspects and, consequently establishing which measure is the most appropriate for the question at hand and what issues are likely to affect it.

2.1 Spatial Inequality and Economic Geography

Spatial inequality has been increasingly addressed by economic geography, development

and income distribution theorists over the previous decades. The question of why economic centers arise and agglomerate has puzzled much of the economics profession until recently. Indeed, inablities to model the process of agglomeration resulted from problems related to economies of scale and imperfect competition. Thus, much of the early work devoted to the subject was limited to insights and the usage of metaphors rather than models³. The importance of the findings of economic geography are particularly important in the case of Poland. Indeed, the literature on the topic predominantly presumes the existence of a market-based system. Since such a system was absent in Poland before 1990 (and moreover took some time to settle in), one can expect the effects to be relatively strong as the system had not had the chance to reach a stable equilibrium. This sub-chapter will overview the main theories which economic geography has offered to explain the emergence and development of spatial inequality and attempt to identify the possible measures of the described phenomena.

One of the early models of economic geography, was illustrated in von Thunen's *Isolated State* (von Thunen, 1826). In this classic piece, von Thunen explains how specific farming activities are located around a central market, with high-yield or high-transport cost activities being concentrated around the center whilst lower-yield and lower-transport cost activities tend to be located further away. In this model a pareto-optimal equilibrium is achieved through the usage of a bid-rent curve, which results in farmers for whom the extra rents are lower than savings on transport bidding for territory closer to the center (and an inverse mechanism in the opposite case). Abstracting from the numerous criticisms based on the nature of the models assumptions the model holds three further problems in regards to this study. Firstly, the extrapolability of the farming-based model is somewhat limited. Secondly, although

³ For a discussion on the history and evolution of development economics, economic geography and a theory of unequal spatial distribution see Krugman (1995).

the model explains how the mechanisms locating various entreprises within the region work it does not explain why the center is established in the first place. Finally, the model discusses arrangements within a city that will not necessarily function the same way a region or country.

A further tradition in economic geography stems from the german 'geometric' school (Krugman, 1995). The school is based on the location theory of Alfred Weber and the central place theory of August Losch (Weber, 1909 & Losch, 1967). These theories contend that in an empty even plain firms tend to cluster together to serve equal size markets, exploiting economies of scale and transportation costs. The firms take into account the size of potential final markets and sources of input (Weber, 1909). Although the theories provide several interesting insights into the motivations of location, including Losch's insight that optimal market areas should be hexagonal (in order to efficiently cover the entire area), they fail to model them statisfingly on account of technical shortcomings arising from the lack of tools to model imperfect markets. Furthermore, the assumptions of an uneven plain and equally distributed resources are too unrealistic.

Further insights into the mechanisms governing spatial economic distribution originate in what is sometimes referred to as social physics. While social physics provdes a number of laws that have been shown to be highly valid, it has little theoretical backing. These include Zipf's law of cities, also known as the rank-size rule which claims that, when plotted, the natural logarith of a city's population and the natural logarith of its rank in a given country form a straight line with a slope close to -1 (Gabaix, 1999). This in turn is derived from the 'gravity law' of trade, which claims that transactions between cities are a function of their size and the distance. Prior to 1990 the economic system in Poland was centrally managed, with choices being often politically biased or based on other non-market factors. Hence, it is possible to assume that once the market

forces, in the midst of which the above mentioned findings were uncovered, were set loose they had a significant impact on the spatial configuration of the Polish economy. Consequently is necessary to control for the urban-biased agglomeration illustrated by the social physics models.

The idea that clustering of entreprises is affected by local externalities dates back at least to Alfred Marshall's work which found that efficient scale supplier's, a 'thick' labor market, and information exchange between firms lead to grouping of firms (Marshall, 1890). Thus, both pecuniary and technological externalities can affect agglomeration forces that lead to the rise of urban and economic centers. The principle weakness of the externalities approach, however, lies in their abstract nature. While the concept makes significant sense, it is difficult to identify a general aspect of externalities which would allow quantifying them (altough it may be easy to identify an externality when faced with it). Consequently, there are significant barriers to establishing an order of strenght of externalities, particularly *a priori*, which results in very weak predictability.

Much of the work concerning both development economics and economic geography evokes the concepts of emergence, circular causality and cumulative causality (Hirschman, 1958 & Harris, 1954). This is perhaps best illustrated by the idea that firms move to big markets making the markets themselves bigger. Indeed, one example involves the United States manufacturing belt, whose large market found itself reinforced by the firms that moved their (Harris, 1954). The large concentration of entreprises leads to increasingly large markets, which in turn lead to regional import substitution and, potentially export growth. This is accentuated by Hirschmann's concept of backward and forward linkages (Hirshmann, 1958). These are essentially tied to economies of scale resulting from the adoption of more modern technologies and production solutions which create bigger input-side resource markets (backward linkages), and provide cheaper goods for output-markets increasing their purchasing power (forward linkages).

Modern economic geography finds its origins in the Core-Periphery (CP) (Krugman, 1991, & Krugman & Venebles, 1995). The model is based on three elements: the market access effect (firms tend to locate themselves near bigger markets; this can be viewed as a derivation from the market-potential concept used in social physics); the 'cost of living' effect (the impact of local industry on local prices), and the market crowding effect which pushes firms to move to regions with few competitors. The first two increase the impact of forces of agglomeration whilst the last encourages dispersion. Migration shifts affect the size of local markets leading some to become relatively larger and thus leading firms to shift their production there (in order to reduce trade costs). This results in cumulative and circular causality. Consequently, once the break point is passed agglomeration is self-reinforcing and can become catastrophic. Although such a mechanism does not have very significant empirical relevance, the model nevertheless provides frutiful insights concerning the forces behind agglomeration. When costs of relocation are included into the model (Tabuchi & Thisse, 2002), the realism of the model is highly increased. The most important aspect of the model for this study, however, can be derived even from the original CP model. Indeed, since agglomerative forces depend on labor migration, it is possible to assess the order of agglomeration by measuring labor flows (in the case of unemployment above the natural rate, as in the case of Polnd internal flows should also be accounted for).

Although groundbreaking, the CP model was found to be very difficult to work with, as "[wage and prices] cannot be expressed as explicit functions of the spatial distribution" (Baldwin, Forslid, Martin, Ottaviano & Robert-Nicoud, 2003: 68). Furthermore, the model had little pratical use in the field of policy advice. One of the most 'appoachable' models used for the

discription of agglomerative forces is known as the 'footloose capital' (FC) model developed by Martin and Rogers (1995). The model cuts-out the circular causality of the CP model by assuming that labor is not subject to migration and rather production is mobile, with the earnings being shifted to the region of origin. Thus, in the FC model agglomeration is the result of the home-market effect, forcing more than the proportionate share of industry to locate in the bigger market, which results in a non-self-reinforcing mechanism (Baldwin, Forslid, Martin, Ottaviano & Robert-Nicoud, 2003). The FC model poses a considerable difficulty for this study as it would be necessary to take into account changes in markets across the globe to estimate the forces of agglomeration taking place. However, a study of the homeoskedasticity found in the models used further in the study should allow for an approximate estimate of whether the model has a significant impact on agglomerative forces in Poland. Indeed, as capital liberalization was very limited in the early period of Polish transition, the agglomerative forces described by the FC model should also be quite weak. Thus, if there is no rising heteroskedasticity in the model, the agglomerative forces of FC model are covered for by the variables intended to measure agglomerative tendencies derived from other models⁴.

All the above mentioned theories, models and metaphors describing the mechanism of agglomeration rest on the assumption of mobile factors of production. These can be decomposed into two parts: capital and labor. Regarding capital it is possible to observe the increases in FDI and regional large-scale investments. Small-scale operations, however, are more difficult to distinguish. This presents an important difficulty when attempting to model the factors influencing spatial inequality. However, since investments which are not of external provenance must be funded by domestic savings it is possible to observe the increases in budget spending of

⁴ Unfortunately, the opposite does not allow for such clear claims as rising heteroskedasticity can be accounted for in many other manners.

local jurisdictions (depending on the nature of the fiscal federalism system this can originate from deficits, increased tax collection, or tax exemptations for investments), in order to determine their size (household investments during the period of analysis in Poland were of negligible order). Thus in order to capture the effects of capital agglomeration one should observe the level of regional investments and increases in budget deficits. Perhaps even more important is the monitoring of shifts in labor provision. As the Polish transition resulted in high levels of unemployment increased levels of production do not necessarily require migration. On the contrary, agglomerative increases economic production can be observed through assymetric decreases of unemployment. In order to render the analysis more exact, however, the inclusion of migration patterns is desirable. The case for such an observation is further strenghtened by the suspectibility of the demographic and economic landscapes of transition countries to subscribe to the regularities exposed by social physics.

Agglomeration has a number of consequences, including technological and pecuniary spillovers. For the purpose of this study, however, I will hold technology to be a constant. I believe that this is a fairly reasonable assumption as the period of analysis is relatively brief. Secondly, technological spillovers can direct production-type towards perfect competition as much as towards imperfect competition and there are no ways (on an aggregate level) to distinguish whether technological spillovers result in shifting industries from consant returns to higher constant returns, increasing returns to higher constant returns or vice versa. Furthermore, there are no discernable criteria by which one can judge the geographical extent of such a spillover (this also holds for improved organizational solutions which spread across a given industry with great alacrity, hence the importance of first-mover advantage), especially with the accrued possibilities of communication. Pecunairy externalities are likely to result in higher wages, increased investments or cheaper goods depending on the nature of the market in which a firm operates. Whichever prevails the likely result will be a increased market development (either internal to the firm or external), which in turn will result in pressures for migration. Once again this renders the inclusion of pecuniary externalities, separately from labor movement, into the model difficult. For this reason I will abstain from the inclusion of pecuniary externalities into the analysis.

A quasi-totality of the work done by economic-geography scholars is based on the assumption that localization is influenced by market forces. Thus, a post-communist country, such as Poland, is likely to have 'built up' delocalization pressures that were set loose by the transtion from central planning to market-based allocation. The following sub-chapter will examine the biases of central planning in regards to spatial allocation of resocurces and production facilities.

2.2 The Impact of Economic Transition on Interjurisdictional Inequality

The period after 1989 was marked by chaotic economic changes and significant political turmoil in the countries of the post-communist block. Poland was in this case no exception. Indeed, the decline of many industries in the post-communist countries resulted in a large fall in both GDP and GDP per capita. This sub-chapter will focus on the effects of economic and political transition on the interjurisdictional inequalities, attempting to identify the mechanisms which could have led to changes in such discrepancies and the heritage of such mechanisms for the following years of transition.

The differences between a capitalist or market-oriented economic system and a socialist, centrally planned one are numerous and systemic in their nature. Indeed, they can be even qualified as genetic (Kornai, 2000 & 2008). Before 1990 the economic system in the communist countries was characterized by bureaucratic coordination, labor shortages (with unemployment on the job, however), chronic shortages and plan bargaining. Thus, the allocation of resources was, at least in large part, centrally determined. Consequently, spatial inequality prior to the economic transformation was also the result of bureaucratic coordination, preventing market-based agglomerative forces to take full effect. Moreover, the lack of possibilities of labor migration was a further barrier to spatial concentration. Together with the socialist principle which claims that one of the goals of the socialist system is to reduce interpersonal and interregional inequalities, it is possible to assume that the level of interjurisdictional inequality in communist countries prior to the economic transformation was lower than it would have been, had the countries followed a capitalist path of development⁵.

One of the most salient features of the economic transition experienced by postcommunist countries was the drastic wall of output. This led to a collapse of many of the countries GDPs accompanied by a significant fall in living conditions. This was also one of the most important factors influencing the spatial distribution in Poland, as Polish industry was assymetrically affected. Indeed, much of the fall in output can be attributed to the cessation of production of 'pure socialist output' (Winiecki, 2001). This resulted from the fact that much of the industrial production of Poland at the time only had any significant value under a socialist system. Within an international framework, trade

One of the classic authors on development economics (whose findings can be

⁵ This is perhaps best illustrated by the subtantial increase in both interpersonal and interjurisdictional inequality that most of the Eastern Bloc economies experienced in the early years of transition.

extrapolated to the cases of transition economics). Kuznets, describes the process of going from a level of low GDP per capita to a high level as marked by a significant increase in income inequality amongst the population which later falls to a lower level, yet still higher than the initial one (Kuznets, 1966). This is due to interpersonal and spatial agglomeration, with the creation of 'isles of prosperity' from which general economic welfare spreads. While the argument put forth by Kuznets has strong logical backing, its usefulness is highly limited. Indeed, the time-frame in which this development takes place has never been ultimately specified. As a result it has been difficult to empirically prove its validity, with the case of the United States presenting an inconvenient counter-example (being both a high GDP per capita and high inequality economy). Furthermore, the arguments and mechanisms describing the different phases of the process are somewhat too abstract. Consequently, I believe that for the current analysis it is not necessary (nor feasible) to quantify and include the mechanism described by the Kuznets curve. Indeed, many of the mechanisms described by Kuznets should be captured within the framework of economic geography and the spatial allocation theories.

2.3 Fiscal Federalism and Inequality

Like snowflakes, no two systems of fiscal federalism are exactly alike. However, they share a number of common dimensions along which they can be classified. These include: the distribution of responsabilities; the level of independence in regards to expenditures and tax collection; the usage of intergovernmental grants; the arrangements regarding the redistributive and stabilizing functions of governance; the number of tiers of governance, the organization of relations between them, and the manner of apointing officials on each of the levels. These dimensions can have an impact on interjurisdictional inequality in various manners. The aim of this subshapter is to identify the priniciple manners in which a fiscal federalist system can affect such spatial inequality and chose the most appropriate measures which can be used in order to estimate the impact of these variables.

First generation fiscal federalism theory (FGT) is strongly inspired by the Tieboutian mechanism of interjurisdictional competition. The model is based on the assumption that people vote with their feet, having a knowledge of the available variants of public goods provided by various constituencies, and move to the jurisdiction which best suits their individual preferences (Tiebout, 1956). Although the model's generalizability is strongly limited by its unrealistic assumptions (such as the mobility of the population, the knowledge of all available options, the existence of mechanisms that maintain an equilibrium level of citizens in a given jurisdiction etc), it demonstrates the basis for a first mechanism leading to a potential exacerbation of interjurisdictional inequality.

FGT is genrally favourable to decentralization on account of its superior possibilities of resolving the public good provision problem. Indeed FGT theorists claim that in the case of heterogenuous preferences, locally adapted means of providing public goods will be better able to take into account the local specificities. This is best illustrated by Oate's decentralization theorem which states that ,,in absence of of cost savings from the centralized provision of local public goods and of interjurisdictional externalities, the level of welfare will always be at least as high (and typically higher) is Pareto-efficient levels of consumption are provided in each jurisdictions if *any* single, uniform level of consumption is maintained across all jurisdictions? (Oates, 1972, p.54, orignal emphasis). This is justified by the higher probablity of meeting the local demands for public goods in the case of decentralized provision rather then by

one which is identical in all juridictions and by the assumption that in all cases when the theorem does not hold, the central government will step in to internalize all the costs stemming from externalities and provide public goods when appopriate (Oates, 1999). This statement highlights the most important weakness of FGT, namely the fact that FGT theorists consider the state to be a benevolent planer, aiming to maximize general utility rather than a structure with organizational problems, conflicts of interest and showing opportunistic behaviour. This blocks of a number of theoretical avenues of investigation which could provide insight into the functioning of decentralized states (Garzarelli, 2004).

Second generation fiscal federalism theory (SGT) is primarily interested into the institutional and incentives-based mechanisms affecting the functioning of decentralized states (Garzarelli, 2004). Thus, it can be understood that SGT theorists focus on the organizational aspect of devolution. According to Garzarelli, a first solution to the problems of accountability, and curbing pressures to increase state budgets, can be found in the Tieboutian model. Indeed, due to the possibility of competing with their feet, consumers of public goods can exert pressure on local politicians and bureaucrats to increase the cost/benefit ratio of public good provision (understood as the ratio between the local taxes paid and the level of public goods provided for them). Thus, Tieboutian competition is a first check to political abuse (Garzarelli, 2004). To this one can add the possibility of voice through voting, influenced both directly by the citizens view of local politicians and 'yardstick competition', based on the citizens' knowledge of developments in other jurisdictions (Hirschmann, 1970). According to this theory, decentralization should shift public good provision towards a more Pareto-optimal level. It is also possible, however, that decentralizaton will not have the desired effects on restricting government spending.

The increase in overall government budget size⁶ that has been witnessed since the Second World War has led to numerous academic attempts to find explanations. One commonly referred to factor pushing up the portion of government spending is 'Wagner's Law'. The law claims that the income elasticity of demand for government spending is greater than unity, resulting in higher levels of relative government output with rising levels of GDP. In an article published in 2003, Jonathan Rodden undertakes the task of exploring the relationship between decentralization and the growth of the governmental 'Leviathan' (Rodden, 2003). Rodden finds that the forseen tax competition, limiting the size of government, does not significantly affect governmental budgets. According to the author, neither can the link between devolution and efficient budgets be confirmed or rejected (Rodden, 2004). However, the type of decentralization plays an important role, whether it is based on expenditure or revenue decentralization, the latter having stronger effects on curbing budget growth. One important aspect to be considered is the question of budget constraints. Indeed, when governments are not limited by their own financing possibilities, politicians can ,,woo myopic voters by expanding the economy during election campaigns" (Rodden & Wibbels 2002, p.499)⁷. Furthermore, it possible that politicians deciding over regional expenditures face only local accountability constraints, chosing to increase local expenditures at the price of general welfare, leading to the proliferation of pork-barrel politics (Rodden & Wibbels, 2002). In their 2002 article, Jonathan Rodden and Erik Wibbels find that higher levels of fiscal imbalance (the difference between self-financed and grant financed exenditures), lead to higher levels of budget deficits and inflation (Rodden & Wibbels, 2002). Consequently, it is important to observe how the finances of a specific federal state are

⁶ This is exemplified by research undertaken by Jonathan Rodden on a sample of 29 countries, in which he finds that government budgets have increased from 39% of GDP in 1978 to over 45% in 1995 (Rodden, 2003)

⁷ It is also possible using election promises that will be kept but are a considerable burden for the rest of the country.

organized, not just in the share of expenditures, but also in the methods of financing them. As government budgets have been linked to the performance of a given economy, the share of ex: grants can affect the outcomes of the studied states. Furthermore, if states depend substantially on own financing, discrepancies between their different potential can have an affect on interjurisdictional disparities in development.

The trend towards decentralization over recent decades has led to increase autonomy and focused on the local provision of public goods. This, however, endangers some of the worse-off jurisdictions that find themselves incapable to finance their expenditures, worsening the cost/benefit ratio of public good provision and entering a vicious cycle in which citizens move to better performing areas and making financing even harder (Musgrave, 1997). One way of circumventing this problem is to retain revenue centralization (particularly in the form of progress nationwide taxes, and limiting devolution to the expenditure side. This would entail financing in the form of grants, intended to equalize the disparities in the various state's development, and particularly the differences in the net benefits that citizens in those states derive from their respective states (Musgrave, 1997). However, this form of financing carries several problems. Non-matching or block grants guarantee the recipients freedom to choose how best to spend to recieved money; they do not, however, allow to direct the purpose of of public spending. Although intergovernmental grants can be wealth enhancing, they can also lead to severe political complications, particularly in the presence of hard budget constraints (Sato, 2007).

A further element to take into consideration when analyzing the potential effects of fiscal federalism on disparities in interjurisdictional development is whether the federalist system is market preserving or not (Wiengast, 1995). Indeed, some nominally federal countries, such as

China, fail to provide a market-preserving type of federalist system, which can be viewed as a significant cause for the rising regional disparities in growth and development (Csaba, 2005). Without such market-preserving charateristics, as well as self-reinforcing conditions protecting various groups or jurisdictions from abuse from potential power-wielders, the state can be captured by coalitions that would divert resources to their own benefit (Wiengast, 1995). Weingast finds five criteria which ensure that a federalist system is market preserving⁸: a hierarchy of governments, meaning at least to superposed levels of governance, with a strictly defined delimitation of competency; autonomy of different government levels, ensuring independence of decision making; subnational governments have regulatory authority over the economy; the common market is preserved from potential barriers to trade, and subnational governments should face hard budget constraints (Wiengast, 1995). These are also necessary conditions for the functioning of the Tieboutian model of interjurisdictional competition (Tiebout, 1956). With the aid of a game-theory based transgression game, in which a central ruler can choose to transgress a local unit but will lose (having a lower payoff) if the other local unit joins in a common act of resistance, Wiengast stresses the need for social collusion against an autogratic central ruler to preserve the independence of local units. Using the example of China, Wiengast illustrates how increased fulfillment on market-preserving conditions can have a lasting effect on regional independence and growth, but limits to the common market lead to regional variation in levels of development (Wiengast, 1995). Thus, the market-preserving characteristics are primordial to ensure that a given fiscal federalist state is safe from internal political and economic abuse on behalf of one or more of its components.

Consequently, in order to assess the impact of a given decentralized state on the regional

⁸ The first two criteria define a system as federalist, while the three last ones are conditions which ensure it is market-presenving.

development of a country, I believe that two issues must be addressed. Firstly, the charateristics of such a state must be identified. These include, the nature of public financing and the organization of the respective policy competencies⁹, electoral structures, and conditions ensuring market-preserving federalism and Tieboutian-type competition. The absence of several of these conditions, or heterodox arrangements can result in an inappropriate subsequent analysis. Indeed, if a nominally federalist system is not really market preserving, or does not have any direct elections on a local level, analyzing it through the perspective of fiscal federalism may be futile. The second issue to address whilst analyzing a decentralized system, within the framework of spatially disparate development, is to observe the levels and changes in variables which can potentially affect regional development. In this subchapter I have identified the following indicators which could have potential effect on such differences: the use of intergovernmental grants, citizen mobility, the possibilities of incentives and self-financing possibilities (relative to the jurisdiction's magnitude). Thus, an analysis of the relation between Poland's system of fiscal federalism and the disparities in regional development should focus on the above mentioned elements in order to provide a rigourous assessment of the mechanisms involved.

⁹ I here refer to the distinction between truly decentralized states and deconcentrated ones. Indeed, whilst a given system may appear to have locally established service providers, if they are simply part of a national organization, the system cannot be considered to be decentralized. A prime example of such a case would the police service, which (in many countries), operates through local units that are part of a national organization.

3. Inequality, Decentralization and Regional Development in Poland Between 1999 and 2006

During the period of almost two decades which have passed since Poland's transition from a socialist to a capitalist system regional inequalities have increased considerably. This can be seen on an interpersonal and interjurisdictional level. This has been due to transitional mechanisms, localization issues and fiscal federalism. The following sub-chapter will present the evolution of spatial inequality in Poland and explore the possible reasons behind it. In order to present a concise yet sufficient account, encompasing the various issues which could have a an effect on the discrepancies in regional development, the chapter will be divided into three sections. Firstly, I will present the evolution of inequality in Poland during the period of study using several aggregate inequality measures, as well as from a unitary perspective. A second section will be dedicated to presenting the Polish system of decentralization, with a particular emphasis on the aspects highlighted in part 1.3. The final section of this chapter will focus on an overview of the effects of transtion on the Polish regions as well as their economic, political and social specificities.

3.1 Inequality in Poland

Following the expected path, outlined in the previous chapter, inequality has increased in Poland, as in most transition economies, both on an interpersonal and interjurisdictional level. Thus I will compare the evolution of the three measures of inequality chosen in this study¹⁰: the

¹⁰ For a methodological discussion on the interjurisdictional inequality measures, see chapter 3.1. 'Measures of

Hoover Index, the Theil Index and the Geographic Concentration Index (GCI). Although the present study is primarily concerned with the spatial or interjurisdictional aspect of unequal development, it is nevertheless noteworthy to measure the evolution of inequality on an interpersonal level as well. Because rising interpersonal inequality has a strong effect on the tastes and capacities for public good consumption, it is reasonable to expect some level of migration of better-off persons towards comunities with higher levels of public good provision, or lower taxation. This can be viewed within the framework of Tieboutian competition (Tiebout, 1956), and could hypothetically lead to a race to the bottom situation in which the inequality between jurisdictions would increase in the form of a vicious cycle resulting in perfect segregation. Albeit improbable in reality, it is important to observe whether the underlying conditions for such a scenario are present.

Although the current study focuses on the changes in regional development in Poland between 1999 and 2006, it is beneficial to first briefly observe the evolution of the situation preceding that during the chosen period of analysis (although desirable, an observation starting at the beginning of the transition period is unfeasible due to lack of statistical data). This should allow for a comparaison between the intial period of economic transition and the period of analysis. It would also permit to verify the hypothesis that the major changes in interjuridictional development in transition economies occur during the early years of transition. However, it is important to remember that a direct comparaison of changes in spatial inequality between the post-1999 and pre-1999 periods is methodologically flawed (except in the case of the Gini coefficient which, not being decomposable and calculated on the basis of people rather than geographical units, can be compared between the two periods). As the territorial division of

Inequality'

Poland has been changed beginning January the 1st, 1999, going from 49 voivodeships to 16, and introducing the powiat as subnational governing entity, the indexes of interjurisdictional inequality are calculated for different groups. Nevetheless, it is possible to broadly compare the dynamics of inequality variation on a yearly basis, in order to percieve the 'scale' of the transformation.

	Table 1. Inequality in Folding Detween 1990 and 1990						
	Year	Gini Coefficient	Hoover Index*	Theil Index*	Adjusted Geographic Concentration Index*		
	1990	0.256	-	-	-		
	1991	0.243	-	-	-		
	1992	0.252	-	-	-		
	1993	0.295	-	-	-		
	1994	0.309	-	-	-		
	1995	0.292	13.35148	1.36456	10.62846		
	1996	0.306	15.36315	1.79318	10.98212		
	1997	0.309	15.81155	1.91228	11.02577		
	1998	0.318	16.10471	2.21674	11.10041		
Т				1	1		

Table 1: Inequality in Poland Between 1990 and 1998

* Calculations for the Hoover, Theil and Adjusted GCI are made based on a geographical reconstruction of 1999 voivodships from *gmina* level data (GUS 2003). The Indexes are multiplied by 100 in order to be more evocative. Sources: The Gini coefficients are from Brzezinski (2002). The Hoover, Theil and Geographic Concentration Indexes as well as standard deviation of regional GDP per capita are based on the authors calculations.

Table 2 illustrates the evolution of inequlaity in Poland in the period up to 1999. When compared to Table 3, presenting the same inequality measures for the period from 1999 to 2006, we can observe a much faster rise in both interpersonal and interjurisdictional inequality. Furthermore, it is interesting to note that the increase in inequality is constant, while the corresponding measures for the 1999-2006 period undergo certain fluctuations. This would suggest that while the early period of transition was characterized by both high and constant increases in interpersonal and interjurisdictional inequality. Table 3 also illustrates the development of interpersonal inequality, as measured by the Gini coefficient, in Poland. We can observe a steady and consistent trend towards an increase income distribution inequality, as

measured by the Gini coefficient, with only mild falls. In the period until 1999, however, we can see that the Gini coefficient experiences both a more significant increase, as well as a steadier one (experiencing only one fall). This would corroborate the popular belief that socialist countries had lower income disparities than capitalist ones, and that transition has significantly increased these disparities.

Year Gini Hoover Theil Adjusted Geographic GDP per Geographic Index¹² Index¹¹ Coefficient Concentration Index Concentration Index capita STD 1999 40.2797 0.323 15.6669 8.2603 5516.599 80.5896 2000 0.335 16.3893 8.7445 40.8983 6340.492 81.7979 2001 0.333 15.5264 8.1778 40.0726 6354.270 80.1623 2002 0.342 16.2846 8.7452 6874.500 40.8936 81.8533 0.347 2003 16.1348 8.8184 40.6263 7239.928 81.2987 40.3381 2004 16.0505 8.4864 7757.710 80.6813 0.345 2005 8713.314 0.349 16.5647 9.2374 40.7061 81.4332 2006 0.345 17.0956 9.5439 41.0132 9709.677 82.0649

 Table 2: Inequality in Poland Between 1999 and 2006

Sources: The Gini coefficients are from Brzezinski (2002), Ulman (2005) and the CIA World Factbook. The Hoover, Theil and Geographic Concentration Indexes as well as standard deviation of regional GDP per capita are based on the authors calculations.

The indexes I have chosen to illustrate interjurisdictional inequality include the Hoover Index, the symmetricized Theil Index, the GCI (both normal and adjusted), and standardized variation of GDP per capita. Although according to all the indexes inequality has increased during the period between 1999 and 2006, we can observe different dynamics of change in the various indexes. We see regional inequality, as measured by the Hoover index, increase in only half of the years, albeit quite importantly. Indeed, the rises in inequality of 1999-2000, 2001-2002, 2004-2005 and 2005-2006 more than compensate for the falls in the other years, resulting

¹¹ The Hoover, Theil and Geographic Concentration Indexes are multiplied by 100 in order to be visually more evocative (this does not affect the interpretation)

¹² I here refer to the symetricized Theil Index. Basing myself on the assumption that incomes are neither stochastically distributed to regions nor regions to incomes, only the symetricized Theil index remains as a measure of inequality.

in a change from around 15.66 in 1999 to 17.09 in 2006.

The Hoover Index can also be visualized through the usuage of Lorenz Curves. Table illustrates the different levels of regional income inequality by constructing a Lorenz Curve of regional income levels. As with its interpersonal equivalent (often used in pair with the Gini coefficient), the further the curve is from the 45-degree line the higher the level of interjuridictional inequality. From the curves in table 3 we can observe that inequality as measured by the Hoover Index was substantially higher in 2000 and 2001 than in other years. In the case of cross-cutting lines, however, statistically rigourous interpretation is not possible. Since the calculation of the Hoover Index shows that interjurisdictional inequality in Poland has increased during the period of analysis, the Lorenz curves for the Hoover index are surprising. One possible factor explaining the disparity is the world economic crisis linked to the collapse of the so-called 'dotcom bubble' (see Appendix G). This led to a significant fall in GDP growth in Poland, as well as in the OECD countries in general. While it is conceivable that this had an asymmetrical effect on Poland's regions, it can only partially explain the differences in the Lorenz curves presented below¹³.

¹³ For a graphic overview of the evolution of inequality in Poland see Appecdix B.



Table 3: Lorenz Curves of the Hoover Index in Poland 1999-2006

Source: Author's calculations based on data from the Polish Regional Statitical Office "Bank Danych Regionalnych 1999-2006"

3.2 Decentralization in Poland

As we have previously seen in section 1.3., nominally federal states can in fact be simply deconcentrated or not adhere to the standards of market-preserving federalism, while countries that are nominally unitary, such as Poland, can in fact potentially be states with successful fiscal federalism systems. In order to classify a specific political entity it is important to look at the particular arrangements in respect such issues as distribution of responsabilities, methods of financing, electoral system, regulatory framework and the political and social rights of its citizens. The following subchapter will focus on the presentation of the Polish system of fiscal federalism. It will be divided into two sections, a first describing the general aspects of system of decentralization, and a second focusing on the education system.

3.2.1 General Aspects of Decentralization in Poland

Poland began the implementation of a new system of fiscal federalism almost at the very beginning of the country's economic and political transition. Indeed, on the 8th of March, 1990, the Polish parliament passed legislation regulating self-governing territorial units, the electoral process to gmina councils (lowest unit of gorernment – roughly translated as district), as well as the law changing the Polish constitution to one permitting the new developments (Wytrazek, 2003). One of the key elements of the 1990 legislation was the guarantee of autonomy in decision making and independence from pressures exerted by hierarchically superior governing entities of the *gminas*. This allowed the first condition of market-preserving federalism to be fulfilled, at least, nominally, by according independence to subnational units. A world bank country report condoned decentralization in Poland as a means of increasing accountability and curtailing expenditure increases, fearing however, that increased independence could lead to abuse of soft budget constraints and partisan politics (World Bank Country Study, 1992). The gminas were defined by the territory they covered, the residents constituting a self-governing community, and their legal position in regards to their domain of competency. Although the gminas were divided into rural and urban units, they were accorded equal status. While the voivodships would seem a higher layer of the decentralized system of governance, they were bereft of self-governing powers, and limited to an individual administrative organ, the Voivode. The Voivodes were nominated by the Prime Minister and entirely subjected to him as a governmental (read federal) representative on the territory of the voivodship, with extensive administrative powers. The self-government Sejm, the political association of the gminas at voivodship level, was entitled to opine upon the Voivode, however, the Prime Minister was permited to ignore this.

In 1992, the situation was revised due to overlapping compentencies. Indeed, the gminas were subject to two centralized administrative organs (three if the central government is included), the voivodship Bureau and the Regional Bureau (Kulesza, 2002). Consequently, the independence of the gminas and the principle of decentralization was reinforced through additional legislation. The two following years were marked by public debates concerning the future of a multi-layer system of self-governance in Poland (Regulski, 2003). Two main arguments were put forth in favor of creating the *powiats* (counties): greater potential financial and managerial capabilities then the *gminas* allowing them to undertake more ambitious projects, and increased ability to carry out harmonious regional policies. Thus, the *powiat* was to be seen as a complementary unit to the gmina (Kulesza, 2002). Although a novel project to implement these changes was ready by mid-1993, centralizing forces prevailed until 1998, when legislation concerning the status of (self-governing) voivodships and *powiats* was passed. The respective policy domains of the various units were defined according to a principle similar to the EU principle of subsidiarity, claiming that whenever possible, specific functions should be carried out by local authorities allowing the higher layers to focus on more general matters¹⁴.

Starting from January he 1st, 1999, Poland has been divided into 2,478 *gminas*, 379 *powiats* (314 rural ones and 65 city counties), and 16 voivodships (Polish Agency for Foreign Investment, 2006). This new system of territorial and governance delimitation required a corresponding political transformation, including the separation of powers and choice electoral

¹⁴ This principle is not absolute, however, as the Polish Constitutional Court has ruled that subnational units cannot exercise their power wherever they see fit based solely on the decentralization principle. It also ruled that in case of conflict the central government can override the decisions of local units. While this clearly delimits the competencies of various layers of government, it can also be seen as constraint (albeit of limited scope) on local autonomy, as the central government has greater influence over the legal framework in which the different layers operate.

arrangements for all levels of subnational government.

In terms of financial arrangements, newly passed legal framework was based on the principle that together with additional responsabilities, the subnational units should recieve the appropriate levels of funding (eventually by entitling subnational units collect some forms of revenues), thus focusing on the decentralization of expenditures rather than revenues (Polish Constitution art. 168). Two major shortcomings are the impossibility of passing on surplus funds of the voivodships to *powiats* and *gminas*, and the lack of a legal framework within which local governments can cooperate. Responsabilities were divided following the above-mentioned principle of decentralization (Kulesza, 2002). Table 4 presents the division of competencies amongst Poland's three levels of subnational government.

Gmina ¹⁵	Powiat	Voivodship ¹⁶
Education at pirmary and middle-school level Healthcare at local level	Education at high-school level Healthcare at country level	Development and maintenance of national identity and Polish
Local infrastructure (roads, bridges, public spaces	Public transport at county level	culture Stimulating economic
etc.)	Maintenance of designated	activity
Public transport at local level	roads	Fostering competitiveness
planning	Building inspection	voivodship level
Granting building permits	Issuing work permits for	Geoprahic coordination
Waste collection	Vehicle registration	water management

 Table 4: Division of Competencies According to Level of Government in Poland

Source: Regulski (2003)

CEU eTD Collection

¹⁵ The activities listed in the table are only those based on the principle of decentralization. In addition to these, the *gminas* also carry out a number of functions based on the principle of deconcentration, such as national census activity, or acting as a partner in larger national projects. Such activities are, in theory, funded to an appropriate extent by the central government.

¹⁶ The Polish voivodshis do not responsabilities in terms of public good provision *per se*. Their main function can be viewed rather as being coordinative. Thus, the listed competencies should not be viewed trhough the same prism as for the other levels of subnational governance.
From Table 4 one can clearly see a dominance of the *powiat* and *gmina* levels of subnational governance in terms of public good provision. A second insight concerns the separation of authority between the two lower levels. Indeed, since the two layers have very similar roles in terms of public good provision, differing primarily by the geographical scope of their activity rather than the nature of their respective competencies, it is reasonable to presume that some difficulties due to overlapping 'jurisdictions'. This potential problem, however, has been foreseen by the Polsih legislation, which accords to the *powiat* governments the role of supporting *gmina*-level activity, thus granting the *gmina* a superior position in cases of conflict (Regulski, 2003). Consequently, it is possible to exert that the condition of delimitation of competencies of different subnational units is fulfilled to a significant extent. In order to more fully assess the functioning decentralized government, however, an overview of the public finances, focusing on the relative size of subnational budgets is needed (Table 5).

Source of Expenditure	2000	2005	2006
Expenditures of the public sector	166446	236920	247841.7
Expenditures of local units: - Gmina - Cities with <i>powiat</i> status ¹⁷ - Powiat - Voivodship	72610 34584 21766 12555 3705	102912 45813 36270 13763 7066	117040 51724 40986 14844 9486
Expenditures of local units as a percent of total spending	43.6	43.4	47.2

 Table 5: Public Finance by Level of Expenditure in Poland Selected Years (mln pln)

Source: Author's own calculations based on Central Statistical Office Yearbook (1999-2006)

¹⁷ This includes *gminas*, which are also cities and from there derive additional entitlements legally qualifying them as cities with *powiat* status (GUS, 2006)

From the table above one can conclude that local governments in Poland, whilst significant, are not the dominant actor in terms of their share in public spending. Furthermore, the portion of expenditures spent by subnational units seems to be kept at a constant level close to 45%. The *gminas* can easilt be identified as having the most proeminent positions amongst the various layers of local governnment, with over 40% of local expenditures taking place at *gmina* level (when the *gmina* with city-*powiat* status are included on the *gmina* side, their share of expenditure rises to over 70% on average). Furthermore, due to the vague nature of the voivodships obligations and their nearly insignificant position in terms of share of public expenditures (particularly when taking into consideration that they have the largest geographic extent), it is possible to conclude that the voivodships do not constitute a real layer of subnational government, at least from the perspective of public good provision.

It is important to note that Polish legislation applies strict criteria for the budget deficits that subnational units are allowed to carry out. Local governments establish the level of desired expenditures for a given year, as well as the means of financing those expenditures. The limit set on any annual budget deficit is 15% of revenues for a given year, and excess deficts are not allowed even when they could be financed by previous surpluses or additional funds from the given unit's coffers (Pankau, 2002). Furthermore, there are a number of constraints indicating how such deficits can be financed. Subnational governments cannot 'roll-over' debt by taking new credits to pay off existing ones. A further constraint is the public debt limit of national finances (public debt cannot account for more than 60% of GDP, in any given year), which, if reached, would signify a halt subnational deficits. In this sense, subnational governments are 'hostage' to the state of central government finances. Although these measures can be seen as barrier to the development of a truely decentralized form of governance, as well as having

limited investments in local infrastructure (Pankau, 2002), they have undoubtedly curtailed the growth of inequalities between Polish districts and imposed a regime of hard budget constraints, lauded by many fiscal federalism theorists.

In regards to autonomy to make economic decisions, the subnational units have freedom regarding the expenditures financed both through own revenues and their share in national-wide taxes¹⁸. However, grants and subsisties are earmarked for specific purposes. The extent to which the expenditures of local governments comes from sources other than their own shows the level in which decentralization is expenditure-side rather than revenue-side. The table (Table 6) below illustrates the composition of revenues in the *powiat* and *gmina*-level governments (voivodships are not added here due to their relatively insignificant role).

Source of Revenue	Gmina** (2000)	Gmina** (2006)	Powiat (2000)	Powiat (2006)
Own revenue	17570 (50.8)	22683 (43.9)	975 (7.8)	4148 (27.9)
Appropriated allocations	4750 (13.7)	10337 (20)	5574 (44.4)	3434 (23.1)
General dotations and subsidies from state budget	11669 (33.7)	16880 (32.6)	5989 (47.7)	6840 (46.1)
Funds for additional own tasks	595 (1.7)	1824 (3.5)	17 (0.1)	422 (2.8)
Total	34584 (100)	51724 (100)	12555 (100)	14844 (100)

 Table 6: Budgetary Composition of Polish Subnational Government Units*

* Data in millions of PLN, values in brackets represent the percent of total expenditures (sums do not add up to 100 on account of approximation)

** This excludes city *gminas* who are legally considered to have *powiat* status. The latter have a similar makeup to that of *powiats*.

Source: Own calculations based on Central Statistical Office Yearbook (2007)

¹⁸ Subnational governments in Poland receive a certain share of two nationwide taxes, the personal income tax and the legal entities tax (the *powiat* governments do not obtain a share in the latter). In 1999, in the case of the personal income tax the shares were 27.6, 1 and 1.5 percent for the *gmina, powiat* and voivodship respectively. In the same year, for the legal entity tax the shares were 5 and 0.5 percent for the *gmina* and voivodship governments respectively. It is important to note that local governments do not decide about this share. This can be seen as a constraint on their freedom of operation (Pankau, 2002).

The study of the Polish system of decentralized government, taking into account its legal framework, electoral arrangements and financial structure can provide a number of insights concerning how to characterize the Polish variant of decentralization, what aspects to take into account in a future analysis of the system, as well as what potential relations could exist between the state organization and regional disparities in growth. In terms of systemic characteristics, we can acknowledge Poland to possess a market-preserving type of federalism, albeit with certain limitations, particularly in terms of clear delimitation of competencies and economic empowerment. A further insight is that, although nominally Poland seems to have a four-level governance structure (when including the central government as a layer), the actual number of effective layers is no more than three. Indeed, both the responsabilities and funding of the voivodships in Poland suggests that, although they may undertake some minor coordinative, administrative, or promotional activities, they only play a secondary role in governance. Regarding the other two layers of subnational government, it is crucial to note the importance of grants and subsidies in their respective incomes, suggesting that the Polish system of fiscal federalism operates more on a basis of expenditure decentralization than revenue decentralization. In conclusion, it seems that Poland has a limited system of decentralization, suggesting relatively few potential links to disparate regional growth, the main being politically motivated differenes in subsidies, discrepancies in the potential own revenues of local units, and differences in competence concerning the utilization of funds available on investments.

3.2.2 The Decentralization of Education in Poland

The communist regime had a highly centralized and strictly controled manner of managing Poland's educational system. The new regime had a significant impact on this, challenging the previous system in a number of manners. This section will review the evolution of Poland's decentralized system of education and present the main problems, threats and challenges that it should overcome in the near future.

The transformation of Poland's education system began in 1991 with the Education Act. The act was viewed as a temporary move away from the previous system, and can be summarized in three major features: abolishing the state's monopoly on establishing schools; the decentralization of establishing curricula and writing textbooks, and empowering local authorities in regards to hiring, financing, and quality control (Rado, 2004). In 1994 a new system of quality monitoring was established, the *kuratorium*. Although the move was opposed by a portion of the local governments and the Teacher's Union, by 1996 (final date for the transition), the system of education had began an irreversible move away from centralization. The main problems of this period were the lack of communication between the various actors, the high degree of politization of the process, and the lack of real empowerment of local authorities (due to severe legal restrictions), (Rado, 2004).

Together with the new administrative system beginning 1999, the Ministry of education introduced a new structure to the Polish system of education. The role of the principles was reinforced. The principles could make choices to hiring and promotion irrespective of the opinion of the local authorities or that of the quality monitoring officials. Four levels of possible status were created for the teachers. One problematic issue related to this appeared as standard salaries were set at national level and financed by the state, while benefits were let to local budgets. Since these vary between around 2% of salary and almost half, this results in significant disparities between regions (Rado, 2004). A further complication was the creation of an empowered quality monitoring agency, as the *kuratoria* had limited funds, and were unable to conduct checks more than once in a few years. The problem of insufficient funds also had another dimension as Polish teachers had substantially less in-work training than their Western counterparts. The suggestion of the Ministry of education was to pool 1% resources for experts and common training sessions. However, in small areas this amounted to insignificant sums of money (Rado, 2004).

Consequently a major problem of the Polish system of decentralization resides in financing. Many of the poorer local governments see their new responsibilities as a form of unfunded mandate. As the working conditions and salaries are highly unequal, teachers will attempt to avoid depressed areas, which may turn into a vicious circle. Furthermore, the unclear extent of power of local governments hinders the adoption of innovative strategies (Rado, 2002). Though they could nominally adopt new curricula and spend money according to their wishes, central funds barely covered the basic salaries of teachers. Thus, the system of education can be qualified as a weak link the Polish system of decentralization.

3.3 Disparities in Poland's Regional Development

In the period since the beginning of their transition from communism to capitalism, the Polish regions underwent different kinds of transformation. The varieties of different experiences depended largely on the communist legacy left behind. Some previously well developed areas, such as Silesia or the Lodz voivodships saw their industries crumble, which resulted in the stagnation of the region for years to come, other regions, like Greater Poland or the Warsaw metropolitan area, adapted to the changes much quicker. Furthermore, several political and social aspects also influenced the region's development. Indeed, the strong trade unions in the Tricity area (composed of Gdansk, Gdynia and Sopot), affected the process of transformation, particularly in regards to the shipbuilding industry, though not limited to it. Similarly, Silesia was affected by the rising political strength of the *Rush dla Autonomi Slaska* (Movement for the Autonomy of Silesia). This subchapter will focus on the regional specifities in Poland which affected the process of transformation (thus influencing the initial state at the beginning of the period of study), influenced the regions' development between 1999 and 2006, or have the potential to affect it in the future.

3.3.1 Historical Explanation of Differences between Poland's Regions

Poland is traditionally divided into East and West, both by external and internal observers. This distinction is made on economic, political and social levels. I will first focus on a presentation of this divide Poland, explaning its historical origins and presenting its current state. I will then pursue with a more detailed account of Polish regional specificities. In this aim, I will

provide a concise overview of the various regions of Poland, as well as a brief overview of specific charateristics (for a summary of these most salient features, see Table 4), together with an account of the most relevant events which have occured in the given region. This subchapter will focus on the above mentioned issues at voivodship level. This level is chosen as many of the changes and specifiities are shared between the areas comprising a given voivodship, and also in the aim of providing both a comprehensive and condensed account. When relevant, however, events taking place in, or features of, major cities in a voivodship will be highlighted.

The most often cited division, between the East and the West, is the result of Prussian (later German) occupation in the Western regions, and that of the Russian and Austro-Hungarian in the Eastern ones. The period referred to is relatively long, from 1792 to 1918, and encompasses important part of the first and second indutrial revolutions, providing one potential explanation of why the period is considered to be so influential. Some Polish authors also contend that it had a significant social impact as it took place partly during the era of nation-building. Although the 'idea' of the Polish nation transcended partional borders, the authors argue that given the different cultural, political and economical farmeworks in which it developed, these ideas evolved *de facto* in parallel to each¹⁹. A major argument against this thesis is that much of the population of present-day Western Poland consists of expelses from the Eastern borderlands (*Kresy*)²⁰. Nevertheless, there is a strong case for the idea the partition era left differences in infrastructure that perdured until this day. This is particularly visible when observing the changes in railway infrastructure (see Appendix D). Consquently, it is important to

¹⁹ This is perhaps best illustrated in an old Polsih joke: Several at a meeting with a Polish merchant the people ask him which is the worst paritition to do business in. He decidely answers that it is the Austro-Hungarian one, answering: "In Prussia you know you can never give bribes, in Russia you know that you always have to, but in Austro-Hungary you never know when you should".

²⁰ However, an overview of electoral maps of recent elections is concides very strongly with the partition era divisions of Poland (see Appendix 1)

control for this factor when undertaking a study of regional development in Poland.

3.3.2 Overview of Polish Voivodships

The tables below (table 3), presents an overview of some selected features of the Polish Voivodships²¹. Due to limitations of the data it is impossible to select all of the same features for the two different tables. However, I believe that many of the most salient issues are selected and a comparative analysis of the two situations can provide useful insights into the region-specific features which may have contributed to differences in regional development in Poland between 1999 and 2006²².

A study of the regional development in Poland shows that proximity to the Western border with Germany (and consequently with Western Europe), or previous belonging to the German partition is neither a sufficient not necessary factor for successful development of a region. Indeed, the Lubusz and Westpomeranian voivodeships failed to meet the average rate of growth while the Lesser Poland voivodship grew at above average rates. This refutes the geographic proximity theory. The amount and population of city counties seems to be unrelated to the outcome of a given voivodship. Interestingly, this also appears to be the case with high levels of urbanization. Although all voivodships with low levels of urbanization were under performers, relatively low levels of urbanization still allowed for above average results (Greater Poland).

²¹ For a description of the essentiel features of each voivodship see Appendix D

²² Some initial expectations can be formulated from the graphical analysis of the development of interjurisdictional inequality in Poland (see Appendix B)

			G (<u> </u>		T T 1	0.1	
	Partition	Main Industries	Sector Distr.	Urban	Major cities	Tourism	Unempl.	Outcome	
Greater Poland	Germany/	BPO	21.11	57.1	4	+	13.4	+	
	Russia	Logistics	34.35		(819818)				
		Automotive	44.54						
Kuyavian-	Germany/	Chemicals	22.21	61.5	4	+	20.8	-	
Pomeranian	Russia	High-Tech	31.33		(785363)				
		Mechanical	46.46						
Lesser Poland	Habsburg	Automotive	22.55	49.6	3	+++	12.7	+	
	_	R&D	26.79		(958460)				
		Tourism	50.66						
Lodz	Russia	Manufacturing	26.77	64.7	3	+	16.7	-	
		BPO	29.46		(892296)				
		Logistics	43.76		· · · ·				
Lower Silesian	Germany	High-Tech	10.51	71.1	3	+	19.1	+	
	5	Electromechanic	35.20		(827428)				
		Automotive	54.29		· · · ·				
Lublin	Russia	BPO	44.41	46.7	4	+	16.4	-	
		Logistics	17.51		(546884)				
		Mechanical	38.08		(/				
Lubusz	Germany	Timber Industry	11.47	64.1	2	-	21.5	-	
Lubusz	Commany	Electrical	35.75	0	(238405)		2110		
		Food Processing	52.79		(200100)				
Masovian	Russia	BPO/Finance	19.45	64.7	5	++	13.0	+	
in a so that	rtubblu	Construction	21.72	0	(2185020)		1010	·	
		Food Processing	58.82		(2100020)				
Onole	Germany	Construction	21.10	52.6	1	_	17.6	-	
Opole	Germany	Chemical	31.64	52.0	(128034)	_	17.0	_	
		Food Processing	47.25		(120051)				
Podlaskie	Russia	Agriculture	42.02	59.4	3	+	14.5	-	
I oulubrie	rubbiu	Food Processing	18.38	0,,,,,	(428016)		1.110		
		Mechanical	39.60		(
Pomeranian	Germany	BPO/High Tech	11.55	67.3	4	+++	17.9	+	
1 onier uniun	Continuity	Maritime Eco	32.58	07.15	(848311)		17.02		
		Logistics	55.87		(*******				
Silesian	Germany/	BPO	5.85	78.6	19	++	14.7	+	
Sheshun	Habsburg	High-Tech	42.28	70.0	(2719189)		11.7	·	
	mussourg	Automotive	51.87		(2,1)10))				
Subcarnathian	Habsburg	Aviation	28.84	40.6	4	+	17.2	-	
Subcurputinun	Hubbburg	Mining	29.24	10.0	(327596)		17.2		
		Food Processing	41.92		(02/0/0)				
Swietorzyskie	Russia/	Health Services	39.99	45.4	1	-	19.2	-	
S WICTON EJSINC	Habshurg	Metallurov	22.68	10.1	(207718)		17.2		
	110000015	Construction	37.33		(20,,10)				
Warmian-	Germany	Timber Industry	20.11	60.0	2	++	25.3		
Masurian	Sermany	Food Processing	31.33	00.0	(301748)		20.0		
TTUSUL MIL		Tourism	48.56		(0017.00)				
West	Germany	Timber Industry	12.04	69.2	3	-	23.3		
Pomeranian	Connairy	BPO	30.62	07.2	(559491)	_	_0.0		
- oner untull		Shipbuilding	57.34		(00) () ()				

Table	4: O	verview	of	Chosen	Features	of	Polish	V	'oiva	dshin)s (2006
I GOIC			UI		I CUCUICO	· • •		•				

Key: Partition: State to which the region belonged during the partition era, (in the case of divided heritage both are included) **Main Industries:** The most important economic activities of the region; **Sectoral Distribution:** Percentage of employed by economic sector: agriculture-industry-services; **Urbanization:** Percentage of the population residing in cities; **Major Cities:** Number of city counties and aggregate population (in brackets); **Tourism:** Importance of the voivodship's tourism destinations²³; **Unemployment:** Level of unemployment in a given voivodship; **Outcome:** Indicates whether contribution to inequality is above or below average (using the Hoover Index)

Source: Central Office of Statistics Yearbook (2006), Voivodship Office Information Centers, Polish Information and Foreign Investment Agency

 $^{^{23}}$ In order to establish the importance of the voivodship's tourism destinations, I compared the top 15 destinations rankings in three different toruism rankings (Lonely Planet, Destination360, and StayPoland). The voivodships containing over 5 destinations on average recieve three stars, between 3 and 5 recieve two stars, up to two destinations recieved one star, and those with no destinations are marked by the – sign.

While the existence of educational centers in a given voivodship does not seem to be a sufficient condition for its development, the cases when a framework has been created to foster cooperation between academia and business seem to be linked with above average performance. Indeed, this seems to be confirmed that above average performers all have a significant share of high-human capital dependent economic activities (such as BPO or high-technology industries). Furthermore we can observe that all voivodships in which argiculture represents over 25% of employment have performed below average. It is interesting to note that the level of unemployment is not highly correlated with the outcome. Indeed, we can see that some voivodships with relatively little unemployment (Lublin), performed below average, while some with higher levels did well (Pomeranian). Finally, we can see that although tourism may contribute to growth in a given voivodship, it is far from being sufficient. An overview of the determinants of above average growth at voivodship level, however, can be highly misleading as development can be concentrated to lower jurisdictions. Consequently, a more detailed analysis is necessary before any binding conclusions can be formulated.

4. Analysis of Determinants of Interjurisdictional Inequality in Poland between 1999 and 2006

Having seen the dynamics of interjurisdictional inequality in Poland, the characteristics of the Polish system of decentralization, and explored some of the particular issues which vary from region to region, this chapter will focus on a quantitative analysis of the relations between spatial inequality as measured by the Hoover, Theil and Geographic Concentration Indexes, and the chosen independent variables: the East-West division, the presence of educational centers, net changes in unemployment, net migration, educational expenditures of subnational governments, the level of grants and subsidies transferred from the central government, and the distance to the closest regional centers. The unit of analysis is the NUTS-3 regions of Poland, known as the *podregion*. In order to conduct the analysis I will take 'snapshots' for the different years by using regression analyses for each year of the study. Thus, this chapter will present the dependent and independent variables used, the limitations of the data, as well as an analysis of the findings²⁴.

4.1 Dependent Variables

In order to measure the differences in interjuridictional development in Poland, I use three different inequality measures: the Hoover Index, the Theil Index and the Geographic Concentration Index. These three indexes vary in their method of measuring inequality and their

²⁴ For a presentation of the results see Appendix G. For a description of the variables used see Appendix F

sensitivities towards such issues as small rather than large changes in the inequality, or geographical or demographical size of the basic units of analysis. Thus, it is important to begin with an overview of the most important features of a given index to take into consideration before using it in an analysis.

Inequality studies mostly concur on the necessity for inequality measures to adhere to certain axioms in order for them to be valid. Five major axioms appear in the litterature on the subject: anonymity, income homogenity, population homogenity, the Pigou-Dalton transfer principle, and decomposability (Litchfield, 1999 & Fields 2001). Altough these axioms generally refer to interpersonal inequality, I believe that their relevance is not reduced when extrapolated to interjurisdictional measures. I will now briefly introduce the axioms and explain how the transposition from individual to spatial inequality affects them. Anonymity refers to the permutation of income vectors. In practice this means that a measure of inequality should not be affected by the order in which units are included into the calculations. Thus, two hypothetical income vectors, Y1 (1,2,3,4) and Y2 (1,3,2,4), should have the same level of inequality. Within a spatial rather than individual framework this indicates that the order in which geographic units are taken into consideration should not have an effect on the obtained inequlaity measure. The income homogenity, also refered to as scale independence, focuses on the effect of proportional universal increases in income. According to the axiom, such an increase should not affect the inequality measure. For example if all incomes were doubled, the relative inequality does not change. This should be reflected in the inequality measure. This is particularly important in the study as the period of analysis was one of strong economic growth in Poland, albeit assymetrical in a spatial dimension. A measure that takes into account income homogenity will allow for a clearer picture of this assymetrical development. *Population homogenity* is the equivalent of the previous axiom, only from a 'sample-size' perspective. It states that populations with different sizes but with identical income distributions should have the same levels of inequality as shown by the indicators. This allows for comparaisons between different populations. In the present study, the units of analysis have populations ranging from just over three hundred thousand up to over one and a half million (Warsaw), making the population homogenity principle highly relevant. The Pigou-Dalton transfer priniciple claims that when income is transfered from highearning individuals to low-income ones, whilst maintaining individual ranks unchanged, this should positively affect the inequality measure (in the sense of decreasing inequality). In an interjurisdictional framework such transfers usually take place in the form of harmonization funds and various types of grants. This is particularly relevant for decentralized countries in which substantial portions of regional budgets are alimented in such a manner. Finally, the *decomposability principle* relates to the inequality within different sub-groups of the population and whether inequality measures can be decomposed into within-group and between-group components. Inequality measures which satisfy all five of these axioms are members of the General Entropy class (Cowell, 1995). The measures which only fulfill the first four axioms, as is the case with the Gini coefficient, are refered to as being strongly Lorenz-consistent (Fields, 2001). As the current study does not aim to look into the evolution of inequality within the principle unit of analysis, the NUTS-3 region or *podregion*, the use of strongly-Lorenz consistent measures of inequality (without the necessity of belonging to the General Entropy class), should be satisfactory.

One of the most often used measures of inequality is the Gini coefficient²⁵. Although the present study is primarily concerned with the spatial or interjurisdictional aspect of unequal

²⁵ To see the evolution of interpersonal inequality in Poland following the beginning of transition, see section 3.1

development, it is nevertheless noteworthy to measure the evolution of inequality on an interpersonal level as well. Because rising interpersonal inequality has a strong effect on the tastes and capacities for public good consumption, it is reasonable to expect some level of migration of better-off persons towards comunities with higher levels of public good provision, or lower taxation. This can be viewed within the framework of Tieboutian competition (Tiebout, 1956), and could hypothetically lead to a race to the bottom situation in which the inequality between jurisdictions would increase in the form of a vicious cycle resulting in perfect segregation. Albeit improbable in reality, it is important to observe whether the underlying conditions for such a scenario are present.

On an interjurisdictional level, however, alternative mesures of income inequality are desirable. The Hoover Index is a measure of inequality which can both be used in regards to interpersonal and interjurisdictional inequality. Initially developed to measure industrial localization, it is derived from Lorenz Curves depicting the geographical homogenity of the distribution of production (Hoover, 1936). The index is calculated using the following formula:

$$H = \frac{1}{2} \sum_{i=1}^{N} \left| \frac{E_i}{E_{total}} - \frac{A_i}{A_{total}} \right|$$

Where Ei is a given region's *i* share of total GDP while Ai is the region's share in total population. It is interpreted as the portion of income that should be redistributed between the regions, in order to acheive levels of aggregate production which are proportional to the region's population. An important aspect of the Hoover index in this case is the fact that it is decomposable into interpretable unit-level components, making it an Atkinson General Entropy class measure, useable in regression analysis as an independent variable.

Being an entropy measure, the Theil Index can be converted into an Atkinson index,

ranging from 0 (perfect equality), to 1 (perfect inequality). Thus it is possible to use these components in regression-type analysis as unit-level measurements of the aggregate spatial inequality. However, the interpretation of the Theil Index is not as straightfoward as that of the Hoover Index. Unlike the Hoover Index, the Theil Index has several normative foundations and is derived from information theory and its approach to entropy in particular. Thus, the index measures the difference between maximum entropy and actual entropy (Conceicao & Ferreira, 2000). In the context of interjurisdictional inequality, this can be understood as a probability of differing from equality of ditribution. In the case of the symmetrized Theil index, however, it is possible to interpret as the disparity between 50:50 distribution and actual distribution (Conceicao & Ferreira, 2000). A specific feature of the Theil index is its increased sensitivity to higher levels of inequality and its sensitivity to income transfers bewteen rich a poor. This results from the concavity of subgroup inequality curves (which produces greater differences from linear inequality measures at central values), and the possibility to decompose the curve into interpretable group-level components²⁶. Consequently, in the case of Poland's fairly low level of interjuridictional inequality, the Theil index components are likely to be more uniform than for the other two indexes (as the outliers are smoothed out). Thus, the advantage of the using the Theil index is clearly the possibility to obtain results that are affected to a lesser degree by extreme cases. The symmetrized Theil Index, used in this study, is calculated according to the following formula:

$$T_{S} = \frac{1}{2} \sum_{i=1}^{N} \ln \frac{E_{i}}{A_{i}} \left(\frac{E_{i}}{E_{total}} - \frac{A_{i}}{A_{total}} \right)$$

Where Ei is a given region's *i* share of total GDP while Ai is the region's share in total

²⁶ For an in-depth discussion on the methodology of employing the Theil index, as well as its interpretation see Conceicao & Ferreira (2000)

population.

The final measure of interjurisdictional inequality used in this study is the Index of Geographic Concentration, proposed as a measure fo spatial inequality by the OECD report on measuring regional economies (Spieza, 2003). This index measures regional inequality by taking into account the disparities between the various regions' respective GDPs and areas, according to the following measure:

$$GC = \sum_{i=1}^{N} \left| Y_i - A_i \right|$$

Where Yi is region *i*'s persentage of the national GDP, and Ai is region *i*'s percentage of the national area. Thus instead of mesuring the difference between the given region's 'fair share' of GDP and what would be expected on population basis, it calculates it based on the 'fair share' of the its area. Consequently, it is to be expected that large, sparsely populated areas should have high contributions to the inequality index (on account of the significant – negative – difference between the GDP and the area, later transformed into a positive by taking the absolute values), as should small highly populated ones (with at least an average level of GDP per capita). In order to standardize the index, bringing values it can take to a 0 to 1 range, it is necessary to adjust the index²⁷. This is done by comparing the value to the maximum level it could take, which is when all the economic activity is concentrated in the smallest region²⁸. The outcome is an Adjusted Geographic Concentration Index:

AGC=GC/GCmax

However, for the purposes of this analysis, I will take a decomposed simple Geographic

²⁷ This standaridization is beneficial for two reasons. Firstly, it allows for international comparability. Secondly, it may provide greater intuitive transparency in understanding. As the current study focuses on Poland alone, the adjusted index will not be used in the subsequent regression analyses. However, it is provided as a compararison in section 3.1, on the Spatial Inequality in Poland.

²⁸ With GC max =2(1-Amin)

Concentration Index (decomposed according to the same principle as the Hoover Index). This results in a measure in which high values are areas with high more-than-proportional shares of economic activity, high negative values have a high less-than-proportional share of economic activity, while levels close to zero represent proportional distribution. The advantage of the index is that it reflects the problem of 'empty territories'. On the other hand, however, highly populated areas will appear to have above average shares even if GDP per capita in those areas is below average.

4.2 Independent Variables

This section is devoted to discussing the independent variables used in the analysis. Access to human capital plays an important role in the decision to invest in a given region. Indeed, this has been especially true during what is referred to as the second wave of outsourcing, during this period of services-based outsourcing many of the jobs outsourced were related to the IT sector, involved database management, or focused on providing after-sale services. Such endevors typically wanted to locate near a large pool of potential candidates, making education centers a prime choice. Consequently, I have decided to include the presence of highly ranked universities as a control variable. I have calculated this variable based on the best-known Polish University ranking, published yearly by the magazine Wprost (Wprost, 1999-2006). Based on the ranking I have composed an index for the most prestigious Polish universities, Politechnics, Economic Schools, and Medical Academies. As public higher education is clearly dominant in Polish society I have restricted my calculations to public institutions. The Index is calculated by giving the highest number of points to the highest ranked university, falling to 1 for the lowest, and then standardized as a percentage of the total²⁹. I expect to educational centers to be related with high positive contribution to the inequality indexes.

The process of agglomeration described in 1.2, is heavily dependent on labour and capital increases. In order to measure the strength of agglomerative processes in Poland during the period of analysis, I use the changes in human capital. Although desirable to also include capital concentration (in the sense of private or public investment), this would seriously violate the assumptions of regression. Indeed, since the measures of inequality all use Gross Regional Product as a basis for calculations and the GRP encompasses investment³⁰, this would result in a dependent variable which is a component of the dependent one. Thus, agglomerative processes will be limited to changes in human capital.

Increases in the utilized labour can be provided for either through employing currently unemployed persons or 'importing workers from abroad'. In order to capture these two effects I have computed a variable measuring changes in the absolute number of unemployed (calculations are based on data obtained from the Central Statistical Office Yearbooks 1998-2006), as well as a variable taking into account the difference between newly registered persons and those who have 'de-registered' in a given area. Under Polish legislation any person changing their place of residence for a period of over two weeks is required to notify the local authorities and register under the new address. One problem related to this is doubtful civil compliance to these regulations. However, in the case of people relocating for employment purposes, the

²⁹ I have not corrected for the population of students as the size of the university, correlates highly with its ranking (Pearson correlations between size of school and its ranking vary from .841 to .906 from year to year). Thus, correcting for population size would exacerbate differences).

³⁰ Calculations are based on a variation of Keynes' classical measure: Y = C+I+G+X, in which investments are symbolized by I.

portion of non-compliance should be significantly lower as failure to adhere would result in numerous administrative complications. A further issue to take into consideration is that tertiary education may also strongly influence migration patterns. Indeed, as young people are often more mobile and will to move for several years to other regions of the country, educationseeking may account for a large portion of migration patterns. This is likely to be reduced, however, by lower incentives and lower propensity to comply with regulations (as typical administrative formalities linked to pursuing University education do not require re-registration). I expect, net increases in registered persons should also be related to increases along the inequality spectrum, decreases should result in the opposite movement.

Unemployment figures may be similarly deficient, people may not register for unemployment, or gain employment but maintain unemployed status in order to reap the benefits from social transfers. While this is a significant problem, I believe that it is less so in the case of using the measures to analyze agglomerative processses. Indeed, one of the charateristics of agglomerative processes is the creation of economic networks which, in order to function properly require transparency that the 'grey' economy does not permit (this is even more the case of the 'black economy'). Furthermore, 'false' reports of unemployment are at least as likely in rural areas as in urban ones. I expect decresses in unemployment to be strongly linked to a rise along the inequality spectrum (moving away from the average in above-average regions and towards it in below-average regions). Finally, unemployment is likely to depend on external macroeconomic factors. However, these changes should remain asymmetric on a regional level both during increases and falls. The variable ranges from -16500 to 20500, with positive values indicating increases in unemployment while negative numbers indicate falls in unemployment³¹.

³¹ However, due the introduction of new unemployment institutional frameworks in 1998, the values for the first

Agglomeration and economic geography are strongly influenced by locational features of economic development. Thus, the distance from regional centers is likely to affect the areas development. In order to introduce this distance I have added the distances from the capital of the *powiats* comprised in a given subregion to the closest regional center in the voivodship³². This variable ranges from 0 (for cities with *powiat* status), to close to 124 kilometres. The difficulty in using this measures resides primaliry in the fact that, in terms of suburban communities, it is the time spent traveling to the workplace that matters rather than the distance to it. Thus, this measure does not take into account problems related to infrastructure³³. Furthermore, this variable does not change from year to year. However, while there may be some ambiguity amongest regions closest to a given urban center, the differences between cases far from centers and those near it are not affected by this. Moreover, since many industrial plants, production facilities and even some corporate bureaus are located around urban areas, the time to travel to the center itself is not as important as the proximity of the location. Thus, the distance should nevertheless affect the regions development, with smaller distances expected to be related to higher values on the inequality measures.

Intergovernmental grants comprise an important part of subnational government spending in Poland. I include an aggregate variable of all the subsidies, grants and funds provided by the central government to *gmina* subnational governments aggregated at the level of the *podregion*. A potential problem with using this variable is the possibility of it being proportional to the areas economic activity, resulting in a lack of perceived relationship in the regression analysis. In this

year are substantially higher than in other years due to a substantial increase in registration.

³² This sum is then divided by the number of *powiats* used as a basis for the calculation, in order to obtain the average distance.

³³ While such a measure could be created by the use of Mappy, or similar applications, which inform you about the time used to travel from one location to another, it can only be done for the present year (or the few most recent years at best). A further problem

case however, this variable should appear to be significant on at least one index (due to their base-differences in measuring inequality). Should grants have an equalizing property, I expect that higher levels of grants should correspond to lower values of the inequality component (if not the opposite should be true).

As one of the main responsabilities of subnational governments in Poland is providing primary and secondary education, I have included a variable representing an aggregate of the *gminas*' educational expenditures in a given *podregion*³⁴. One potential problem is that the value of this variable would vary proportionately with the decomposed inequality measures. However, this would violate the principle that subnational governments are provided with funding to fulfill the responsibilities that they are assigned. While this principle may be violated to a certain extent, it is unlikely that it should do so substantially that it renders the measure useless. Nevertheless, I expect that higher educational expenses will correspond to higher values of the inequality components.

The historical differences between the levels of development in the Polish regions resulting from the legacy of the partition-era period have been included by the use of a dummy variable. The dummy takes the value of 1 for regions in Western Poland and 0 for Eastern Poland. While this seems to be insignificant based on a comparison of Polish voivodships, the effects may be noticeable on smaller units. The problem of such a binary variable is that it may capture effects of other binary characteristics common to the regions. However, the different regions in the Western and Eastern halves respectively are quite varied, reducing the probability

³⁴ One problem of using absolute measures of subantional expenditures is the fact that larger areas will spend more on education even if relatively their spending is identical to smaller ones. However, the amount spent is highly correlated with the per capita expenditures and as a portion of the budget. One advantage of this measure is that that the measure avoids the problem that some regions may spend substantially more than average on their pupils but still see it as a lower portion of their relative income (as they have more money to spend on other issues as well). Thus, I believe that the absolute measure should be maintained.

that of other common features. Should this variable turn out to be significant, I expect it to be related with higher values along the inequality measure.

4.3 Limitations of the Data

The analysis is conducted on the entire population composed of Poland's 66 NUTS-3 regions (the unit of analysis). This presents the evident advantage that conclusion made based on the analysis are valid for the entire country. Thus, we do not encounter the usual problems related to using regressions on samples. One of the problems related to the relatively small number or cases, for the purposes of regression analysis, is that insufficient variation will result the insignificant results for the independent variables. However, the analysis results show a number of variables to be significant. Furthermore, high R Square values indicate that a large portion of the variance of the independent values is explained by variance of the dependent ones.

Regarding the basic assumptions of regression, while most of the necessary conditions are fulfilled, there are several problems to keep in mind. Both the dependent and independent variables are normally distributed, with the exception of educational centers. As these only appear in larger cities, areas without any of these are over-represented. Since large cities are likely to be disproportionately represented amongst regions which are above-averagely developed, problems related to multicollinearity may appear (as some of the measures may be biased towards cities)³⁵. A further complication is the presence of outliers in the variable distributions (beyond the distance of three standard deviations). These are systematically comprised of the Warsaw metropolitain areas, and (for some of the variables) Poznan, Katowice,

³⁵ However, an overview of Variance Influence Statistics suggests that this is not a major issue.

Krakow, Wroclaw and Lodz. However, running the regression models after the elimination of these outliers does not significantly affect the results. In regards to homoskedasticity, the points are evenly distributed throughout the plot suggesting no substantial problems. Error distribution is roughly normal. Autocorrelation of errors also does not seem to represent a substantial problem for the model as Durbin-Watson statistics vary in range of 1.8-2.2, signifying that no serious violation of this condition is present.

4.4 Analysis of Results

The results of the regressions run in the previous section are summarized in the table below (Table 5)³⁶. From the table we can see the existence of educational centers is significant for all years except the year 2000 for the Theil Index. This suggests that the existence of educational centers is strongly related to above average development (understood as a positive, or above average contribution to the inequality measure), in a given region. However, since the educational centers are located primarily in major cities (and all are located in cities), it is probable that this variable also takes into account other features related to cities, thus capturing effects that are not solely due to the presence of educational centers, but also the cities within which they are located.

³⁶ For a review of the results for the regression analyses for individual years see Appendix G.

Index	Hoover Index							Theil Index									Geographic Concentration										
																			Index								
Year	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8			
West/East	-	-	-	-	-	-	-	-	*	-	*	*	*	*	-	-	-	-	-	-	-	-	-	-			
									*		*																
Distance to	-	-	-	-	-	*	*	*	-	*	*	-	*	-	-	-	*	*	*	*	*	*	*	*			
Center							*	*		*			*				*	*	*			*	*	*			
Education	*	*	*	*	*	*	*	*	*	-	*	*	*	*	*	*	*	*	*	*	*	*	*	*			
Centers	*	*	*	*	*	*	*	*			*	*	*	*	*	*	*	*	*	*	*	*	*	*			
Unemploy.	*	-	-	*	*	*	-	-	*	-	-	*	-	-	-	*	-	-	-	-	-	-	-	-			
	*											*															
Net Migration	*	-	-	-	*	-	-	-	-	*	-	-	-	*	*	*	-	-	-	-	-	*	*	*			
					*					*						*								*			
Education	*	*	*	*	-	*	*	*	*	*	-	-	*	*	*	*	*	*	*	*	-	*	*	*			
Expenses	*	*	*	*		*	*	*	*	*			*	*	*	*	*	*	*	*		*	*	*			
Grants	*	*	*	*	-	*	*	*	-	*	-	-	*	*	*	*	*	*	*	-	-	*	*	*			
	*	*	*	*		*	*	*		*				*	*	*	*	*				*	*	*			

Table 5: Summary of Significant Dependent Variables

** significant at 0.01 level

* significant at 0.05 level

- not significant

The West/East dichotomous variable turns out to be significant only in the models using the Theil Index as dependent variable (and only in 5 out of the 8 years, and mainly at 0.05 level). Since the Theil index is more sensitive at high levels of inequality, which is not the case in Poland, it is possible to assume that some mildened general variation can still be accounted for by the partition era heritages of the Polish regions. In the case of the other indexes, the higher levels of interregional variation, particularly the existence of isolated 'isles of prosperity' in the eastern regions, makes the partition-period differences insignificant. Regarding the significant years for the Theil index, it is interesting to note that it is significant only in the period until full recovery from the 2000 fall in GDP growth. This suggests that the high growth years . The dummy is most probably insignificant in the case for the Geographic Concentration index because of large empty regions in the western part of Poland (particularly in Pomerania, West Pomerania and the Lubusz Voivodship), and small rich ones in the east (Krakow and Warsaw agglomerations).

The distance to center variable is found to be systematically significant for the geographic concentration index. This is not surprising as areas closer to large urban centers tend to be smaller, more densely populated, and richer (per capita). All three factors would bias the goegraphic concentration index in favor of such areas (in the sense that their contribution to the inequality index would be positive and fairly high). For the Hoover index, distance to center becomes significant in the last three years of the analysis. This suggests that agglomerative processes may have led to above average development in those regions, in the sense of having 'trickled down' from the cities to the 'suburbs'. Surprisingly, in the case of the Theil index, distance to center is significant only for the second, third, and fifth year of the study. This roughly corresponds to slumps in Poland's economic performance, suggesting that some regions lost disproportionately in during the economic stagnation, making variation due to distance more relevant (one possiblity is that the crisis primarily affected rural regions). However, the effect of distance is less than expected, suggesting that either the process of rurbanization has not developed in Poland and the economic development is still strongly constricted to cities, that agglomerative processes are not as important a determinant of regional growth as expected, or that growth is spread out more evenly and that cities of smaller order also play a significant role (as most of the units of analysis contain such cities, the variable does not turn out to be significant).

Withholding the second year for the Theil index as dependent variable, the educational centers variable is significant in every single year in all the models. This suggests three things.

Firstly, that educational centers played an important role in regional transformation, allowing for a more succesful transition to modern economic activities. This has been seen in section 2.3, particularly in the case of BPO-based growth and cooperation between business and academia, which allowed for more dynamic and innovative solutions. Second, education plays an important role in determining the outcome of a city. While cities begin with different levels of development, it would appear that posing highly ranked tertiary education institutes is important in the long-term prospects of an area, as suggested by the relatively high standardized coefficients that the variable possesses (varying around half a standard deviation). Thus, even as time passes educational centers continue to have a strong competitive advantage. Finally, as educational centers are located in major urban areas, those areas probably possess other advantages which are captured by the variable. Thus it is safe to assume that larger cities are net beneficiaries either of agglomerative or devolutionary processes, or both.

It is interesting to note that net changes in unemployment does not turn out to be significant, except in the first, fourth, fifth and sixth, and first, fourth and eight years for the Hoover and Theil indexes respectively (it is significant at 0.05 level except for the first year for the Hoover index and the fourth year for the Theil index).

The aggregate level of grants and subsidies is significant in almost all the years for all indexes. The exceptions to this are the fifth year in the Hoover Index, the third and fourth years in the Theil index, and the fourth and fifth years in the geographic concentration index. The grant coefficients are systematically negative indicating that poorer regions recieve more grants. This proves that the Polish grant scheme is equalizing. While this is explicitly stated as an aim in the legislation, it recomforting to see that practice appears to be following preaching. Furthermore the standardized coefficients for the grants variable are mostly quite important, reaching over one standard deviation (and being the second biggest after educational expenses), and being higher during periods of economic trouble.

5. Conclusion

The present study has been able to identify some salient mechanisms connecting the Polish system of decentralization and interjurisdictional inequality. To the extent of my knowledge no study exploring the relationship between decentralization and interjurisdictional inequality in Poland has been undertaken, making this an original contribution. Furthermore, very few studies have been made on the both the nature of decentralization in Poland and the levels of regional inequality during the period of analysis of this study have been made.

Both processes related to economic concentration and devolution have had a significant impact on the differences in regional development in Poland during the period of analysis, ranging from 1999 and 2006. In this period, interjurisdictional inequality increased according to all the measures used in the study. While the exact proportions and net effect of the increase in inequality attributed to devolutionary or agglomerative processes are difficult to measure, it has nevertheless been possible to identify some of the major issues involved.

Unsurprisingly, major cities are found to have a significant competitive advantage over their rural counterparts. This is particularly true in the case when the former possess an important base for the development of human capital and have organizational infrastructure to exploit its potential. Section 4.3 in particular has demonstrated that even at the voivodship level, such a development hub can provide significant, even crucial, support in transforming outdated industries (while the lack of such a center can result in the failure of major high-tech industrial, such as the Aviation Valley in the Subcarpathian Voivodship).

A further insight is that the partition era division of Poland's territory has much less

influence than many Poles believe. Indeed, both the east and the west of the country, generally speaking have depressed regions and 'isles of prosperity'. This may be an encouraging finding for many of the discouraged citizens of 'Poland B and C'. Similarly, distance to major cities is not a major determinant of development, indicating that growth can spread out beyond the lucky few.

In regards to the agglomerative processes measured by movement of human capital, neither changes in unemployment nor net migration seem to be strongly linked to regional inequality. Regarding the former, the present analysis seems to conclude that, during the period of analysis, unemployment was more determined by general national and internation trends than regional ones, indicating a low level of specialization. Furthermore, it is interesting to note that during periods of fall in GDP growth, the richer regions suffered from higher falls in the level of unemployment, although they started with lower levels (suggesting that the poorer ones may have had little room for rises in unemployment).

Migration also did not appear to be strongly linked to the level of development of a given region, suggesting that Polish worker's have low mobility. This may become a problem in the near future, as labor migration may become a constraint to the growth of the country's main economic centers. Indeed, due to its low levels of mobility, internal migration may not compensate for the deficiencies in human capital once unemployed human capital 'runs out'. This may be linked to the situation in the housing infrastructure in Poland, which is quite deficient, and has been an issue in recent electoral campaigns. An interesting finding is that emigration was found to be higher in richer regions in some years (particularly after 2004, the year of Poland's accession to the EU). This may suggest that the citizens of these regions had greater capacities to emigrate to outside of Poland. A second explanation for this trend is that due

to the ongoing process of reprivatization in Poland, significant numbers of people regained possession of estates from which they were evicted in the aftermath of the war or during the communist period, and moved out of the centers where they resided. Furthermore, the small significance of net migration in the models may indicate that Tieboutian 'voting with feet' was not a large scale phenomenon in Poland.

Although the level of desirable inter-regional inequality (if any) is extremely difficult to determine, the present study has a number of important implications for Poland's future policies. A first problem to address is the question of grants. Though they seem to have net equalizing effects, their usage may result in numerous types of inefficiences, meriting a comprehensive a regular overview of their results. Moreover, as the Polish system of decentralization is strongly expenditure oriented (own revenues represent at best half of subnational government's revenues), it is likely to encounter several related problems, such as the expansion of the public sector, potentially crowding private entreprise.

One of the biggest problems of the current devolutionary system in Poland is the appoach to education. Primary and secondary education in particular, are deeply affected by regional inequalities and they are likely to increase those inequalities in the future. Because of the high level of self-financing required of the regions, the level of primary and secondary schools is likely to detiriorate in many areas. In this sense the Polish system combines the worst of both worlds: the level of independence is not sufficient to allow for innovative solutions to be tested by creative school directors; the limited central funding, however, leads (and will continue to lead), to ever greater disparities between the level of basic schooling in wealthier and poorer areas. Thus, it contributes to the other problems related to maintaining a competent cadre of teachers and motivating them to work in rural areas. Some disparities are unavoidable, but the present system will increase them, reducing the chances of many rural children, lowering the general level of Polish primary and secondary education, and depressing long-term growth possibilities. Furthermore, it may lead to a race to the bottom situation destroying social cohesion and threatening the country's unity.

One issue to address, on the subnational level, is the links between academia and business. In particular the development of technology parks and special economic zones can take fully take advantage of those competitive advantages that some of the Polish urban centers possess. The development of special economic zones and economic centers can create regional motors. However, it would be unwise to attempt to spread out development based solely on the advantages of urban centers. Indeed, it is hardly reasonable to advise the creation of more educational centers in the country to 'even' out development as this may compromise the level of existing ones. Furthermore, this would not address the problem of most rural areas. However, the development of infrastructure, a major deficiency in Poland, should allow different parts of the country to integrate better, removing some of the constraints on growth imposed by economic (and often social) isolation. The question of who should be responsible for the latter is a major problem, as neither regional nor central governments have strong credentials in this area.

The major issues identified in this study of Poland merit comparative studies in other countries. Indeed, the current trend towards increasing inequality (both personal and regional) as well as the spread of glocalization, suggest that when constructed inappropriately, decentralized government can have a number of negative effects. These can lead to increased spatial segregation, possibly within a 'race to the bottom'-type framework. This could lead to a two-speed world in which wealth becomes increasingly concentrated in small areas of the globe, leading not only to economic problems, but also political ones. In order to increase the

understanding of these processes, however, further research is required. An important issue to address is the matter of measuring agglomerative forces. Indeed, it would be highly useful to include capital movements into the analysis. Furthermore, a more indepth analysis, either on the entire population of smaller subnational units, or indepth case studies, could allow for a better picture of the mechanisms at work. A greater time-span would allow to identify trends more clearly. Finally, a greater amount of aspects of decentralization, in particular the effects on the provision of other types of public goods, should be taken into consideration in order to develop a broader understanding of the often interconnected processes involved.

Appendix A: Polish Electoral Map

Map 1: Polish Electoral Map (Polish Legislative Elections 2007) with Superimposed Contours of the Imperial German State (1871-1918)



Source: http://strangemaps.wordpress.com/2008/12/15/348-an-imperial-palimpsest-on-polands-electoral-map/ (accessed 21.05.2009)

Appendix B: Evolution of Interjurisdictional Inequality in Poland



Map 2: Inequality in Poland 1999 (left), and 2006 (right)

Key: Dark Blue: development index³⁷ 0-0.5; Blue: development index 0.5-1; Light Blue: 1-1.5 Light Red: development index 1.5-2; Red: development index 2-2.5; Dark Red: 2.5-3

Source: Own calculations based on Central Statistical Office Yearbook (1999-2006)

Appendix C: Administrative Division of Poland



Map 3: Administrative Division of Poland After 1999

Source: Polish Agency for Foreign Investment; The black, red and blue lines show voivodship, powiat and gmina delimitations respectively
Appendix D: Changes In Railway Infrastructure in Poland





Source: Polish Information and Foreign Investment Agency (2006)





Key: Black: built 1842-1880; Pink: built 1885-1918; Yellow: built 1919-1944 Blue: built 1945 Source: Wielka Encyklopedia PWN (2003)

Appendix E: Overview of Polish Voivodships³⁸

Greater Poland is often known as the cradle of the Polish nation, containing within its borders Poland's first capital, Gniezno. It is also one of the biggest voivodships, both demographically (3rd) and by area (2nd). Centered on Poznan, it has traditionally been one of the motors of the Polish economy. The city is home to some of the country's most presitigious educational institutions. These are well intergrated into the local economy, in part due to the Poznan Science and Technology Park. With a well developed local infrastructure, and good connections both to Germany and the rest of Poland, Greater Poland is a logistical center sometimes refered to as the bridge between Poland and the West. Since the transition to capitalism, the region has recieved a substantial portion of the country's FDIs, and developed a solid automotive industry and captured a large portion of BPO.

The Kuyavian-Pomeranian Voivodship is one of the two Polish voivodships with dual capitals (the other being the Lubusz Voivodship), with the Bydgoszcz serving as the seat of the Voivode, while Torun houses the regional assembly. Due to the small distance separating the two cities, Bydgoszcz and Torun have recently undertaken measures to form a common metropolitan area. Both cities house important Polish universities, notably the Mikolaj Kopernik University in Torun, named after the cities most famous resident. Torun is also one of the voivodship's main tourist attractions. The high level of human capital has resulted in important developments in high technology industries, particularly due to the special economic zones, as well as the Torun Technology Park and Technology Transfer center. The voivodship also has a tradition in the Chemicals and Mechanical industries.

Lesser Poland is arguably the country's main cultural and historic center. Centered on Krakow, Poland's former capital and loaction of its oldest and most presitigious university (the Jagellonian University), the region is also Poland's major tourist destination. Apart from the capital, the voivodship also contains 10 national parks, as well as Zakopane, Poland's winter capital and prime ski destination. It also contains to world heritage sites, the Wielicaka Salt Mine (an underground church carved in rock salt), and the infamous Auswitz-Birkenau concentration camp. The proximity of the of the aviation hub in the Subcarpathian voivodship and Silesia (major industrial area of Poland), have resulted in the development of numerous sub-contractors to the automotive and aviation industries (primarily the latter). Due to significant resources in human capital, Krakow has also become a center of research and development, with strong links between business and academia. This has been further developed thanks to the 'Jagiellonski Park and Incubator Technology', a technology park. As an educational and artistic center, Krakow has a highly active student population, with a substantial impact on national political developments.

Located at the center of Poland the Lodz is the capital of the eponymous voivodship. Having developed in the 19th century, Lodz became an industrial center under the Russian Empire (being the fifth biggest city in 1897). During the communist period the voivodship was a major center of light industry, whilst maintaining high agricultural productions. The voivodship underwent a difficult transition after the collapse of communism with a collapse of substantial amounts of indutrial production and few investments. This trend has only begun reverse in recent

³⁸ Data obtained from the Polish Agency for Information and Foreign Investment, voivodship websites and (Davies, 1981)

years, despite the creation of special economic zones have been created in the voivodship to attract foreign capital. Lodz is also Poland's cinematographic capital, with the renowned Lodz Film School having produced a vast majority of the country's top film-makers, and baptising the institution "HollyLodz".

The Lower Silesian Voivodship is part of the recovered lands having previously belonged to Germany. Its capital, Wroclaw, has recently recently been dubbed the "civilizational capital of Poland", by the current Prime Minister, Donald Tusk. The Prime Minister argued his claim on the basis of Wroclaw's achievements in terms of creating a vibrant educational base (becoming the chief competitor to Budapest for the site of the European Institute of Technology project), as well as the region's ability to effectively transform the communist-era industries and embrace new economic activities. Indeed, the electro-mechanical and automotive industries developed under communism have transformed succesfully, partially due to the ability to foster productive connections between business and academia. Further advantages of the region are its solid infrastructure and high urbanization.

The Lublin Voivodship is located along the Ukrainian and Belarussian borders in Eastern Poland. As a result the capital, Lublin, is a logistical center for trade between Poland and its Eastern neighbours. However, although it is located along a transit corridor to Western Poland, the region's poor internal infrastructure is a constraint to development. The region is also traditionally engaged in the mechanical industry, producing passenger cars and trucks, as well as food processing due to the important Home to two of Poland's major universities, Lublin is also a regional educational hub. This has led to developments in the BPO sector.

The Lubusz Voivodship is the second of Poland's bi-central regions, with the Governor's seat in Gorzow Wielkopolski and the Regional Assembly housed in Zielona Gora. The voivodship is heavily forested (48% of woodlands), which has resulted in the development of a sizable timber industry, providing a range from raw materials to finished products. Other economic activities in the region include the production of electronnic components (originating in the communist a having transformed relatively well), as well as food processing.

Centered on Warsaw, Masovia is Poland's largest voivodship, both in population and size. It is the country's most rapidly developing region and main economic center of the country; the voivodship contains the headquarters of 43 of Poland's top one hundred companies and around 30% of foreign corporations. The Warsaw Stock exchange makes it not only Poland's financial center, but also one of growing regional importance (the only one in Central Eastern Europe to reach the depth and liquidity of western stock markets). It has been a prime choice for BPO, and has also recently developed significantly in the building and construction sector, with numerous EU-subsidized investments. The Masovian Voivodship also remains a major Polish agricultural region, making food processing an important activity. The voivodship also benefits from its special economic zones and a number of legal arrangements. Indeed, even the part of the grants which are re-transfered to subnational governments are transfered through Warsaw and many companies register there due to tax incentives while primarily conducting operations in other areas of Poland.

The Opole Voivodship is nestled between the regions of Silesia proper and Lower Silesia. This strategic position, between two economic powerhouses, and with good infrastructural connections to the rest of the country is a clear advantage of the voivodship. However, it has not had an extremely strong effect on the region's economic sectoral composition, which has remained dominated by the traditional activities of the region: metallurgy, food processing, and the chemical industry. In recent years the construction sector has also turned into a major regional industry. The voivodship is home to Poland's biggest ethnic-German minority.

The Podlasie Voivodship runs along the Belarussian border from which it is separated by the Bialowieza National Park, a UNESCO World Heritage site and major tourist attraction in the region. The voivodship is sparsely populated and is highly dependent on agriculture, making food processing one of the most important economic activities. A further important activity in the region is the production of agricultural machines. The region is set back by its poorlydeveloped infrastructure.

Pomerania is perhaps best known for its capital city Gdansk. A major shipbuiding center of the previous Eastern Bloc, it was also the site of Poland's final push against its communist leaders. In the years following the transition to capitalism, this back-fired as many investors were wary of the region's high-profile trade-unions. However, in recent years the voivodship's main metropolitan area, the Tricity area (including the eponymous Gdanks, Gdynia and Sopot), has witnessed high growth and become an economic motor of the country. The metropole, comprising over half of the voivodship's inhabitants, is a major logistical center and major destination for BPO (due to the numerous educational facilities). Oil extraction and refining consitute part of the region's maritime economy, an important source for employment. The voivodship also encompasses the historical region of Cassubia. Cassubs constitute one of Poland's traditional ethnic minorities, with a distinct language and culture. Cassubia is part of the region's tourist attractions (an activity of growing importance in recent years), which also include martime national parks, and the world's largest brick castle in Malbork.

The Silesian Voivodship is the Poland's second largest in terms of population. Contrary to common knowledge, it is also home to Poland's biggest urban agglomeration, the Upper Silesian Coal Basin, with a population of around 3.5 million (the core of which is currently planning to form a metropolitan union under the unofficial name, Silesia – population 2.7 million). It is traditionally one of the most specific Polish regions. Highly urbanized, with a dense infrastructure and a concentration of heavy industry which developed around the region's coal mines. After the collapse of communism the mining industry went into crisis depressing the region's development. In recent years, however, the voivodship has been undergoing a boom particularly in BPO, high tech industries and automotives. This is partially due to the region's numerous educational facilities (7 major universities, 48 tertiary education institutes), and the development of special economic zones, entreprenurial incubators and technology parks. It is also the Polish region with the highest separatist tendencies, with a movement (the Movement for Silesian Autonomy), calling for greater autonomy based on historical, cultural and ethnic specificities, which it claims distinguish Silesians from Poles³⁹.

The Subcarpathian Voivodship is located in the southeastern corner of Poland, neighboring Ukraine. As a mountainous region with many historic cities, it has attracted increasing levels of tourism of the past years. Traditionally a mining area, the Subcarpathian voivodship has deposits of sulphur, crude oil, natural gas, sandstone and lime. The voivodship is also home to the Aviation Valley (*Dolina Lotnicza*), Poland's aviation hub since 1919, concentrating over 90% of the sector in Poland. It is currently a special economic zone with, amongst others, lower company taxes. Over recent years the Subcarpathian Voivodship has seen

³⁹ It also suggests that, due to the specific configuration of Silesia's features, a binary variable may be useful in subsequent regression analyses.

some investements in the IT sector.

The Swietokrzyskie Voivodship takes its name from the mountain range that covers a large portion of its surface. Due to the well-preserved swathes of natural terrain (covering 66% of the region's surface), the area is one of the traditional *sanatorium* (health recuperation), regions of Poland. As a result of its natural endowments, the voivodship is also engaged in agriculture and metallurgy, both suffering from a decline in the past years. In recent times, building and construction have replaced traditional industries, partially due to large deposits of cement and plaster, creating a regional hub around Kielce, the capital. The voivodship also contains the country's only center for satellite services and its second largest trade fair complex.

The Warmian-Masurian Voivodship, although located in Poland's northeast, is also largely constituted of recovered lands (Warmia-Masuria covers historical Prussia). The landscape is dominated by woodlands and over 2000 lakes, resulting in the region's 'ecotourism' appeal. As a result the voivodship is also heavily engaged in the timber industries and food processing. With both a low population and low degree of urbanization, Warmia-Masuria has a high portion of people engaged in agriculture and is also one of Poland's poorer regions.

Situated at the northwestern exterme of Poland, the West Pomeranian voivodship consitutes part of the *ziemi odzyskane* (recovered lands), annexed from the Third Reich. Its capital, Szczecin, was the center of Poland's second biggest shipbuilding hub. After the fall of communism this activity has suffered a slow demise (although it has been recovering), and has been recently replaced by BPO (business process outsourcing), thanks to the concentration of educational facilities around Szczecin. Covered by swathes of woodland, the voivodship is also active in the timber industries, in terms of raw, semi-processed or final components. Although Szczecin has the potential to become one of Poland's major logitic centers (with access to the Baltic sea and good connections to Western Europe), the lack of connections to other Polish cities (no planned highway connections), has hampered growth.

Annex F: Description of Data

Variable	Values	Source
Inequality measured by	From008466857 (below average development) to	Own calculations based on
the Hoover Index	.90204753 (above average development)	data from the Central Statistical Office of Poland 1999-2006
Inequality measured by the Theil Index	From579106677 (below average development) to 1.108455548 (above average development)	Own calculations based on data from the Central Statistical Office of Poland 1999-2006
Inequality measured by the Geographic Concentration Index	From024838250 (below average development) to .132994190 (above average development)	Own calculations based on data from the Central Statistical Office of Poland 1999-2006
East West Binary variable	From 0 (predominantly influenced by the Russian and Habsburg Empires during partition period) to 1 (predominantly influenced by Germany during partition period)	Devised based on historical accounts from Davies (1981)
Distance to center	From 0 miles (the subnational unit is the regional center), to 77.041 miles (far from regional center)	Own calculations using Distance Calculator on Google Maps Distance Calculator
Educational Centers	From 0 (lack of any noteworthy tertiary educational institutions) to 19.47 (major educational center)	Own calculation based on Wprost Higher School Rankings 1999-2006
Unemployment changes	From -19069 (strong fall in the number of unemployed) to 34998 (strong rise in the number of unemployed)	Own calculations based on data from the Central Statistical Office of Poland, Regional Data Bank, 1999- 2006
Net migration	From -2054 (substantially more immigrants than emigrants), to 8359 (substantiall less immigrants than emigrants)	Own calculations based on data from the Central Statistical Office of Poland, Regional Data Bank, 1999- 2006
Education Expenses	From 133.62 mln pln (low expenses on education) to 1,751.84 mln pln (high expenses on education)	Own calculations based on data from the Central Statistical Office of Poland, Regional Data Bank, 1999- 2006
Aggregate Grants	From 150.55 mln pln (low level of grants) to 1,264.42 mln (high level of grants)	Own calculations based on data from the Central Statistical Office of Poland, Regional Data Bank, 1999- 2006

Table 6: Description of Data

Appendix G: Results of Regression Analyses

Multiple linear regressions have been run on the collected data in order to determine the relationships between the chosen dependent and independent variables. The following table (Tables 7 through 15) provides a summary of the results obtained through this analysis. The unstandardized coefficients have not been included as the variables are coded on highly divergent scales, rendering the comparaison difficult in some cases.

	Hoover Index	Theil Index	Geographic Concentration Index
			Concentration Index
Constant (unstandardized)	009	430	014
West/East	.090	.332**	.034
Distance to Center	.029	142	204**
Education Centers	.362**	.248*	.287**
Unemployment Change	148**	204*	106
Net Migration	129*	.104	049
Education Expenses	1.472**	.541**	1.093**
Grants	-1.053**	092	645**
R Square	.875	.731	.838
Adjusted R Square	.860	.698	.819
F-test	57.875**	22.496**	42.993**
Std. Error of the Estimate	.004143123670	.165579299624	.008582045911

 Table 7: Regression Analysis 1999

** Significant at 0.01 level

* Significant at 0.05 level

From the table above we can observe that the independent variables account for a large portion of the variance of the respective dependent variables, with R Square values between .698 to .86. The high values of the F-statistics suggest that the models are significant at a 0.01 level. For the Hoover Index, the presence of education, net unemployment changes, net migration, educational expenses and aggregated grants are found to be significant (all at 0.01 level, except net migration, significant at a 0.05 level). The results indicate that an increase of one standard deviation in the strength of educational centers corresponded to an increase of .362 standard deviations in the level of inequality as measured by the decomposed Hoover index. An increase of one standard deviation in unemployment corresponded to -.148 standard deviations change in the level of inequality, indicating that increases in unemployment led to a fall of the relative position of the regions in that year. In regards to net migration, according to the analysis, an increase of one standard deviation in net migration corresponds to a decrease of .129 in the inequality contribution, which is an unexpected result. This may be due to the greater mobility of citizens in richer areas, which allowed them to move to Western countries. An increase of one standard deviation in educational expenses is corresponds to an increase of 1.472 standard deviations in the inequality measure, suggesting that richer areas spent more on educational expenses. Finally, an increase of one standard deviation in the level of grants corresponds to a decrease of 1.053 standard deviations, signalizing that grants tend benefit poorer regions disproportionately.

For the multiple linear regression using inequality as measured by the Theil Index, the distance to center, the net migration and the grants variables are found to be insignificant. The last of these is highly surprising, possibly due the lower importance accorded to rich areas which receive very low levels of grants and subsidies. This would suggest that the Polish system of grants is not as equalizing as first indicated. The East/West dummy variable is found to be significant at 0.01 level with a standarized coefficient of .332, indicating that being located in the west of Poland increases the inequality component contribution by .332 standard deviations. This suggests that after reducing the impact of isles of prosperity in the east and depressed regions in the west, the level of development was still influenced by the partition period of Poland's history in 1999. Education is found to be significant at 0.05 level, with an increase of one standard deviation of the value of educational centers being linked to .248 standard deviations in the level of inequality. The lower significance and standardized coefficients than in the case of the model using the Hoover index as dependent variable, indicate that although educational centers are linked to above averagely developed regions, this is more the case in the extremes than a general tendency (which is expected as these centers appear only in major cities). Unemployment changes are found to be significant at a 0.05 level, with a standardized coefficient of -.204. This shows that one standard deviation increase of unemployment changes corresponded to -.204 standard deviations in the level of inequality. Finally, educational expenditures were found to be related to the level of development at 0.01 level. The variation of this variable has the storngest link to the variation of the dependent variable, with an increase of one standard deviation corresponding to an increase of .541 standard deviations in the region's contribution to the inequality index.

In the model with the GCI as the dependent variable distance to center, educational centers, educational expenditures and grants are all significant at 0.01 level. The fact that many relatively poor, large areas (such as in the West Pomeranian Voivodship), are located in west, while small relatively rich regions (around Krakow and Warsaw for example), are situated in the east, renders the east/west dummy insignificant. Changes in unemployment and net migration also appear to have little impact on a region's level of development. This is probably due to the lack of balance between population and area of a region. However, distance to center is significant, with a change of one standard deviation corresponding to a decrease of .204 standard deviations in the level of inequality (logical since areas around cities not only tend to be richer, but also smaller). Educational centers have a positive impact on a region's development, with an increase of one standard deviation of each being linked to a change of 1.093 and -.645 standard deviations respectively (it is interesting to note that both coefficients are quite high).

	Hoover Index	Theil Index	Geographic Concentration Index
Constant (unstandardized)	008	006	010
West/East	.045	084	006
Distance to Center	.002	.110	232**
Education Centers	.514**	.499**	.352**
Unemployment Change	.099	041	.141
Net Migration	109	229**	024
Education Expenses	1.221**	1.484**	.901**
Grants	-1.002**	-1.188**	623**
R Square	.885	.841	.840
Adjusted R Square	.871	.822	.821
F-test	63.500**	43.986**	43.525**
Std. Error of the Estimate	.003998069214	.004392310042	.008579603644

Table 8: Regression Analysis 2000

** Significant at 0.01 level * Significant at 0.05 level

* Significant at 0.05 level

The independent variables in the three regression models used in the analysis for the year 2000 explain a significant portion of the variance of the dependent variables. Indeed, the analyses give adjusted R-Square values of .871, .822, and .821 for the models using the Hoover Index, the Theil Index and GCI respectively. Furthermore, the high levels of the F-test show that the models used are significant at 0.01 level. In the model using the Hoover Index, the West/East dummy, the distance to center, changes in unemployment and net migration are found to be insignificant. This suggests that neither historical criteria nor agglomerative processes played a significant role in directing resources towards certain regions. On the contrary, educational centers, educational expenses and grants are significant at a 0.01 level. An increase of one standard deviation in the level of the educational centers in a given regions corresponds to an increase of .514 standard deviations in the level of development as measured by the Hoover index. Educational expenditures appear to be highly related with the level of inequality. Indeed, an increase of one standard deviation in the level of educational expenses corresponds to an increase of 1.221 standard deviations in the inequality contribution (indicating that richer areas spend significantly more on education). On the other hand, an increase of one standard deviation in aggregate grants corresponds to a decrease of the 1.002 in the level of development (signaling that poorer regions get more than a proportionate share of aggregate grants).

In the model using the Theil index as dependent variable, the West/East dummy, the distance to center and changes in unemployment are found to have no significant impact on the level of inequality (or inequality on them). Education centers are found to be significant at a 0.01 level, with a standard deviation increase in the importance of educational centers corresponding to .499 increase in the development of regions as measured by the Theil Index. Net migration is also significant at a 0.01 level. A increase of one standard deviation in the net level of migration is linked to an decrease .299 in the level of inequality. This is surprising and may once again be the result of greater mobility of the citizens of more developed regions (who chose to migrate to Western countries), though not the most developed ones (otherwise net migration and grants are also significant at 0.01, with one standard deviation in those variables corresponding to an increase of 1.484 standard deviation in the level of contribution to the inequality measure in the

case of education expenses and a decrease of 1.188 in the level of development in the case of grants.

In the model using the GCI as dependent variable, the educational center, distance to center, educational expenses and grants are all found to be significant at 0.01 level. The distance variable shows that regions closer to centers have an above-average level of development, as an increase of one standard deviation in the distance variable is linked to a decrease of .232 standard deviations in the level of GCI. An increase of one standard deviation in the educational center variable corresponds to an increase of .352 in the inequality measure. Educational expenses are postively related to the level of development, with one standard deviation corresponding to an increase of .901 standard deviations in the level of grants corresponds to a decrease of .623 in the level of development.

	Hoover Index	Theil Index	Geographic Concentration Index
Constant (unstandardized)	008	372	12
West/East	004	.255**	026
Distance to Center	050	202*	266**
Education Centers	.734**	.475**	.532**
Unemployment Change	.206	.134	.130
Net Migration	134	.098	040
Education Expenses	.873**	.030	.598**
Grants	906**	.079	455*
R Square	.787	.697	.763
Adjusted R Square	.761	.660	.734
F-test	30.606**	19.042**	26.668**
Std. Error of the Estimate	.005389669391	.184813987802	.010339920799

Table 9: Regression Analysis 2001

** Significant at 0.01 level

* Significant at 0.05 level

In the multiple linear regression models for the year 2001, one can observe once again both high adjusted R-Squares (between .761 and .660), indicating that a substantial portion of the variation of the dependent variables is explained by the independent variables. High F-test levels indicate that the models are significant at 0.01 levels.

In the case of the model using the Hoover Index as dependent variable the west/east, distance to center, unemployment changes and net migration variables are found to be insignificant. The Educational center variable is significant at 0.01 level, an increase of one standard deviation in the educational center variable corresponds to an increase of .734 standard deviations in the inequality measure. Educational expenditures are also significant at 0.01 level, with an increase of one standard deviation corresponding to an increase of .873 standard deviations in the level of inequality. Finally, the variable to measure grants is significant at 0.01. An increase of one standard deviation signals a decrease of .906 standard deviations in the region's contribution to the inequality measure.

For the model using the Theil Index as a dependent variable the changes in unempolyment, net migration, educational expenses, and grants are all found to be insignificant, a highly surprising result. The year 2001 corresponded to the middle of the dotcom crash (see Appendix 3), the analogic fall in GDP growth may be responsible for this surprising result. As cities that had previously embraced the third industrial revolution the strongest were also hit the most significantly (for example those that had made the transition from industry to services the most effectively). This resulted in such features as the west/east to resurface as determinants of the regions relative position. Indeed, the west/east binary variable was significant at 0.01 level, with the fact of being in the west corresponding to .255 standard deviation increase in the average values of the regions contribution's to the inequality measure. The distance to center is also significant, albeit at 0.05 level, with one standard deviation increase in distance from the center corresponding to a fall of .202 standard deviations in the level of the region's development. Finally, the educational centers are also significant at 0.01 level, with an increase of one standard deviation corresponding to an increase of .475 standard deviations in the level of inequality as measured by the Theil index. This indicates that during the crisis cities maintained their distinctive advantage in terms of development.

In the case of the model which uses the GCI as dependent variable, one can observe that once again the educational center, distance to center, educational expenses and grants are all found to be significant at 0.01 level. The distance variable shows that regions closer to centers have an above-average level of development, as an increase of one standard deviation in the distance variable is linked to a decrease of .266 standard deviations in the level of GCI. An increase of one standard deviation in the educational center variable corresponds to an increase of .532 in the inequality measure. In the case of educational expendituress one standard deviation corresponding to an increase of .598 standard deviations in the level of inequality as mesured by the GCI. Finally, an increase of one standard deviation in the level of grants was related to a decrease of .455 in the level of development.

	Hoover Index	Theil Index	Geographic Concentration Index
Constant (unstandardized)	012	336	014
West/East	.004	.174*	029
Distance to Center	.047	110	206*
Education Centers	.515**	.381**	.382**
Unemployment Change	.181*	.276**	.145
Net Migration	035	.145	.017
Education Expenses	1.152**	.062	.716**
Grants	826**	.080	368
R Square	.813	.711	.799
Adjusted R Square	.791	.677	.775
F-test	36.118**	20.425**	32.976**
Std. Error of the Estimate	.005231900374	.170958168125	.009748116000

 Table 10: Regression Analysis 2002

** Significant at 0.01 level

* Significant at 0.05 level

The independent variables in the three regression models used in the analysis for the year 2002 explain a significant portion of the variance of the dependent variables, with adjusted R-Square values of .791, .677, and .775 for the models using the Hoover Index, the Theil Index and GCI respectively. Moreover, the high levels of the F-test show that the models used are significant at 0.01 level.

In the model using the Hoover Index as dependent variable, the west/east, distance to center and net migration variables are found to be insignificant. The educational center variable is significant at a 0.01 level, with an increase of one standard deviation corresponds to .515 standard deviations in inequality as measured by the Hoover Index. The change in unemployment variable is significant at 0.05 level, with increases of one standard deviation the contributions to the inequality increase by .181. This is surprising and may be due to the fact that richer areas, which were more dependent on such economic activities as BPO, which were affected by the crisis to a greater extent. Thus, more developed areas seem to have been harder hit by rising unemployment. A further two variables that were found to be significant in the model at 0.01 level were educational expenses and grants. An increase of one standard deviation in the level of educational expenses corresponds to 1.152 standard deviations higher levels in the inequality measured by the Hoover index. In regards to grants, an increase of one standard deviation deviation corresponds to a decrease of .826 in the level of inequality.

The west/east, unemployment change and educational center variables are significant in the model for 2002 using the Theil index as dependent variable (the first at 0.05 level, the other two at 0.01 level). This presupposes similar mechanisms at work as in the previous year. The fact of being historically part of western Poland corresponds to .174 standard deviations higher levels of development, as mesured by the Theil Index. An increase of one standard deviation in the educational center variable corresponds to an increase of .381 in the inequality measure. Similarly, an increase of unemployment of one standard deviation corresponds to an increase of .276 standard deviations in the inequality variable. This confirms the idea that the economic crisis had a more severe impact on unemployment in more developed areas (who had lower levels to begin with).

In the model using the GCI as dependent variable, the west/east, unemployment changes, net migration and grants variables are found to be insignificant. The distance to center variable is significant at a 0.01 level. An increase of one standard deviation in this variable corresponds to a decrease of .206 standard deviations in the level of inequality measured by the GCI. Educational centers are found to be significant at a 0.01 level, and play a beneficial role, with an increase of one standard deviations in the regions contribution to the inequality measure. Finally, the level of educational expenses is significant at 0.01 level. An increase of one standard deviation in the level of educational expenses is significant at 0.01 level. An increase of one standard deviation in the level of educational expenses is significant at 0.01 level. An increase of one standard deviation in the level of educational expensions corresponding to an increase of interval.

	Hoover Index	Theil Index	Geographic Concentration Index
Constant (unstandardized)	014	269	017
West/East	.113	.200*	.028
Distance to Center	.073	243**	192*
Education Centers	.573**	.535**	.444**
Unemployment Change	171*	.029	022
Net Migration	.254**	078	.137
Education Expenses	.575	.960**	.532
Grants	305	782*	198
R Square	.766	.734	.768
Adjusted R Square	.738	.702	.740
F-test	27.138**	22.879**	27.470**
Std. Error of the Estimate	.005987066675	.168576663856	.010531544805

 Table 11: Regression Analysis 2003

** Significant at 0.01 level

* Significant at 0.05 level

The independent variables in the three regression models used in the analysis for the year 2003 explain a significant portion of the variance of the dependent variables. Indeed, the analyses give adjusted R-Square values of .738, .702, and .740 for the models using the Hoover Index, the Theil Index and GCI respectively. Furthermore, the high levels of the F-test show that the models used are significant at 0.01 level.

In the model using the Hoover Index, the West/East dummy, the distance to center, educational expenditures and grants are found to be insignificant. This is an unexpected result, suggesting important differences either in the levels of inequality or public finances in that year (neither of which appear to be the case from the previous research). On the other hand, educational centers, unemployment changes and net migration are significant (all at a 0.01 level except for changes in unemployment, significant at a 0.05 level). An increase of one standard deviation in the level of the educational centers in a given regions corresponds to an increase of .573 standard deviations in the level of development as measured by the Hoover index. An increase of one standard deviations in the level of unemployment changes corresponds to an decrease of .171 standard deviations in the inequality contribution (indicating that richer areas had more important falls in unemployment). On the other hand, an increase of one standard deviation in net migration corresponds to an increase of the .254 in the level of development (signaling that richer regions had positive net migration).

In the model using the Theil index as dependent variable, net migrations and changes in unemployment are found to have no significant impact on the level of inequality (or inequality on them). The west/east variable is significant at 0.05 level, with being in the west corresponding to .200 standard deviations higher levels of development as measured by the Theil Index. Distance to center is significant at 0.01, with an increase of one standard deviation signalling a decrease of .243 standard deviations in the inequality measure component. Education centers are found to be significant at a 0.01 level, with a standard deviation increase in the importance of educational centers corresponding to .535 standard deviations increase in the development of regions as measured by the Theil Index. The education expenses variable is also significant at a 0.01 level. A increase of one standard deviation in the net level of expenses is linked to an increase of .960 in the level of inequality. Finally, grants are also highly significant (at 0.01 level), with an increase of one standard deviation corresponding to a decrease of .782 in the level

of development.

In the model using the GCI as dependent variable, only the educational center, and distance to center variables are found to be significant (at 0.05 level for the former and at 0.01 level for the latter). This is an unexpected result, confirming some suspected distortions in comparaison to previous years (in regards to educational expenditures and grants in particular). The distance variable shows that regions closer to centers have an above-average level of development, as an increase of one standard deviation in the distance variable is linked to a decrease of .192 standard deviations in the level of GCI. An increase of one standard deviation in the educational center variable corresponds to an increase of .444 in the inequality measure.

	Hoover Index	Theil Index	Geographic Concentration Index
			Concentration math
Constant (unstandardized)	009	176	007
West/East	.071	.161*	033
Distance to Center	.138*	156	152**
Education Centers	.330**	.362**	.272**
Unemployment Change	.128*	059	.022
Net Migration	079	198*	129*
Education Expenses	1.428**	1.224**	1.359**
Grants	902**	947**	881**
R Square	.894	.769	.889
Adjusted R Square	.881	.741	.875
F-test	70.046**	27.605**	66.112**
Std. Error of the Estimate	.003806411437	.158299968183	.007115367966

Table 12: Regression Analysis 2004

** Significant at 0.01 level

* Significant at 0.05 level

In the multiple linear regression models for the year 2004, one can observe once again both high adjusted R-Squares (between .881 and .741), indicating that a substantial portion of the variation of the dependent variables is explained by the independent variables. The high F-test values, indicate that the models are significant at 0.01 levels.

For the model based on the Hoover Index, education centers, education expenses and grants are found to be significant at 0.01 level, while the distance to center and unemployment change variables are significant at 0.05 level. The closer to the center the better developed a given region, with one standard deviation increase corresponding to an increase of .138 standard deviations in the inequality measure. Similarly educational centers are positively linked to development, with one standard deviation increase leading to an increase of .330 standard deviations. Unemployment fell slower in richer areas in this period (possibly due to new funding and markets from farmers due to EU accession), as one increase in the level of unemployment corresponded to an increase of .128 in the inequality measure. Once again educational expenses and grants have the strongest relationship with the level of inequality. One standard deviation increase in the level of educational expenses corresponds to an increase in the relative unit-level of inequality of 1.428 standard deviations. An increase in the level of government grants leads to a decrease of .902 in the inequality component.

The east/west, educational center, net migration education expenses and grants variables are significant in the model for 2004 using the Theil index as dependent variable (the east/west

dummy and net migration at 0.05 level, the others at 0.01 level). The fact of being historically part of western Poland corresponds to .161 standard deviations higher levels of development, as mesured by the Theil Index. An increase of one standard deviation in the educational center variable corresponds to an increase of .362 in the inequality measure. An increase of net migration of one standard deviation corresponds to an decrease of .198 standard deviations in the inequality variable (thus more people migrated from richer areas). Educational expenses were strongly related to the level of development, with an increase of one standard deviation corresponding to an increase of 1.224 standard deviations in the inequality measure. Grants also had a strong relation with the level of development, one standard deviation increase being linked to decrease of .947 standard deviations in the level of development.

In the case of the model which uses the GCI as dependent variable, one can observe that once again the educational center, distance to center, educational expenses and grants are all found to be significant at 0.01 level, and net migration at 0.05 level. The distance variable shows that an increase of one standard deviation in the distance variable is linked to a decrease of .152 standard deviations in the level of GCI. An increase of one standard deviation in the educational center variable corresponds to an increase of .272 in the inequality measure. Migration seems to have occurred from richer areas (as in the case of the model using the Theil index). This may have been accrued by Poland's accession to the EU. In the case of educational expendituress one standard deviation corresponds to an increase of 1.359 standard deviations in the level of inequality as mesured by the GCI. Finally, an increase of one standard deviation in the level of grants was related to a decrease of .881 in the level of development.

	Hoover Index	Theil Index	Geographic Concentration Index
Constant (unstandardized)	010	169	006
West/East	.013	.127	072
Distance to Center	.160**	151	138**
Education Centers	.316**	.352**	.244**
Unemployment Change	007	107	054
Net Migration	048	188*	121*
Education Expenses	1.362**	1.049**	1.282**
Grants	848**	807**	814**
R Square	.900	.782	.910
Adjusted R Square	.888	.755	.899
F-test	74.719**	29.689**	83.866**
Std. Error of the Estimate	.003973938595	.156756699316	.006605284987

 Table 13: Regression Analysis 2005

** Significant at 0.01 level

* Significant at 0.05 level

In the multiple linear regression models for the year 2005, we can observe once again both high adjusted R-Squares (between .899 and .755), indicating that a substantial portion of the variation of the dependent variables is explained by the independent variables. High F-test levels show that the models are significant at 0.01 levels.

For the model using the Hoover Index as independent variable, the distance to center is found to be significant at 0.01 level, with one standard deviation increase corresponding to an increase of .160 standard deviations in the inequality measure. Education centers are also

significant at a 0.01 level, with one standard deviation increase corresponding to .316 standard deviations of increase in the level of development as measured by the inequality measure. The educational expenses and grants variables are also highly significant, at 0.01 level. An increase of one standard deviation in the level of educational expenses corresponds to an increase of 1.362 standard deviations in the measure of inequality, a high level. Grants also have a strong relation with the level of regional development; one standard deviation increase in the level of grants corresponds to a decrease of .848 in the level of development.

In the model using the Theil index as depedendent variable, the education centers, educational expenses and grants are found to be significant at a 0.01 level. Net migration is found to be significant at a 0.05 level. An increase of one standard deviation in the measure of educational centers corresponds to an increase of the .352 in the measure of inequality. Educational expenses were strongly linked to the level of regional development; one standard deviation increase in the level of educational expenses corresponds to an increase of 1.049 standard deviations in the level of regional development. Similarly, the level of grants is also highly linked to interjurisdictional inequality; an increase of one standard deviation in the level of grants corresponds to a decrease of .807 standard deviations in the inequality measure. Finally, the net migration variable suggests that more people migrated from richer areas, as one standard deviation increase in net migration corresponds to a decrease of .188 in development

In the model using the GCI as dependent variable, the educational center, distance to center, educational expenses and grants are all found to be significant at 0.01 level. An increase of one standard deviation in the distance variable is linked to a decrease of .138 standard deviations in the level of GCI. An increase of one standard deviation in the educational center variable corresponds to an increase of .244 in the inequality measure. An increase of one standard deviations in the level of inequality as mesured by the GCI. An increase of one standard deviation in the level of grants corresponds to a decrease of .814 in the level of development. Finally, an increase of one standard deviation in the level of regional development.

	Hoover Index	Theil Index	Geographic Concentration Index
Constant (unstandardized)	011	200	008
West/East	.003	.074	087
Distance to Center	.158**	135	129**
Education Centers	.309**	.311**	.218**
Unemployment Change	014	180*	071
Net Migration	054	223**	143**
Education Expenses	1.271**	1.111**	1.273**
Grants	776**	908**	817**
R Square	.887	.803	.918
Adjusted R Square	.873	.780	.908
F-test	64.881**	33.877**	92.729**
Std. Error of the Estimate	.004315745109	.151006141593	.006375085956

 Table 14: Regression Analysis 2006

** Significant at 0.01 level

* Significant at 0.05 level

In the final set of models, analyzing the data for 2006, we find that the independent variables explain significant portions of the variation of the dependent variables. Indeed, adjusted R-Square levels are between .908 and .780. Moreover, an observation of the F-test statistics indicates that the models are significant at 0.01 level.

In the model using the Hoover Index, the West/East dummy, changes in unemployment and net migration are found to be insignificant. On the contrary, distance to center, educational centers, educational expenses and grants are significant at a 0.01 level. The closer a region to the regional center the higher its development, with the increase of one standard deviation corresponding to an increase of .158 in the level of development. An increase of one standard deviation in the level of the educational centers in a given regions corresponds to an increase of .309 standard deviations in the level of development as measured by the Hoover index. Educational expenditures appear to be highly related with the level of inequality. Indeed, an increase of one standard deviation in the level of educational expenses corresponds to an increase of 1.271 standard deviations in the inequality contribution. On the other hand, an increase of one standard deviation in aggregate grants corresponds to a decrease of the .776 in the level of development.

In the model using the Theil index as dependent variable, the West/East dummy and the distance to center are found to have no significant impact on the level of inequality (or inequality on them). Education centers are found to be significant at a 0.01 level, with a standard deviation increase in the importance of educational centers corresponding to .311 increase in the development of regions as measured by the Theil Index. Unemployment fell more in richer regions, with one standard deviation increase corresponding to an decrease in the level of inequality of .180 standard deviations. Net migration was significant at a 0.01 level. An increase of one standard deviation in the net level of migration is linked to a decrease .233 in the level of inequality. Finally, expenses on education and grants are also significant at 0.01; one standard deviation in the second grants are also significant at 0.01; one standard deviation in the case of education expenses and a decrease of .908 in the level of development in the case of grants.

In the case of the model which uses the GCI as dependent variable, one can observe that once again the educational center, distance to center, net migration, educational expenses and grants are all found to be significant at 0.01 level. The distance variable shows that an increase of one standard deviation in the distance variable is linked to a decrease of .129 standard deviations in the level of GCI. An increase of one standard deviation in the educational center variable corresponds to an increase of .218 in the inequality measure. In the case of educational expendituress one standard deviation corresponds to an increase of 1.273 standard deviations in the level of inequality as mesured by the GCI. Finally, an increase of one standard deviation in the level of grants was related to a decrease of .817 in the level of development. Finally, the net migration variable suggests that more people migrated from richer areas, as one standard deviation increase in net migration corresponds to a decrease of .143 in development.

Appendix H: Polish Macroeconomic Indicators



Table 15: Polish Growth 1993-2006







Source:

http://2.bp.blogspot.com/_ngczZkrw340/RxhSYQjmxWI/AAAAAAABxg/jq5SurNDIcE/s400/poland+annual+un employment.jpg accessed, 18.05.2009

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