

Modern Interregional Migration: Evidence from Japan and Poland

A Dissertation

Presented to
Graduate School of
Humanities and Social Sciences
(Doctor`s Course)
OKAYAMA UNIVERSITY

In Partial Fulfillment
of the Requirements for the Degree of
Doctor of Philosophy in Economics (経済学)

by

Anna Maria Dzienis

September 2012

Table of Contents

Modern Interregional Migration: Evidence from Japan and Poland

Introduction	1
Chapter I	
Modeling Interregional Migration	5
1. Introduction	5
2. Modeling Interregional Migration	5
2.1 Interregional Migration, Theories Selection	5
2.2 Determinants of Migration	9
2.3 Explanatory and Demographic Models	13
2.3.1 Explanatory Models	13
2.3.2 Population Projection Models	14
2.4 Gravity Approach	15
2.4.1 Entropy and Spatial Interaction Models	17
2.4.2 Alonso`s General Theory of Movement	21
2.4.3 Destination Choice Models	23
2.4.4 Gravity Model as Migration Velocity Measure	31
2.4.5 Gravity Equation with Micro-Foundation	32
2.5 New Economic Geography Approach	35
2.5.1 Consumers and Producers	39
2.5.2 Market Potential Function	42
2.5.3 Migration Choice	45
3. Conclusions	49
Chapter II	
An Analysis of Polish Labor Migration	50
1. Introduction	50
2. Characteristics of the EU and Polish Immigration Policy	51
3. Features of Polish Labor Migration	53
4. Polish Socio-Economic Regional Differences	59
5. Polish Labor Migration and Domestic Labor Market	63
6. Trends in Polish Labor Migration After the Global Financial Crisis	67
7. Conclusions	69
Chapter III	
An Analysis of Japanese Internal Migration	71
1. Introduction	71
2. Japanese Internal Migration Before 1973	71

3. Japanese Internal Migration After 1973	73
4. Migrants Destinations	74
5. Japanese Migrant After the Bubble Economy Period	75
6. Income Gap in Japan	77
7. Japanese Internal Migration and Economic Growth	80
8. Change in Factors Affecting Japanese Demography	82
9. Internal Migration and Labor Market	84
10. International Migration	85
11. Conclusions	89
Chapter IV	
The Relationship Among Internal Migration, Income Inequalities and Economic Growth in Japan and Poland	90
1. Introduction	90
2. Early Post-War Period and Patterns of Population Concentration	92
3. Post-War Internal Migration in Poland	96
4. Income Inequalities and Internal Migration	104
5. GDP Growth, Inequalities and Migration	109
6. Conclusions	112
Chapter V	
Internal Migration Model on the Example of Japan and Poland	114
1. Introduction	114
2. Theoretical Approach	114
3. The Gravity Type Model and the Data	122
4. Results and Interpretation	124
4.1 Results	124
4.2 Interpretation	130
4.2.1 The General Interpretation	131
4.2.2 Year by Year Analysis	132
4.3 Conclusions	139
Chapter VI	
The NEG Theory Based Model	141
1. Introduction	141
2. Theoretical Approach	142
3. Data and Model Estimation	146
4. Results and Interpretation	147
5. Conclusions	154

Final Conclusions	155
References	158

Introduction

The interregional inequalities has long attracted the attention of economists (Thisse, 2011: 9). Thisse (2011) writes: *Economic geography – or geographical economics – aims to explain the existence of peaks and troughs in the spatial distributions of population and wealth. Ever since the emergence of civilization, human activities and standards of living have been unevenly distributed among both the continents and their territories. Economic life is concentrated in a fairly limited number of human settlements (cities and clusters), which are gathered under the heading of “economic agglomerations.” Furthermore, there are large and small agglomerations with very different combinations of firms and households* (after Thisse, 2011: 1).

This paper provides data based analyses of recent interregional migration on the examples of Japan and Poland. The analyses are conducted against a background of general demographic and economic situation of both countries, in particular regional disparities and economic growth. They aim at describing the migrants` behavior in Japan and Poland through New Economic Geography theory based model.

P. Krugman`s (1991) NEG theory was the first one to introduce spatial dimension to basic economic modeling by taking into consideration the presence of scale economies, which makes possible analyzing spatial concentration of economic activity and what is very important, interregional differences. Moreover, NEG perspective is open to any exogenous shocks, which may result in or be a part of *cumulative causation* that influences economic development.

Japan and Poland are far apart in terms of economic situation as well as distance. Although their areas do not differ much, the population of Japan is three times that of Poland. Poland is a country situated in Central Europe, with good access to other European Union countries, a member of Schengen Area, whilst Japan is an isolated archipelago in the Far East. Polish are lured by countries with higher wages and bigger markets, Japan itself is such a country for Asian nations.

According to data fact findings, we can intuitively imagine the difference of migrant behavior between Japan and Poland. Until 90s Polish migrant was characterized by low civil liberties, restrained by centrally planned economy and not seldom took part in state managed recruitment. In 90s, despite having more liberty, migrants refrained from moving, due to poor economic situation, high unemployment and lack of resources. On the other hand, emigration has always been present in Polish history. Recently, there was a record high increase in Polish labor migration, triggered by high unemployment and low earnings at home market and career building opportunities abroad. In contrast, Japanese migrant is generally more mobile and less attached to the particular region, which may suggest that amenities and regional uniformization facilitate the decision to move. Moreover, fast and intensive urbanization in Japan, accompanied by high economic growth were what could have accustomed a Japanese migrant to frequent moving. The emigration of Japanese has been insignificant and often related to company transfers.

The aim of the analysis is to construct NEG theory based migration model originally proposed by Crozet (2004) and test the behavioral hypothesis. Interestingly, in both Japan and Poland the migrant behaviour is responsive to stimulus stemming from two following mechanisms: the relationship between income inequalities level and net migration toward capital regions and similarly, the relationship between income inequalities movement and GDP growth rate.

This paper was inspired by the research on the relationship between mobility of labor and regional disparities, based on NEG theory, where in a world of increasing returns to scale, the locations of the factors of production (labor) are endogenous. First come studies by Krugman (1991), in which he argues that *manufacturing firms tend to locate in the region with larger demand, but the location of demand itself depends on the distribution of manufacturing* (Krugman, 1991: 483). Then the paper by Tabuchi and Thisse (2002), which shows the impact of the heterogeneity of the labor force on the spatial distribution of activities. However, the work which is crucial for this paper's approach is one by Crozet (2004), where the author published a new model explaining

forward linkage that relates labor migration to the geography of production through real wage differentials on the example of a few European countries. Quite similar approach was later presented by Pons et. al (2007) on the example of Spain and Herring and Paillacar (2008) on the example of Brazil.

This dissertation consists of six chapters organized in the following order: Chapter 1, Modeling Interregional Migration; Chapter 2, An Analysis of Polish Labor Migration; Chapter 3, An Analysis of Japanese Internal Migration; Chapter 4, The Relationship Among Internal Migration, Income Inequalities and Economic Growth in Japan and Poland; Chapter 5, Internal Migration Model on the Example of Japan and Poland; and Chapter 6, The NEG Theory Based Model.

Chapter 1 presents an overview of the literature concerning migration based research. It aims at presenting more important achievements in migration modeling and those that have the most practical use in everyday life. This section is organized in a way to define interregional migration pattern that would be adaptable to the case of both Japan and Poland and to choose the most applicable model for the comparative analysis of those two countries. The main stress will be put on gravity approach, gravity equation with micro-foundation and NEG approach.

Chapter 2 is devoted to the phenomenon of Polish migration after joining European Union (EU). Labor migration would be analysed against the background of Polish labor market and Polish socio-economic regional discrepancies. Such facts as high unemployment rate and low earnings level at home market seem to be very important factors in migration. This chapter will focus on analyzing Polish labor migration impacts on general economic situation, in particular its influence on regions, demography, domestic labor market and policy.

Chapter 3 is oriented towards describing Japanese internal migration. Almost half of population and nearly half of working age population in Japan live in major urban areas: Tokyo, Osaka and Nagoya. Analysis of Japanese statistical data show some similarities in people's propensity toward migration, annual economic growth rate and

regional income disparities. In the end it may be assumed that internal migration flows as well as foreign influxes into Japan might grow in significance as a factor of population growth.

Chapter 4 is aimed at outlining post-war internal migration in Poland, its causes, trends and repercussions. Moreover, it focuses on data based analysis of post-war internal migration flows on the example of Japan and Poland, against a background of general demographic and economic situation. It makes an attempt on answering the question whether any relationship among internal migration, income inequalities and economic growth in Japan and Poland exists.

Chapter 5 presents the NEG theory approach towards migration phenomena. However, at the first stage of estimation, gravity models will be estimated. Then their results and interpretation in the light of NEG theory would be given. The gravity equation allows for the identification of possible specification issues.

Chapter 6 deals with the NEG theory applied to migration modeling. Mobility of production factors constitutes one of NEG blocks (economies of scale, trade costs), which also contributes to agglomeration. A modified NEG model will be constructed and estimated to verify if this theory is also applicable to Japanese and Polish internal migration.

This paper is devoted to making use of the new modeling theory, presented here as NEG model, towards Japanese and Polish migrant behavior. The most important references were published in *Journal of Economic Geography* and *Journal of Regional Science*. Data used to dataset preparation is issued by Japanese Statistics Bureau, Polish Central Statistical Office and Eurostat Database. For model computation purposes Stata statistical software package was used.

Chapter 1 Modeling Interregional Migration

1. Introduction

There is plethora of literature concerning migration based research and that is why it would not be possible to mention all the authors and their works in the following chapter. Main focus will be then to present the more important achievements in migration modeling and those that have the most practical use in everyday life. A search will be performed to answer how migration modeling has been developed through years, how the approaches to migration problem have been divided to (micro, macro etc.) and in what way the researches have come to arrange migration determinants (usually dependent variables in modeling) till now would be performed. Moreover, this section is organized in a way to define interregional migration pattern that would be adaptable to the case of both Japan and Poland and to choose the most applicable model for the comparative analysis of those two countries.

2. Modeling Interregional Migration

2.1 Interregional Migration, Theories Selection

The problem of migration is quite a complex and interdisciplinary phenomenon. That is why there is plenty of theories which have arisen on the basis of several disciplines such as sociology, economics and human geography (see: Table 1.1). This diversity of theories imposes many difficulties on wise arranging the existing set of approaches. Amongst many Stillwell and Congdon (1991) propose a crucial distinction in migration modeling, that between micro and macro approaches. As the authors explain, micro theory is related to the individual migrating unit (person, group or household) and to the processes determining the decision of the potential migrant to move or not from the actual location. This approach is based on the identification of those factors that influence the decision making process of choosing new location or not. It takes under consideration the successive phases in the individual decision making which involves choice between the alternative locations available, once the decision to move has been taken. The approach to migration modeling at the micro level is often called the *discrete choice* approach, clearly because the choices at both phases are between discrete options (move or stay, move to i or j). The discrete choice approach

(discrete statistical models) has its roots in the axiom of utility maximization since those are people's expectations about improving their own prospects in various locations that are at the heart of the decision-making process (after Stillwell, 2005: 3).

Table 1.1 Migration theories



非表示

Source: Kupiszewski (2005), Bijak (2006), own elaboration.

The factors of migration decision making comprise both characteristics of individual persons (age, marital status etc.) or family units (family size etc.) and the features of the potential receiving region (unemployment rate, wages, immigrant networks etc.).

Since Thomas (1938) publication many researches have examined the relationship between migration behaviour and one`s life dynamics. There were also many researches on intra-urban residential mobility, involving social psychologists such as Rossi (1955), who stated that `families adjust their housing to the housing needs that are generated by shifts in family composition that accompany life cycle changes (after Rossi, 1955: 10).

The axioms of stochastic utility (Blavatsky, 2008: 11-12) tell, that micro model formulation is composed of the probability that an individual will choose destination region *i* and an expression that is determined by an alternative option (region *j* etc.) attributes. In this case a form of a multinomial logit model is calibrated empirically.

However, Stillwell (2005) writes that some potential destinations may be evaluated similarly because of preferences for certain types of area, and this may lead to correlation in the random component of utility functions, leading to a contradiction of the assumptions of the model. Consequently, subdivide the decision making process conceptually into two parts and consider that people`s evaluation of alternative destinations are correlated (after Stillwell, 2005: 3-4). He concludes, that in this case nested logit models or multinomial probit models are used to process the data.

On the other hand, macro theory relates to aggregate migration flows, measures the magnitude and directions of migration and seeks factors that affect migration (Yorimitsu, 1987: 2). Stillwell (2005) underlines that macroanalytical studies are more appropriate for setting migration in its labor context in order to deal with questions such as whether people migrate into areas where jobs are available or where prices are lower, rather than the behavioral aspects surrounding the migration decision itself (Stillwell, 1991: 4). In macro approaches the following macro variables are used: population sizes, unemployment rates or environmental conditions.

According to the theories concerning equilibrating or disequilibrating effects of migration on regional balance, classical models present the former (diminishing interregional differences, Ohlin 1967) meanwhile the arguments of selectiveness of

migration support the latter (growing intraregional differences, Myrdal 1957) (Eff, 1998: 1-2).

An interesting theory, which makes use of macro tools and simultaneously constitutes an example of the sociological approach, is that proposed by Lee (1966; 1969). Lee was the first to identify *push-and-pull factors* affecting aggregate migration flows. As to his specifications, migration is determined by the existence of attracting (*pull*) factors at destination and repelling (*push*) factors at origin (Bijak, 2006: 6).

Cadwallader's (1987) micro and macro modeling classification system is also worth mentioning, as it allows to clearly understand the relationship between those two approaches (after Stillwell, 2005: 4), i.e.:

- the relationship between aggregate migration and regional attributes that has been traditionally investigated by macro models;
- the relationship between the regional variables defined objectively and the subjective perceptions of those indicators by individual migrants;
- the integration of those perceptions of places into aggregate utility functions;
- and their subsequent translation into aggregate migration flows.

Macro models work on aggregated data, and mainly compare the attraction factors of both receiving and destination regions, and these data completion is rather not problematic for researches thanks to numerous censuses and registers of explanatory variables from various sources. The micro model data collecting presents slightly different situation. There are still relatively few national and regional level researches on migrants' characteristics and on their migration motivation.

A slightly different distinction in selecting theories is presented by Kupiszewski (2002; 2005) and Bijak (2006). They tend to organize theories which pertain to migration problem regarding their original disciplines of science (mainly sociology, economics, geography).

From the sociological point of view, Stouffer (1940; 1960) with his idea of the *intervening opportunities* is said to be the forerunner of the sociological theories of migration. Stouffer claims 'the number of persons going a given distance is directly

proportional to the number of opportunities at that distance and inversely proportional to the number of intervening opportunities (Stouffer, 1940: 846). Here opportunities at the destination are seen as the attracting factors toward migrants. Bijak (2006) stresses that Stouffer does not relate migration directly to distance but to the reciprocal relationship between distance and opportunities available in various locations (Bijak, 2006: 6). Previously mentioned Lee's (1966) theory is also ranked among sociological approaches to migration. In the third place comes Taylor (1986) with his conception of *migrant network* at the receiving place, which is understood as people sharing kinship, friendship or acquaintance ties (Bijak, 2006: 6).

As far as the neoclassical macroeconomic theory of migration (Lewis, 1954; Harris, Todaro, 1970; Todaro, 1976) is concerned, low income in sending region is what motivates migrants, therefore migration is considered as a labor markets equilibration mechanism. Subsequently, neoclassical microeconomic theory supports the stance that the migrants assess the individualized costs and gains related to migration (Sjaastad, 1962; Todaro, 1976). Migration is treated here as a kind of investment and migrants aim at maximizing their income on capital invested in migration. Another approach is that of the new economic theory of migration (Stark and Bloom 1985; Stark 1991), which assumes that not individuals but entire households, in effort to limit the risk of losing revenues, take decision on migration (after Kupiszewski, 2005: 3-4).

2.2 Determinants of Migration

The majority of macro analyses treat migration flows measured by aggregated data as dependent variable and then allow some independent variables to be constructed. Finally, those independent variables are tested by statistical methods to estimate their contribution to migration (Yorimitsu, 1987: 3).

Micro analysis focuses on migrant's or their family's decision making process and uses micro data. Collecting data for microanalytical purposes is quite specific. First, there is a possibility to complete the data by delimiting sample for research objectives. Second, minute data on the factors that have influence on decision to move may be completed. Third, data on potential migrants concerning the wishes and reasons to move or stay and the selection process of destination may be collected (after Yorimitsu, 1987: 6).

As to the macro approach, Lee's (1966) classic study on migration involving origins, destinations and the links between them has gained considerable popularity. According to his conceptions the features of origins may act as *push* factors for potential out-migrants while the characteristics of the destination present *pull* factors that attract migrants to a particular destination. The distinction of origin region and destination region burdens migration with a certain cost and, as Stillwell (2005) mentions, the term *impedance* is often used to refer to the frictional effect of distance on migration (Stillwell, 1991: 7). The earliest studies on relationship between migration and distance were triggered by Ravenstein's *laws of migration* (Ravenstein, 1885). Then some researches on the inverse relationship between migration and distance were done and finally the gravity model was formulated. The early formulations of the model were based on distance and population size factors used as variables, measured by the total populations of the sending region and the receiving one and the physical distance between them.

However, there are also many arguments that physical distance may not mirror social or time costs of moving, because those factors are often not proportional to distance. According to the ways of measuring physical distance they may differ from Euclidan distances, mileage distances or network-weighted distances (Gaag van et al., 2003: 15).

In migration models there are also contiguity variables for distance that take value of 1 for adjacent regions and 0 for other pairs of regions. These variables capture the fact that neighbouring regions tend to have higher migration rates because this migration includes a proportion of short-distance moves between the adjacent regions.

In 1960s models arguing *psychological distance* over physical one were constructed (Burford, 1962) and models dealing with friends, relatives or *migration stock* in destination region as an important factor in migration decision making process (Nelson, 1959; Greenwood, 1969). In 1970s models involving relationship between distance and information about the destination were developed (Schwartz, 1973) (after Yorimitsu, 1987: 5).

Moreover, Fotheringham (1986) claims that highly populated regions may be less attractive to migrants, all other things being equal, due to increased spatial competition between locations of destination.

Generally speaking, determinants of migration expressed as variables may be arranged in six groups, which were first proposed by Stillwell (2005) and after some modifications made by the author they come as follow:

a) Economic variables

These variables refer mainly to the sending and receiving regions' relative economic prosperity, growth dynamics, business environment, job opportunities or inequalities etc. More precisely, as variables measuring levels of those factors GDP per capita, the number of new business registrations and other indexes considering regional dynamics are used. Some of those measures are closely related to the variables characterizing the regional labor market. Regional inequalities may be measured in many ways. Ishikawa (1995) uses a difference of destination and origin prefecture's income gap levels, Canaletta et al. (2004) mentions GDP per employed worker (GDPpw), standard derivation of its logarithms under the name of *sigma* indice, the Gini index or Theil and Atkinson indices (Canaletta et al., 2004: 76-77).

b) Labor market variables

Labor market characteristics may act both as push factors from the origin region and pull factors to the destination region. Most commonly they are expressed as levels of employment, unemployment rates, changes in jobs, average wage levels, jobs tenure periods etc. Besides, the example of Europe shows that nowadays, the accession of a migrant's origin country to the European Union allows him to participate in the EU common labor market often with no restriction and this fact of accession to EU may also be captured as a variable influencing migrant's destination choice.

c) Housing market variables

House prices, vacancy rates as well as commuting distance may play important role in migrant's decision making process to move, therefore those factors should be also taken into account while studying migration problem.

d) Environment variables

This term covers all the physical, economic, social, political and institutional aspects affecting the quality of everyday life of the residents. Some variables mentioned under the other paragraphs above and below may be considered to be equal; still this category refers to derelict and vacant land, the proportion of new housing on brownfield land, population density, settlement size and level of urbanisation, crime and anti-social behavior, climate and air quality, sports and leisure facilities as well as *bright lights* and good schools (after Stillwell, 2005: 9). These characteristics may affect migrant's considerations to move by inducing a feeling of dissatisfaction with a region in question or just the opposite.

e) Institutional and policy variables

This group of variables comprise direct influences through migration incentives as well as restraints, migration policy and indirect impacts of government grants, local taxes, higher education popularisation etc. The way of issuing and time of anticipating for work permissions may also be considered as migration facilitation or inhibition and should be also considered as variables.

f) Cultural variable

This category of variables refer mainly to inter-regional migration, interpreted as international migration and may include such culture characteristics as language, religion, context of the culture in question etc.

g) Education

Many recent studies take under consideration also such variables as education level (Jauhiainen, 2010), Waldorf (2005) applied Index of Relative Educational Deprivation (IRED), which places region's educational status on a scale bounded by the national extremes in the percentage of highly and poorly educated residents, due to capture the growth of knowledge agglomeration. The mobility of highly educated workers was the object of Mukkala (2010) computations for the purpose of finding differences in highly educated high technology (HEHT) workers and the non-HEHT workers across Finish regions.

There should be also mentioned pulling factors specified by Florida (2002; 2005; 2008), who is known for his controversial *creative class* theories. He propagated the 3T, i.e. Technology, Talent and Tolerance (Florida, 2005) as the cities' success and attracting characteristics and devised such indices as Bohemian, Gay and diversity indexes (Florida, 2005), which according to his assumptions make the most creative units concentrate in the regions of high value of those indexes.

The groups of variables mentioned above make it possible to realize that the phenomenon of inter-regional migration is an intricate problem. People decide to move to a chosen region, nevertheless pros and cons in their decision making process are specific for each one of them. In the studies on the migrants' choices and flows, the features such as trends in migration intensities over time or duration of out-migration (short-term vs. long-term migration) are also of great importance. In the end it is important to mention again that research on the determinants of migration seeks the factors that have major impact on the migrant's decision making process and are based on the aggregate data or micro data on the different aggregate levels.

2.3 Explanatory and Demographic Models

2.3.1 Explanatory Models

Explanatory or non-demographic models tend to explain and predict migration processes. The analysis of spatial patterns is conducted using multidimensional contingency tables in the sense of explanatory model interpreted by Gale (1972). This model provides instruments for synthesizing several existing theories and according to Stillwell (2005) may be applied to explain regional differences in out-migration, the relative attractiveness of destination regions for in-migration, the net balance between out-migration and in-migration across a set of regions or the spatial distribution of migrant flows between origins and destinations.

Early research on migration focused on both model explication and data collection. Precursory migration models had their origin in the theories of the geographer Ravenstein (1885), who formulated 11 laws of migration as a result of his studies on the migration processes in Great Britain and United States. Those laws are as follow:

- a) although most migrants travel short distances, longer-distance migrants prefer to go to centers of commerce or industry
- b) each stream of migration produces a counterstream
- c) large towns owe more of their growth to migration than to natural increase
- d) the volume of migration increases with the development of industry and commerce and as transportation improves
- e) most migration is from agricultural areas to centers of commerce and industry
- f) main causes of migration are economic.¹

Moreover, Ravenstein (1885), as well as Newton, recognised the importance of the *friction* or distance between the sending and receiving region. This theory evolved into gravity model and then was further developed in 1940s (Stouffer, 1940; Zipf, 1946).

Stouffer (1940) argued that distance is a surrogate for the effect of *intervening opportunities* and he operationalized the concept and successfully tested the proposition that intervening opportunities are a significant impediment to geographic mobility (after Wadycki, 1975: 121).

On the other hand Zipf (1946) conducted research on urban-to-urban migration by the principle of least effort. In Zipf's theory the migrants flow is a function of the distance between the cities. This relationship is further known as *distance-decay* or *inverse-distance* relationship.²

Finally, explanatory migration models were based on variables measuring the masses of each origin and destination and the distance between them and were calibrated statistically using loglinear regression techniques (after Gaag van et al., 2003: 18).

2.3.2 Population Projection Models

The very first demographic models concentrated on one region population were founded on *cohort component* model, which was first used by Bernardelli (1941) and

¹ <http://www.csiss.org/classics/content/90>, 2011.03.20.

² http://globalgeography.aag.org/Migration1e/ConceptualFramework_Jan10/ConceptualFramework_Jan104.html, 2011.03.18.

Leslie (1945) (after: Bijak, 2006: 25). This term comprised the components of the region's demography dynamics, i.e. estimation of the population, the number of births and deaths. On their basis, the survivorship of particular birth cohorts is calculated in order to yield population size and age structure in subsequent projection steps (Bijak, 2006: 25). Studies on cohort component model went through the uni-regional model in matrix notation, net-migration included forms and is still under development.

In mid-1960s further research on demographic models' components allowed to expand the dimension of studies on demography from uni-regional to multi-regional level. Consequently, Leslie matrix for a multi-region system (Rogers, 1966; 1967; 1968) and multi-region life tables (Rogers 1973) were created. Then, Rogers (1990) proposed the use of migration flows rather than net balances. In opposition to this approach, in 1970s multi-regional survival model known as *accounts-based* modeling was developed by Rees and Wilson (1977). The model was constructed for *transition data* in the first instance before applying similar techniques to *movement data* (Rees, 2008: 4). Willekens and Drewe (1984) brought the Rogers and Rees approaches together by switching from a dependence in the model on the multi-regional life table to period-cohort rates (after Stillwell, 2005: 16).

Thus, demographic models have been developed in complex models requiring profound information about migration. They evolved from aggregate net migration balances, through the pool migrant methods applied in 1970s and 1980s to disaggregated migration flow information.

2.4 Gravity Approach

The gravity equation is a good illustration of a multi-dimensional reality, that the researches meet nowadays. This reality is made of many complex chains of indirect spatial effects and should be considered while analyzing migration (after Behrens and Thisse, 2006: 8). Though the gravity modeling is mainly applied in studies on international trade, it also constitutes foundation for many researches on migration problem.

After early Newton's (1687) law of gravity and analogous Ravenstein's Laws of Migration numerous modifications to formulation of gravity model were made by

introducing parameters to weight the influence of the sending and receiving region's factors and by further combinations with alternative distance functions (Gaag van et al., 2003: 18). During the 1940s Stouffer (1940) introduced the notion of intervening opportunities. In other words, the nature of potential destination may be even more important than the distance in migration decision process.

In general, the gravity theory of migration (Stewart, 1941; Zipf, 1946; Isard, 1960) assumes that migration flows between regions i and j , M_{ij} , are proportional to the population sizes in the origin and destination regions (P_i and P_j) and inversely proportional to the β^{th} power of distance between the two regions, d_{ij} , which is a discounting factor (after Bijak, 2006: 13)

$$M_{ij} = G \frac{P_i P_j}{d_{ij}^\beta} \quad (1.1)$$

In the terms of statistical interpretation the model may be written as follows (after Combes et al., 2008: 103):

$$M_{ij} = G \frac{P_i^\alpha P_j^\beta}{d_{ij}^\delta}$$

where G , α , β and δ are parameters to be estimated. δ is an indicator of the sensitivity of trade (or any other flow) to the distance between partners (Combes et al., 2008: 103).

Subsequently, the multiplicative form of the beforementioned equation allows for taking logarithms by which its parameters may be estimated (after Combes et al., 2008: 103):

$$\ln M_{ij} = \ln G + \alpha \ln P_i + \beta \ln P_j - \delta \ln d_{ij} + \varepsilon_{ij}$$

where ε_{ij} denotes an error term and δ measures the elasticity of flow with respect to distance.

Stewart (1947) formulated potential form of the gravity equation under the shape of (after Ishikawa, 1995: 159):

$${}_iV = \sum_{j=1}^n \frac{P_j}{d_{ij}} k \quad (1.2)$$

where ${}_iV$ constitutes *population potential*, k is a fixed term.

Isard (1960) pointed out that the conceptions of mass and distance may be defined in different ways. According to his theories, the sizes of population masses (P_i, P_j) may be substituted by some economic variables such as employment or income level and distance may be measured in different metric units (after Bijak, 2006: 13-14).

2.4.1 Entropy and Spatial Interacton Models

a) Mathematical Formulations

One of the shortcomings of the early approaches to migration modeling was the inability of the Ordinary Least Squares (OLS) regression formulation to predict interaction that was consistent with observed flows from each origin and to each destination. Much effort to overcome this problem was made by Wilson (1967; 1970; 1974) (after Nijkamp, 2000: 1), who related spatial interaction models to the entropy concept and introduced a family of models: the unconstrained gravity model, the production-constrained model and the doubly constrained model (Nijkamp, 2000:1). Wilson (1965) constructed so-called *balancing factors* (or systematic variables) to ensure the coherence and equilibrium within the model and the derivation of the same model based on entropy-maximising techniques (Wilson 1970) (after Stillwel, 2005: 10). Wilson's family of four models of spatial interaction between any two zones i and j take the following general form:

$$M_{ij} =$$

Scaling factor (or balancing factors)

*Origin out-migration (or attractiveness factor)

*Destination in-migration (or attractiveness factor)

*Distance function (with distance decay parameter)

where a scaling factor is used when no observed out-migration or in-migration totals are known, so that the sum of all the flows predicted in the origin-destination matrix is constrained to the total number of migrations observed in the system (the so-called unconstrained case) (after Stillwell, 2005: 10-11).

Attractiveness factors act as substitute for mass terms when migration flow totals are unknown. When out-migration or in-migration totals are given, balancing factors replace the scaling factor to ensure that the row or column elements of the predicted matrix are consistent with the observations. The doubly constrained (or production-attraction-constrained) model of migration between regions i and j incorporated balancing factors for both origins and destinations ($A_i B_j$), mass terms ($O_i D_j$) and the distance function (d_{ij}) used either as a power function or an exponential function ($\exp(-\beta d_{ij})$) (after Gaag van et al. 2003: 18-19):

$$M_{ij} = A_i B_j O_i D_j d_{ij}^{-\beta} \quad (1.3)$$

These mathematical formulations are calibrated using search techniques that lead to produce an optimum distance decay parameter by repetition of a sequence of instructions.

In general, spatial interaction modeling stems from the gravity model, which was further improved through Wilson's family of SIMs and then Alonso's General Theory of Movement (GTM) (Nijkamp, 2000: 3). Its history is relatively long and dates back to the 19th century. Wilson's family of SIMs gives wider set of instruments to model spatial interactions, however the necessity to choose the assumption about the relationship between the flows, the outflows and the inflows as starting point set some limitations. It is important to point out that in reality there often exist mutual influences (after Nijkamp, 2000: 4). Alonso's GTM is not easy to interpret, although it allows to overcome some limitations that appear in spatial interactions models. Alonso (1978) called it a *systematic model* as all the elements present in the system are related (after Nijkamp, 2000: 10). In short, the gravity approach captured the main characteristics of

interactions, Wilson's approach introduced constraints, Alonso's GTM allows for substitution effects in place of beforementioned constraints.

Going back to the abovementioned doubly constrained approach, it was further extended with the calibration of zone-specific distance decay parameters by Stillwell (1978) and the incorporation of a competing destinations variable to remove the effect of spatial structure by Fotheringham (1983; 1991) (after Stillwell 2005: 11).

More recently, Fotheringham et al. (2001) have shown how the competing destinations model makes explicit the linkage between spatial choice behaviour at different levels in the spatial hierarchy.

The authors underline that the problem with the SIMs stems from the fact that it can only be derived from the principles of random utility maximisation by making the assumption that individuals employ a *flat* information processing strategy. An alternative assumption is that of hierarchical information processing. They say that hierarchical decision-making in spatial choice is likely to occur, especially when one considers that spatial choice situations often contain very large numbers of alternatives which an individual would have great difficulty evaluating (after Fotheringham et al., 2001: 902).

The importance of internal migration as a component of population change has been widely recognised by those responsible for creating sub-national population estimates and projections. Consequently, a second genre of approaches to modeling migration has been developed within the field of multi-state demography whose aim was to generate projections of migration flows without involving the type of detailed explanatory factors. Wilson (2001) provides a detailed review of the evolution of multi-regional demography, with a clear specification of the model equations (after Stillwell, 2005: 16).

b) Statistical Formulations

Along with the development of mathematically calibrated spatial interaction models, statistical modeling of inter-regional migration has also evolved and new forms of model have been introduced. In those models the variables are log transformed and take the following form (after Gaag van et al., 2003: 19):

$$\log(M_{ij}) = b_0 + b_1 \log(P_i) + b_2 \log(P_j) + b_3 \log(d_{ij}) + \varepsilon_{ij} \quad (1.4)$$

where b_0 is the constant and b_1 , b_2 and b_3 are the regression coefficients of the terms applied to the population and distance, and where ε_{ij} is the random error term of each interaction. This universal linear model formulation is equal to an unconstrained SIM in the Wilson's family (after Gaag van et al., 2003: 20).

One of the basic assumptions of the linear model is that the observations are independent of one another and that the relationship between migration and the predictor variables is the same across each zone in the system of interest. The recognition that there are likely to be local variations in regression parameters has led to the application of geographically weighted regression (GWR) (Fotheringham et al., 1998) (after Nakaya, 2001: 347). The approach estimates local regression coefficients with a moving weighting kernel to infer local variations of parameters (after Nakaya, 2001: 347). The re-specification of the model in the following form (after Gaag van et.al., 2003: 20):

$$\log M_{ij}(g) = b_0(g) + b_1(g) \log(X_i) + b_2(g) \log(Y_j) + \varepsilon_{ij} \quad (1.5)$$

where X_i and Y_j represent explanatory variables, and (g) indicates that the parameters are to be estimated at a location whose co-ordinates are given by the vector g .

The constraints imposed on the lognormal model have triggered off some new statistical models based on the Poisson distribution (after Stillwell, 2005: 12). The lognormal approximation assumes that flows (more specific: dependent variable and error term) are lognormally distributed with constant residual variance regardless of the size of the estimation flow (Congdon, 2009: 772). Moreover, a lognormal regression scheme may be appropriate when there are only a few zero migrant flows but is problematic when there are many zero flows (after Congdon, 2009: 757). However, drawbacks of the lognormal model and problems in assuming lognormality when there are many zero flows led Flowerdew (1991) and Flowerdew and Aitkin (1992) to apply

a Poisson regression method, though this would not be appropriate if the data are over-dispersed (after Congdon, 2009: 772). In terms of model structure, the Poisson regression equation becomes (after Stillwell, 2005: 12):

$$M_{ij} = \exp(b_0 + b_1 \log P_i + b_2 \log P_j + \log d_{ij}) + \varepsilon_{ij} \quad (1.6)$$

In generalised linear modeling (GLM), a statistical tool which decomposes the observed variation in the dependent variable into two components, a linear combination of model parameters and the random residual (after Willekens and Baydar, 1986: 205), a likelihood ratio statistic is used to estimate the data fitness of the model. This statistic is called the deviance, and as the number of flows and the size of the flows increases, the deviance converges to the *chi*-squared distribution. Thus, the size of the deviance can be used to assess the goodness-of-fit of the model (Stillwell, 2005: 12).

Summing up, Stillwell (2005) reports that Scholten and Van Wissen (1985) compared the performance of spatial interaction models with loglinear approaches and according to their results loglinear models with historical interaction parameters performed better than other approaches in terms of model fit and prediction. Furthermore, he mentions that Flowerdew (1991) made evident the possibilities of fitting Poisson regression models on quite large data sets using generalized linear interactive modeling (GLIM) and the Poisson regression method has been developed and adopted in plural research since Flowerdew and Lovett (1988), Amrhein and Flowerdew (1992), Bohara and Krieg (1996) and Boyle et al. (1998) studies. More recently, the application of origin-specific Poisson spatial interaction model, calibrated by using the weighted maximum likelihood principle, the core of geographically weighted regression, has been examined too (Nakaya (2001)).

2.4.2 Alonso`s General Theory of Movement

In the section above some improvements to the gravity equation made by Wilson (1967; 1970; 1974) were mentioned and here further improvements made by Alonso`s General Theory of Movement should be reported. Alonso (1973) developed his model as a part of a demographic model for the United States (after Nijkamp, 2000: 1). More

specifically, it was a submodel for interregional migration of the form of SIM, which offered a new specification of flows, inflows, outflows and their interrelationship. Alonso (1978) specified the model as a general framework for SIM. There are many ways to interpret the GTM model, one among the simplest is to perceive it as an interpolation between the various members of Wilson`s Family of SIMs as special cases. The Alonso`s General Theory of Movement is more flexible because it enables interaction between flows and marginal totals (after Nijkamp, 2000: 2). GTM model maps outflows from n origins to m destinations. The variables to be explained are M_{ij} (flow from origin i to destination j) and their marginal totals O_i (total outflow from i) and D_j (total inflow to j). The exogenous variables are summarized in functions F_{ij} , V_i and W_j , related respectively to connections, origins and destinations. F_{ij} , the facility of movement between i and j , is a decreasing function of distance or travel costs. V_i indicates the size of origin i , and W_j the size of destination j . The GTM may be presented in the following five equations (after Nijkamp, 2000: 6-7):

$$M_{ij} = A_i B_j O_i D_j F_{ij} \quad (1.7)$$

$$O_i = A_i^{-\alpha} V_i$$

$$D_j = B_j^{-\beta} W_j$$

$$\sum_i M_{ij} = D_j$$

$$\sum_j M_{ij} = O_i$$

The first three equations are behavioral equations, containing exogenous variables. The first constitutes a part of doubly constrained model of Wilson. It describes flow M_{ij} as proportional to total outflow O_i from origin i , total inflow D_j to destination j , and two proportionality factors A_i and B_j . Contrary to Wilson`s doubly constrained model O_i and D_j are not treated as given. The second and third equation relate them to the prportionality factors and the exogenous variables. The parameters α and β are assumed to differ between zero and one. The identities the forth and fifth

equations define O_i and D_j as sums of flows. The model as a whole is nonlinear. (after Nijkamp, 2000: 7).

2.4.3 Destination Choice Models

Elaboration of suitable methods of measuring location attractiveness was presented by Fotheringham et. al (2000).

The authors introduced a measure of the relative intrinsic attractiveness (RIA) of places, that takes account of the spatial context of each place in terms of its accessibility from all the other places that are *at risk* of supplying residents to it. They try to describe and demonstrate the utility of the measure of migration attractiveness.

There are many methods of rating destinations in terms of their relative attractiveness and one of them is the use of gross inflows into each destination. Another one is the use of gross inflows into each destination divided by some measure of the size of the destination to yield an in-migration rate. Yet another one is the use of net migration figure such as total in-migration minus total out-migration, often divided again by some measure of destination size.

The authors' approach involves a measure that allows for the geographical situation of each destination relative to the populations that are *at risk* of supplying migrants to it \pm a measure which they refer to as relative *intrinsic attractiveness*. They employ a spatial-interaction-based method to calculate RIA. The researchers demonstrate that the technique can successfully be applied to small and much larger sets of destinations.

The authors consider the following model of spatial interaction applied to flows of migrants:

$$M_{ij} = O_i \frac{A_j d_{ij}^\beta}{\sum_j A_j d_{ij}^\beta} \epsilon_{ij} \quad (1.8)$$

where M_{ij} represents the migration flow from origin i to destination j ; O_i represents the total number of migrants leaving origin i ; A_j represents the overall intrinsic attractiveness

of destination j ; d_{ij} represents the spatial separation of origin i and destination j , here measured by a function of distance; β is a distance-decay parameter representing the influence of spatial separation on migration flows and ε_{ij} is an error term representing idiosyncratic features of particular flows which are not captured by the systematic part of the model. This form of a spatial interaction model is commonly referred to as a production-constrained model because the denominator of the abovementioned equation acts as a constraint such that:

$$\sum_j M_{ij}' = \sum_j M_{ij} \quad \text{for all } i \quad (1.9)$$

where $\hat{}$ denotes an estimated value. The sum of the predicted outflows from any origin will equal the known total outflows from that origin. The model simply allocates the total number of migrants leaving an origin, O_i , to destinations based on the relative drawing power of each destination.

Furthermore, It has been shown that the non-linear production-constrained model in equation (1.8) can be transformed into a linear-in-parameters model of the form:

$$\begin{aligned} \ln M_{ij} - (1/n) \sum_j \ln M_{ij} = \\ \ln A_j - (1/n) \sum_j \ln A_j + \beta \\ [\ln d_{ij} - (1/n) \sum_j \ln d_{ij}] + e_{ij} \end{aligned} \quad (1.10)$$

where \ln denotes a natural logarithm and e_{ij} is an error term assumed to be normally distributed around a mean of 0.

To see how estimates of RIA can be derived from this form of the model, the authors consider its calibration by ordinary least squares regression. The intercept term that will be estimated is $[\ln A_j - (1/n) \sum_j \ln A_j]$ which, since the latter term is a constant across the origins, can be replaced by $(\ln A_j - C)$. Hence, the migration model can be rewritten as

$$\begin{aligned} \ln M_{ij} - (1/n) \sum_j \ln M_{ij} = \\ \alpha_j + \beta [\ln d_{ij} - (1/n) \sum_j \ln d_{ij}] + e_{ij} \end{aligned} \quad (1.11)$$

where

$$\alpha_j = \ln A_j - C$$

Estimates of a_j can then be obtained by placing a dummy variable in the equation for each destination so that the model to be calibrated is then:

$$\begin{aligned} \ln M_{ij} - (1/n) \sum_j \ln M_{ij} = \alpha_0 + \alpha_1 D_1 + \alpha_2 \\ D_2 + \dots + \alpha_{n-1} D_{n-1} + \beta \\ [\ln d_{ij} - (1/n) \sum_j \ln d_{ij}] + e_{ij} \end{aligned} \quad (1.12)$$

where D_j is a dummy variable which takes the value of 1 when the migration flow is to destination j and 0 otherwise. Estimates of the RIA value for each destination are then given by the estimated values of α in this model. The estimate of the RIA for the destination excluded from the set of dummy variables is given by:

$$\text{RIA (excluded destination)} = \exp(\alpha_0)$$

and the RIA for the other destinations is given by:

$$\text{RIA (included destination } j) = \exp(\alpha_0 + \alpha_j)$$

Since the RIA values are all relative, it is generally convenient to rescale the values:

$$\text{RIA (rescaled)} = \text{RIA} / \text{minimum RIA}$$

This means that the minimum value is 1.0 and each RIA score depicts how many more times this particular place is attractive than the least attractive place.

As to the measurement of inter-zonal distances, the authors calculate the distance between a pair of districts as a migration-weighted sum of the distances between the wards or pseudo-postcode sectors nested within both districts. That is:

$$d_{ij} = \frac{\sum_r \sum_s (m_{rs} + m_{sr}) d_{rs}}{\sum_r \sum_s (m_{rs} + m_{sr})} \quad (1.13)$$

where d_{ij} is the inter-district distance, d_{rs} is the inter-ward distance, m_{rs} is the migration between wards r and s and the summations are over all wards in district i and all wards in district j . When there is no migration recorded between a pair of districts, obviously the above formulated equation is no longer applicable and then the inter-district distance is taken as the average of the distances between the wards that nest into the two districts. That is:

$$d_{ij} = \frac{\sum_r \sum_s d_{rs}}{NW_i \cdot NW_j} \quad (1.14)$$

where NW_i represents the number of wards in district i and NW_j represents the number of wards in district j .

Stimulated by the current interest shown in migration by both academics and policymakers in Britain and other countries, the authors have described and implemented a measure of migration attractivity that is considered superior to those most widely used in previous studies.

The research concludes that more heavily populated areas of Britain are not attracting as many newcomers as might be expected, while most of the more rural and remote regions are receiving more than expected and say that this, however, is consistent with previous studies of population redistribution in Britain that have

suggested that out-migration from the largest cities has affected a much wider area than might have been the case if development pressures, allied with planning restrictions, had been less severe in the more accessible zones around these cities.

Another interesting approach to the migrants choice behaviour is presented in slightly later analysis by Fotheringham et. al (2001) which constitute a simulation experiment based on spatial units in Japan.

The authors present the *conventional* spatial interaction model form as a logit or *share* model, which is, as it was mentioned before, the most commonly referred to as a production-constrained spatial interaction model of the general form:

$$p_{ij} = \frac{V_{1j}^{\alpha_1} V_{2j}^{\alpha_2} \dots V_{nj}^{\alpha_n} d_{ij}^{\beta}}{\sum V_{1j}^{\alpha_1} V_{2j}^{\alpha_2} \dots V_{nj}^{\alpha_n} d_{ij}^{\beta}} \quad (1.15)$$

where p_{ij} is the probability that an individual at location i will select destination j ; V_j represents an attribute of place j of which there are n ; d_{ij} represents the distance between location i and location j and the α and β mean the influence of the various destination characteristics on the probability of that destination being selected.

The authors underline that the problem with the (15) model stems from the fact that it can only be derived from the principles of random utility maximisation by making the assumption that individuals employ a flat information processing strategy. They specify that an alternative assumption about the way individuals make spatial choices is that of hierarchical information processing, in which spatial clusters of destinations are first selected and then only destinations within these selected clusters are evaluated.

Subsequently, the authors define the utility or benefit from selecting an individual destination j as U_j and that from selecting a cluster of destinations c as U_c . If individuals employ a flat information processing strategy and evaluate every destination independently, then the utility associated with any cluster is simply the sum of the utilities associated with the cluster's constituent destinations:

$$U_c = \sum_{j \in c} U_j \quad (1.16)$$

Alternatively, they consider the simplest form of hierarchical information processing where destination choice results from a two-stage process in which an individual initially evaluates a set of destination clusters. The outcome is the selection of a particular cluster of alternatives so that, in the case of hierarchical information processing, clusters are initially evaluated by an individual so that:

$$U_c (\sum_{j \in c} U_j)^\delta \quad (1.17)$$

where d is an empirically determined relationship between the number of destinations within a cluster and an individual's assessment of the utility of that cluster.

The authors consider the application of a spatial interaction model of the general form given in equation (1.35) to flows to individual destinations when these flows result from a hierarchical information processing strategy. The accuracy of the predicted flows will depend on δ (the utility of selecting destinations in large clusters).

Concerning all abovementioned misspecifications of the spatial interaction models caused by hierarchical choice, the authors present a solution under the form of the competing destinations model:

$$P_{ij} = \frac{V_{1j}^{\alpha_1} V_{2j}^{\alpha_2} \dots V_{nj}^{\alpha_n} d_{ij}^\beta C_j^\gamma}{\sum_j V_{1j}^{\alpha_1} V_{2j}^{\alpha_2} \dots V_{nj}^{\alpha_n} d_{ij}^\beta C_j^\gamma} \quad (1.18)$$

where C_j is some measure of the proximity of destination j to all other possible destinations and γ is a parameter which reflects the relationship between the choice of a particular destination and its proximity to other destinations. If agglomeration forces are present, destinations in close proximity to others will be more attractive and $\gamma > 0$. If competition effects are present, destinations in close proximity to others will be less

attractive and $\gamma < 0$. When there is no hierarchical choice and the location of destinations vis-a-vis one another is unimportant in explaining destination choice, $\gamma = 0$.

The researchers conduct simulation under assumption that individuals might make spatial choices hierarchically and that there are two levels to this hierarchy. They clarify that in case of Japan level 1 contains clusters of 109 area zones, each of which is a cluster of individual cities, and level 2 consists of 727 city zones which are the individual destinations.

The first step of this analysis is choice behaviour simulation at level 1. Here the origins are 727 city zones and the authors simulate destination choices by the residents of these zones. Firstly, they simulate the choice of one of the 109 area zones so that a 727 x 109 matrix of interaction probabilities is simulated using a model whose general form corresponds to that of equation (1.15). The form of the model used is:

$$P_{ik} = \frac{S_k^{\alpha(1)} d_{ik}^{\beta(1)}}{\sum_k S_k^{\alpha(1)} d_{ik}^{\beta(1)}} \quad (1.19)$$

where p_{ik} is the probability that an individual in city zone i selects area zone k ; S_k is the population of area zone k , and d_{ik} is the straightline distance between the geometrical centroid of city zone i and the population-weighted centroid of area zone k . The parameters $\alpha(1)$ and $\beta(1)$ reflect the sensitivities of the probabilities to area-zone size and distance, respectively. The notation (1) indicates that these parameters operate at this first level of the decision making process.

The second step of this analysis is choice behaviour simulation at level 2. The authors simulate the selection of a particular destination given that a cluster of destinations has been selected. The probability of selecting a level-2 destination (a city zone) is then given by:

$$P_{ij} = P_{ik} \frac{S_j^{\alpha(2)} d_{ij}^{\beta(2)}}{\sum_{j \in k} S_j^{\alpha(2)} d_{ij}^{\beta(2)}} \quad (1.20)$$

where p_{ij} is the probability of an individual in city zone i selecting city zone j ; p_{ik} is the probability of first selecting area zone k , derived from equation (1.19); S_j is the population of city zone j ; d_{ij} is the Euclidean distance between the centroids of location i and location j ; $\alpha(2)$ and $\beta(2)$ denote the sensitivities of interaction to population size and distance, respectively, at level 2 of the decision making process. As a result of the second step of the simulation, a 727 x 726 interaction matrix was produced.

The researchers calibrated two models by means of the maximum likelihood method, i.e. the conventional production-constrained model in equation (1.15) and the competing destinations model in equation (1.18). Both models were calibrated separately for each origin. For the competing destinations model, destination competition was measured by the following expression:

$$C_j = \sum_{m(m \neq j)} \frac{P_m}{d_{jm}^\delta} \quad (1.21)$$

where m represents a destination other than j , and $\delta = 1.0$.

With reference to the results of the spatial distribution of the variable, city zones around Tokyo and Osaka had the highest destination competition values and city zones on the islands of Hokkaido to the north and Kyushu to the south had the lowest values.

In the end, Fotheringham et al. (2001) highlight the inability of conventional spatial interaction models to model flows accurately when such flows result from a hierarchical decision making process. The researchers show how spatial behaviour at one spatial scale can affect the measurement of spatial behaviour at a different scale and claim that in this case, the relationship between the probability of selecting a destination cluster and the size of that cluster, biases the estimation of distance-decay parameters in conventional spatial interaction models applied to flows to individual destinations. In their opinion the remedy for these problems is the destination competition parameter, γ , which is obtained by the calibration of a competing destinations model, and which allows relatively unbiased estimates of distance-decay parameters.

2.4.4 Gravity Model as Migration Velocity Measure

One of the acknowledged Japanese researchers dealing with the problem of migration is Ishikawa Yoshitaka whose work on quantitative geography in view of population migration (1995) delivers several approaches to the measuring migration phenomenon. The author himself conducts regression analysis to find changes in internal Japanese migration patterns between 1955 and 1970. In order to overcome the differences that exist among the prefectures in Japan (i.e. population size, cohorts sizes) he devised the *migration velocity* dependent variable. The dependent variable is measured here as population exchange rates, more specifically to the number of migrants from prefecture i to prefecture j the population of the origin and destination is added. The adopted model is of the following form:

$$V_{ij} = \frac{M_{ij}P}{P_iP_j} \quad (1.22)$$

where V_{ij} is migration velocity from prefecture i to prefecture j , M_{ij} stands for migrants number from prefecture i to prefecture j , P is the overall population size (nation), P_i is total population of origin (prefecture i), P_j is population of destination (prefecture j). The author uses Basic Resident Register data on migration for M_{ij} variable and national population census data for P , P_i , P_j variables.

As the independent variables Ishikawa (1995) specifies income gap (measured as a difference of destination and origin prefectures income gap levels), increase in employment, distance (the shortest distance between the major stations), progress of urbanization (captured as the index of population ratio in secondary and tertiary industry in destination region), ratio of rural population, central administrative function, democratization level per inhabitant, age, education level, migration totals and *nonmigrant propensity*. Among those mentioned above, distance and nonmigrant propensity variables take minus values.

Moreover, to investigate the changes in reasons of migration in Japanese post-war migration patterns in 1955 and in 1970, the author carries on cross section analysis and formulates four levels of migration analysis: A. Total inter-prefectural migration: B.

Migration from non-urban zones to urban zones: C. Migration from urban zones to non-urban zones and D. Migration among urban zones. The model is calibrated by step-wise regression analysis and according to the results distance, income gap, increase in employment and education level turn out to be the most significant out of the eleven variables. The author underlines that in D. type of migration, company transfers accounted for 40% of all mobility cases.

2.4.5 Gravity Equation with Micro-Foundation

The abovementioned gravity equations are not founded on any trade theory. They are assumed to hold macroeconomic relations without a formal derivation through a utility maximization procedure and that is why they are not micro-founded. Those models may be used to describe bilateral flows but not identify their causes (Cafiso, 2007: 7).

Theoretical basis for the gravity equation was first provided by Anderson (1979), who assumed constant elasticity of substitution (CES) preferences and goods that are differentiated by country of origin (Kerr and Gaisford, 2006: 46). Although his studies concentrated mainly on the field of the international trade, his model may allow more variables to be considered, even those based on demographic or geographic factors.

Bergstrand (1990) derived a gravity equation from a monopolistic competition trade model in which the countries are completely specialized in different product varieties. In this case, each country exports one variety of a differentiated product to other countries (after Kerr and Gaisford, 2006: 46). This Bergstrand (1989, 1990) departure from the Heckscher-Ohlin model by assuming Dixit-Stiglitz (1977) monopolistic competition was imbedded in a two-sector economy in which each monopolistically competitive sector had different factor proportions, thus being a hybrid of the perfectly competitive HO model and the one-sector monopolistically competitive model of Krugman (1979) (after Deardorff, 1998: 10).

Deardorff (1998) has shown that the standard gravity model can arise from the HO model, at least in some of the equilibria that permits it, which explains trade based model on relative differences in factor endowments across countries (Deardorff, 1998: 7-9).

Feenstra (2004) notes that conventional gravity model assumes identical prices across countries. Therefore, price is not included in the gravity equation as a variable that affects bilateral trade flows. Under the micro-foundations approach this results in misspecification of the gravity model. It is important to allow for differing prices due to trade barriers (such as transport costs or tariffs) between countries. The gravity equation with so called *price effects* was first derived by Anderson (1979). Feenstra (2004) suggests three approaches to estimating this equation. First, the price effects may be measured by *price indexes*, as in Bergstrand (1985, 1989) and Baier and Bergstrand (2001). Second, the use of *estimated border effects* as an alternative measure, as in Anderson and Wincoop (2003). Third, a *fixed effects* approach to account for the price effects, which allows each country to be different, may be applied as in Redding and Venables (2000) and Rose and van Wincoop (2001) (after Feenstra, 2004: 152).

Going back to Anderson (1979) approach, he argues that the gravity model may be applied to a wide variety of goods and factors moving over regional and national borders under differing circumstances and that it usually produces a good fit. He presents the ordinary equation specified as (after Anderson, 1979: 106):

$$M_{ijk} = \alpha_k Y_i^{\beta_k} Y_j^{\gamma_k} N_i^{\xi_k} N_j^{\epsilon_k} d_{ij}^{\mu_k} U_{ijk} \quad (1.23)$$

where M_{ijk} is the currency flow of good or factor k from country or region i to country or region j , Y_i and Y_j are income in i and j , N_i and N_j are population in i and j , and d_{ij} is the distance between countries (regions) i and j . The U_{ijk} is a lognormally distributed error term with $E(\ln U_{ijk}) = 0$. He points out that ordinarily the equation is calibrated on cross-section data and sometimes on pooled data.

Anderson assumes homothetic preferences across region, products differentiation by place of origin, specifies that the share of national expenditure accounted for by spending on tradeables is a stable unidentified reduced form function of income and population. Another specification is that the share of total tradeable goods expenditure accounted for by each tradeable good category across regions is an identified function of transit cost variables. As the author concludes, such a model explains the multiplicative form of the equation, it permits an interpretation of distance in the

equation, identifying the estimated coefficient, and can be used as part of an attack on estimating the effect of instrument changes. Moreover, the assumption of identical *structure* across regions is straightforwardly interpreted as identical expenditure functions, what suggests disaggregation. He concludes, that the usual estimator of the equation may be biased, requiring change in the method of estimation (Anderson, 1979: 106-108).

Anderson specifies the gravity model as follows:

- a) he makes use of Cobb-Douglas expenditure function
- b) assumes that each country is completely specialized in the production of its own good (there is one good for each country)
- c) no tariffs or transport costs exist
- d) the fraction of income spent on the product of country i is denoted b_i and is the same in all countries
- e) prices are constant at equilibrium values
- f) consumption in value and quantity terms of good i in country j ; thus (after Anderson, 1979: 108):

$$M_{ij} = b_i Y_j \tag{1.24}$$

where Y_j is income in country j . Because income must equal sales we get:

$$Y_i = b_i (\sum_j Y_j) \tag{1.25}$$

Solving (1.25) for b_i and substituting into (1.24), we obtain:

$$M_{ij} = Y_i Y_j / \sum Y_j \tag{1.26}$$

As to Anderson, this is the simplest form of gravity model.

2.5 New Economic Geography Approach

New Economic Geography approach (NEG) is thought to facilitate the understanding of (medium-term) flows, which are, according to the assumptions, influenced by the dynamics of the agglomeration of economic activity. Many studies on the effect of the distance on trade flows through the gravity equation gave birth to research on how geography affects the distribution of economic activity across countries (Cafiso, 2007: 27). NEG models tend to explain why economic activity concentrates in some regions and not in others, by using the interaction between trade costs and firm-level scale economies as source of agglomeration.

Combes et al. mention that the general form of the gravity model may be linked to the Dixit-Stiglitz-Krugman (DSK) model (1980), which endows it with micro-economic foundations (Combes et al., 2008: 102). Nevertheless, the NEG models are mainly those which refer to Krugman (1991a, 1991b) approach. Cafiso (2007) quotes after Head and Mayer (2003) main theoretical points that distinguish NEG models from other approaches to the economic geography (after Cafiso, 2007: 28):

- a) Increasing Returns to Scale (IRS) internal to the firm
- b) Imperfect competition
- c) Trade costs
- d) Endogenous location of firms
- e) Endogenous location of demand.

Furthermore, considering the beforementioned five assumptions at the same time, dynamic analysis may show how factor's movement and profitability cause reallocation of production over time. The dynamics of allocation is featured by some fundamental theoretical prescriptions as follow (after Cafiso, 2007: 29):

- a) Market potential induces factor inflows
- b) Home market/magnification effect (HME)³
- c) Trade induces agglomeration
- d) Shock sensitivity.

³ Regions with large demand attract IRS industries, increasing their production over time.

The example of research dealing with new economic geography tools in the field of migration measuring is Crozet (2004), Kancs (2005), Hering and Paillacar (2008) and Pons et al. (2007). All beforementioned papers were strongly influenced by the new economic geography approach, first presented by Tabuchi and Thisse (2002), which examines whether access to markets had a significant influence on migration choices. Crozet (2004) and Pons et al. (2007) perform a structural contrast of a new economic geography model that focuses on the forward linkage⁴ through the estimation of the equation in the NEG model that relates labor migrations to the geography of production through real wage differentials. The obtained results prove the existence of a direct relation between workers' localization decisions and the market potential of the host regions. Hering and Paillacar (2008) search for the answer whether people migrate in their capacity as consumers and choose the regions, where the price level is low (forward linkage), or in their capacity they migrate as production factor - backward linkage. The authors explore implications derived from two economic frameworks: the NEG theory and the labor economics tradition, which stresses the role of individual characteristics as determinants of spatial inequality and a possible selection bias in individual migration decisions. The main difference between Crozet (2004), Pons et al. (2007) and Hering and Paillacar (2008) study is in the market potential equation. The former present market potential function as the inverse of a price index of manufactured goods derived from the real wage equation, the latter use the equation of the real market potential or market access, which is defined as the sum of the final demand addressed to region i , weighted by the accessibility from i to these markets j (the authors also consider the *free-ness* of trade) and by the market crowding level of every region j (Chapter 5). Kancs (2005) applies a canonical reduced-form of the NEG model to predicting migration flows. He derives his estimation equation directly from the NEG theory, makes endogenic both explanatory variables and the migration rate, derives utility differential, and in the end calculates the estimator for *phi-ness* (of trade), adopted from Baldwin et al. (2003). Below, I will present a model derivation from the NEG theory, conducted by the beforementioned authors.

⁴ Linkage, which links workers location choice with geography of industrial production.

The new explanatory element that was introduced to the elements traditionally employed by historians is the relationship between the migration dynamics and the spacial geographical structure of industry and its changes along the process of economic development. The authors specify an explanatory model of the interregional migratory fluxes that is derived structurally from a new economic geography model. They use the estimated model to evaluate the main determinants of the migratory fluxes and to discuss its changes during the industrialization process.

The model is specified as follows. The economy has three sectors, a perfectly competitive agriculture, a monopolistically competitive industry, and monopolistically competitive nontraded services. Each of these sectors employs a single factor, farmers in the agricultural sector and workers in the industry and services sector. Each of these sector-specific factors (farmers and workers) is in fixed supply.

- one country composed of R regions
- the country has a fixed supply of L^A farmers, each region is endowed with an equal share of the country agricultural labor force
- this population is assumed to be completely immobile between regions
- the labor force used in manufacturing and services is mobile over time and at any point in time we denote region r supply of mobile workers by L^M_r
- all regions have identical preferences and technology, the agricultural sector is perfectly competitive and produces a homogeneous good under constant returns to scale, which is traded between the regions at no cost
- both industry and services are monopolistically competitive sectors that produce a variety of goods under increasing returns to scale
- the manufactured goods are subject to iceberg transport costs; a fraction of the good melts away in transportation so that $T_{rs} > 1$ units of the good have to be exported from region r to deliver one unit to region s ; this transport cost is assumed to be an increasing function of the distance between the two regions d_{rs} :

$$T_{rs} = B d_{rs}^\delta$$

It should be noted that services are produced locally and are not traded.

The NEG theory shows that both workers' and firms' location choices are related to the measures of access to markets. Crozet (2004) looks back to Harris's (1954) market potential function, which in his opinion grasps well the presence of centripetal forces leading to agglomeration (Crozet, 2004: 441):

$$MarketPotential_i = \sum_{r=1}^R (Y_r / d_{ir})$$

where R is the number of locations within a relevant area, Y_r , the economic size of region r , and d_{ir} is the geographical distance between locations i and r .

According to the NEG modeling assumption, there is a country composed of R regions, endowed with two factors of labor, immobile and mobile workers. The economy of a country has three sectors producing three goods, a homogenous *traditional* good, non-traded services and manufactured goods. The first one is assumed to be homogenous and produced under perfect competition by immobile workers only, then traded at no cost across regions. On the other hand, manufactured goods and services are monopolistically competitive sectors, that employ mobile labor force to produce differentiated varieties. The later two industries are subject to economies of scale (Crozet, 2004: 441-442; Pons et al., 2007: 296).

Hering and Paillacar (2008) introduce some modifications and consider a country of R regions and a two-sector economy. As the authors define, the first is characterized by constant returns, perfect competition and no trade costs. The agglomeration forces take place in the second sector. This sector produces the differentiated goods, experiencing trade costs and increasing returns to scale (Hering and Paillacar, 2008: 4).

All regions have identical preferences and technology. Trade cost of manufactured goods between two regions i and j take the form of iceberg cost, where $T_{ij} > 1$ units of the good have to be exported from region i to deliver one unit to region j . This transport cost is assumed to be an increasing function of the distance between the two regions d_{ij} (Pons et al., 2007: 296; Hering and Paillacar, 2008: 4).

2.5.1 Consumers and Producers

Preferences are defined by a Cobb-Douglas function with a Dixit-Stiglitz sub-utility for C_{xi} good (Hering and Paillacar, 2008: 4):

$$\begin{aligned} U_i &= C_{xi}^\mu C_{zi}^{1-\mu} \\ i &\in [1, R] \\ 0 < \mu < 1 \end{aligned} \tag{1.27}$$

where μ and $(1-\mu)$ are expenditure shares for manufactured goods (x) and the *traditional* good (y), respectively.

Crozet (2004) expands the abovementioned function by services industry, so that consumers have identical preferences over goods as follows (Crozet, 2004: 442):

$$\begin{aligned} U_i &= C_{yi}^\phi C_{xi}^\mu C_{zi}^{1-\phi-\mu} \\ i &\in [1, R] \\ 0 < \mu < 1 \end{aligned} \tag{1.27a}$$

where ϕ , μ and $(1-\phi-\mu)$ are expenditure shares for manufactured goods, services (y) and the traditional good, respectively.

Consequently, C_{xi} is a composite of manufacturing product varieties (Crozet, 2004: 442):

$$\begin{aligned} C_{xi} &= \left(\sum_{m=1}^{n_x} c(m)_{xi}^{(\sigma_x-1/\sigma_x)} \right)^{\sigma_x/(\sigma_x-1)} \\ i &\in [1, R] \end{aligned} \tag{1.28}$$

where σ_x denotes the constant elasticity of substitution (CES) between any varieties, $c(m)_{xi}$ is the quantity of variety m consumed in region i , n_x , is the total number of varieties available in the economy ($n_x = \sum_{i=1}^R n_{xi}$). Consumers cannot import service varieties from other regions, therefore the number of varieties y available in region i is

the number of varieties produced within the region (n_{yi}) and C_{yi} is symmetric to C_{xi} (Crozet, 2004: 442).

Considering the beforementioned trade costs between the regions, which are assumed to take the form of the iceberg costs, with the *fob* price (or mill price) p_i , products from i are sold in region j for the price $p_{ij}=p_i\tau_{ij}$ (Pons et. al.: 2007: 297; Hering and Paillacar, 2008: 4-5) :

$$q_{ij} = \mu Y_j p_{xij}^{-\sigma} P_{xj}^{\sigma-1}$$

$$P_{xj} = \left[\sum_i^R n_{xi} (p_{xi} \tau_{ij})^{1-\sigma} \right]^{\frac{1}{1-\sigma}} \quad (1.29)$$

The price index $P_{xj}^{1-\sigma}$ is defined as the sum over the prices of individual varieties and reflects the potential suppliers of this market, considering trade costs, the elasticity of substitution, and the prices they charge (after Hering and Paillacar, 2008: 5).

Crozet (2004) defines demand function as the sectoral employments in region i . Within industry x , the labor required to produce a quantity q is: $\beta_x q_x + \varepsilon_x$, where β_x and ε_x are marginal and fixed input requirements for production in industry x . If n_{xi} denotes the number of varieties of good x produced in region i , the x sectoral employment in region i is (Crozet, 2004: 442; Pons et al.; 2007: 297-298):

$$L_i^x = n_x (\beta_x q_{xi} + \varepsilon_x) \quad (1.30)$$

$$i \in [1, R]$$

where L_i is the total number of mobile workers in region i (Crozet, 2004: 442):

$$L_i = L_i^x + L_i^y .$$

Afterwards, Hering and Paillacar (2008) specify that increasing returns in the C_{xi} industry usually depend on a fixed cost per plant f_i and a constant marginal cost m_i . Hence, profits of a firm are (after Hering and Paillacar, 2008: 5):

$$\pi = p_{xi}q_{xi} - m_iq_{xi} - f_i \quad (1.31)$$

All manufacturers have identical profit maximization price, which is a constant mark-up over a constant marginal cost:

$$p_{xi} = \frac{m_i\sigma_x}{\sigma_x - 1} \quad (1.32)$$

Crozet (2004) and Pons et al. (2007) rewrite fixed and marginal costs as mentioned before $\beta_x q_x + \varepsilon_x$. Then, denoting w_i as the mobile workers' wage in region i , the *fob* price of a variety produced in region i is (Crozet, 2004: 442; Pons et al., 2007: 298):

$$p_{xi} = \frac{\sigma_x}{\sigma_x - 1} \beta_x w_i \quad (1.32a)$$

$i \in [1, R]$

Subsequently Crozet (2004) and Pons et al. (2007) search for the number of firms in each region. They state that free entry in each sector leads to zero profits at equilibrium, which leads them to the number of firms in each region equation (Crozet, 2004: 442; Pons et al. 2007: 298):

$$n_{xi} = \frac{L_i^x}{\varepsilon_x \sigma_x} \quad (1.33)$$

$i \in [1, R]$

Going back to Hering and Paillacar (2008) specifications, putting together the constant mark-up equation, the demand function and the fact that gross profits are given by $\pi_{ij}=p_{ij}q_{ij}/\sigma$, gives the profits earned in each market j :

$$\pi_i = \frac{1}{\sigma} [p_i^{1-\sigma} (\frac{\mu Y_j}{P_j^{1-\sigma}}) \phi_{ij}] - f_i \quad (1.34)$$

The authors adopted after Baldwin et al. (2003) the term free-ness of trade $\phi_{ij} \equiv \tau_{ij}^{1-\sigma}$ that represents the combined impact of trade costs and the elasticity of substitution on demand.

2.5.2 Market Potential Function

As Crozet (2004) and Pons et al. (2007) note, agricultural or traditional good are freely tradable, so that their price may be normalized to one (price of good z is considered as the numeraire). Therefore, the real wage equation of mobile workers in region i becomes (Crozet, 2004: 443; Pons et al., 2007: 298):

$$\omega_i = \frac{W_i}{P_{yi}^\phi P_{xi}^\mu} \quad (1.35)$$

where P_{yi} and P_{xi} are respectively the CES price indexes of the service and industrial goods in region i (obtained from the consumer's optimization problem). Using the equation for the number of firms in each region, the abovementioned formulation can be written as (Crozet, 2004: 443; Pons et al., 2007: 298):

$$P_{xi} = \left[\sum_{r=1}^R \left(\sum_{m=1}^{n_{xr}} (\tau_{ir} p_{xr})^{1-\sigma_x} \right) \right]^{1/(1-\sigma_x)} = \left[\sum_{r=1}^R n_{xr} (Bd_{ir}^\delta p_{xr})^{1-\sigma_x} \right]^{1/(1-\sigma_x)} \quad (1.36)$$

$$P_{yi} = \left(\sum_{m'=1}^{n_i} p_{yi}^{1-\sigma_y} \right)^{1/(1-\sigma_y)} = n_{yi}^{1/(1-\sigma_y)} p_{yi} \quad (1.37)$$

As the equation shows, the price index of manufactured goods may be considered as the inverse of the market potential function: it consists of a sum of market sizes in all

regions weighted by distance. *Ceteris paribus*, the lower the price index in a region, the higher the share of manufacturing firms that are concentrated in this region or in the regions that are close. According to the NEG, such effect is called the *price-index effect* or *forward linkage*. The price index effect makes regions with a high density of services and low cost more attractive places to live due to the access to large manufacturing markets (Crozet, 2004: 443; Pons et al., 2007: 298-299).

Furthermore, regarding the beforementioned Hering and Paillacar (2008) notations, the authors derive the market access function from the expression of net profit earned in each potential location i . More precisely, the authors sum the profits from all locations j using equation on the constant mark-up and profits earned in each market j (Hering and Paillacar, 2008: 5):

$$\Pi_i = \frac{1}{\sigma} \left[\left(\frac{\sigma}{\sigma-1} \right)^{1-\sigma} m_i^{1-\sigma} \sum_j^R \left(\frac{\mu Y_j}{P_j^{1-\sigma}} \phi_{ij} \right) \right] - f_i; \quad (1.38)$$

$$\sum_j^R \left(\frac{\mu Y_j}{P_j^{1-\sigma}} \phi_{ij} \right) = MA_i$$

The term in the sum is called *Market Access (Real Market Potential)*, MA, where MA_i is described as a sum of the final demand addressed to region i , weighted by the accessibility from i to these markets j (since it considers ϕ_{ij}) and by the market crowding level of every region j (since it considers $P_j^{1-\sigma}$) (after Hering and Paillacar, 2008: 5).

Then the authors develop their approach by rewriting the equation of equilibrium under the hypothesis that all firms will earn the same profit and present a relationship between costs and MA (after Hering and Paillacar, 2008: 5):

$$m_i^{\sigma-1} f_i = \frac{1}{\sigma} \left(\frac{\sigma}{\sigma-1} \right)^{1-\sigma} MA_i \quad (1.39)$$

Next, they consider the distribution of the economic activity across regions in short and long run and characterise these two adjustment versions as respectively *price version* and *quantity version* (Hering and Paillacar, 2008: 5-6).

Regarding the price version, Hering and Paillacar (2008) follow Head and Mayer (2006) approach by introducing worker heterogeneity into the standard Krugman (1980) model, assuming that labor is the only production factor and positing both a fixed, F , and a variable, a , component of firm-level labor requirements. Subsequently they obtain what Fujita et al. (1999) call the *wage equation*, indicating which wages a firm from a given location i can afford to pay to worker k (after Hering and Paillacar, 2008: 6):

$$w_{ki} = \left[\left(\frac{\left(\frac{\sigma}{\sigma-1} \right)^{1-\sigma}}{\sigma F [a]^{\sigma-1}} \right) MA_i \right]^{\frac{1}{\sigma}} \exp(\rho \Lambda k) \quad (1.40)$$

where w_{ki} is the wage from individual k in region i , and Λ_k represents individual characteristics like school years, gender and age etc.

Referring to the quantity version, in general equilibrium, migration can eliminate the effects of market access on wages. The authors use quite simple two region migration dynamic equation, adopted after Fujita et al. (1999) (Hering and Paillacar, 2008: 6-7):

$$\dot{s}_s = (w_i - w_j) s_s (1 - s_s) \quad (1.41)$$

where s_s represents the share of skilled workers in region i , and ω represents real wages (that is, w_i deflated by the price index P_j).

To derive estimate of market access equation, the authors follow methodology by Redding and Venables (2004), who obtained market access from a gravity equation. They denote the bilateral exports T_{ij} from region i to region j and use the iceberg trade costs and get (Hering and Paillacar, 2008: 8-9):

$$\begin{aligned}
T_{ij} &= n_i p_{ij} q_{ij} = n_i p_i^{1-\sigma} \phi_{ij} \mu Y_j P_j^{\sigma-1} \\
n_i p_i^{1-\sigma} &= FX_i \\
\mu Y_j P_j^{\sigma-1} &= FM_j
\end{aligned} \tag{1.42}$$

where the exporter and importer fixed effects, specific dummy variables FX_i and FM_j , capture the impact of distance on trade over a very long time period and for many regions (Combes, Mayer and Thisse, 2008: 110).

Hering and Paillacar (2008), take logs of the above equation and get the estimated specification of the trade equation (Hering and Paillacar, 2008: 9, 11):

$$\ln T_{ij} = FX_i + FM_j + \delta \ln d_{ij} + \lambda_1 C_{ij} + \lambda_2 B_{ij} + \lambda_3 (B_{ij} * C_{ij}) + \lambda_4 b_{ij} + u_{ij} \tag{1.43}$$

where the phi-ness of trade (ϕ_{ij}) is based on variables that enhance or deter trade such as bilateral distance d_{ij} and contiguity C_{ij} and B_{ij} are identified as a national border. Additionally, they enrich the equation with a correction function λ_j^* , the correction of the selection bias, that uses the first-best migration probability and the retention probability. This fact makes this paper one of the first to reconcile the NEG models with economic literature on labor migration (Hering and Paillacar, 2008: 9, 11).

2.5.3 Migration Choice

Crozet (2004) and Pons et al. (2007) model follows that of Tabuchi and Thisse (2002). They consider a mobile worker k from region j and his location choice among R regions (including j), whose migration choice results from a comparison of the perceived quality of life in the various locations and his migration decision is designed to maximize the following objective function (Crozet 2004, 444; Pons et al., 2008: 299).

$$\begin{aligned}
\pi_{ji,t}^k &= V_{ji,t}^k + \varepsilon_i^k = \ln \left[\omega_{i,t} \rho_{i,t-1} \left[d_{ij} (1 + bF_{ij}) \right]^{-\lambda} \right] + t_i^k \\
i &\in [1, R]
\end{aligned} \tag{1.44}$$

where ρ_i is the employment probability for an immigrant in region i and $[d_{ij}(1 + bF_{ij})]^\lambda$ is a migration cost which increases with the distance between home and host regions. λ and b are strictly positive coefficients and F_{ij} is a dummy variable indicating whether regions i and j do not share a common border. t_i^k is a stochastic component capturing k 's personal perception of the characteristics of region i . To avoid endogeneity problem Crozet (2004) assumes that migration choices at date t are determined from a comparison of π_{ji}^k across regions at date $t-1$. Therefore, individual k will choose to locate in region i if $V_{ji,t-1}^k > V_{jr,t-1}^k, \forall r \neq i$. With assumption on distribution t_i^k , the probability of choosing region i is given by the logit function (after Crozet, 2004: 444):

$$P(M_{ji,t}) = e^{V_{ji,t-1}^k} / \sum_{r=1}^R e^{V_{jr,t-1}^k} \quad (1.45)$$

The expected migration flux from region j to i is defined by: $L_{j,t}P(M_{ji,t})$ and respectively, the total outflow from region j is $L_{j,t}[1 - P(M_{jj,t})]$. Hence, the share of emigrants from region j choosing to go to region i is (Crozet, 2004: 444; Pons et al., 2007: 299):

$$\frac{migr_{ji,t}}{\sum_{i' \neq j} migr_{ji',t}} = \frac{e^{V_{ji,t-1}^k}}{\sum_{r=1}^R e^{V_{jr,t-1}^k} - e^{V_{jj,t-1}^k}} \quad (1.46)$$

Using (1.32a), (1.33), (1.35), (1.36), (1.37) and the definition of $V_{ji,t}^k$, this share may be written as (Crozet, 2004: 444; Pons et al., 2007: 300):

$$\ln\left(\frac{migr_{ji,t}}{\sum_{i' \neq j} migr_{ji',t}}\right) = \ln\left[\left(L_{i,t-1}^y\right)^{\phi/(\sigma_y-1)}\right] + \ln\left[\left(\sum_{r=1}^R L_{r,t-1}^x \left(w_{r,t-1} d_{ij}^\delta\right)^{1-\sigma_x}\right)^{\mu/(\sigma_x-1)}\right] \\ + \ln\left[w_{i,t-1}^{1-\phi} \rho_{i,t-1}\right] + \ln\left[d_{ij}(1 + bF_{ij})\right]^{-\lambda} + \tilde{a}_{j,t-1} \quad (1.47)$$

$$\tilde{a}_{j,t-1} = -\ln\left(\sum_{r=1}^R e^{V_{jr,t-1}^k} - e^{V_{ij,t-1}^k}\right)$$

According to Crozet (2004) specifications, the above equation captures the trade-off faced by potential migrants who have to choose among several possible locations. The left-hand side of the equation is the share of migrants from a given region who have decided to move to region i . On the right-hand side, the third term represents the expected wage in the region, which increases with the host region's nominal wage and the probability of being employed in this region. The fourth term captures the impact of bilateral distance on migration flows and is interpreted as a measure of mobility cost. The two first terms denote region i 's access to markets: the price indices for non-traded service varieties and for manufactured goods in region i . The second term is the most important term in this equation. It corresponds to a market potential function and relates labor migration to the location of industrial activities and can therefore be seen as the forward linkage emphasized by the NEG. Moreover, the main parameters of the NEG framework (the elasticity of substitution and the parameters of the trade cost function) can be estimated from this price index function. Hence, if the empirical analysis confirms that this price index actually governs migration flows, i.e., that *migrants do follow market potentials*, it will validate the role of forward linkage as a part of the endogenous agglomeration process (after Crozet, 2004: 444-445).

Meanwhile Hering and Paillacar (2008) approach shows how the migration probability for each specific group of migrants is affected by different variables. The authors concentrate on region-specific returns to skills (in terms of education level), market access and amenities as key factors of the individual migration decision (Hering and Paillacar, 2008: 11).

Hering and Paillacar (2008) decompose the utility function: $V_{kij} = V_{ij} + e_{kij}$ as (Hering and Paillacar, 2008: 11):

$$V_{kij} = X_{ij}\beta + \xi_{ij} + e_{kij} \quad (1.48)$$

The utility of migrating to region j for an individual k from origin i is determined by X_{ij} , the characteristics of the locations i and j .

As described before, individuals go to the location that maximizes their utility, for that (Hering and Paillacar, 2008: 11-12):

$$\Pr(V_{kij} > V_{kim}) \forall j \neq m \quad (1.49)$$

$$\Pr(e_{kij} - e_{kim} > X_{im}\beta - X_{ij}\beta + \xi_{im} - \xi_{ij}) \forall j \neq m \quad (1.50)$$

As to McFadden (1974), the authors integrate out the migration probabilities over the distribution of the logistic distribution and obtain (Hering and Paillacar, 2008: 12):

$$\Pr(M_{ijk} = 1) = \frac{\exp(X_{ij}\beta + \xi_{ij})}{\sum_{j=1}^J \exp(X_{ij}\beta + \xi_{ij})} \quad (1.51)$$

Since the probability of an individual from i moving to j can also be interpreted as the share of individuals from i moving to j , the share of migrants from i to j may be rewritten as s_{ij} (Hering and Paillacar, 2008: 12):

$$s_{ij} = \Pr(M_{ijk} = 1) = \frac{\exp(X_{ij}\beta + \xi_{ij})}{\sum_{j=1}^J \exp(X_{ij}\beta + \xi_{ij})} \quad (1.52)$$

and the share of stayers of region i , s_{ii} as (Hering and Paillacar, 2008: 12):

$$s_{ii} = \Pr(M_{ijk} = 1) = \frac{\exp(X_{ii}\beta + \xi_{ii})}{\sum_{j=1}^J \exp(X_{ij}\beta + \xi_{ij})} \quad (1.53)$$

Dividing equation (1.52) by equation (1.53) and taking the log yields migration equation of the following form:

$$\ln\left(\frac{s_{ij}}{s_{ii}}\right) = \ln\left(\frac{\exp(X_{ij}\beta + \xi_{ij})}{\exp(X_{ii}\beta + \xi_{ii})}\right) = X_{ij}\beta - X_{ii}\beta + \xi_{ij} - \xi_{ii} \quad (1.54)$$

3. Conclusions

The phenomenon of migration has evolved through years and that is why migration management guidelines should take these changes under consideration. Nowadays, such facilities as Internet, less time and money-consuming travels, cheapening phone calls make the distance shorter and allow a migrant to keep in touch with relatives.

It would be of much importance to capture the main features of migrant decision making process via comparative analysis, using as a tool mentioned above logit family model, extended by Fotheringham et al. (2000; 2001) and Crozet (2004) ideas and dealing with such variables as regional disparities, political or institutional changes, labor market needs etc. In the following part of this work, there would be conducted a comparative study of Polish and Japanese migrant spatial choice behaviour.

Chapter 2 An Analysis of Polish Labor Migration

1. Introduction

There are many studies on Polish migration after joining the European Union (EU), nevertheless, in this chapter the main stress will be put on the relation among Polish migration, labor market and trends in Polish labor migration after the last Global Financial Crisis.

In general, recent Polish labor migration is strongly related to the domestic labor market situation. As the main reason for the decision to go abroad, so called *push factors*⁵, may be considered such factors as high unemployment rate and low earnings level at home market. On the other hand, increase in demand for labor force in developed countries becomes the most important factor, *pull factor*, for emigration decisions.

According to the fact that 05.01.2004 Poland joined the EU, the country found itself in some new institutional frameworks. The best example of such a new situation was that for the first time in history Polish citizens were allowed to work freely in several European countries. The first EU countries to open their labor markets to Polish workers were as follows: 05.01.2004 - Great Britain, Ireland, Sweden, 05.01.2006 - Spain, Portugal, Greece, Finland, Iceland, 07.31.2006 - Italy, 05.01.2007 - Holland. Moreover, labor markets of 10 new EU members (excluding Malta)⁶ have also lifted barriers on Polish workers from 05.01.2004. Further, 01.01.2007 this group of countries was enlarged by Bulgaria and Romania (the new EU members). In the end, Denmark and Belgium opened their labor markets 05.01.2009 and Germany 05.01.2011.

Joining the EU by Poland had strong impact on choices of Polish migrants. According to the news reports, millions of Polish people went abroad in search of a better life. However, such opinions are rather overstatements than evaluation of this phenomenon. Nowadays, with globalization in process, it is quite difficult to define the key determinants of labor factors mobility.

⁵ Lee`s pull-push model.

⁶ More specifically, new EU members from 05.01.2004, Czech, Estonia, Cyprus, Latvia, Lithuania, Hungary, Poland, Slovenia and Slovakia.

This chapter will focus on analyzing Polish labor migration influence on general economic situation, in particular its influence on regions, demography, domestic labor market and policy. People`s migration, notably labor migration, which assumes return migration in short time (New Economics of Labor Migration: NELM) may produce positive effects in developing countries. Furthermore, it may contribute to income inequalities correction, poverty reduction, increase in employment or human capital development across regions.

2. Characteristics of the EU and Polish Immigration Policy

First of all there will be presented some characteristics of the EU and Polish immigration policy.

After joining the EU, much importance was placed on harmonization of Polish policies with the EU ones, including immigration policy. Poland as a full-fledged member of the EU, is obliged to implement common immigration policy toward third countries` citizens entering her borders. On the other hand, the EU immigration policy which has its fundamentals in the *first pillar: community integration method*, is practiced in accordance with the basic principles of European Union. Those postulates concretize visa, asylum, immigration and other questions upon people`s free mobility policies.

The first EU attempt on solving asylum problem was made during Dublin Convention⁷ in 1990. Next step in establishing common immigration policy was Maastricht Treaty⁸ in 1992, however the most important measures against immigration problem were taken by Amsterdam Treaty⁹ in 1997. According to this Treaty, Schengen Agreement went into force and the necessity of exchange of information and experience on migration and transfers was accentuated. Moreover, the need of EU countries cooperation in the field of common immigration policy became clear. Then, in 1999, during the EU summit in Tampere, Finland, preservation of some limitation to

⁷ Dublin Convention signed 06.15.1990, was replaced in 2003 by Dublin Regulation. Council Regulation (EC) No 343/2003, <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32003R0343:EN:NOT> Access: 08.18.2010.

⁸ Treaty on European Union, Declaration on Asylum, <http://eur-lex.europa.eu/en/treaties/dat/11992M/htm/11992M.html#0108000051> Access: 18.08.2010.

⁹ Amsterdam Treaty, Title IV, Article 61-69, <http://eur-lex.europa.eu/en/treaties/dat/11997E/htm/11997E.html#0173010078> Access: 08.18.2010.

immigration was decided. On the basis of the arrangements in Tampere, the European Commission established the following rules:

- the rights concerning family reunion
- the status of EU citizen
- the rights concerning the third countries` citizens job-hunting process at the EU labor market
- the rights concerning students and labor workers inflow into the EU zone
- the asylum policy
- the fight with discrimination
- the welfare system grants toward third countries` citizens

Furthermore, according to the economic and demographic subjects, tying the future needs of the EU labor markets with immigration phenomenon was declared.¹⁰

Nowadays, the EU is also experiencing population aging problem, resulting from the decline in the birth rate and as Muenez (2007) states, between 2005 and 2025 Europe should absorb 130 milion of workers annually to guarantee future economic growth in the EU and maintain welfare society (Muenez, 2007: 10-11).

In the early 1990s Poland adopted policy toward asylum and refugees and enforced border guard troops, in particular those in the eastern regions. With the begining of the 2000s, the most important problems of immigration policy have become: repatriation, refugeedom, illegal immigration, labor migration and implementation of *Acquis communautaire* in this area of policy.

Summing up, much effort was devoted to shift from reactive immigration policy (rejection and discrimination of immigrants) to positive immigration policy (long-term migration management). Recently, more and more attention gain such issues like: the case of the assistance¹¹ for the return migration, creation of Polish migrants network, activation of student exchange and their professional career development or promotion of Poland abroad.

¹⁰ http://europa.eu/legislation_summaries/other/c10611_en.htm Access: 08.20.2010.

¹¹ Portal www.powroty.gov.pl, as an assistance by Ministry of Labor and Social Policy or employment agencies concerning formalities related to return migration, tax exemption etc.

3. Features of Polish Labor Migration

This section aims at statistical analysis of Polish labor migration characteristics.

The first feature is that in the case of Poland migration outflows exceed inflows, so Poland is a net-emigration country. From 1980 to 1989 almost 110-120 thousand people left country for the short term (from 2 to 12 months). The year 1989 marked the record migration outflow, however according to the statistical data, liberalization associated with systemic transformation did not contribute to the increase in migration fluxes. On the contrary, for a short time labor migrants numbers decreased, however several weeks-lasting labor migration increased.

As to the registered data from 1990 to 2004, population outflow accounted for 33 thousand people. In 2004 19 thousand Polish citizens left the country, which represented a fall in the trend by 2 thousand people in comparison to 2003.

Yet the decline in migration flows after 1990 was partially caused by change in statistical standards in Poland. New statistical rules recognized as migrants those, who left the country with a purpose of settling down abroad and those who deregistered themselves from the habitat. Research on migration imposes many difficulties due to significant data inconsistency.

As reported by Polish Central Statistical Office (Główny Urząd Statystyczny: GUS), 01.01.2007, total population of Poland accounted for 38.2 million people, meanwhile 1.95 million of Polish people resided abroad for more than 2 months (GUS, 2008a). On 12.31.2007, 2.27 million Poles stayed abroad, which means that between 05.1.2004 and 12.31.2007 net migration outflow reached a level of 1.27 million people. On the other hand, according to the research by GUS in early 2008, in the period from Poland's joining EU till the first quarter of 2008, legal immigration to Poland achieved a level of 10 thousand people (among them Ukrainians accounted for 26.6%, Belarusians for 9.2% and Chinese for 4.2% of the total immigration (GUS, 2008b).

The second feature of the most recent Polish labor migration is the fact that short-time duration migration has been prevailing. Regrettably, it is very difficult to mark out labor migration from the total migration outflow or estimate how many Polish citizens resided abroad before 05.01.2004. However, there is data that may be relevant for a purpose of such an analysis. As to the Labor Force Survey (Badania Aktywności

Ekonomicznej Ludności: BAEL) data, in the period from the second quarter of 1994 to the second quarter of 2005, there were 10-30 thousand Polish people residing abroad. The most intensive fluxes were recorded after 05.01.2004 (see: Figure 2.1). After EU accession, the number of Polish migrants residing abroad for a short term grew by 20% in comparison to 2003, and by 50% in comparison to 2002. The share of Polish citizens staying in foreign countries for less than 12 months also increased. Since 2004, with response to European labor markets liberalization, the group of a short time migration participants, in particular this within 12 months, has become outstanding (see: Figure 2.2) (GUS, 2008a).

Figure 2.1 Polish labor force abroad by residency period (thousands of people)



Source: Based on Kaczmarczyk (2006) elaborations.

Figure 2.2 Short term (less than 2 months) Polish residents (thousands of people), 2000-2006, second quarters



Source: Based on elaborations by Kaczmarczyk (2007c).

Nevertheless, statistics by BAEL do not include Polish citizens, who stay abroad for less than 2 months. The most competent for a short time migration information is data issued by government departments and agencies, e.g., according to the Ministry of Labor and Social Policy, there are from 350 to 400 thousand Polish people working abroad under the bilateral agreements. The most numerous is a short term migration group of seasonal workers employed in Germany under the bilateral arrangement from 1990. In late 1990s this group of migrants accounted for 220 thousand people, and in 2004 exceeded the level of 320 thousand people. This used to be the most important Polish migrants outflow until Polish accession to EU.¹²

In the end of 2007, there were 2.27 million of short term migrants among all migrants (in 2004 - 1 milion, 2005 - 1.45 milion, 2006 - 1.95 milion migrants). Then, 1.925 milion among those lived in Europe (in 2006 - 1.61 milion people). Moreover, a majority of Polish temporary migrants (in 2007 - 1.86 milion migrants) resided in EU countries. However, estimations by GUS include long term migrants regardless of the residence status and do not inclose seasonal labor migrants.

¹² <http://www.mpips.gov.pl/index.php?gid=32> Access: 08.17.2009.

The third characteristic constitutes changes in the choices of migrants' destination countries. After joining EU, new trends in destination selection occurred. The main stream of Polish citizens flowed to Great Britain, Ireland and Norway, meanwhile the intensity of migration to France and Germany lost its dynamics (see: Figure 2.3).

Figure 2.3 The number work permits issued to Polish seasonal workers in Germany, from 1993 to 2005, (thousands of cases)



Source: Based on Kaczmarczyk (2007c) elaborations.

In 2003, it was estimated that in Great Britain there are almost 70 thousand Polish citizens. According to Workers Registration Scheme statistics, in the period from 05.01.2004 to 12.31.2006, nearly 510 thousand people applied for registration in this system and among them Poles accounted for 307,670 persons (see: Table 2.1). Between 2003 and 2005, 245 thousand of National Insurance Numbers were issued to Polish migrants in Great Britain.¹³ Moreover, according to GUS, in the end of 2004 there were 150 thousand Polish migrants in United Kingdom and those numbers grew to the levels as follow: 2005 - 340 thousand, 2006 - 580 thousand and 2007 - 690 thousand. Obviously, Great Britain became a leading country in Polish temporary migrants' destination ranking (GUS, 2008). This means, that in the end of 2007 there was a 5-fold growth in Polish migrant numbers compared to 2003.

¹³ <http://www.ukba.homeoffice.gov.uk/workingintheuk/eea/wrs/> Access: 17.08.2009.

Table 2.1 Labor migrants in Great Britain by top ten nationalities, 2002-2006,
(thousands of people)

非表示

Source: Based on elaborations by Kaczmarczyk (2007b).

Furthermore, in Ireland from 05.01.2004 to 10.31.2006, 298,814 Personal Public Service Numbers (PPS No.) were issued to EU8 citizens.

Among the destination choices of Polish migrants, United Kingdom and Ireland turned out to be of the most importance. Germany, the most attractive destination over the past years, came second in the end of 2006 (in 2006, 450 thousand Polish people stayed in Germany, in 2007 490 thousand). 80-90% of Polish citizens stayed abroad for economic reasons.

Table 2.2 Leading destination countries for Polish temporary migrants (staying more than 2 months abroad), (thousands of people)

非表示

Source: GUS (2008).

The fourth feature is the profile of a potential Polish migrant and his migration pattern. The most willing to migrate were two groups of Poles:

- 20-44 years old citizens, from non urban areas or small towns (where population is less than 100 thousand people), male and female graduates from special technical schools or specialized vocational high school.
- 25-44 years old citizens, from big cities (where population is more than 100 thousand people), male and female who completed at least master course (this group constitutes the most valuable human capital resources for Polish economy).

As it was mentioned above, Polish migration patterns has changed (see: Table 2.3).

Table 2.3 Change in migration patterns

非表示

Source: Based on estimatins by Kaczmarczyk (2006).

Every year, almost 1 milion of Polish people is employed in the EU countries. However, 70% among these are migrants staying abroad for more than 2 years, but eventually willing to go back to Poland. More specifically, there were many permanent residents of Polish origins in the EU countries in the past years, nevertheless recent Polish migration has been dictated by wage differentials or professionnal career opportunities accessible in the EU regions.

4. Polish Socio-Economic Regional Differences

In the following section, some features of Polish regional differences will be presented.

Generally speaking, Polish spatial and demographic dynamics has been determined by several socio-economic factors interaction. Among determinants shaping demographic trends across Polish regions, there are pure demographic and socio-economic factors. All of them act at the following spatial levels: local, subregional, regional, national and foreign (in particular in Europe). Beforementioned economic factors, perceived as the key elements of social processes, play also an important role in producing demographic trends (Rządowa Rada Ludnościowa, 2008: 13-14).

From 2002 to 2008, the positive demographic processes were enabled by some favorable economic conditions. Above all, thanks to the economic growth, the living standard of people improved markedly. More precisely, the belowmentioned facts occurred:

- GDP per capita increased. If we take EU27 average as a 100 points, Poland showed 48 in 2002, 51.3 in 2005, 53.7 in 2007 and 57.5 in 2008, which means growth by 10 points in 6 years.¹⁴
- Households' disposable income per capita per month increased. On a year-over-year basis, by 1.4% in 2005, 8.5% in 2006, 8.6% in 2007 and 8.0% in 2008 (GUS, 2009).
- Registered unemployment decreased considerably, from 3.2 million of people in 2002 to 1.7 million of people in 2008, constituting fall by 46%. Unemployment rate declined from 20% in 2002 to 11.3% in 2007 and even to 8.8% in October 2008 (see: Figure 2.4) (GUS, 2009).

Figure 2.4 Polish unemployment rate, from 2000 to 2012, (%)



Source: http://www.stat.gov.pl/gus/5840_677_PLK_HTML.htm Access: 04.14.2012.

¹⁴ <http://epp.eurostat.ec.europa.eu/tgm/table.do?pcode=tsieb010&tab=table&language=en&plugin=1&init=1> Access: 08.19.2009.

At the same time, from 2002 to 2007, the following unfavorable conditions were still present:

- Despite the government poverty reduction efforts, in 2005 there were 18% of households below the official poverty line and 18% of households below the relative poverty level (GUS, 2009).
- Disparities in economic growth across regions widened. Regions of the highest economic growth were those with complexes of multifunctional urban areas. As a result of such a growth allocation, the expanding gap among regions became more visible (Figure 2.5).
- As it was mentioned before, there was a considerable increase in number of labor migrants.

Figure 2.5 The level of productivity in Polish regions, 2006, (Poland 100%)



Source: Based on GUS (2009), *Rocznik województw 2009*.

In the period from 2002 to 2005, regions which achieved the most dynamic economic growth exceeded EU27 GDP per capita average level. For example, if we take 100 as the EU27 GDP per capita average, Masovian GDP per capita increased from 74.7 to 81.2, Great Poland from 50.2 to 54.8, Lubusz from 42.5 to 46.2, Opole from 39.1 to 42.5, Lower Silesian from 50.0 to 53.0, so mostly central and western

voivodeships improved their economic condition. On the other hand, in the regions with low productivity level, GDP per capita levels grew no more than by 1 point (West Pomeranian, Podlaskie, Kuyavian-Pomeranian, Lublin).

Recently, there also have changed factors shaping demographic trends in Polish regions. This change is related to the socio-economic system transition. In particular:

- As a result of economic restructurization and modernization, there was a shift in leading industries. Many investments were made in the larger scale subregions as well as in major urban areas. On the other hand, the role of periphery and rural areas and the regions with traditional industries declined. This phenomenon became visible especially after European Regional Development Fund (ERDF) investments.
- Growth in population took part only in major urban zones (Masovian, Pomeranian, Great Poland, Lesser Poland).
- The bipolarization of people`s living standard advanced. Under such a situation, larger inequalities in both social and economic promotion opportunities were observed. This became one of the push factors for labor migrants. The most attractive destinations for internal migrants were still regions with urban centers. Another big issue was the phenomenon of progressing aging society (see: Figure 2.6).

Figure 2.6 Working age population by regions (2008, reference year: 2003), (%)



Source: Based on data by GUS (2009), *Regiony Polski*.

5. Polish Labor Migration and Domestic Labor Market

Subsequently, some considerations on the relationship between Polish labor market and labor migrants will be presented.

Stagnation at the labor market turned out to be an important push factor for labor migrants. Meanwhile, shortages in labor force in the western EU countries became pull factor for Polish migrants. Furthermore, the phenomenon of labor migration was reported to act as the *unemployment export*, though for many individuals working abroad it was a career building-up experience. On the other hand, diminished human economic activity at the internal labor market and career or skill levels gap due to the disparities in income levels could also be push factors. Thus, labor migration had multidimensional influence on Polish labor market.

During the last few years, trends in labor migration and spurring job creation at the labor market have had much influence on the fall in unemployment rate. This effect was especially visible at the local labor markets. However, migrants' job categories and the demand for labor force at Polish labor market (specialized fields) showed a certain mismatch. In sum, career experience or skills acquired abroad not always matched the internal market necessities. As a result, though the Polish employment index (the number of employees according to the relevant annual survey divided by the number of

employees in the reference year) is quite high, the rate of working population (rate that applies to the number of unemployed and the number of job seekers aged over 15 but under 64) is low (see: Figure 2.7). According to Polish Ministry of Economy, in the fourth quarter of 2007 in the group of population aged over 15 and under 64, the employment index was at the level of 58.1% (the EU average employment index is at the level of 65%). Moreover, according to Eurostat, in present Polish society, 15.5 million of working population support 14.5 million of non-working population.

Figure 2.7 Polish labor force professional activity, BAEL, from 2000 to 2007, (thousands of people)



Source: Based on Kaczmarczyk (2007b) elaborations.

Since 1998, another interesting phenomenon has been present at the Polish labor market. Namely, the level of education of Polish workers has been gradually increasing. Consequently, the number of migrants with higher education in total outflow also has grown (GUS, 2004).

There is a multiple mutual relationship between labor market and labor migration. Recently observed outflow of well educated migrants is dubbed *brain overflow*. Brain overflow in contrast to *brain drain* means the outflow of the surplus labor work. As an example may serve the case of Polish plumbers. Cutbacks in manpower in Gdansk Shipyard and Gdynia Shipyard, accompanied by invariably low wages, became a push factor for this group of technical workforce. As a result of massive outflows, in the first

quarter of 2008 Warsaw Employment Agency announced that plumber profession was at the 35th position in the list of deficiency professions (UP, 2009).

Next phenomenon is *brain waste* (also called *deskilling*). Many Polish migrants went abroad in hope to take advantage of the acquired skills. However, at the labor markets of accepting countries there were from 40% to 80% of labor migrants, who made use of earlier obtained skills (Kaczmarczyk and Tyrowicz, 2008: 5-7). In other words, many labor migrants worked abroad below their qualifications. Moreover, Polish economic situation between 2001 and 2004 made it difficult for fresh university graduates to start their career in Poland.

Another feature is *brain circulation*, which means that generally well qualified labor force is more mobile than other professional groups, what enables them with better elasticity toward new occupational opportunities. This circle does not always close with return migration but often leads to the labor force exchange at the international level. Nevertheless, if the outflow exceeds the inflow there is a brain drain phenomenon, otherwise *brain gain* phenomenon appears.

While economy pass through the period of globalization, the freeness of labor force mobility becomes natural. People`s mobility, under the globalization process, may lead to labor shortages elimination and increase in wage levels, leading to a gradual convergence (see: Figure 2.8).¹⁵ Furthermore, remittances from abroad accounted for almost 1% of Polish GDP, which also had some influence on income equalization in Poland.

¹⁵According to the Polish Ministry of Economy, due to creation of new job opportunities, the mismatches at the Polish labor market became clear. The decrease in unemployment rate, high economic growth or shortages in some professions put an upward pressure on wages (MG: 2007).

Figure 2.8 Wage dynamics and inflation trends, from 2001 to 2011, (compared to the previous year)



Source: http://www.stat.gov.pl/gus/5840_1630_PLK_HTML.htm (Access: 04.14.2012); <http://www.nbp.pl/home.aspx?f=/statystyka/bazowa/bazowa.htm> (Access: 04.14.2012).

Since 2004, Polish labor market, as the EU member, have been facing downtrend. The labor cost had been growing until the Global Financial Crisis and then new trends occurred (see: Figure 2.9). Notwithstanding, Polish labor force was still competitive at the European labor market and when compared to Swedish or Danish labor force, in terms of costs, it was 4 times cheaper. Inside the EU less expensive labor force was in Slovakia, Lithuania, Latvia, Romania and Bulgaria.¹⁶

¹⁶ http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/search_database Access: 04.14.2012.

Figure 2.9 Labor force productivity and costs, 2000-2013, (percentage change on previous period)



Source: Based on data by Eurostat.

6. Trends in Polish Labor Migration After the Global Financial Crisis

Finally, some facts concerning the change in immigration and labor migration patterns due to the Global Financial Crisis will be described.

Along with the economic depression of the main destination countries of Polish migrants, Great Britain and Ireland, it was expected that intense return migration would appear. Yet, the concern for the gigantic outflow of the foreign capital from Poland did not come true and Polish economy remained in relatively good condition.

However, as a result, e.g., of the jobless benefits bestowed by the British social welfare system, many Polish migrants staying in this country put off their decision to go back to Poland. In particular, non-qualified workers extended their stay and did not feel like coming back soon (see: Figure 2.10).

Figure 2.10 The numbers of return migrants from 2000 to 2008 (thousands of people)



Source: Based on data by GUS (2008b).

In December 2008, Bialystok University conducted a survey, which confirmed that labor migrants residing abroad did not hurry to return to Poland. The sample was the group of 500 migrants of Podlasie Voivodeship origin and the results are as follow:

- 64% of respondents left Poland after 2004.
- 28% of respondents resided in Great Britain or Ireland, 20% of respondents resided in USA.
- 77% of respondents decided to migrate because of economic reasons.
- 55% of respondents declared that, if they were paid 3,000-4,999 zlotych per month, they would stay in Poland.
- 22% of migrants aimed at work abroad for a long period, among them 18% wanted to settle down abroad.
- 12% of respondents declared they would return to Poland within 6 months.¹⁷

According to the survey conducted by Iglicka, the dynamics of migration decreased at the time of financial crisis (Iglicka, 2009: p.3). Furthermore, return migration at that time was not permanent return but temporary, cyclical or seasonal one (see: Table 2.4).

¹⁷ <http://www.obserwatorium.up.podlasie.pl/default.aspx?docId=4476&newsId=10> Access: 08.15.2009.

The factors that made migrants' choice to stay abroad were as follow:

- the consideration that the financial crisis would affect all regions
- there had relatives abroad
- they wanted to stay abroad for a longer time.

Table 2.4 Reemigration by countries



非表示

Source: Iglicka (2009).

A majority of Polish migrants chosen a strategy to survive the financial crisis abroad, however this may bring them some problems in the accepting countries:

- strict conditions of employment
- alienation at the labor market
- progressing poverty in a group of labor migrants
- animosity grounded in the common belief that immigrants take away natives' jobs (after Iglicka, 2009: 28).

7. Conclusions

This paper was aimed at describing trends in recent Polish labor migration as well as its relationship with labor market. The following facts have been discovered:

- Since 2004, the number of temporary migrants has grown considerably.
- The index of employment has increased, nevertheless, the rate of working population has remained low. It is highly probable, that there is a mismatch at the Polish labor market.

- After the world financial crisis in 2007, no rush for return migration has been observed.

In general, the temporary migration of the surplus labor force has brought good results. In particular, the unemployment rate has fallen, productivity of the human capital has improved, competitiveness has been strengthened, new socio-cultural experiences have been gained, labor force has been diversified and significant amount of the remittances has been transferred from abroad. Besides, labor migration creates many possibilities for knowledge exchange. Recently, many temporary migrants consider migration as a kind of investment. To maximize migrant's return on this investment, it is important to create attractive offers for the return migrants at the Polish labor market.

The system transition in Poland did not take effect in fully mature labor market. There were many fears that huge cohorts would leave Poland. However, opening the labor markets (especially in Great Britain and Ireland) for Polish labors, has made the accepting countries beneficiary. Nowadays the most important problem for Poland in the case of labor migration is how to encourage migrants to return to the country.

Joining the EU has taken effect in incorporation of Poland into European system of people mobility. This is a new challenge for Polish immigration strategy. Above all, the key issues are how to manage adequately Polish migrants flows and tackle with the problem in conformity with the needs of Polish economy.

Chapter 3 An Analysis of Japanese Internal Migration

1. Introduction

Japanese internal migration started with industrial revolution in Meiji period (1868-1912). Main flows, excluding early 1940s, occurred from rural areas to urban areas (major municipalities' zones). From the very beginning Tokyo and Osaka dominated in population concentration. This tendency continued till the end of 1950s. In 1960s, a shift in migration patterns occurred, characterized by: a) increase in migration rates from three major city zones (Tokyo, Osaka, Nagoya) to non urban zones, b) growth in numbers in inter-big-city areas migration, c) augmentation in inter-prefectural migration flows. In mid-1970s internal migration reached balance, in particular between non-urban and big city zones. In the beginning of 1980s an increase in influxes into big city zones was recorded again (Kurota, 1976: 61-63).

In 2005 almost 50% of Japanese population resided in three major city zones while other regions accounted for 49.8% of total population. According to the National Institute of Population and Social Security Research, by 2035, the areas of the three big municipalities would occupy 53.2% of total population and their working age population will account for 54.7% of total population.¹⁸

2. Japanese Internal Migration Before 1973

In late 1940s and 1950s Japanese population concentrated mainly in Tokyo and Osaka, which means that they were attracted by big cities and their suburbs, mainly due to high economic growth. During that time bipolarization of the central urban areas (Tokyo, Osaka and Nagoya in particular) and non-urban areas begun to be present. Ishikawa (1995) points out that intensive migration before 1973 constituted an important factor in successful modernization and industrialization in Japan (Ishikawa, 1995: 52).

First changes in migration patterns took place in the end of 1960s, when, as it was mentioned before, migration flows multi-channelization (*maruchichaneruka*) phenomenon was observed (after Kurota, 1976: 61-65). Other important new tendencies

¹⁸ <http://www.ipss.go.jp/syoushika/tohkei/suikei07/suikei.html> Access: 28.04.2011.

manifested themselves by a rise *U-turn* (migration back to origins, finding job there) and *J-turn* (migration back to larger city near the home town, rather than to home town itself) migration (Ishikawa, 1995: 53).

After 1970 high migration flows started to decrease, nevertheless the three big cities zones were invariably the most popular destination locations. Looking at the annual economic growth rate and migration rates, it may be assumed that there is a strong relation between economic growth and migration into big cities areas (see: Figure 3.1).

Figure 3.1 Japanese annual economic growth rate and internal migration rate (%)



Source: GDP Growth Rate published by Cabinet Office, Government Japan, in 68 SNA. Number of Internal Migrants 1954-2004 published by MIC, Statistics Bureau. Own elaboration.

In the period from 1950s to 1970s Japan's population increased by 84.11 million to 104.67 million, meaning increase by 24.4% of the population. Working age population recorded growth from 50.17 million to 72.12 million people, which accounted for 43.8% growth in this group, while labor force in the years between 1953 and 1973 increased from 39.89 million to the level of 52.89 million people, constituting 32.6% increase in this group.¹⁹

¹⁹ Ministry of Internal Affairs and Communications (MIC), Statistics Bureau, Labor Force Survey.

In the beginning of 1970s there was a second shift in migration factors, attracting and repelling agents become more differentiated and complicated, which manifested itself in U-turn, J-turn and *I-turn* (city-born people migrate to rural areas) migration flows. As shown by studies by Ishikawa (1995), before 1973 the most important factors of Japanese internal migration were distance, income gap, employment possibilities, age and education level (Ishikawa, 1995: 65-89).

3. Japanese Internal Migration After 1973

The first oil shock in 1973 caused recession in Japan and subsequently the migration flows decreased. During that time migration pattern known from 1950s and 1960s collapsed.

In early 1970s rapid decrease in in-migration to all regions took place. In 1970, the three big city zones received an inflow of 410 thousand people, which diminished from 1971 to 1975 as follow: 307 thousand - 227 thousand - 136 thousand - 52 thousand - 21 thousand and finally in 1976 they turned out to be out-migration zones with an outflow at the level of 10 thousand people.²⁰

In late 1970s migration between urban and non-urban areas was almost balanced. However, with the beginning of 1980s migration flows augmented again. Demographic transition was accomplished in Japan in the end of 1970s (Ishikawa, 1995: 53). In the beginning of 1970s the phenomenon of suburbanization continued in Ibaraki, Shiga and those prefectures recorded increased in-migration, besides in all other prefectures migration flows were close to 0. During 1980s the most intensive in-migration fluxes were registered in Saitama, Chiba, Kanagawa, Shiga and Nara.²¹

According to Yorimitsu (1987), the 1985 Population Census Data and the fact that during 1980s the decline in birth rates and the reduction of rural and urban deviations in birth rates were recorded, prove that internal migration in Japan came to be the major determinant of population growth in each region (Yorimitsu, 1987: 22).

Summing up, the following trends of net migration of each prefecture from 1955 to 1985 may be observed:

- prefectures continuing to show net gain - Saitama, Kanagawa;

²⁰ Ministry of Internal Affairs and Communications (MIC), Statistics Bureau, Labor Force Survey.

²¹ MIC, Statistical Bureau.

- prefectures continuing to show net loss - Aomori, Iwate, Akita, Yamagata, Fukushima, Niigata, Toyama, Fukui, Wakayama, Shimane, Yamaguchi, Tokushima, Ehime, Saga, Nagasaki;
- prefectures which showed a change from net gain to net loss - Osaka, Hyogo;
- prefectures which showed a change from net loss to net gain - Ibaraki, Chiba, Yamanashi, Shiga, Nara;
- prefectures which showed a repeated change between gain and loss - Hokkaido, Miyagi, Tochigi, Gunma, Tokyo, Ishikawa, Nagano, Gifu, Shizuoka, Aichi, Mie, Kyoto, Tottori, Okayama, Hiroshima, Kagawa, Kochi, Fukuoka, Kumamoto, Oita, Miyazaki, Kagoshima, Okinawa (Yorimitsu, 1987: 25).

4. Migrants Destinations

In post-war Japan, during high economic growth period in 1950s and 1960s, there was a rapid growth in migrants influx to the three major city zones. Tokyo zone was in constant in-migration, Osaka area in 1950s and 1960s was also in-migration zone, however from the beginning of 1970 in-migration dynamics decreased and from 1974 became out-migration zone. Recently Nagoya area has recorded increase in in-migration flows. In the terms of prefectures, there were 11 in-migration zones with big center cities: Saitama, Chiba, Tokyo, Kanagawa, Gifu, Aichi, Shiga, Kyoto, Osaka, Hyogo, Nara. People migrated toward those destination to settle up in the suburbs (see: Figure 3.2).²²

²² National Institute of Population and Social Security Research, Department of Population Structure Research.

Figure 3.2 Population density in Japan (population log)



Source: Data on Population Density 1898-2005 released by MIC, Statistics Bureau. Own elaboration.

5. Japanese Migrant After the Bubble Economy Period

As shown by the the Fourth Migration Survey conducted on July 1, 1996, which describes trends in Japanese internal migration during the years from 1991 to 1996, people who lived in a different residence five years earlier (in 1991) accounted for 22.2% of all respondents. The rate was lower than the rate in the previous survey - 26.7% for the period 1986-1991. Mobility was highest in the 25-29 age group, which constituted 49.5% of all migrants. Both, intra-municipality migration and inter-prefectural migration decreased in the period from 1991 to 1996.

The survey reveals that, in the years in question, people moved 3.12 times on average in their lifetime and the average number of prefectures where respondents have ever resided was 2.13. Very interesting in the case of Japan is the fact that the average number of moves was highest among those in their fifties, who were in their adolescence at the time of Japan's high economic growth.²³

As far as the reasons for move were concerned, most frequently mentioned causes for migration were moved with "parents/spouse" (30.1%), followed by "housing-

²³ The Fourth Migration Survey, 1996, Source: National Institute of Population and Social Security Research.

related” (22.4%), ”job-related” (17.2%) and ”marriage/divorce” (16.4%). The beforementioned reasons for migration were the same as those published in the Third Migration Survey. Moreover, according to the Fourth Survey 6.2% of respondents aged 65 years and over lived in a different residence from the one in 1991. Moreover, the percentage of those who selected ”to live with/near a child” as their push factor for migration was especially high among movers aged 75 years and over and accounted for 32.3% of total respondents. That figure was 21.3% among those aged 65 to 74 years. The proportion of those who selected this reason for moving increased together with the age of movers.

According to the series of Report on Internal Migration in Japan (2002-2009)²⁴, which inform on the situation of internal, intra-prefectural, and inter-prefectural migration in Japan:

- the number of Japanese internal migrants is in constant decrease (see: Figure 3.3)
- it has been over than 6 million migrants for 41 years since 1961, but these records fell below 6 million in 2002
- in 2009 the rate of inter-prefectural migration was 1.96% and this was the lowest record in the past
- in 2009 the rate of intra-prefectural migration was 2.25%, a decrease for 6 straight years
- in 2009 the decrease range of net-migration in Tokyo area has expanded to over 20 thousand, a first increase in 22 years since 1987
- the highest plus net-migration showed the following prefectures: in 2004 Tokyo, Kanagawa, Okinawa; in 2005 and 2006 Tokyo, Aichi and Kanagawa; in 2007 and 2008 Tokyo, Kanagawa and Chiba; in 2009 Tokyo, Chiba and Kanagawa
- the highest minus net-migration showed the aftermentioned prefectures: in 2004 Aomori, Nagasaki, Nara; in 2005 Nagasaki, Aomori and Iwate, in 2006 and 2007 Aomori, Nagasaki, Akita; in 2008 Hokkaido, Aomori, Nagasaki; in 2009 Hokkaido, Fukushima and Aomori.
- the three major metropolitan zones were Tokyo area, Nagoya area and Osaka area.

²⁴ Report on the International Migration in Japan: Summary of Results in 2002, Released on March 14, 2003 by Statistics Bureau of Japan.

Figure 3.3 Recent Internal Migration in Japan



Source: Number of Internal Migrants 1954-2004 published by MIC, Statistics Bureau. Own elaboration.

6. Income Gap in Japan

From 1955 to 2005 income-gap per capita was almost at the same level as migration flows to the three major municipality zones. After 1970 economic inequalities between cities and other regions shrank, nevertheless further increase in income-gap after 2003 was recorded (see: Figure 3.4).

Figure 3.4 Income inequalities in Japan 1997-2008 (coefficient of variation)



Source: Data on *Hitoriatari kenmin shotoku* (Income per capita) 1996-2008, published by Cabinet Office, Government of Japan in *Kokumin keizai keisan*. Own elaboration (the coefficient of variation was calculated on the basis of top 5 and bottom 5 prefectures' income per capita).

Income gap in Japan has been growing since 1980, and the cause of this problem is considered to be the aging society phenomenon. The phrase: *kakusa shakai* (unequal society) has grown in popularity since 2006, when it was ranked among top-ten of the 2006 buzzwords (*ryukogo daisho*).

After 2002 the income gap became particularly visible in intra-age groups. In Japan intra-age group income grows rapidly among people in their 40s, when inequalities in promotion become clear. Moreover, since 1999 inequalities in consumption expenditures across Japan there have also been observed. Otake (2007) claims that not softening but tightening of regulations may act as a countermeasure against inequalities in Japan. The growing feeling of income inequalities among the Japanese is also caused by the gap between the actual determinants of income and its subjective sense of worth (Otake, 2007: 5).

Another important factor in income gap variation is a change in the structure of Japanese households. Until 1980s, 25% of the families had 4 members, while nowadays this group account for 15% of all households. One-person households constitute 15% of households, two-person families almost 30% of total units. This shift in families

structure slowed down the progress of *inequalitization* (*fubyodoka*), yet, after 1990s the trend of growing inequalities has not changed. Low income groups, in particular those represented by males, experience further drop in salaries. This situation is compared to the situation in the United States of America, where the main causes of income inequalities are said to lie in further increase in earnings in high income group (Otake, 2007: 2). Nowadays, the fact that many housewives have entered the labor market also contributes to the growing income gap in the society. On the other hand the group of single mothers has grown considerably and this may be responsible for almost 40% of income gap growth from 1979 to 1996.²⁵

According to the MIC Statistics Bureau, in 2000 11 year of Heisei, in the data of households of more than one member and one-member households, Gini index for disposable earnings was ranked at the level of 0.273. 1984 - 0.252, 1989 - 0.260, 1994 - 0.265, which shows that income inequalities were expanding. Looking at the data concerning Gini index by the age-groups, under 30s group - 0.222, 30~49 group - 0.235, 50~64 group - 0.277, over 65 - 0.308, it may be said that income gap is growing with age.

Otake (2000) assumes, that the sense of income gap began in the period of bubble burst. He suggests that Japanese companies should transfer from wage system (*chingin seido*) and seniority system (*nenkojoretsu*) to the current operating performance concept (*gyosekishugi*). Furthermore, that they should reduce the number of full-fledged employees (*seishain*) and create more opportunities for part-time (*pato*) and temporary (*haken*) workers to restore competitiveness of Japanese economy. At these times the latter two groups make income gap spread.²⁶

Japanese Ministry of Health, Labor and Welfare calculates and publishes Gini index for Japan in surveys on income redistribution (*shotoku saibunpu chosa*). In these statistics pretax income values are adequate to be compared with other developed countries` Gini index levels, among which Japan is in the middle rank. According to the intra-age group income inequalities Otake (2000) states: *If the society keeps aging, the level of inequalities in the whole economy will continue to rise. If the changes in the*

²⁵ MIC, Statistics Bureau.

²⁶ <http://www.iser.osaka-u.ac.jp/~ohtake/paper/shotokukakusa.html> Access: 11.03.2011.

*population characteristic are the source of growing inequality, we can call it a “seeming inequality growth”.*²⁷

Summing up, the main causes for the expanding income gap may be seen in: part-time workers` low wages and lack of career opportunities, change in household structure and aging society phenomenon.

7. Japanese Internal Migration and Economic Growth

Population growth in Japan achieved high rates in prosperity period (*Jimmu keiki* 12.1954 - 06.1957, *Iwato keiki* 07.1958 - 12.1961, Tokyo Olympic Games 1964, *Izanagi keiki* 11.1965 - 7.1970). During the time from 1953 to 1973 Japan experienced a period of surplus working population and dynamic migration helped in maintaining high economic growth. The first oil shock in 1973 slowed down the economy and in-migration to the three major city zones decreased.

In that period people were prone to migrate to regions of high productivity, which is considered to be important for sustaining high economic growth. Harada and Yoshioka (2004) state: *Before 1970s, Japanese economy propelled growth and people migration, responding to the technical gap between Japan and Western countries. A lot was invested in private as well as public capital* (after Nawata, 2008: 25).

Excluding 1976 year and period from 1993 to 1995 big cities were recorded as an in-migration zone. In-migration numbers were especially high in late 1950s and in 1960s. Tokyo zone was constant in-migration, Osaka area also constituted in-migration zone in the period from 1950 to 1960, nevertheless after a rapid decrease in migration propensity in early 1970s the city became out-migration zone from beginning of 1974. The meaning of Tokyo area as a destination place has remained important for years and as consequence of the shift in migration patterns Nagoya and its suburbs has become more and more attractive location for Japanese migrants.

GDP growth rate from 1970 to 1975 presented the following levels: 8.2%, 5.0%, 9.1%, 5.1%, 1.2%, -0.5%, 4.0%, which meant a sharp downturn in economic performance and the end of high economic growth era in Japan.²⁸ Other reason for the

²⁷ <http://www.iser.osaka-u.ac.jp/~ohtake/paper/shotokukakusa.html> Access: 11.03.2011.

²⁸ GDP Growth Rate published by Cabinet Office, Government Japan, in 68 SNA.

drop in migration rates until the early 1970s was the fact of diminishing regional income inequalities (see: Figure 3.5).

In the years from 1970 to 1975 the following falls in income gap levels were recorded: 2.04-fold - 1.93-fold - 1.85-fold - 1.80-fold - 1.63-fold - 1.58-fold. Labor productivity increased in the three big city zones by 1.9-fold from 1970 to 1975, at the same time in other regions labor productivity increased by 2.2-fold. It may be assumed that early 1970s put an end to the circle: labor productivity inequalities - income gap - in-migration to the three big city zones (after Nawata, 2008: 27).

Figure 3.5 Economic inequalities in Japan (1955 - 2000)



Source: Ministry of Land, Infrastructure, Transport and Tourism estimations (calculated on the basis of top 5 and bottom 5 prefectures' income per capita average differences).

Comprehensive National Development Plan (1962) (*zenkokusogokaihatsukeikaku*) and the following: 1969 - *shinzenso*, 1977 - *sanzenso*, 1987 - *yozenso*, allowed for considerable public investments. The wave of industrialization went from the three big city zones to other regions, due to the lower level of wages firms continued to locate factories in the other regions, where firms continued to locate their factories due to the lower level of wages. Gravity force of regional manufacturing industry increased since late 1960s (Nawata, 2008: 28). Manufacturing industry of the three big cities zones fell from the peak 66.6% in 1965 to the level of 58.0% share in 1990, while other regions

recorded growth in this share from 33.4% to 42.0%. Looking at the breakdown of the three big city zones, Tokyo zone share shrank slightly from 33.9% in 1965 to 29.0% in 1990. Osaka area share accounted for 23.3% in 1955 and 15.7% in 1990. The change in Osaka's share could be caused by the curbing of the factory location investments toward capital zone and Kinki area. The phenomenon of the diminishing income gap between provinces and cities began in mid-1960s.²⁹

In the years from 1970 to 1980, there was a fivefold increase in public works' costs. In 1980, higher in-migration rates to the three big city zones returned and public works spread as well. Drop in in-migration rates during 1970s falls on *nippon retto kaizou bumu*³⁰ (*Japanese archipelago reconstruction boom*) period (after Nawata, 2008: 29). On the other hand, *dankai*³¹ generation, which supplied migration to big cities settled down during 1970s, which might have contributed to decreasing migration rates.

According to *Toshokoyo-to toshikino-ni kakaru senryakukadai-no kenkyu* (Rodoseisaku kenkyu kenshu kiko, 2007) population share augmented in: Tokyo area with Kanagawa, Chiba and Saitama, Aichi, Shiga, Hyogo, Fukuoka, Okinawa (Nawata, 2008: 32).

Nowadays, migration rates is in decrease, nevertheless Tokyo area and Aichi population is in constant increase. In other regions the most attractive locations for migrants are the following cities: Sapporo, Sendai, Fukuoka.³²

8. Change in factors affecting Japanese demography

Facts such as demographic transition, suburbanization, population concentration in major municipalities, J-turn, U-turn, I-turn and aging society constitute important factors affect Japanese demography.

In 1950s the size of population of Kyushu, Okinawa and Kinki was almost the same as the size of population of Tohoku. After 1970, population continued to grow in south Kanto and Kinki (Kanto population increased from 15.5% to 23.0% of the total population, Kinki from 13.8% to 16.6% of the total population), while in Tohoku,

²⁹ MIC, Statistics Bureau.

³⁰ Tanaka speech in 1972, just before he became prime minister, concerning development plan for Japan.

³¹ Generation born during the first baby boom or shortly after the Second World War in Japan.

³² National Institute of Population and Social Security.

Kyushu, Chugoku and Shikoku population decreased.³³ A simple interpretation of this phenomenon is that in given period economic growth in Japan was high and people migrated to places, where they had access to the bigger market.

As to the statistics concerning the group of working age population against total population, in 2005 big cities accounted for 50.2% of the total population. This trend was expected to remain stable from that time on.

From 1950 to 2005, in 55 years, population of Japan increased by 43.65 million, however, 80% of this growth took place in the three big city zones, more precisely this number equaled to 34.97 million people (see: Figure 3.5).³⁴

According to Malmberg, Japan was the first Asian country to complete the demographic transition and to reach the old age phase (in the late 1980s). Growth in the child group was present up to 1950, when it was suddenly stopped and then turned backward. Increase in the young adult group had its beginning in the end of the 19th century, however it was the most dynamic in the 1920s and between 1940 and 1950. This group's growth was stable up to 1970 when suddenly stopped. The middle age group started growing slowly in the early 1900s and accelerated after 1940. Finally, growth in the old age group has almost entirely been a post-1950s phenomenon (after Malmberg, 2006: 63).

³³ MIC, Statistics Bureau, Population Census.

³⁴ Population of Cities (1920-2005) published by MIC, Statistics Bureau.

Figure 3.6 Population of cities in Japan (1975-2005)



Source: Population of Cities (1920-2005) published by MIC, Statistics Bureau. Own elaboration.

In the 1950s only one in twelve Japanese was above 60 years of age. Since then the number of elderly people has grown rapidly and since 2005, almost one in three Japanese is above 60 years of age. Japanese economic, social and political development since the late 19th century has been strongly influenced by the age transition. Industrialization in Japan, as in other developed countries, falls on the period from 1920 to 1969, when the big municipalities areas tripled their population (Malmberg, 2006: 65).

9. Internal Migration and Labor Market

In mid-1990s due to the financial crisis more non-regular system (*pato*, *haken* etc.) job places were created, mainly in services sector. This situation made visible the demand-supply mismatch in the Japanese labor market. After 2000 there was a growth in independent contract workers (*ukeoi*) and dispatchers (*haken*), caused by regression in manufacturing industry. Around 2003, Japanese economy showed signs of slight recovery and during that time non-regular workers accounted for one third of all workers. Nevertheless, at the same time earnings per capita level decreased.

The Japanese economy has recorded positive growth since the second half of 2002. The expectation for its recovery led to improvement of stock prices, which

contributed to stabilization of financial sector. Outward direct investment to Asia, especially to China, continued to grow and expansion of export to China and the other Asian economies as well as domestic capital formation especially in electronics industry has offset negative deflationary pressures. The deflation has not yet been overcome, as consumer price index has been declining for more than five years (after Iguchi, 2004: 339).

The labor market situation in Japan remained behind the recovery in its economy. The unemployment rate was over 5 % and the number of unemployed amounts to around 3.5 million. However, employment adjustment in enterprises peaked in the first half of 2003. Although real wages were declining, there were signs of recovery such as increase in bonus payment in summer 2003 (after Iguchi, 2004: 343).

In 2008 more drastic job cuts, in particular in manufacturing sector, were recorded. Dispatched workers were cancelled or had their contract not renewed. Shift in Japanese employment system may have its origins in economic globalization phenomenon under which more and more companies face uncertainty as to the future demand for their products. In Japan this uncertainty is concentrated in export-oriented industries (automobile industry) and electrical and electronics sector. This means that companies belonging to the abovementioned sectors had been increasing their proportion of non-regular workers simply to avoid fixed labor costs (Tsuru, 2009).

10. International Migration

Iguchi (2006) notes that the number of foreign workers in Japan has been growing rapidly, when the number of foreign workers including those who obtained ordinary permanent resident statuses are taken under consideration. As to the Ministry of Justice statistics it has reached 900 thousand. Worth mentioning seems to be the fact that foreign students, who graduated from Japanese universities and changed status of residence for working, has reached 5 thousand persons per year (Iguchi, 2006: 2).

After the Plaza Agreement of 1985 the appreciation of the Japanese yen against the United States dollar had acted as a pull factor for many foreigners to come to Japan. However, vagueness of that time regulation toward foreign workers led the Government to review the Immigration Control and Refugee Recognition Act in 1989 for the first time in 38 years. The revised Act amended Japan's immigration law in several ways. It

expanded the categories of foreign workers, more precisely added 10 new categories, who would be eligible for entering and residing in Japan, but also limited legal admission to foreigners who possessed specialized skills or knowledge that nationals could not provide. In 1994, the law was further expanded, by adding more jobs that would fall into the skilled professions categories that foreigners could apply for. Moreover the Government made it clear that Japan would keep entry prohibition of unskilled migrant workers in view of the long-term adverse effects on the domestic market and on the society (Art. 2-2, 7).

The total number of resident foreign nationals working in Japan rose from 181,806 in 2006 to 215,676 in 2009, and they have been engaged in a wide range of economic activities in the country.

The number of specialists involved in humanities and international services, entertainers, foreign engineers and technical workers showed large increases during that period. Most foreign entertainers, engineers and technical workers were nationals of Asian countries.³⁵

The admission of foreigners through expanded categories of skilled professions was sufficient to cope with the persistent labor shortages in labor-intensive industries or menial jobs that educated young Japanese were unwilling to take. Increasingly, acute demand for unskilled manpower has been met by three sources of foreign workers legally admitted to Japan: (a) Descendants of Japanese from Latin America, (b) foreign-job trainees and (c) foreign students working part-time. Furthermore, the new Immigration Control and Refugee Recognition Act of Japan of 1989 for the first time established the admission status of the second- and third- generation descendants of Japanese emigrants and authorized them to reside in Japan as long-term residents or spouses or children of Japanese. Many of those Japanese descendants from Latin America take up unskilled jobs in manufacturing or construction companies located in industrial cities (after UN, 2003: 73).

It may be stated that with increasing inflows of foreign nationals, ethnic homogeneity is no longer a demographic feature of Japan.

³⁵ Ministry of Justice, *Toroku gaikokujin tokei*, 2006, 2009.

Figure 3.7 Foreigners in Japan by entry and departure (1954-2002)



Source: Foreigners who Legally Entered and Departed from Japan by Nationality (1954-2004), MIC, Statistics Bureau. Own elaboration.

Since the late 1980s, the stock of foreign population in Japan had grown rapidly, gaining about 700 thousand foreign residents between 1985 and 1999. This group accounted for 1.23% of the population in Japan in 1999. In recent years the largest migration inflow into Japan was that from neighbouring Asian countries such as China, the Philippines and Thailand as well as that from Latin America, in particular Brazil and Peru and finally that from United States of America.

According to Iguchi (2004) international migration and migration policy in Japan have been characterized by some elements as (after Iguchi, 2004: 339):

- the inflow of foreign nationals has been increasing since 2002 after the drop in 2001 irrespective of some risks after the Iraq War and SARS
- the number of foreign workers in Japan and those who acquired permanent resident status is also at constant increase
- the crimes of foreigners are growing, where more than half of them had been overstaying
- problems of education and unemployment for foreign youths are becoming more serious
- the number of students accepted by Japan reached its target of 100 thousand in 2003

- the Japan Employers Federation published its intermediate report on foreign workers' policy and it stimulates further discussions
- the consultation on movement of natural persons within the future framework of "Economic Partnership Agreement" especially with Thailand and the Philippines has started.

Recently, Japan is experiencing enormous pressure of intraregional migration in East Asia, which may stem from the international tourism and developing regional economic integration. In consequence of tightening of regulations in Japan, such categories of occupations as entertainers, pre-college and college students did not grow substantially, while foreign trainees continue to increase in numbers considerably. This fact may be related to the *Technical Intern Traineeship Program* (Japan International Training Cooperation Organization) is managed on the basis of bilateral arrangements. *The purpose of this program is to transfer Skills to Technical Intern Trainees who will form a basis of economic development in their respective countries and play an important role in Japan's international cooperation and contribution (JITCO).*

According to Iguchi (2006), the first priority for migration policy may be to reorganize the legal system on *entry, stay and work* concerning the fact that the more and more foreigners are staying in Japan for long-term or with permanent residence status in municipalities. The second priority may be to put into words strategies for East Asia to develop human resources and to make the movement of persons more flexible. It is an important task for the East Asia Community (EAC, Japanese intellectual policy platform) members to create effective cooperation in this field. The naturalization of foreigners reaches almost 17 thousand cases per year and it does not influence much on the trends in Japanese population (after Iguchi, 2006: 3).

11. Conclusions

In Japan internal migration on a larger scale began with industrialization process in Meiji era. The main recorded migration flows were from rural areas to urban ones. In particular, the most important destinations were Tokyo, Osaka and Nagoya and those cities areas seem to be the most attractive for migrants at present time. Almost half of population and nearly half of working age population in Japan live in major urban areas. Intensive internal migration helped in maintaining dynamic economic growth, Japanese competitiveness and innovativeness.

Analysis of Japanese statistical data shows some similarities in people's propensity toward migration, annual economic growth rate and regional income disparities. However, there has recently been a lot of discussion about growing inequalities in job opportunities and social promotion stemming from the expanding share of non-regular workers. This may mean that bipolarization of living standards in Japan will appear, unless a new approach (legal and social) towards non-regular workers is taken.

In the end, the significance of internal migration flows (as well as foreign influxes) might grow further as Japan faces the abovementioned problems and aging society phenomenon.

Chapter 4 The Relationship Among Internal Migration, Income Inequalities and Economic Growth in Japan and Poland

1. Introduction

In Poland the most detailed information on internal migration flows provide National Census of Population and Housing conducted by GUS (Główny Urząd Statystyczny). During the last century, there were seven National Censuses of Population and Housing (1921, 1931, 1950, 1960, 1970, 1978, 1988, 2002, 2011), one General Summarized Population Census in 1946 and three Microcensuses in 1974, 1984 and 1995.

According to GUS, the term of internal migration refers to people flows within a country`s borders. There are several types of internal migration, such as (Narodowy Spis Powszechny, 2002: 22):

- inter-prefectural migration
- intra-prefectural migration
- smaller administration units` inter- and intra-flows.

As to the internal migration, there are different directions of the fluxes, which may be classified in the following way (Narodowy Spis Powszechny, 2002: 22):

- rural-urban migration
- urban-rural migration
- urban-urban migration
- rural-rural migration.

Studies on internal migration show that there are some general regularities in people`s flows:

- Migration and distance

Short distance migration prevails over long distance migration. In case when long distance is chosen the destination location distinguishes itself as a big industrial or trade center.

- Migration by stages

People from rural areas move to neighbouring urban areas and in turn they are replaced by people from the farther regions.

- Influence of the technical progress on migration

Infrastructure and telecommunication development make the distance shorter and migration flows bigger.

- Prevailing economic reasons

Among the various regional economic inequalities, economic reasons for migration are still the most important ones.

- Globalization and migration

Migration flows are intrinsically associated with globalization processes.

Since the end of the First World War, Poland had quite a complex administrative, as well as political, history. Periods of different political influences came one after another, and then the Second World War, brought alternating changes and difficulties for coherent statistical documentation (even as to the terminology), making it extremely difficult to create a systematical long-time-series data base. In short, after the WWII, Poland experienced the following administrative divisions:

- 1944-1945 - 10 voivodeships (including autonomic Silesia voivodeship plus 1 autonomic city)
- 1945-1946 - 11 voivodeships (plus one autonomic city)
- 1946-1950 - 14 voivodeships (plus 2 autonomic cities)
- 1950-1975 - 17 voivodeships (plus 2 autonomic cities; 5 autonomic cities since 1954)
- 1975-1998 - 49 voivodeships
- and finally 16 voivodeships since 1999, January 1.

The administrative reform, which took effect in 1999, has established 16 voivodeships, in order to create bigger regions consistent with the EU NUTS (Nomenclature of Territorial Units for Statistics) division.

In case of Poland, the major obstacle that a researcher meets is the fact that, in the first half of XX century, the country had no internal migration registration system. The

sizes of internal cohorts are approximated by population censuses, but only if they question about birth place and habitation. It may be said that the year 1950 ended the period of undocumented internal migration in Poland.

The case of Japan is not so complicated. Since WWII, 47 prefectures have existed in the *todofuken* system and *Somusho Tokeikyoku* (Ministry of Internal Affairs and Communications, Statistics Bureau) provides a wide range of coherent long-time-series data. Moreover, at the post-war international stage, Japan has been politically independent country, though under the considerable influence of United States.

This paper aims at data based analysis of post-war internal migration flows on the example of Japan and Poland, against a background of general demographic and economic situation. However, the situation in Poland would be described in more detail compared to Japan. For more detailed information on Japanese internal migration please refer to the previous Chapter 3.

Data used for the computation purposes were published by Polish GUS (Local Data Bank) and Japanese *Somusho Tokeikyoku*.

2. Early Post-War Period and Patterns of Population Concentration

In general, WWII and political situation just after the war had a huge impact on the post-war development of Poland, as well as Japan. Nevertheless, Poland was in far less development favorable demographic, geo-political and economic coniguration. Poland entered the 1950s with a loss over 10 milions (29%) of population between 1938 and 1946, while Japan started its post-war recovery with an advantage of more than 5 milions (7%) of population gained from 1940 and 1947 (see: Figure 4.1). The development of both countries in late 40s and early 50s established some internal migration patterns and main destination for migrants.

Figure 4.1 Demographic situation in Japan and Poland before and after the WWII



Source: Somusho Tokeikyoku, GUS.

Figure 4.2 Concentration of population in Japan



Source: Somusho Tokeikyoku.

In Poland, as a consequence of political arrangements and territorial changes, huge internal migration flows occurred, mostly due to forced transfers of people from

*old territories to recovered territories*³⁶, just after WWII. Wide range of such a migration flows developed in northern Polish regions of Poland, especially Masuria-Kurpie borderland and lasted till the end of 1945. Some of those groups plundered the land, were others consisted of teachers, civil servants, railwayman taking part in a pioneering migration, convinced that they had to rebuild the recovered territories. Along with transfers, there was also state-managed colonization of some regions, mainly in the eastern and western parts of the country, both organized by *National Office of Repatriation* (Państwowy Urząd Repatriacyjny (PUR), a communist governmental organization established in October 1944). The aim of such political measures was to allow for fast and complete integration of the recovered territories with Poland and unloading overpopulated rural areas (Gawryszewski, 2005: 385-388).

Polish unconstrained internal migration from rural to urban areas intensified after 1956. Subsequently, during mid-60s urbanization index exceeded the level of 50% and in late 70s the population movement toward urban areas weakened. The main areas of population concentration turned out to be Warsaw, Cracow and Katowice area (see: Figure 4.3a, 4.3b, 4.3c). Data constituting Figure 4.3 was divided in 3 time periods due to the abovementioned differences in administrative division in post-war Poland followed by the change of regions` number, size and statistical tabulation.

Post-war Japan was characterized by dynamic population growth and distinctive inequalities in employment opportunities between major cities, in particular 3 urban zones: Tokyo, Osaka and Nagoya, what along with high economic growth, pushed people to migrate toward urbanized areas. Intensified internal migration from rural zones to major urban zones lasted till early 70s. (see: Figure 4.2).

The figures show that in Poland the phenomenon of urbanization of the key regions was not so apparent as in the case of Japan. Population concentration in central areas has remained at the same level and does not exceed 14% of total population. In the first period, Warsaw region was 20% smaller, in the second period, 80% smaller than

³⁶ Western and northern parts of nowadays Poland that became a part of Poland after WWII according to Potsdam Conference.

the present Masovian voivodeship, which can be explained by the changing area of the voivodeship, especially during the years 1975-1998. Interestingly, present Masovian voivodeship's surface is almost the same as Kanto area (35,558km² and 32,423 km² respectively). This fact makes comparing those two capital city zones possible and shows that concentration of population in Japan is far more intensive than in Poland and Europe (e.g. the region of Great London accounts for 14% of total population in Great Britain). A search for the reasons of such situation is one of the goals of this paper.

Figure 4.3a Population concentration in Poland in years from 1960 to 1973



Source: Roczniki Statystyczne, 1959-1975, GUS.

Figure 4.3b Population concentration in Poland in years from 1978 to 1988



Source: Roczniki Statystyczne, 1979-1992, GUS.

Figure 4.3c Population concentration in Poland in years from 1995 to 2008



Source: Local Data Bank, 1995-2008, GUS.

3. Post-War Internal Migration in Poland

This section is thought to shed light on the Polish economic and political situation since Japan was analyzed in the previous Chapter 3. Moreover, some historical facts will help to analyze and statistical data on the regional income inequalities and internal

migration flows and understand the relationship between economic growth and income gap.

First it has to be stressed, that Poland from the end of WWII till 1989 was a country dependent on Soviet Union communist policy and its economy was centrally planned. Soviet hegemony drove Poland to economic and social chaos, loss of the concept of private property and left the country and the nation with enormous international debt.

Starting from the beginning, the Polish government's *Six-Year Plan* (Plan Szescioletni, 1950-1955) was designed to concentrate all efforts on new industrial plants construction, giving priority to metallurgy (Nowa Huta) and engineering industry. Besides, shipbuilding industry, motor industry (Żeran, Starachowice), airline industry (Mielec) and chemical industry (Oświęcim) centers were founded. This period was characterised by huge capital expenditures and sharp increase in employment, often by rural population recruitment. The urbanization processes was intensive at that time and during the years from 1949 to 1953 employment in non rural sector grew from 3.6 million people to 5.4 million people (GUS 1959). Till the end of 50s employment in non rural sector increased further to 6.6 million people, internal migration flows accounted for 13.6 million people and urban areas gained over million of new residents.

During 60s, investments in mining and manufacturing industry were continued in Silesia Superior, and Lubin-Głogów industrial area, Turoszów and Konin coal field, in chemical industry (Puławy, Police), light industry (Łódź). However, the all-important investment was in the refinery and petrochemical plant in Płock (PKN ORLEN at present) and *Druzhba pipeline*.

Eventually, as a result of deglomeration policy, investments made in Warsaw came to a stop (see: Figure 4.4). In 1970, the average employment in non-rural *socialized economy* (predominant sector in Polish socialist economy, where the ownership was public or cooperative) accounted for 8.9 million people, in 60s there were 9.4 million internal migrants recorded and the positive net migration for urban

areas amounted to 1.2 million people. In particular, the most numerous cohorts flew toward the cities as follows: Warsaw (10.4 persons per 1000 inhabitants), Cracow (9.7), Wrocław (6.8), Poznań (5.1); and the following voivodeships: Katowice (3.4), Szczecin (3.0), Gdańsk (2.7), Opole (1.7) (GUS 1960-1970, Gawryszewski, 2005: 391).

Since 1971 Polish economy had recovered and acceleration in GDP growth rate was recorded. Subsequently, according to the changing economic situation there was a shift in investment flow from petroenergy and chemical industry to electromechanical industry, metallurgy, light industry, food industry and housing construction. The then ruling group (with Gierek as a leader), had two main goals: economic growth of the country and improvement of the level of living. The authorities created huge enterprises, that each of them employed at least 1 thousand workers. In 1980 that form of employment accounted for 70% of all workers in Poland while one fourth of plants employed over 5 thousand laborers. However, after a short time of improvement in living conditions, incompetent policy (consumption of almost 37% of loans) led to the economic crisis in late 70s. (GUS 1970-1980, Gawryszewski, 2005: 391-392)

In 1980 the employment in socialized economy reached the level of 10.9 million people. During those years the number of internal migrants showed record of 8.9 million people and urban areas gained almost 2 million new residents. Positive net migration occurred in 12 voivodeships: Warsaw (9.3 persons per 1000 of inhabitants), Katowice (8.4), Legnica (7.9), Gdańsk (6.1), Łódź (5.9), Cracow (4.3), Poznań (3), Lublin (1.2), Bielsko-Biała (1.1), Opole (0.6), Rzeszów (0.3) and Wrocław (0.2). The main pull factors towards migrants seemed to be industrial centers in abovementioned urban areas. (GUS 1970-1980, Gawryszewski, 2005: 391-392)

Till 70s The main push factors for these internal flows in Poland were economic reasons, in particular employment opportunities in industry sector in developing urban areas (e.g. Górnośląski Okręg Przemysłowy (GOP): *Upper Silesian Industrial Region*, Centralny Okręg Przemysłowy (COP): *Central Industrial Region*). (GUS 1959). Interestingly, a poll conducted by GUS in 1974 revealed that an important factor of

decision on moving was housing such as communal, works or cooperative flat procurement. The other weighty reason was job and then family reasons.

The 80s in Poland were the years of deep economic recession. All branches of industry experienced stagnation and the suspension of new investment in technology led to fast depreciation of national capital (premises and equipment). Nevertheless, economically tough times mobilized people to set up their own small business activities so in the end there was a considerable growth in private sector. In 1988 employment in private sector amounted to 1.1 million people while in non-rural socialized economy the employment reached 10.7 million people.

In the beginning of the decade on 13 December 1981, the then authorities declared martial law, which prohibited population migration without a special permission. Those who wanted to leave their permanent residence for more than 48h had to get a permission issued by a proper administration unit (municipal office, city) and had to register in a new location without delay. According to the statistics, in 80s there were 6.7 million displacement records, positive net migration to urban areas scored 1.3 million people. (GUS 1980-1990, Gawryszewski, 2005: 395)

As to the shift in political situation in Poland several economic and social changes had been introduced, which produced chaos and high inflation. However, not long after the first changes economic growth hit the bottom, private sector's share increased and the structure of employment undergone transformation. Unfortunately, the positive changes were accompanied by the negative ones: the unemployment rate augmented sharply and the situation of north-eastern rural regions (Masurian, Pomeranian) aggravated. The best economic condition characterized urban areas such as Warsaw, Poznań, Cracow, Tricity, Wrocław, Szczecin and their suburbs. Internal migration flows fell by one third in comparison to 80s, the rural-urban flows diminished and urban areas gained merely 364 thousand people. Those times people's lifestyle changed, more and more wealthier citizens started to build their houses in the suburbs. (Gawryszewski, 2005: 396)

During the last decade the highest migration rate was recorded by Masovian, Silesian and Great Poland voivodeships. It may be assumed that an important pull factor for migrants to these regions was its population size. The most mobile turned out to be the inhabitants of Pomeranian (12%), Warmian-Masurian and Lubusz (each 11.5%). The less proneness to migrate showed the citizens of central and southern regions, Świętokrzyskie (8.4%), Łódź (8.5%). The highest proportion of migrants was recorded in Lublin voivodeship (12.2%), the lowest in Łódź (7.5%). Interestingly, the overall net migration to urban areas amounted to -6,5 thousand people.

Recent migration resulted in population growth in Masovian, Great Poland, Silesian, Pomeranian, Lesser Poland and Lubusz and visible population decrease in Subcarpathian, Lublin, Łódź and Lower Silesian voivodeships. In the years 1989-2002 more than 10% of total population changed their habitat (see: Table 4.1). Internal migration intensified in the end of the period 1989-2002 and the most numerous group of movers was registered in 2001 (*Migracje Wewnętrzne Ludności 2002, 2003: 27-34*).

Among internal migration flows, the direction urban to urban areas prevailed. Net migration as to the rural-urban areas movements was positive to cities. The directions of internal migration were quite diversified, in particular when inter- and intra-prefectural migration is compared, yet the biggest flows were toward Silesian and Great Poland voivodeships.

Table 4.1 Internal migration by directions, 1989-2002

非表示

Source: Narodowy Spis Powszechny, 2002, GUS.

Among the internal migrations during the period 1989-2002 the most popular was the pattern of intra-prefectural migration, which constituted 73% of all population movements (inter-prefectural migration accounted for 25% of total flows).

The biggest share of intra-prefectural migration was recorded in Lublin voivodeship (81.7%), the smallest in Opole voivodeship (65.6%). Population moved mainly from rural areas to urban areas, the most intensive flows were in Podlasie (44.7%). Urban to urban areas direction dominated in Lower Silesian, Masovian, Pomeranian and Silesian voivodeships, urban to rural areas in Lubusz and Lesser Poland voivodeship.

Inter-prefectural inflows in absolute terms were the biggest in Masovian, Silesian and Lesser Poland voivodeships and the biggest outflows in Masovian, Silesian and Lesser Silesian voivodeships. The most intensive flows in absolute terms were recorded from Lublin to Masovian voivodeship (32.5 thousand people) and between Silesian and Lesser Poland voivodeships.

Table 4.2 Origin-destination comparison, 1989-2002

非表示

Source: Narodowy Spis Powszechny 2002, GUS.

After the analysis of present and previous location of residence of migrants it may be said, that people tend to choose adjacent regions (see: Table 4.2).

Among the inter-prefectural movements, people migrated from urban to urban areas mainly, which accounted for 53% of all inter-prefectural movements, rural to urban areas flows amounted to 22% of all interprefectural movements.

In general, among the inter-prefectural flows, the direction were much more diversified in comparison to intra-prefectural migration.

During the last decade most voivodeships noted negative net migration. In 2007 the positive net migration was present in Masovian, Great Poland, Pomeranian, Lesser Poland and Lower Silesian voivodeships. However, if we take emigration under consideration, the positive net migration was recorded in four voivodeships that time: Masovian, Pomeranian, Lesser Poland and Great Poland. (GUS, 2010)

According to the NSP (GUS, 2002), as a main reason for migration interviewed specified family reasons such as marriage and the second important reason was the housing problem. Then came less important reasons for questioned, which were: job related reasons, education, unemployment threat (see: Table 4.3).

Table 4.3 Reasons for migration during the years 1989-2002

非表示

Source: Narodowy Spis Powszechny, 2002, GUS.

Almost half of interviewed admitted that their decision to move was followed by other family members leading to whole households migration.

As the researches conducted by CBOS (Centrum Badan Opinii Spolecznej, Public Opinion Research Center) in February 2010 show, merely 28% of Polish population changed their location for job related reasons. Interestingly, most decisions to migrate are dictated by housing problems, more precisely by the need of settling down (44% of interviewed) and the housing conditions (31% of questioned). Education and studies were specified by 6% of interviewed. The research showed that the most important obstacle to mobility of Polish citizens are dwelling conditions: the supply of accomodations poses no problems as far, however renting or buying a flat is often too expensive when compared to monthly average earnings.

Afterwards, job related reasons came third in this ranking, indicating that less people in comparison to the results of the similar research in 2007, are prone to migration for pure economic reasons such as better paid job or setting oneself up. It may be assumed that intensified emigration just after joining UE in 2004 allowed for accomplishment of migration plans (e.g. making money) of some population (Biuletyn Migracyjny, 26).

4. Income Inequalities and Internal Migration

The regional income inequalities were always present in Poland, however their visible deepening dates back to the Partitions of Poland (starting in 1772 and lasting for 123 years) by the Russia Empire, the Kingdom of Prussia and Habsburg Austria.

The devastations after WWII and then planned economy policies of socialist government made regional gap even wider. Moreover, the government did not make efforts to diminish the inequalities.

In the period from 1955 to 1968 the best performance was shown by the cities of Warsaw and Cracow (see: Figure 4.4) and Katowickie, Gdańskie and Szczecińskie voivodeships, where positive net migration was recorded (see: Figure 4.5a). The negative net migration to Warszawskie or Krakowskie (showed in Figure 4.5b) stems from the fact, that Warsaw and Cracow were not included in the voivodeships' statistics.

Figure 4.4 Regional inequalities in Poland in the period from 1955 to 1968



Source: Roczniki Statystyczne 1959-1969, GUS.

Figure 4.5a Net migration in thousands toward major cities in Poland, in the years from 1966 to 1973



Source: Roczniki Statystyczne 1965-1974, GUS.

Figure 4.5b Net migration in thousands toward major regions in Poland, in the years form 1966 to1973



Source: Roczniki Statystyczne 1965-1974, GUS.

Figure 4.6a Income inequalities and net migration in thousads in Warszawskie voivodeship in years 1975-1993



Source: Roczniki Statystyczne 1974-1994.

Figure 4.6b Income inequalities and net migration in Masovian voivodeship from 1995 to 2010



Source: Local Data Bank, GUS.

Figure 4.7 Income inequalities and net migration in Tokyo area in years from 1955 to 2008



Source: Somusho tokei kyoku.

In general, in the 60s cities (e.g. Warsaw, Cracow) and regions (e.g. Katowickie) characterized by good economic performance and absorbtive labor markets constituted

main destinations for migrants. Much like in case of Japan, until late 70s income inequalities and net migration to central urban zones showed the following relationship: higher income inequalities resulted in higher net migration to the capital zones (see: Figure 4.7). In Poland this relationship could be observed till 1984, except for 1979, when first symptoms of aggravating economic and political situation showed up (see: Figure 4.6a); in Japan it was disturbed in 1978. In Japan this phenomenon might be explained by public 1977 investments in development of provincial areas (*Daisanji zenkoku sogokaihatsu keikaku*), which led to diminishing income inequalities and less numerous migration toward capital region (Nakamura, 2002: 53). In Poland the collapse of this relationship in early 80s happened mostly due to the political and economic situation in the country: in particular very high unemployment rate along with progressive pauperisation of the nation, rampant inflation and short supply of food and other goods. During the 80s, income inequalities in Poland rose considerably, however the most significant increase took place in period from 1988 to 1992, during the very early phase of economic transformation, when the privatization process began and high structural unemployment came about (e.g. always considerably positive migration to Katowickie voivodeship declined sharply in 1992 became negative from 1993 and on). At that time in Poland the above-mentioned relationship between income gap and migration was restored.

In Japan the bubble economy period starting from late 80s disturbed this relationship again. Income inequalities increased sharply, however tough economic situation made people go back to provincial areas rather than to capital zone, so simultaneously rapid decrease in net migration toward capital region was recorded. The relationship vanished again in period from 1998 to 2002, when, despite of diminishing income gap, net migration toward Tokyo area intensified. This fact may be related to: the economic stagnation in Japan at that time, fall in CPI index and in land prices and possibly higher unemployment rate.

In Poland years from 2000 to 2004 were also characterized by not so obvious relationship between income inequalities and net migration to the central region (see: Figure 4.6b). At that time the country prepared itself for joining the EU (2004, May 1)

and received diversified pre-accession funds from the Community, in order to stimulate the regional development. As a result, EU funds contributed to expanding regional inequalities rather than to reducing income gap. Moreover, high labor emigration around 2003 could have led to improvement in economic situation in many households via money transfers from abroad.

5. GDP Growth, Income Inequalities and Migration

It may be said that there is no point in comparing two economies as far apart as the centrally planned Polish economy till 1989, when all economic strategies were subject to socialist government policy, and Japanese economy, capitalistic though very specific. However, comparing processes, that accompanied the economic development of both countries are worth comparing and learn from history is always beneficial.

Unfortunately Polish data on economic growth before 1974, in 1979, from 1989 to 1991 and in 1994 are hardly accessible, so the main stress in this section will be put on the period from 1975 to 2008 except for the abovementioned years.

Japanese economy showed very good performance till 1973 and as data analysis illustrates (see: Figure 4.8). Periods of higher economic growth were followed by higher income inequalities, however income gap showed generally decreasing tendencies. This phenomenon was backed up by consecutive prosperity periods: Jimmu keiki, Iwato keiki, Tokyo Olympics and Izanagi keiki (all between 1953 to 1973) and surplus working population. People were prone to migrate to regions of high productivity, and dynamic migration at that time helped in maintaining high economic growth in Japan.

With the first oil shock in 1973 Japanese economy started to change. GDP growth rate decreased considerably, followed by diminishing income inequalities and significantly less in-migration to the three major cities zones. Interestingly, the economy recovered quickly and between 1976 and 1979, despite of increasing GDP growth rate, income gap shrank. This fact may be related to mentioned earlier public investments in provincial areas. Then the situation presented itself as before; higher economic growth stimulated growing income inequalities, which lasted till bubble economy period, when

income gap increased (1990) despite slower economic growth. The next period, so-called *lost decade* (1991-2001) was characterized by diminishing income inequalities and efforts made to revitalize the economy. Finally, recovery became visible around 2004, when Junichiro Koizumi was the head of the ruling party. Years 2006 and 2007 shows situation similar to that from 1990, i.e. in spite of the fact, that GDP growth rate was decreasing, income gap rose slightly.

Polish income gap increased dramatically during the 80s, at the time of recession and tense economic atmosphere. Nevertheless, till 1989 changes in GDP growth rate were followed by income gap shifts (see: Figure 4.9a). Enormous increase in income gap was recorded in early 90s, especially from 1992 to 1993. This situation may reflect economic and political chaos in the country and the galloping pauperization of the nation, in particular heavy industry workers, constituting the group of the highest risk. Meanwhile, those who conducted privatization process could make unlimited profits from those transactions. Divergence between income gap and economic growth evolution clearly appear in the period between 1998 and 2004 (see: Figure 4.9b), when, despite of the decreasing GDP growth rate from 1998 to 2001, income gap expands. Then from 2002 to 2004 income inequalities shrank, as the economy recovery. Those two facts may have their origins in the phenomenon of *jobless growth*, which appeared to be very intensive in Poland, mainly due to the high structural unemployment.

Figure 4.8 Income inequalities and GDP growth rate in Japan in years from 1955 to 2009



Source: Somusho tokei kyoku.

Figure 4.9a Income inequalities and GDP growth rate in Poland in years 1975 to 2008



Source: GUS.

Figure 4.9b Income inequalities and GDP growth rate in Poland in years from 1995 to 2008



Source: Local Data Bank, GUS.

6. Conclusions

History of Polish economy differs strongly from that of Japanese. However, taking some processes like urbanization, internal migration evolution, GDP growth path or income inequalities changes under consideration, encountering some universal regularities is possible.

Urbanization of capital region in Japan has been intensive, and goes on till now. In Poland there was no such a dynamic population movement toward major zones, however when we look at the other European cities, this phenomenon does not seem isolated. In general, Japanese are more mobile and probably less attached to the particular region. In Europe, in Europeans, and in Poles the concept of regionalism is deeply rooted and associated with concepts of pride and identity.

In post-war history Poland was entangled in a complicated political situation, in which nation and economy were subject to communist government. As to the internal migration, first, forced transfers of large groups of people took place, then expanded heavy industry absorbed many workers, and finally, political shift brought high structural unemployment level and high poverty rate. After 2000, the possibilities of

labor migration to EU member countries lured many people, what had also favorable influence on the country, as it was mentioned before in the Chapter 2.

Interestingly, in both Japan and Poland, there is a relationship between the level of income inequalities and net migration toward capital regions: higher income inequalities enhance more intensive migration, and smaller income gap discourage people from migrating. In Japan this relationship was disturbed in late 70s, late 80s, between 1998 and 2002, and slightly around 2005; in Poland from 1984 to 1989 and from 2000 to 2004. Similarly, there is a relationship between income inequalities movement and GDP growth rate, and periods of higher economic growth prove to have larger income gap and vice versa. Nevertheless, these regularities turned out not to be present in years from 1976 to 1979, in 1990 and around 2006 and 2007 in Japan, and in periods from 1984 to 1989 and from 1998 to 2004 in Poland. The analyzed mechanisms took place almost at the same time, generally due to some exogenous changes.

Chapter 5 Internal Migration Model on the Example of Japan and Poland

1. Introduction

Mobility of production factors constitutes one of the New Economic Geography blocks (economies of scale, trade costs), which also contributes to agglomeration. Agglomeration in turn gives such effects as *forward linkage* and *backward linkage*. More specifically, the former phenomenon, cost externalities in other words, describes the situation, when workers migrate to industrial centers because in these regions, goods for consumption incur lower transportation costs, which means that these centers have a lower cost of living and are therefore attracting people who want to maximize their consumption. The latter one, called also demand externalities, take place when demand for goods of a given region increases and new workers come to the region to fill in the additional positions needed to satisfy the higher demand (after Hering and Paillacar, 2008: 2).

In the presence of scale economies firms have incentives to rethink its location. There are external and internal returns to scale, the former being closely related to the size of the economy or, in other words, the size of the regions. The NEG points out the spillovers of external returns to scale, such as R&D or knowledge, that units may obtain by being located in centers. Internal returns to scale describe the situation when a firm increases its output while reducing its input.

As it was mentioned before, distance turns out to be the most significant factor for people`s mobility, mainly because of transaction costs. Hence, the closer the access to a variety of goods, the more migrants will be attracted to settle down in these regions to reduce their transaction costs.

Moreover, the NEG highlights, that a passion for varieties and the number of varieties contribute to economic growth across regions.

2. Theoretical Approach

Subsequently, the Crozet (2004) and Pons et al. (2007) define the consumers and producers` side in the model. As to the consumers, their utility function is featured by the following equation:

$$U = I^\mu S^\phi A^{1-\mu-\phi} \quad (5.1)$$

μ , ϕ and $(1-\mu-\phi)$ are respectively, expenditure shares for the industrial goods, services and the agricultural good. A is the consumption of the homogeneous agricultural good; I is an aggregate of the industrial varieties defined by a CES function of the form:

$$I = \left[\int_0^{n_I} x(i)^{p_I} di \right]^{1/p_I}, 0 < p_I < 1 \quad (5.2)$$

$x(i)$ denotes the consumption of each available variety and n_I is the number of available varieties in the economy composed by R regions ($n_I = \sum_{r=1}^R n_{I_r}$).

S is also an aggregate of service varieties defined by a CES function of the form:

$$S = \left[\int_0^{n_S} x'(i)^{p_S} di \right]^{1/p_S}, 0 < p_S < 1 \quad (5.3)$$

Consumers maximize utility under the budget constraint:

$$Y = p^A A + \int_0^{n_I} p_I(i) x(i) di + \int_0^{n_S} p_S(i) x'(i) di \quad (5.4)$$

Solving the consumer's problem yields the following demand function in region r of an industrial variety produced in s (all varieties produced in the same region are symmetric):

$$x_r(j) = \mu Y_r (p_{IS} T_{Sr})^{-\sigma_I} P_{Ir}^{\sigma_I - 1} \quad (5.5)$$

Where:

$$P_r = \left[\sum_{S=1}^R n_{IS} (p_{IS} T_{Sr})^{1-\sigma_I} \right]^{1/1-\sigma_I} = \left[\sum n_{IS} (B d_{rS}^\delta p_{IS})^{1-\sigma_I} \right]^{1/1-\sigma_I} \quad (5.6)$$

is the industrial price index in region s , which may be thought of as an expenditure function. The price index of the aggregate of service goods in region r is:

$$P_{Sr} = (n_{Sr})^{1/1-\sigma} S p_{Sr} \quad (5.7)$$

On the other hand the producers' side is specified as follows.

Under the assumption that industrial goods and services are monopolistically competitive industries and that the production of each variety requires F units of mobile workers as a fixed cost and lq units as a variable input, with $lq = c \cdot q$. The labor input requirement to produce a quantity q of any industrial and services variety at any given location is respectively:

$$\begin{aligned} l^I &= F^I + c^I q^I \\ l^S &= F^S + c^S q^S \end{aligned} \quad (5.8)$$

Next, the authors define that if nIr and nSr denote the number of varieties of good I and S produced in region r , the total employment in each industry or region r is:

$$\begin{aligned} L_r^I &= n_r (c^I q_r^I + F^I) \\ L_r^S &= n_{Sr} (c^S q_r^S + F^S) \end{aligned} \quad (5.9)$$

Denoting w_r the mobile workers' wage in region r , the *fob* price of a variety produced in region r is:

$$\begin{aligned} p_{lr} &= \frac{\sigma_I}{\sigma_I - 1} c^I w_r \\ p_{sr} &= \frac{\sigma_S}{\sigma_S - 1} c^S w_r \end{aligned} \tag{5.10}$$

Afterwards, the zero-profit condition implies that the equilibrium output of any active firm is:

$$\begin{aligned} q^{I*} &= \frac{F^I (\sigma_I - 1)}{c^I} \\ q^{S*} &= \frac{F^S (\sigma_S - 1)}{c^S} \end{aligned} \tag{5.11}$$

Using (5.9) and (5.11) the following expressions for the number of firms in each region is obtained:

$$\begin{aligned} n_{lr} &= \frac{L_r^I}{F^I \sigma_I} \\ n_{sr} &= \frac{L_r^S}{F^S \sigma_S} \end{aligned} \tag{5.12}$$

In the third place the researchers search for the price index of manufactures under the form of market potential function. They notify that the wage of mobile workers is equal to the nominal wage deflated by the cost of living index in region r :

$$\omega_r = \frac{w_r}{P_{lr}^\mu P_{sr}^\phi P_{Ar}^{1-\mu-\phi}} \tag{5.13}$$

As it is noticed the agricultural good is freely tradable and its price can be normalized to one, so the real wage equation of mobile workers becomes as follows:

$$\omega_r = \frac{W_r}{P_{Ir}^{\mu} P_{Sr}^{\phi}} \quad (5.14)$$

where P_{Ir} and P_{Sr} are respectively the price indexes of the industrial and service goods in region r (obtained from the consumer's optimization problem) and that can now be written using the expression for the number of firms (5.12):

$$P_{Ir} = \left[\sum_{s=1}^R n_{Is} (Bd_{rs}^{\delta} p_{Is})^{1-\sigma_I} \right]^{1/1-\sigma_I} = \left[\sum_{s=1}^R \frac{L_r^I}{F^I \sigma_I} (Bd_{rs}^{\delta} p_{Is})^{1-\sigma_I} \right]^{1/1-\sigma_I} \quad (5.15)$$

$$P_{Sr} = (n_{Sr})^{1/1-\sigma_s} p_{Sr} = \left(\frac{L_r^S}{F^S \sigma_S} \right)^{1/1-\sigma_s} p_{Sr} \quad (5.16)$$

Equation (5.15), the manufacturing price index equation) says that if, *ceteris paribus*, the price index in a region tend to be lower, the higher the share of manufacturing that is concentrated in this region or in regions that are close, because smaller proportion of this region's manufacturing consumption bears transport costs (price-index effect or forward linkage). The price index of services (5.16) would, similarly, be lower in regions offering a relatively high number of service varieties. Considering the real wage (5.14) and supposing that the nominal wages in all regions were similar, workers' real income would be lower in remote regions where the price index is higher or in regions with a low density of services. The price index of manufacturers can therefore be considered as the inverse of a market potential function: it exhibits a sum of market sizes in all regions weighted by distances.

Finally, the authors explain migration choice model. They consider a mobile worker k from region s and his location choice among R regions (including s). Mobile worker's migration choice results from a comparison of the perceived quality of life in

the various locations. The migration decision is designed to maximize the following objective function:

$$\pi_{sr,t}^k = V_{sr,t}^k + \varepsilon_r^k = \ln[\omega_{r,t} \rho_{r,t-1} [d_{rs} (1 + bFR_{rs})]^{-\lambda}] + \varepsilon_r^k \quad (5.17)$$

where ρ_{rt} is the employment probability for an immigrant in region r at date t and $[d_{rs} (1 + bFR_{rs})]^{-\lambda}$ is a migration cost which increases with the distance between home and host regions. More specific, λ and b are strictly positive coefficients, and FR_{rs} is a dummy variable indicating whether regions r and s share a common border. ε_r^k is a stochastic component capturing worker's k personal perception of the characteristics of region r . To avoid endogeneity problems in the empirical application, migration choices at date t are determined from a comparison of V_{sr}^k across regions at date $t - 1$. Worker k will choose to locate in region r if $V_{sr,t-1}^k > V_{sj,t-1}^k, \forall j \neq r$.

The probability of choosing region r is given by the logit function:

$$P(M_{sr,t}) = e^{V_{sr,t-1}^k} / \sum_{j=1}^R e^{V_{sj,t-1}^k} \quad (5.18)$$

The expected migration flow between regions s and r is $L_{s,t} P(M_{sr,t})$. The total outflow from s is $L_{s,t} [1 - P(M_{ss,t})]$, the share of emigrants from region s choosing to go to region r is

$$\frac{migr_{sr,t}}{\sum_{r' \neq s} migr_{sr',t}} = \frac{e^{V_{sr,t-1}^k}}{\sum_{j=1}^R e^{V_{sj,t-1}^k} - e^{V_{ss,t-1}^k}} \quad (5.19)$$

Using Equations (5.10), (5.13), (5.15), and (5.16) and the definition of V_{sr}^k :

$$\begin{aligned}
\ln\left(\frac{\text{migr}_{srt}}{\sum_{r' \neq s} \text{migr}_{sr't}}\right) &= \ln[(L_{r(t-1)}^S)^{\frac{\phi}{\sigma_s - 1}}] + \ln\left[\sum_{s=1}^{s=R} L_{s(t-1)}^I \cdot (w_{k(t-1)} \cdot (d_{rs})^\delta)^{1-\sigma_I}\right]^{\frac{\mu}{\sigma_I - 1}} \\
&+ \ln[w_{r(t-1)}^{1-\phi} \rho_{r(t-1)}] + \ln[d_{rs} (1 + bFRrs)]^{-\lambda} + \tilde{a}_{s(t-1)} \\
\tilde{a}_{s(t-1)} &= -\ln\left(\sum_{j=1}^R e^{V_{sj,t-1}^k} - e^{V_{ss,t-1}^k}\right)
\end{aligned} \tag{5.20}$$

In conclusion, equation (5.20) captures the trade-off faced by potential migrants that have to choose among several possible locations. The variable in the left-hand side of the equation is the share of migrants from a given region who have decided to move to region r . The first two terms in the right-hand of the equation denote regions r access to markets, the former is the price index for nontraded service varieties in region r , the former is the price index for manufactured goods in region r and is the most important. The third term represents the expected wage in the region that is increasing with the host's nominal wage and the probability of being employed in this region. The fourth term captures the impact of bilateral distance on migration flows and can be interpreted as a measure of mobility costs.

Lastly, the authors estimate two versions of the structural equation: the first is a reduced form equivalent to the following equation³⁷:

$$\begin{aligned}
\log\left(\frac{\text{migr}_{srt}}{\sum_{r' \neq s} \text{migr}_{sr't}}\right) &= \beta_1 \cdot \log(L_{r(t-1)}) + \beta_2 \cdot \log(w_{r(t-1)}) + \beta_3 \cdot \log(d_{rs}) \\
&+ \beta_4 FR_{rs} + \alpha_s + v_{rst}
\end{aligned} \tag{5.21}$$

Two alternative versions of equation (5.21) are estimated using both OLS and including fixed effects for each region of origin. In the second one the authors broke down the total working population in the host region into three components: agricultural, industrial, and services working population. It turned out that the

³⁷ In addition to the nominal wage in the host regions, the migratory flows between two regions increase with the size of the host region and decrease with the distance between the two locations.

explanatory power of the equation is high in both cases. The estimated coefficients showed to be significant and present the expected signs. The influence of distance on the migratory flows remained negative. These flows tend to be stronger in the case of neighboring provinces. Moreover, higher wages in the host region encourage migration. The authors observe a significant, positive influence of the size of the host region on migratory flows, confirming the existence of the expected centripetal force in the determination of the bilateral migratory flows.

The researchers mention, that in the context of NEG models, the positive relation between the migratory flow and the size of the host region has causes in the association with the market potential of the regions, which would be transferred to the price index observed there. In large regions a wider variety of goods is offered in markets operating in imperfect competition, leading to lower prices. This is why migration is expected to increase in line with the size of the regions.

The next estimation (5.22) reflects more accurately the functional form relating the migratory movement with the market potential derived directly from the NEG model. As it may be seen, the relation fully reflects the market potential of the regions by considering that their production is also sold in neighboring regions. Furthermore, it allows direct estimation of key parameters in the NEG models such as elasticities of substitution, transport costs and migration costs.

$$\begin{aligned} \log\left(\frac{migr_{srt}}{\sum_{r' \neq s} migr_{sr't}}\right) &= \frac{\mu}{\sigma_I - 1} \cdot \log\left(\sum_{s=1}^{s=R} L_{s(t-1)}^I \cdot (w_{s(t-1)} \cdot (d_{rs})^\delta)^{1-\sigma_I}\right) \\ &+ \alpha_1 \cdot \log(L_{r(t-1)}^S) + \alpha_2 \cdot \log(w_{r(t-1)}) \\ &- \lambda \cdot \log(d_{rs} \cdot (1 - b \cdot FR_{rs})) + v_s + v_{rst} \end{aligned} \quad (5.22)$$

The first two explanatory variables reflect aspects linked to the market potential of the host regions. The former corresponds to the market potential deriving from the production of manufactured goods and is interpreted as the inverse of the price index of manufactured goods in region r . As these are traded goods, the market potential considers the market size of neighboring regions. The latter variable reflects the market potential derived from the production of services which are not traded outside the

region. The third explanatory variable is the nominal wage in the host region. The fourth is the cost of migration, which increases with distance and decreases if there is a common border between the regions in question. The estimation of equation (5.22) is conducted by nonlinear least squares method.

Unlike the model, the estimation of equation (5.22) offers a structural estimation of the parameters that define the function of market potential in the NEG model. In this regard the results obtained are very positive.

Regarding the results obtained by Crozet (2004) and Pons et. al (2007), workers' decision to migrate was influenced by the market potential of the host regions, i.e. workers were attracted by industrial agglomerations.

3. The Gravity Type Model and the Data

Based on the Crozet (2004) approach, first gravity type equation will be estimated and its results will be compared with the one obtained from Crozet (2004) and Pons et. al (2007) gravity type equations for both: Japanese and Polish internal migration. Generally, as the very first results show, the migration flow between two regions increases with the size of destination location and decreases with the geographic distance between the two regions. Crozet (2004) shows that such an equation may provide a good starting point for assessing, whether migrants are attracted to large markets. Moreover, a gravity model of that kind allows for identification of possible specification issues and provides a sound competing model to the complete NEG framework (after Crozet, 2004: 10).

As to the model specifications, a proxy for the probability of finding a job in the host region would be the regional employment rate $ER_{b,t-1}$ (more specifically, one minus unemployment rate), which is correlated with wages. That is why, a single variable would be defined by the wage and employment rate: $w_{b,t-1}(1-UR_{b,t-1})$. In case of Japan dummies are set 1 for 11-14 code prefectures and 25-29 code prefectures as the host regions, in case of Poland a dummy is set 1 for Masovian voivodeship as the host regions. This would make possible to control for specific structural difficulties of eventual destination regions. Consequently, the gravity based equation to be estimated is:

Model for Japan

$$\log\left(\frac{migr_{abt}}{\sum_{b \neq a} migr_{ab't}}\right) = \beta_1 \cdot \log\left(\frac{GRPpc_{b,t-1}}{CPI_{b,t-1}}\right) + \beta_2 \cdot \log\left(\frac{LP_{b,t-1}}{CPI_{b,t-1}}\right) + \beta_3 \left(w_{b,t-1} (1 - UR_{b,t-1})\right) + \beta_4 \cdot \log(Dist_{ab}) + \beta_5 S_b + \beta_6 Adj_{ab} + \beta_7 Dummy1_b + \beta_8 Dummy2_b + v_{ab,t}$$

(5.29a)

where a is an origin region, b is a destination location, t stands for time, migration flow is denoted by $migr$, $GRPpc$ is Gross Regional Product per capita, here weighted by CPI , price index, LP means land price, here also weighted by CPI , UR is unemployment rate and w wages. Furthermore, $Dist$ stands for distance, Adj adjacency and, as mentioned above, $Dummy1b$ is set 1 for 11-14 code prefectures as destination prefectures, $Dummy2b$ is set 1 for 25-29 code destination regions for migrants. $v_{ab,t}$ is an error term.

In the case of Poland the model is rewritten as follow:

Model for Poland

$$\log\left(\frac{migr_{abt}}{\sum_{b \neq a} migr_{ab't}}\right) = \beta_1 \cdot \log\left(\frac{GRPpc_{b,t-1}}{CPI_{b,t-1}}\right) + \beta_2 \cdot \log\left(\frac{LP_{b,t-1}}{CPI_{b,t-1}}\right) + \beta_3 \left(w_{b,t-1} (1 - UR_{b,t-1})\right) + \beta_4 \cdot \log(Dist_{ab}) + \beta_5 S_b + \beta_6 Adj_{ab} + \beta_7 Dummy1_b + v_{ab,t}$$

(5.29b)

where specifications are the same as in the case of equation for Japan, except for $Dummy1b$, which here is set 1 for Masovian voivodeship.

According to Crozet (2004), regional attractiveness should increase with the expected wage and decrease with distance from the source region. Above all β_i should be expected to be significantly positive, since the NEG framework suggests that a larger regions (here in terms of GRP per capita) offer a lower cost of living.

The results from the abovementioned equations (5.29) will be compared to the results obtained from Crozet (2004) (5.30) and Pons et. al (2007) (5.31) results, computed by using Japanese and Polish data:

$$\log\left(\frac{migr_{ab,t}}{\sum_{b' \neq a} migr_{ab',t}}\right) = \beta_1 \log(population_{b,t-1}) + \beta_2 \log(w_{b,t-1}(1 - UR_{b,t-1})) + \beta_3(Dist_{ab}) + \beta_4(Adj_{ab}) + \beta_5 \log(S_b) + v_{ab,t} \quad (5.30)$$

$$\log\left(\frac{migr_{ab,t}}{\sum_{b' \neq a} migr_{ab',t}}\right) = \beta_1 \log(population_{b,t-1}) + \beta_2 \log(w_{b,t-1}) + \beta_3(Dist_{ab}) + \beta_4(Adj_{ab}) + v_{ab,t} \quad (5.31)$$

Most data used in model estimation are provided by *Somusho Tokeikyoku* (*Ministry of Internal Affairs and Communications (MIC), Statistics Bureau*) in case of Japan and *Główny Urząd Statystyczny (GUS), Bank Danych Lokalnych* (*Central Statistical Office, Local Data Bank*) in case of Poland. Data on Japan are available at the prefectural level while data on Poland at NUTS2³⁸. Data span is from 1999 to 2008.

4. Results and Interpretation

4.1 Results

The results of the gravity type equation (5.29), (5.30) and (5.31) are presented below in Tables 5.1, 5.2 and 5.3, for both Japan and Poland. The estimation was made by OLS method.

³⁸ NUTS (nomenclature of territorial units for statistics) is a nomenclature providing a hierarchical structure of sub-national regions covering Europe.

Table 5.1 Crozet model

Parameters	Dependent variables	Japan				Poland			
		2000		2008		2000		2008	
		Estimate	Estimate α	Estimate	Estimate α	Estimate	Estimate α	Estimate	Estimate α
b_1	log population	1.351*** (49.00)		1.444*** (52.31)		0.619*** (4.43)		0.632*** (6.67)	
b_2	log employment probability	-1.501*** (-6.87)	5.773*** (24.79)	-1.623*** (-8.33)	5.842*** (29.22)	1.758*** (3.94)	2.859*** (7.42)	1.877*** (5.63)	3.369*** (12.52)
b_3	log distance	-0.803*** (-34.36)	-0.598*** (17.89)	-0.749*** (-34.04)	-0.555*** (-16.98)	-0.845*** (-6.74)	-0.956*** (-7.49)	-0.871*** (-9.31)	-0.971*** (-9.66)
b_4	dummy for no adjacency	-0.781*** (-12.17)	-1.084*** (-11.68)	-0.890*** (-14.59)	-1.166*** (-12.75)	-0.666*** (-5.07)	-0.607*** (-4.47)	-0.651*** (-6.59)	-0.597*** (-5.77)
b_5	log size	-0.246*** (-9.47)	0.235*** (6.72)	-0.274*** (-11.54)	0.145*** (4.30)	0.149 (0.96)	0.532*** (3.99)	0.505*** (4.96)	0.756*** (7.34)
No. obs.		2,162	2,162	2,162	2,162	240	240	240	240
R ²		0.757	0.486	0.786	0.515	0.661	0.633	0.803	0.765

For all tables: *, ** and *** denote significant level at 10%, 5% and 1%. T-value in parenthesis.

Table 5.2 Pons et al. model

Parameters	Dependent variables	Japan				Poland			
		2000		2008		2000		2008	
		Estimate	Estimate α	Estimate	Estimate α	Estimate	Estimate α	Estimate	Estimate α
b_1	log population	1.230*** (45.19)		1.318*** (48.06)		0.671*** (6.45)		0.769*** (9.20)	
b_2	log wage	-0.182 (-0.92)	5.687*** (27.26)	-0.487*** (-2.58)	5.953*** (31.17)	2.501*** (5.47)	4.093*** (9.82)	2.533*** (6.58)	4.880*** (14.56)
b_3	log distance	-0.781*** (-32.88)	-0.571*** (-17.56)	-0.742 (-32.94)	-0.543*** (-17.04)	-0.821*** (-7.02)	-0.881*** (-6.98)	-0.722*** (-7.64)	-0.811*** (-7.41)
b_4	dummy for adjacency	0.825*** (12.69)	1.140*** (12.64)	0.910*** (14.60)	1.203*** (13.48)	0.687*** (5.50)	0.691*** (5.10)	0.778*** (7.85)	0.752*** (6.51)
No. obs.		2,162	2,162	2,162	2,162	240	240	240	240
R ²		0.748	0.509	0.773	0.513	0.679	0.622	0.800	0.728

For all tables: *, ** and *** denote significant level at 10%, 5% and 1%. T-value in parenthesis.

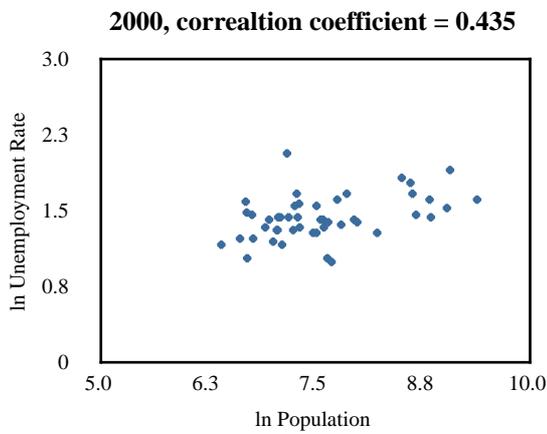
Table 5.3 Gravity model

Parameters	Dependent variables	Japan		Poland	
		2000	2008	2000	2008
		Estimate		Estimate	
b_1	log (GRPpc/CPI)	-1.178*** (-4.27)	0.309 (1.55)	0.532*** (2.73)	1.901*** (5.11)
b_2	log (land price/CPI)	1.365*** (19.08)	1.509*** (23.43)	-0.489*** (-2.50)	-0.529*** (-4.37)
b_3	log employment probability	0.387 (0.93)	-0.355 (-1.22)	3.204*** (3.04)	3.361*** (6.41)
b_4	log distance	-0.674*** (-23.58)	-0.611*** (-21.99)	-1.021*** (-8.53)	-0.975*** (-10.12)
b_5	log size	0.545*** (17.07)	0.539*** (17.24)	0.698*** (4.81)	0.972*** (8.33)
b_6	dummy for adjacency	1.005*** (12.88)	1.129*** (14.82)	0.598*** (4.73)	0.593*** (5.88)
b_7	dummy for capital region	1.053*** (10.61)	0.621*** (6.22)	-0.769*** (-2.07)	-1.267*** (-5.49)
b_8	dummy for Osaka region	-0.295*** (-3.94)	-0.291*** (-4.09)		
No. obs.		2,162	2,162	240	240
R ²		0.635	0.662	0.688	0.799

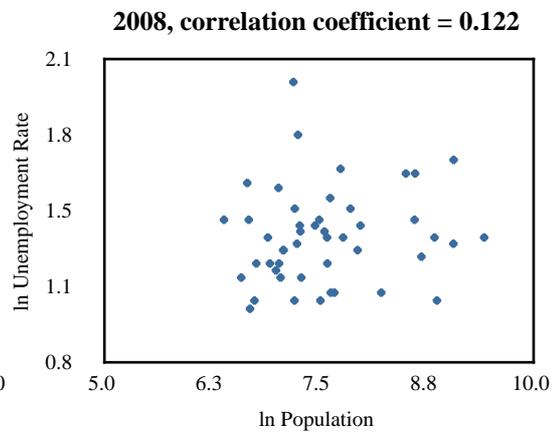
For all tables: *, ** and *** denote significant level at 10%, 5% and 1%. T-value in parenthesis.

Figure 5.4 Correlation coefficient for Japan

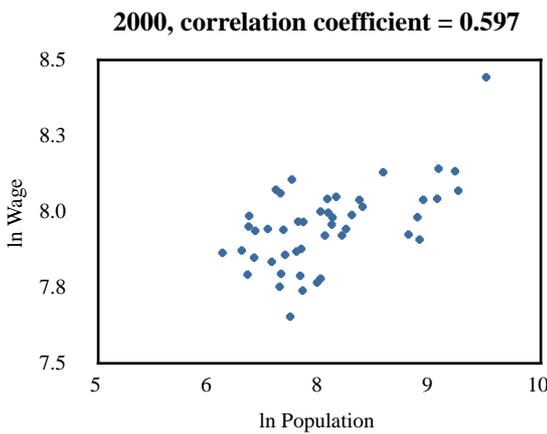
a)



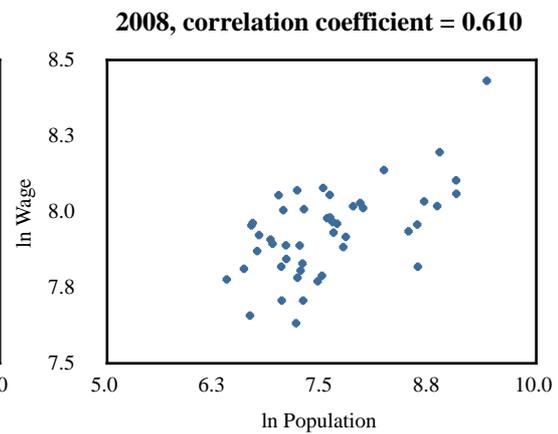
b)



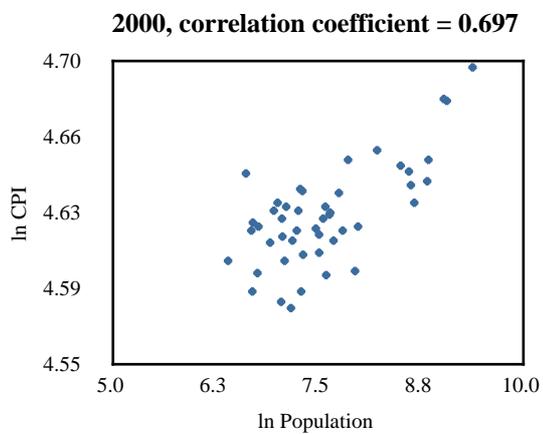
c)



d)



e)



f)

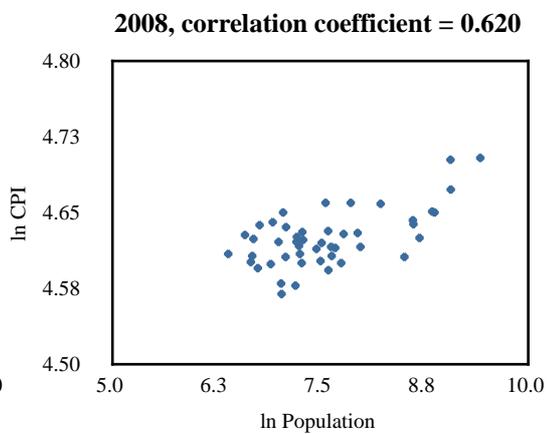
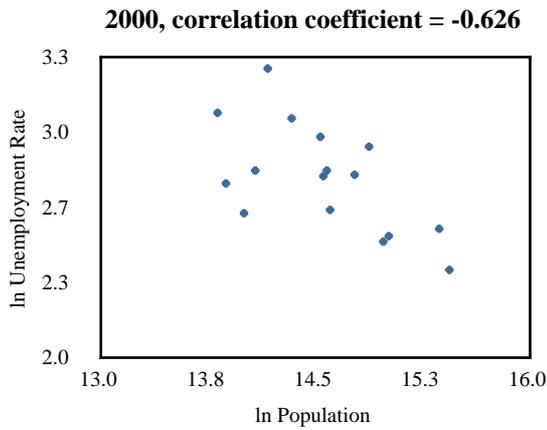
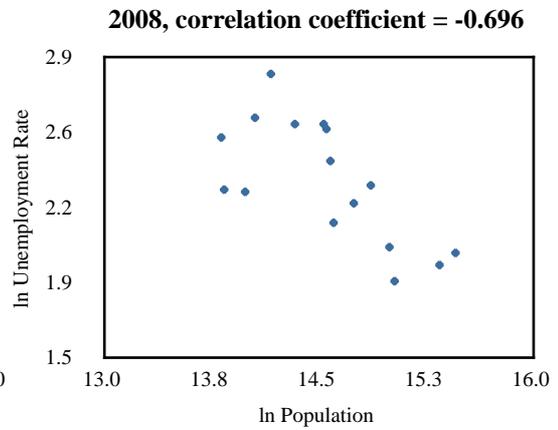


Figure 5.5 Correlation coefficient for Poland

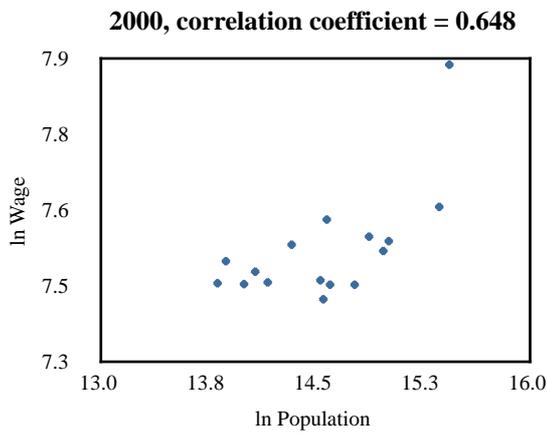
a)



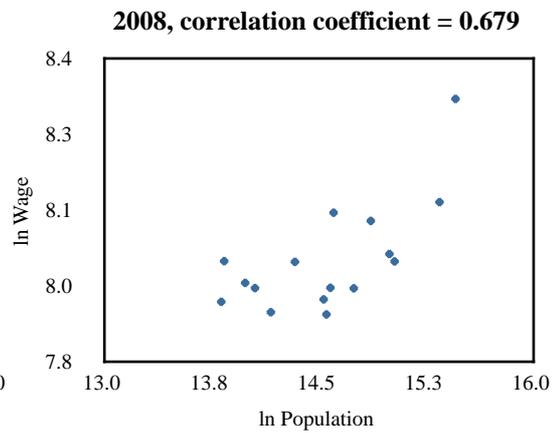
b)



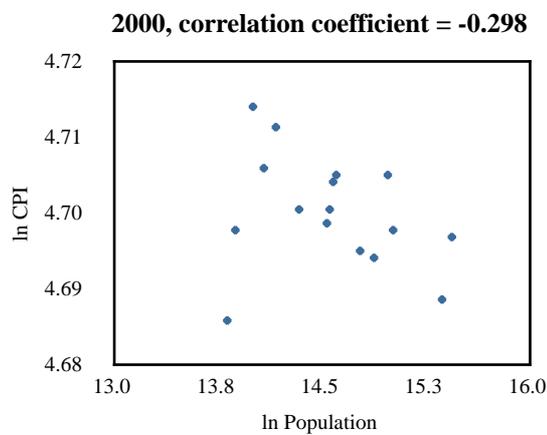
c)



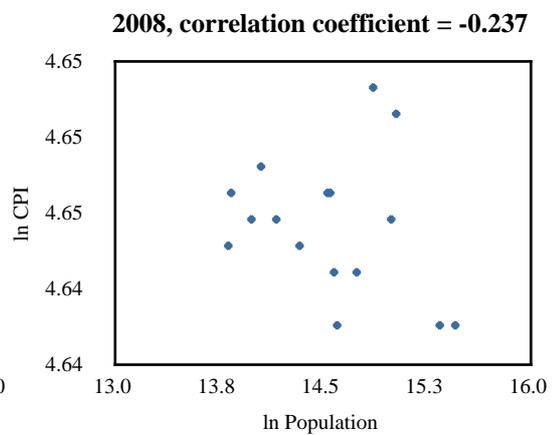
d)



e)



f)



4.2 Interpretation

This section aims at results' interpretation in a framework of the NEG theory. P. Krugman's NEG theory was the first one to introduce spatial dimension to basic economic modeling through considering the presence of scale economies. This makes possible analyzing spatial concentration of economic activity and, what is very important in this analysis, interregional differences. Moreover, the NEG perspective is open to any exogenous shocks, which may result in or be a part of cumulative causation that influences economic development.

While analyzing the models' results we should have in mind such exogenous shocks for Japanese and Polish economies. In period from 2000 to 2008 we may, for example, consider as an unpredictable factors the following facts and their repercussions for both countries:

- in case of Japan - legislation concerning temporary employment
- in case of Poland - continuation of economic transformation, EU funds, joining EU
- in case of both countries - dot-com bubble (2001), late 2000s financial crisis etc.

The following interpretation refers to the NEG theory by making use of the idea of agglomeration forces, in particular centripetal and centrifugal forces, whilst analyzing spatial divergence of economy in both countries in question.

Figures 5.4 and 5.5 above show correlation coefficient between population size and other variables, calculated by using Japanese and Polish data for population, unemployment rate, wages and price index for 2000 and 2008. In case of Japan, the correlation coefficient between population size and unemployment rate is medium positive for 2000 and decreases to small positive in 2008; correlation between population and wages is strongly positive for both 2000 and 2008; and finally correlation between CPI and population size is also strongly positive in 2000 and 2008. In case of Poland the correlation between population size and unemployment rate is strongly negative for 2000 and 2008; correlation between population size and wages is strongly positive for both 2000 and 2008; and the magnitude of correlation between population size and CPI is small negative. This results point to a very interesting fact,

that in Japan more populated areas are characterized by higher unemployment rate and higher prices. This relationship is inverse for Poland and in more populated regions a migrant may expect higher employment and relatively lower prices.

The three models were calculated by OLS method.

4.2.1 The General Interpretation

The three models show high explanatory power. The estimated coefficients are highly significant and, in general, present the expected signs. As it was assumed, the influence of distance on the migratory flows remains negative. As to the adjacency factor, in both countries flows are stronger in case of neighbouring provinces.

In Poland higher wages in the host region encourage migration, nevertheless in Japan this relationship is not so clear, the coefficients are significant but often turn negative.

Wage probability coefficient in a Crozet's model has positive sign only for Poland. In this model the coefficients for the size of the host region are negative for Japan, however in gravity equation (3) the influence of the size of the host region on migratory flows is positive and significant, what may confirm the expected centripetal forces in the determination of the bilateral migratory flows. Yet, it is hard to evaluate the influence of the host region size (surface) simply, especially in Japan, where the most populated are relatively small regions.

Nonetheless, in the analyzed models, there is another variable which may be considered as a measure of regions' size - population. According to the theory, the size of population in the region reflects the size of its economic sectors, manufacturing and service sectors. Furthermore, regions such as Tokyo-to or Osaka-fu are densely populated, though their surface is rather small as for NUTS2 level statistics. Consequently, the influence of the population size of the host region in Pons's and Crozet's models is always significant and positive in particular for Japan. On the other hand, the population variable is correlated with other variables used in the models (see: Figure 5.4 and 5.5). To assess its influence on the results of the models, an *estimate a* is presented in Table 5.1 and 5.2, which was calculated after subtracting population

variable from the model. The modification effect is easily observable: wage and employment probability coefficients turn highly positive and in Crozet model coefficient for region's size becomes positive too.

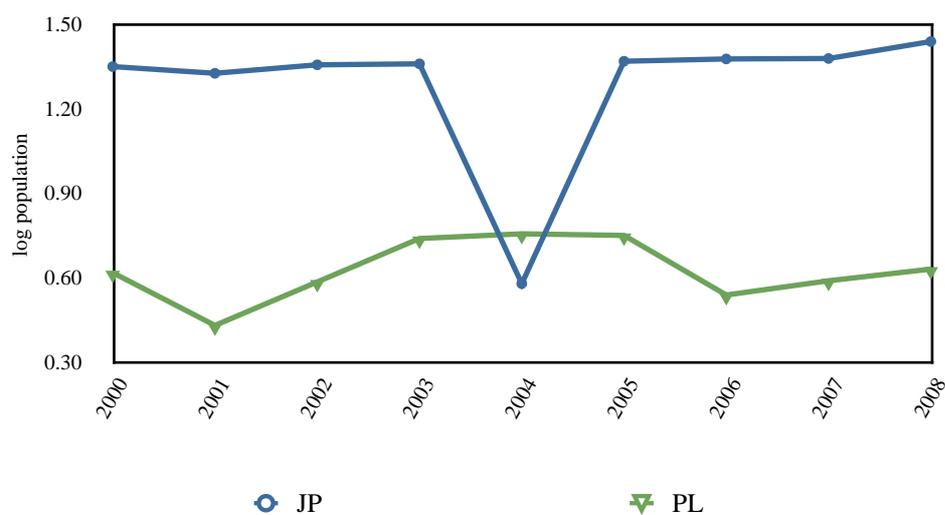
Pons et. al (2007) state, that the aim of such an analysis is to provide an initial empirical estimation of the attraction exerted by large regions on migrants and thus to be able to estimate the explanatory power of the complete functional form derived from the NEG model. Then assume, that in the NEG context the positive relation between the migratory flow and the size of the host region has other causes: it is associated with the market potential of the region, which will be transferred to the price index observed there (Pons et al., 2007: 3001, 303). Is that so? The answer for this question may bring the year by year analysis of the results of the three calculated models.

4.2.2 Year by Year Results Analysis

a) Crozet's model

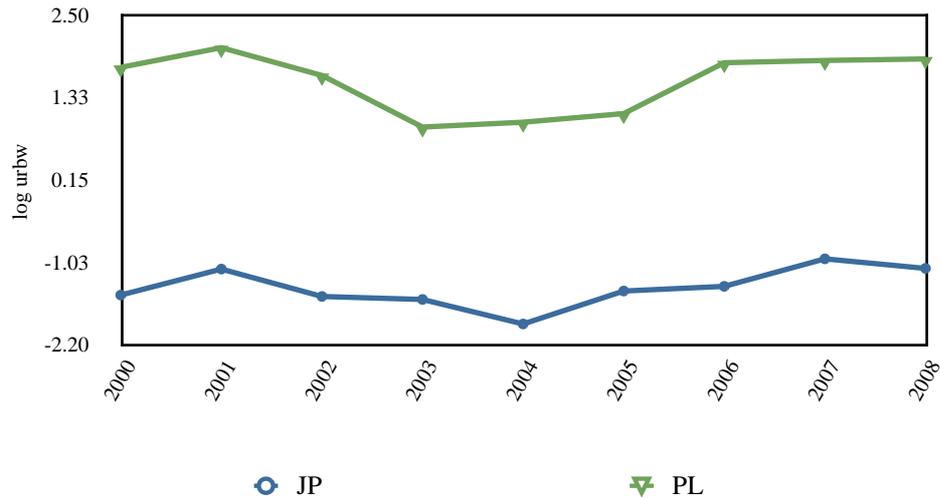
For Japan the variable *log population* (Figure 5.6) has the smallest value of 0.58 in 2004 and the highest of 1.44 in 2008. The rest of the values are close to the highest one. For Poland the smallest value of 0.43 shows 2001 and the highest of 0.75: 2004.

Figure 5.6



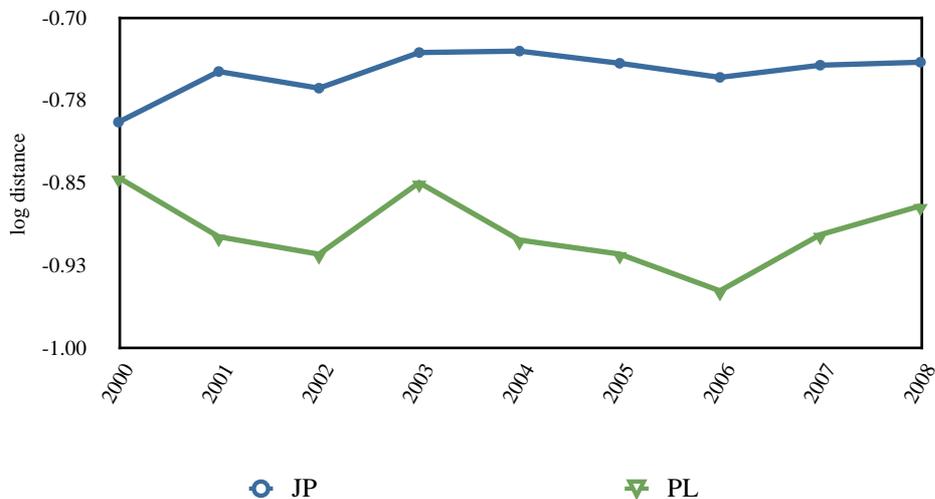
The variable *log urbw* (wage probability) (Figure 5.7) for Japan is the smallest in 2004: -1.89 and the highest in 2007: -0.97. The rest of the values are mostly negative and smaller than -1.0. In case of Poland the smallest value of 0.90 falls on 2003 and the highest of 2.03 on 2001. The rest of the values become stable after 2005.

Figure 5.7



The variable *log distance* (Figure 5.8) is negative in both cases: in Japan the smallest is in 2000: -0.80 and the highest is in 2004: -0.73. In Poland respectively, 2006: -0.94 and 2000: -0.84. The other values of that coefficient do not vary much.

Figure 5.8



The variable *dummy for no adjacency* is highest in 2000: -0.78 and lowest in 2003: -0.95. For Poland the values are as follow: the smallest in 2002: -0.91 and the highest in 2003: -0.66

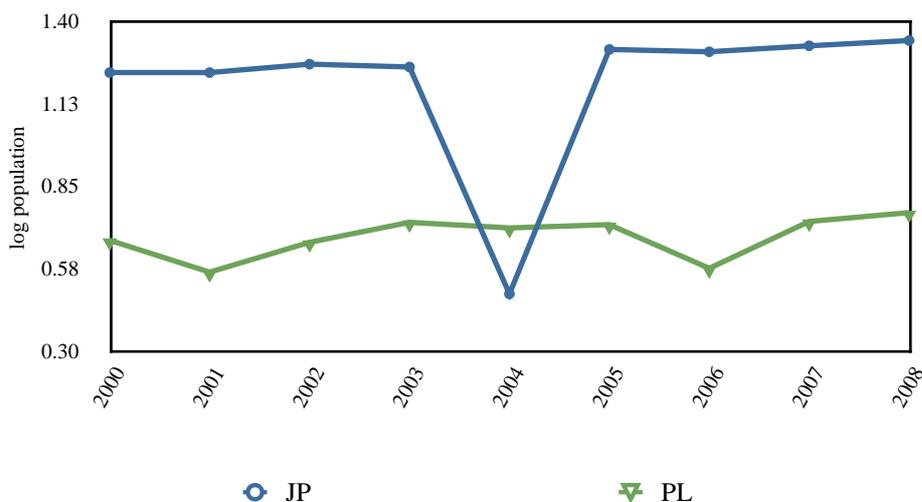
The last variable *log size* in this model does not become any important gravity force (especially in case of Japan), which means that migration flows do not grow with the size of the host region.

R-squared values for Japan have the range between 0.757 and 0.786 (2000 and 2008) and for Poland between 0.661 and 0.803 (2000 and 2008). The values grew with the time.

b) Pons` s model

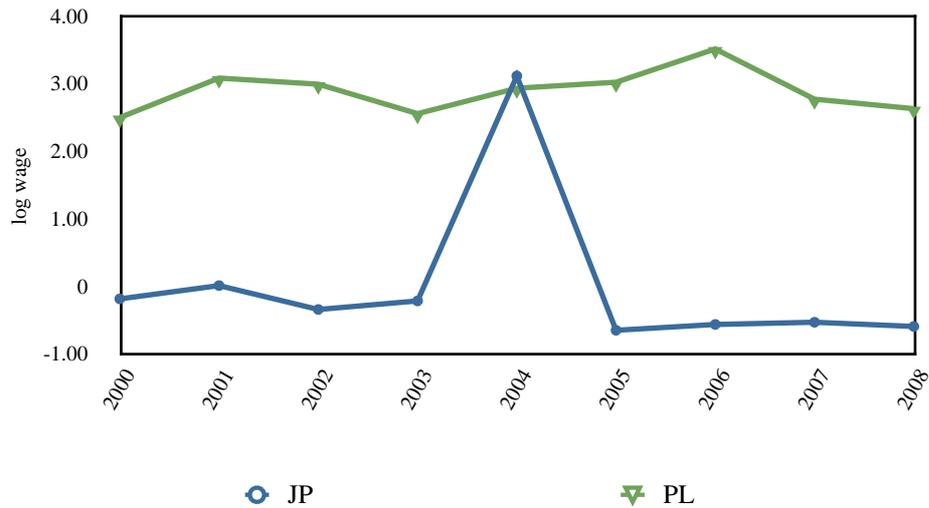
For Japan the variable *log population* (Figure 5.9) has the smallest value of 0.49 in 2004 and the highest of 1.32 in 2008. The rest of the values are close to the highest one. For Poland the smallest value of 0.56 shows 2001 and the highest of 0.77: 2008. This estimate values are almost the same as in Crozet`s model.

Figure 5.9



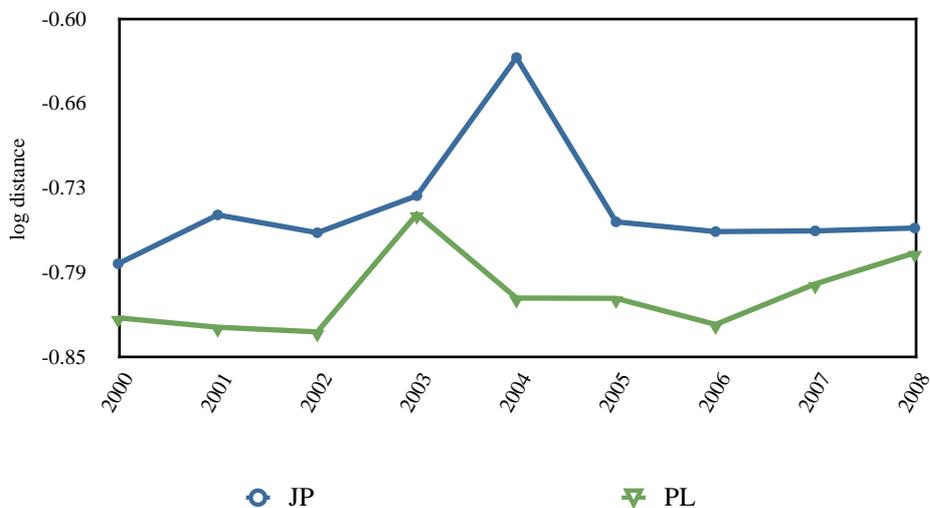
The variable *log wage* (Figure 5.10) for Japan is the smallest in 2005: -0.65 and the highest in 2004 3.12. The rest of the values are mostly negative and most often oscillate around the value of -0.5. In case of Poland the smallest value of 2.50 falls on 2000 and the highest of 3.51 on 2006. The rest of the values are quite stable.

Figure 5.10



The variable *log distance* (Figure 5.11) is negative in both cases: in Japan the smallest is in 2000: -0.78 and the highest is in 2004: -0.62. In Poland respectively: in 2002: -0.83 and in 2003: -0.74. Other values of this coefficient do not vary much.

Figure 5.11



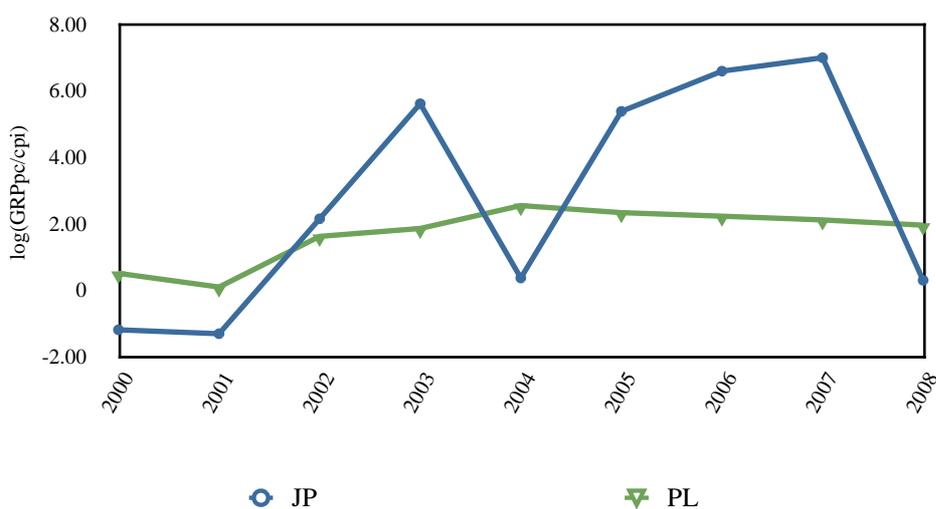
The last variable, *dummy for adjacency*, is always positive in both cases, however higher for Japan: the smallest value in 2000: 0.82 and the highest in 2004: 1.01. For Poland the values are as follow: the smallest in 2002: 0.68 and the highest in 2003: 0.76.

R-squared values for Japan have the range between 0.633 and 0.777 (2004 and 2007) and for Poland between 0.679 and 0.800 (2000 and 2008). The values grow with the time.

c) Gravity model

For Japan the variable $\log (GRPpc)/cpi$ (Figure 5.12) has the smallest value of -1.30 in 2001 and the highest of 7.00 in 2007. The rest of the values have positive sign from 2002 on. For Poland the smallest value of 0.11 shows 2001 and the highest of 2.56: 2004. The values grow until 2004, then stay almost flat, however decrease slightly.

Figure 5.12

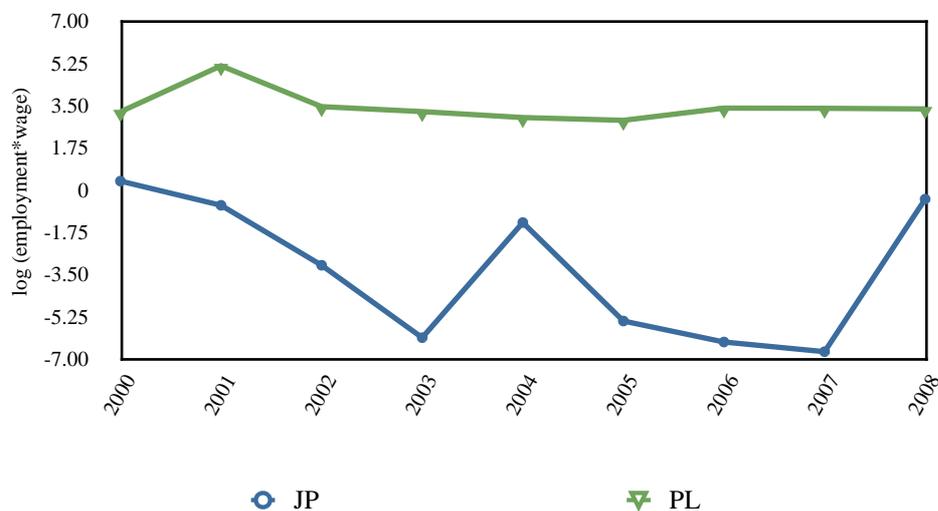


The variable $\log (land\ price)/cpi$ for Japan in the smallest in 2000: 1.37 and the highest in 2007: 1.68. The rest of the values do not differ much from the beforementioned values. In case of Poland the smallest value of -0.81 falls on 2001 and

the highest of -0.49 on 2000. The rest of the values are very similar. These results confirm the fact-finding conclusions, that in Poland housing problems are still present and influence migration negatively. Nevertheless, high, positive and significant values of this coefficient in Japan show that high housing costs in *shutoken* does not discourage migrants to move.

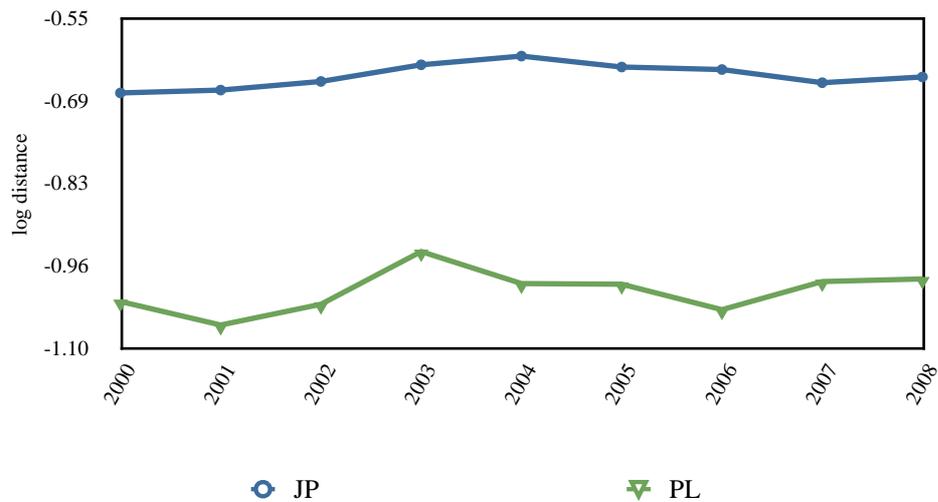
The variable $\log(\text{employment} \cdot \text{wage})$ (wage probability) (Figure 5.13) for Japan is the smallest in 2007: -6.68 and the highest in 2000: 0.39. The rest of the values are negative and the lowest in 2007, 2006 and 2003. The positive value is recorded only in 2000. In case of Poland the smallest value of 2.91 falls on 2005 and the highest of 5.16 on 2001. The rest of the values oscillate around the value of 3.4. These results may be related to the fact that in Japan in period from 2002 to 2008 the wages were decreasing with slight changes from 2003 to 2005 and visible drop in 2007 and 2008, while in Poland wages were in constant increase.

Figure 5.13



The variable $\log \text{ distance}$ (Figure 5.14) is negative in both cases: in Japan the smallest is in 2000: -0.67 and the highest is in 2004: -0.61. In Poland respectively: in 2001 -1.06 and in 2003: -0.93. The other values of this coefficient do not vary much.

Figure 5.14



The variable *dummy for adjacency* is always positive, for Japan takes the smallest value in 2000: 1.01 and the highest in 2008: 1.13. For Poland the values are as follow: the smallest in 2001: 0.56 and the highest in 2000: 0.60.

The values of the variable *log size* for Japan are as follow, the smallest in 2000: 0.55 and the highest in 2007: 0.63 and respectively for Poland 2001: 0.65 and 2007: 1.00.

The results for *dummy1b*, dummy set for Tokyo metropolitan area for Japan and Masovian voivodeship for Poland, shows the lowest value in 2008: 0.62 and the highest value in 2003: 1.04 for Japan and respectively in 2001: -1.36 and 2000: -0.78 for Poland.

The last variable *dummy2b*, is set for Osaka metropolitan area for Japan and is smallest in 2001: -0.35 and the highest in 2005: -0.24.

R-squared values for Japan have the range between 0.635 and 0.671 (2000 and 2007) and for Poland between 0.635 and 0.672 (2000 and 2007). The values also grew with the time.

To interpret the abovementioned results in the context of the NEG theory, what in practice means the search of agglomeration forces, first the dynamics of the three crucial factors in the period in question should be analyzed. Those factors are: employment, wages and costs (cost of living).

4.3 Conclusions

a) Japan

As to the employment there were slight changes in this factor in Japan between 2000 and 2008. The employment in service sector grew a little while the employment in manufacturing sector diminished gently.

According to the Eurostat data, the wages in Japan in the period from 2002 to 2008 were decreasing. Japanese regional data shows that the growth dynamics in wages mean equaled -4.98 points in 2005 (to 2000). Furthermore, among 47 prefectures only 5 regions had positive growth dynamics in wages in 2005 (to 2000). Those prefectures were (in ascending order): Fukushima, Kanagawa, Aomori, Ibaraki, Ehime.

This situation raises a question: if agglomerations are still the most attractive localizations for employees interested in earnings maximization?

The cost of life in Japan measured by *bukka kakusa* data seems to be flat in the period in question. From 2000 to 2008 increase in costs exceeding 1 point was observed in 13 prefectures. The highest augmentation was recorded in (in ascending order): Yamanashi, Tokushima, Kanagawa, Ishikawa, Hiroshima and Okayama. During this period the cost of life in metropolitan areas such as Osaka-fu, Chiba (Chiba city), Hyogo (Kobe), Aichi (Nagoya) slightly decreased while in Tokyo-to increased by 0.8 points.

The unemployment rate in Japan was insignificantly decreasing until 2007 and then augmented.

b) Poland

In Poland the employment was diminishing gradually till 2004 and then increased. Very similar changes showed the data on wages. These two facts may be related to intensive labor migration to other EU countries before 2004.

More precisely, the employment in manufacturing sector decreases until 2003 and then reaches the level from the beginning of the period in question in 2008. The employment in service sector also showed drops until 2003 and then began to grow.

According to the Consumer Price Index, after 2003 the cost of life in Poland started to increase and in the period between 2003 and 2008 grew on average by 3.5 points. This situation was present in all voivodeships, in particular in Świętokrzyskie, Warmian-Masurian and Kuyavian-Pomeranian. Interestingly, the growth of the cost of life in Masovian voivodeship (Warsaw) was the smallest and equaled 2.8 points (2008 to 2003).

The unemployment rate in the country decreased visibly (by almost half) from 2000 to 2008.

The NEG model relates the regional development to the demand in that region, saying that the level of wages in that region stimulates immigration and consequently demand. In Japan as well as in Poland the wages are higher in agglomeration areas though the cost of life is also higher in metropolis. This means that costs do not constitute centrifugal force strong enough to overcome the centripetal forces such as higher earnings, better employment possibilities etc. Moreover, in case of Japan, locations such as Tokyo, Osaka, Nagoya seem to be well established and very strong gravity centers and despite the fact that in the years from 2000 to 2008 wages and employment grew in other regions better, migrants were prone to go to those cities in first place.

Chapter 6 The NEG theory based model

1. Introduction

In the previous chapter, I presented the Crozet (2004) approach to the NEG based migration modeling and gravity type equation estimation, interpreted in view of the NEG theory. The next step was to estimate the expected migration flow between regions by the NEG equation including market access term expressed as a price index of nontraded services and manufactured goods. However, several attempts to estimate the abovementioned model turned out to be unsuccessful, in both cases of Japan and Poland.

There are diverse reasons for these failures. Among the most persuasive are the structure and the country distribution of the following variables: price index, wages and unemployment rate. As to the first variable, despite the fact that in the NEG theory real wage is determined by deflating it by price index, implying supply access, real data in both countries, Japan and Poland, shows that the price index is usually higher in big cities, though the supply access to them is better than to other cities. The problem with the second variable is that, mentioned also by Crozet (2000), in general, wages are not good determinants of migration patterns and introduce multicollinearity to the model (Crozet, 2000: 18). In consequence, the results, especially in the case of Japan, showed that migrants' decisions were not influenced by wages level, or even that they chosen regions characterized by lower wages. Besides, model estimation reveals strong correlation between market potential and wage terms. The third variable, unemployment rate, turned out to be unstable as well. This may be related to the fact, that, according to the Japanese data, the unemployment rate e.g. in Tokyo or Osaka is higher than in the other Japanese cities.

The abovementioned problems with the estimation of the original equation impelled me to look for the alternative specifications of the model, and yet consistent with the NEG theory.

Still there are not too many empirical studies on migration location choices in view of the NEG theory, so it is worth searching for satisfying examples of this theoretical approach in the real world and add to the empirical evidence on NEG.

2. Theoretical approach

The modification of the Crozet (2004) like NEG approach presented in the earlier section is based on the literature focused on the market potential formula applied to modeling. Very useful proved to be studies by Head and Mayer (2003), Head and Mayer (2004), Aoki (2007) and Bosker et al. (2010).

Head and Mayer (2003) underline that there are three main specifications of the market potential estimated, the first one corresponds to the theoretical equation for the profitability of each location (Head, Mayer, 2003: 17):

$$V_j \equiv \ln[\sigma(\Pi_j + F_j)] = -(\sigma - 1)\ln c_j + \ln RMP_j \quad (6.1)$$

where c_j is the constant marginal cost, F_j is the plant-specific cost, Π_j is net profit and RMP_j is Real Market Potential.

The second reduces market potential to the Harris (1954) formula which simplifies the assumed trade costs and neglects the impact of competitors on the location choice. The third specification follows Redding and Venables (2000) and separates RMP_j into local and nonlocal components (Head, Mayer, 2003: 17).

In Head and Mayer (2004) the point of the theoretical and empirical departure is the fact that the profit equation incorporates a term closely related to the market potential index, originally introduced by Harris (1954).

$$\Pi_r = \frac{c_r^{1-\sigma}}{\sigma} \sum_{j=1}^R \phi_{rj} \frac{E_j}{G_j} - F_r = \frac{c_r^{1-\sigma}}{\sigma} M_r - F_r \quad (6.2)$$

where Π_r is the aggregate net profit to be earned in each potential location r , c_r is marginal cost, E_j is denotes expenditure, F_r is fixed cost, $G_j \equiv \sum_r n_r (c_r \tau_{rj})^{1-\sigma}$ and

$$M_r \equiv \sum_j \frac{\phi_{rj} E_j}{G_j}$$

is the *Krugman market potential*, where Φ_{rj} is *freeness* of trade. If we set $G_j=1$ and $\Phi_{rj}=1/d_{rj}$, then M_r reduces to $\sum_j E_j / d_{rj}$, the Harris (1954) market potential measure (Head and Mayer, 2004: 960-961).

The authors use the Harris (1954) and Krugman (1992) market potential measures to estimate market potential effect on location choice of Japanese investments in Europe. Additionally, they estimate the border and the distance effects that determine market accessibility using a bilateral trade equation implied by the same model that generates the profit equation (Head and Mayer, 2004: 969).

Interestingly, they find that the Harris (1954) market potential outperforms the Krugman (1992) market potential in both magnitude and fit, though originally Harris (1954) approach is atheoretical. Then they conclude that their results suggest that the downstream linkages emphasized in Krugman (1991) are not the only or even the main cause of agglomeration (Head and Mayer, 2004: 969).

Aoki (2007) uses the market potential term as a dependent variable in an equation of expected migration flows and runs two stage estimation. First he derives wage equation:

$$W_i = \left(\frac{\beta^{1-\sigma}}{\gamma\sigma} \right)^{\frac{1}{\sigma}} (MP_i)^{\frac{1}{\sigma}} \quad (6.3)$$

directly from the equations identical with (6.2) and Krugman market potential term and then he passes to the migration choice equation.

Bosker et al. (2010) use the NEG model to analyze the relationship between market access, labor mobility and agglomeration for China. Their NEG approach is based on Puga (1999) model, in which the balance between agglomeration and spreading forces and hence equilibrium spatial allocation depends explicitly on the degree of interregional labor mobility (Bosker et al., 2010: 2).

First the authors estimate the NEG wage equation, however they use a simplified version which is as follows:

$$\ln(w_i) = \frac{1}{\sigma} \ln \left(\sum_{j=1}^J e_j \tau_{ij}^{1-\sigma} q_j^{\sigma-1} \right) \quad (6.4)$$

where e_j denotes expenditure, q_j (manufacturing) price index and τ_{ij} means distance costs.

The term between brackets constitutes the market access. As their dependent variable expenditures (income) the authors use GDP per capita for each unit (Bosker et al., 2010: 14).

Following Hanson (2005) they estimate wage equation directly and then use the obtained parameters to estimate their full-blown NEG model.

Leamer and Levinsohn (1994) say *we estimate and don't test* and remark that we should *work hard to make a clear and close link between the theory and data* (Leamer and Levinsohn, 1994: 2). Having in mind these words and according to the findings by Head and Mayer (2004), in both cases of Japan and Poland, possibly there should be first estimated a well established model like Harris (1954) market potential formula consistent with the NEG theory in the wide sense.

As to the migration equation, the original specification of the model in the fifth chapter took form of (equation 5.20):

$$\begin{aligned}
\ln\left(\frac{migr_{srt}}{\sum_{r' \neq s} migr_{sr't}}\right) &= \ln[(L_{r(t-1)}^S)^{\frac{\phi}{\sigma_s-1}}] + \ln\left[\sum_{s=1}^{s=R} L_{s(t-1)}^I \cdot (w_{k(t-1)} \cdot (d_{rs})^\delta)^{1-\sigma_t}\right]^{\frac{\mu}{\sigma_t-1}} \\
&+ \ln[w_{r(t-1)}^{1-\phi} \rho_{r(t-1)}] + \ln[d_{rs}(1 + bFRrs)]^{-\lambda} + \tilde{a}_{s(t-1)} \\
\tilde{a}_{s(t-1)} &= -\ln\left(\sum_{j=1}^R e^{V_{sj,t-1}^k} - e^{V_{ss,t-1}^k}\right)
\end{aligned} \tag{6.5}$$

The estimation of this equation did not turn satisfying results, mainly due to enumerated above reasons. Taking under consideration the calibration problems and the beforementioned research on the market potential term, a new specification considering market potential which is similar to the concept of the NEG model may be proposed:

$$\ln\left(\frac{migr_{ji,t}}{\sum_{i' \neq j} migr_{ji',t}}\right) = \alpha_0 + \alpha_1 \ln(MP_i) - \lambda \ln[d_{ij}(1 + b_D D_{ij})] + \alpha_W WAW \tag{6.6}$$

where λ denotes distance elasticity of cost, b is the influence of borders on migration cost, D_{ij} is a time distance, WAW is a dummy set 1 if a migration destination belongs to Warsaw metropolitan area, and MP is a market potential term.

For Japan the migration equation takes a form of:

$$\ln\left(\frac{migr_{ji,t}}{\sum_{i' \neq j} migr_{ji',t}}\right) = b_0 + b_1 \ln(MP_i) - \lambda \ln[d_{ij}(1 + b_D D_{ij})] + b_T TKY + b_O OSK \tag{6.7}$$

where TKY is a dummy set one if a migration destination region belongs to the Tokyo metropolitan area. Dummy denoted as OSK is set 1 if a migration destination region belongs to the Osaka metropolitan area. b_D is set 1 if regions share a border, D_{ij} is a time distance.

Fortunately, data for both countries allows for estimation of wage equation derived from equation (6.3). After taking logarithm of both sides:

$$\ln w_i = \alpha_0 + \sigma^{-1} \ln MP_i \quad (6.8)$$

and substituting MP_i term with Krugman like market potential formula, the following wage equation is obtained:

$$\ln w_i = \alpha_0 + \frac{1}{\sigma - 1} \sum_{j=1}^R d_{ij}^{\gamma(1-\sigma)} P_j^\sigma \frac{E_j}{P_j} \quad (6.9)$$

where d_{ij} is distance between region i and j , E_j denotes gross regional product in region j , P_j price index in region j , w_i is payroll per worker in region i . This approach makes it possible to estimate *sigma*, key parameter in the NEG theory based models.

Since it is impossible to obtain σ and γ parameters simultaneously in migration equation estimation, two stage estimation will be run. First, the wage equation, as a function of market potential, will be estimated and then the obtained parameters will be used to estimate interregional migration flows.

3. Data and Model Estimation

The first element of the estimation constitutes wage equation which is as follows (6.9):

$$\ln w_i = \alpha_0 + \frac{1}{\sigma - 1} \sum_{j=1}^R d_{ij}^{\gamma(1-\sigma)} P_j^\sigma \frac{E_j}{P_j}$$

Estimation of this equation makes it is possible to obtain the distance parameter, γ , and elasticity of substitution parameter, σ . In the next step of the estimation, those two

parameters are substituted with the obtained values and we may estimate the expected share of emigrants from region j choosing to go to region i .

Most data used in model estimation are provided by *Somusho Tokeikyoku* (*Ministry of Internal Affairs and Communications (MIC), Statistics Bureau*) and Cabinet Office of Japan in case of Japan and *Główny Urząd Statystyczny (GUS), Bank Danych Lokalnych* (*Central Statistical Office, Local Data Bank*) in case of Poland. Data on Japan are available at the prefectural level while data on Poland at NUTS2.

4. Results and Interpretation

The estimation of the first stage equation (6.9) for Poland turned the distance parameter value $\gamma = 0.15$ and elasticity of substitution parameter $\sigma = 3.1$ (Table 6.1.). After introduction of this value to the second stage equation (6.6), the following results are obtained (Table 6.2.1. and Table 6.2.2.).

Table 6.1. (equation 6.9)

Poland		
Parameters	Dependent variables	Estimate
α_0	constant term	5.847 (1.30)
σ	elasticity of substitution	3.101** (2.00)
γ	distance elasticity of migration cost	0.149*** (3.26)
No. obs.		16
R^2		0.683

For all tables: *, ** and *** denote significant level at 10%, 5% and 1%. T-value in parenthesis.

Table 6.2.1. (equation 6.6)

Poland				
Parameters	Dependent variables	Estimate	Estimate <i>a</i>	Estimate <i>b</i>
α_0	constant term	-53.448*** (7.68)	-54.192*** (-5.56)	275.240*** (3.43)
α_1	log (Market Potential)	2.507*** (8.07)	2.538*** (6.00)	2.356*** (7.77)
α_2	log (Unemployment Rate)		0.024 (0.11)	
α_3	log (CPI)			-70.181*** (4.10)
λ	distance elasticity of migration cost	0.684*** (5.99)	0.683*** (5.94)	0.776*** (6.88)
b_D	influence of borders on migration cost dummy variable	-0.704*** (-6.95)	-0.704*** (-6.93)	-0.630*** (-6.40)
α_w	for Warsaw metropolitan area	0.419** (2.06)	0.412* (1.93)	0.284 (1.42)
No. obs.		240	240	240
R^2		0.709	0.709	0.729

For all tables: *, ** and *** denote significant level at 10%, 5% and 1%. T-value in parenthesis.

Table 6.2.2. Correlation matrix (equation 6.6)

Correlation matrix

	<i>ln</i> Out Mig Share	<i>ln</i> CPI	<i>ln</i> Un. Rate	<i>ln</i> MP	<i>ln</i> Time Distance
<i>ln</i> Out Mig Share	1.000				
<i>ln</i> CPI	-0.235	1.000			
<i>ln</i> Un. Rate	-0.377	0.242	1.000		
<i>ln</i> MP	0.579	-0.251	-0.689	1.000	
<i>ln</i> Time Distance	-0.667	-0.102	0.154	-0.241	1.000

The above results show that elasticity of substitution and transport cost (σ and γ) in equation (6.9) have the expected sign and are significant and that in equation (6.6) all dependent variables are significant and the overall fit of the model is good. Moreover, they confirm that relatively higher market potential in a destination is an important pull factor for interregional migrants. As to the two parameters expressing migration cost (b and λ) the first is strictly, the second negative and both highly significant. The simplest interpretation of this fact is that migration flows decrease with the distance. b_D coefficient is relatively high which means that most migrants choose the adjacent regions. The value of distance elasticity of migration cost parameter is high as well, so in the end long distance migration cost in Poland is high. In general, Polish internal migrants, alike in other European countries, are not very mobile. However, Polish migrants are still attracted by larger labor markets with high employment possibilities and relatively high wages. On the other hand, migrants are discouraged from migrating to locations with a higher price index. Interestingly, the capital region of Warsaw is not the most attractive location across the country.

For Japan, the results are as follow (Table 6.3., Table 6.4.1. and Table 6.4.2.):

Table 6.3. (equation 6.9)

Japan		
Parameters	Dependent variables	Estimate
α_0	constant term	-12.650 (-0.31)
σ	elasticity of substitution	2.327*** (3.64)
γ	distance elasticity of migration cost	0.306*** (4.44)
No. obs.		47
R^2		0.399

For all tables: *, ** and *** denote significant level at 10%, 5% and 1%. T-value in parenthesis.

Table 6.4.1. (equation 6.7)

Japan				
Parameters	Dependent variables	Estimate	Estimate <i>a</i>	Estimate <i>b</i>
b_0	constant term	-19.165*** (-2.69)	-63.711*** (-7.34)	-37.438*** (-5.29)
b_1	log (Market Potential)	0.846*** (2.98)	2.537*** (7.75)	-0.552* (-1.84)
b_2	log (Unemployment Rate)		1.313*** (8.65)	
b_2	log (CPI)			11.454*** (11.78)
λ	distance elasticity of migration cost	0.815*** (15.99)	0.826*** (16.48)	0.819*** (16.57)
b_D	influence of borders on migration cost dummy variable	-0.856*** (-29.94)	-0.848*** (-29.38)	-0.854*** (-30.60)
b_T	for Tokyo metropolitan area dummy variable	2.142*** (23.42)	1.931*** (20.71)	1.829 (19.72)
b_O	for Osaka metropolitan area	0.737*** (9.97)	0.567*** (7.54)	0.613*** (8.47)
No. obs.		2,162	2,162	2,162
R^2		0.511	0.527	0.541

For all tables: *, ** and *** denote significant level at 10%, 5% and 1%. T-value in parenthesis.

Table 6.4.2. Correlation matrix (equation 6.7)

Correlation matrix					
	<i>ln</i> Out Mig Share	<i>ln</i> CPI	<i>ln</i> Un. Rate	<i>ln</i> MP	<i>ln</i> Time Distance
<i>ln</i> Out Mig Share	1.000				
<i>ln</i> CPI	0.443	1.000			
<i>ln</i> Un. Rate	-0.041	-0.365	1.000		
<i>ln</i> MP	0.408	0.592	-0.534	1.000	
<i>ln</i> Time Distance	-0.481	-0.119	0.175	-0.261	1.000

The results of the first equation (6.9) for Japan exhibit that elasticity of substitution as well as transport cost (σ and γ) have the expected sign and are highly significant. Low value of the complete coefficient on mobility cost $\gamma(1-\sigma) = -0.39$ suggests high level of regional specialization in Japan. After substituting the (6.9) equation parameters with the values of the parameters obtained before, finally it is possible to estimate the migration equation. All parameters in equation (6.7) are highly significant. b_I parameter is strictly positive and confirms that market potential has influence on workers' mobility. The distance elasticity of migration cost ($\lambda=0.815$) and the influence of borders on migration cost, b_D , prove that in Japan long distance migration cost is relatively high. Besides, high and robust parameter for dummy variable *TKY* indicates an outstanding influence of Tokyo metropolitan area on Japanese migrants' behavior. The value of the parameter for Osaka metropolitan area is also positive and strong, however most migration flows in Japan are toward Tokyo area.

5. Conclusions

This section presents an attempt to the analysis of migration location choice. Due to the fact that the NEG model estimation met with several failures, which were mentioned earlier, the original formulation was modified on the basis of beforementioned studies on market potential formula. In spite of the fact that the new specification is not a pure NEG approach, the results of the modified model are consistent with the NEG theory. Migrants (workers) tend to choose destination with higher market potential.

The results for both countries confirm assumed earlier differences between them. First, Japan is characterized by very mobile population. The traditional migration destination like Tokyo and Osaka are still of great importance and Japanese tend to concentrate in metropolitan areas. Second, wage level and unemployment rate differences among the regions in Japan do not constitute significant pull factors for migrants. This may be related to the fact that Japanese labor market is more controlled than Europeans labor markets and that migrants may be more attracted by regional specialization or geographic distribution of economic activities than by wages and employment rate.

Polish internal migration, in turn, was proved to be most influenced by two fairly different factors. First, Polish migration occur mainly among adjacent regions. This confirms the key role of Polish regional labor markets in migrants' choice behavior (interestingly, this pattern is also present in other EU countries). In Poland, agglomeration forces work rather at region-scale than at country-scale, as it is in Japan. Second, employment opportunities in a destination region act as a very important pull factor. In general in Poland, bigger cities and their areas are characterized by lower unemployment rate and people tend to move to regional center in search of a job.

Final conclusions

This paper sheds light on the mechanism of uneven concentration of population among regions on the example of Japan and Poland. Japan, as an archipelago and economically high developed country was analyzed on the basis of internal migration. In case of Poland, which still is a developing economy and constitutes an element of the EU system, a twofold analysis was conducted: internal migration and inter EU migration. The final part of the dissertation presents an attempt on the description of the migration dynamics phenomena through a gravity type model, in comparison with Crozet (2004) and Pons et al. (2007) gravity type models, and the interpretation of its results in view of the NEG theory, in terms of centripetal and centrifugal forces. The NEG approach, originally proposed by Crozet (2004), was modified to the formulation which includes the Harris (1954) type market potential formula. The NEG theory lured me with its very innovative approach to the problem of the intraregional inequalities and the very few cases of its application for empirical research on the migration behavior.

Combes et al. (2008) give some important thoughts on the economic geography. They state that spatial economy tends to explain the very complex interactions between globalization and spatial inequalities. However, it does not mean that because of the fact that the distance and trade cost decrease, the location means less (Combes et al., 2008: 365). As the example of the EU and Polish labor migration in particular shows, lifting country borders to labor mobility makes the migrants even more sensitive to differences between the regions and these differences have an impact on their spatial distribution. They argue, that economic integration imposes lifestyle changes that force agents to think, act, and work on a new spatial scale, which means that individual location decisions are made on the basis of an increasingly richer set of factors (Combes et al., 2008: 366).

Polish foreign labor migration indeed proved to be very responsive to the new spatial reality after joining the EU in 2004. Due to the command of foreign languages and the mobility facilitation, the EU local labor markets grew in importance and spatial mobility, especially in the case of skilled workers, appeared to be new career choice.

Migrants choose to join a foreign labor market not with the expectation to gain a foreign experience, but with expectation to maximize their career profits or utility. Japanese skilled workers as well, follow the firms distribution and tend to choose the three big cities: Tokyo, Osaka and Nagoya.

The researchers dealing with the migration in view of the NEG theory argue, that two effects due to agglomeration occur: forward linkage and backward linkage. The former phenomena describes the situation, when workers migrate to industrial centers, because in these regions goods for consumption incur lower transportation costs, which means that these centers have a lower cost of living and are therefore attracting people who want to maximize their consumption. However, data based analyses show, that in majority, agglomerations are the most expensive location to live in. On the other hand, the big city area gives the access to a big and flexible labor market and other facilities making life more dynamic and career focused. The latter one takes place when demand for goods of a given region increases and new workers come to the region to fill in the additional positions needed to satisfy the higher demand. It may be assumed, that nowadays, in economically developed countries, there would rather occur the backward effect than the forward linkage, and that, as to the migration phenomena, the latter one would describe the country under the industrial development rather than developed one.

In Japan as well as in Poland the wages are generally higher in agglomeration areas, nevertheless the living costs in metropolis are higher too. This leads to the conclusion, that costs do not constitute centrifugal force strong enough to overcome the centripetal forces such as higher earnings, better employment possibilities etc.

This dissertation was aimed at making use of the NEG model, to find if this theory, though already practiced in the field of research on migration, is a general-purpose theory. However, after repeating unsatisfying results, at the first stage the gravity type model was estimated and some of the NEG theory elements were used to interpret its results. Interestingly, the results of the gravity type model estimated in this paper and Crozet (2004) and Pons et al. (2007) gravity type model results do not fall apart much.

Finally, considering some studies on the market potential term, the model consistent with the NEG theory was built. Its central part constitutes the market potential formula, originally introduced by Harris (1954). The purpose of this model estimation was to answer the question if Japanese and Polish internal migrant follow the market potential or not. The most important finding is that the migrants (workers) in both countries tend to choose location with higher market potential, despite the imperfections that are present at Japanese as well as Polish labor market.

References:

- Aoki, K., *Chugoku no chiikikan jinko rodoryoku ido to shijo petensharu*, Konan keizai gakuronshu dai 48 maki dai 2 go, September 2007.
- Anderson, J., E., (1979), *A Theoretical Foundation for the Gravity Equation*, The American Economy Review, vol. 69 (1), (March 1979), 106-116.
- Bauder, H., (2006), *Labor movement. How migration regulates labor markets*, Oxford University Press Inc., New York.
- Behrens K., Thisse F., (2006), *Regional economics: a new economic geography perspective*, Regional Science and Urban Economics, Elsevier, vol. 37 (4) (July 2006), 457-465.
- Bijak, J., (2006), *Forecasting International Migration: Selected Theories, Models and Methods*, CEFMR (Central European Forum for Migration and Population Research), Working Papers, 4/2006.
- Blavatsky, P., R., (2008), *Stochastic Utility Theorem*, Journal of Mathematical Economics 44 (2008), 1049-1050.
- Bosker, M., Brakman, S., Garretsen, H., Schramm, M., *The New Economic Geography of Prefecture Cities in China: The Relevance of Market Access and Labor Mobility for Agglomeration*, April 2010.
- Brunello, G., (1988), *Organizational Adjustment and Institutional Factors in Japanese Labor Market Adjustment: An Empirical Evaluation*, European Economic Review 32 (1988), 841-860.
- Budnik, K., B., (2009), *Rationality of Post-Accession Migration, Focus on European Economic Integration*, Oesterreichische Nationalbank (Austrian Central Bank), issue 1, (February 2009), 57-83.
- Cafiso, G., (2007), *The Geographic Space in International Trade: from Gravity to New Economic Geography*, MPRA Munich Personal RePEc Archive, MPRA Paper No. 20269.
- Canaleta C., G., Arzo P., P., Garate M., R., (2004), *Regional Economic Disparities and Decentralization*, Urban Studies Journal, vol. 41 (1), (January 2004), 71-94.
- Cassarino, J-P., (2004), *Theorising Return Migration: The Conceptual Approach to Return Migrants Revisited*, International Journal on Multicultural Societies, 6, no. 2, UNESCO, Paris.

- Combes, P-P., Mayer, T., Thisse, J-F., (2008), *Economic Geography, The Integration of Regions and Nations*, Princeton University Press.
- Crozet, M., *Do migrants believe in market potential?*, TEAM - Paris 1 Pantheon-Sorbonne University, CNRS, Maison des Sciences Economiques, 2000.
- Crozet, M., (2004), *Do migrants follow market potential? An estimation of a new economic geography model*, *Journal of Economic Geography* vol. 4 (4), (2004), 439-458.
- Dębowska, O., (2007), *Migracje – wyniki aktualnych badań i analiz*, Małopolskie Obserwatorium Rynku Pracy i Edukacji, Kraków.
- Drinkwater, S., Eade, J., Garapich, M., (2006), *Poles Apart? EU Enlargement and the Labor Market Outcomes of Immigrants in the UK*, Discussion Papers, Forschungsinstitut zur Zukunft der Arbeit, Institute for the Study of Labor, October.
- Eff, A., E., (1998), *Myrdal contra Ohlin: Accounting for the Sources of U.S. County Per Capita Income Convergence Using a Flexible Decomposition Approach*, Middle Tennessee State University, Murfreesboro, (November 1998).
- Falaris, E., M., (1982), *Migration and Regional Wages*, *Southern Economy Journal*, vol. 48 (3), (January 1982), 670-686.
- Feenstra, R., C., (2004), *Advanced international trade: theory and evidence*, Princeton University Press.
- Fotheringham, A., S., Nakaya, T., Yano, K., Openshaw, S., Ishikawa, Y., (2001), *Hierarchical destination choice and spatial interaction modeling: a simulation experiment*, *Environment and Planning, A* vol. 33 (5), (2001), 901-920.
- Fotheringham, S., A., Champion, T., Wymer, C., Coombes, M., (2000), *Measuring Destination Attractivity: A Migration Example*, *International Journal of Population Geography*, vol. 6 (6), (2000), 391-421.
- Gaag, N. van der, Wissen, L. van, Rees, P., Stillwell, J., Kupiszewski, M., (2003), *Study of Past and Future Interregional Migration Trends and Patterns within European Union Countries In Search of a Generally Applicable Explanatory Model*, Report for Eurostat under contract 2002/S 67-052015/EN; Lot 5.
- Gale, S., (1972), *Inexactness, Fuzzy Sets, and the Foundations of Behavioral Geography*, *Geographical Analysis*, vol. 4 (4), (October 1972), 337-349.

- GUS, (2002), *Migracje zagraniczne ludności w latach 1988-2002*, Warszawa, Główny Urząd Statystyczny, Departament Badań Demograficznych.
- GUS, (2004) *Migracje długookresowe ludności w latach 1989-2002 na podstawie Ankiety Migracyjnej 2002*, Warszawa, Główny Urząd Statystyczny, Departament Statystyki Społecznej, Grudzień.
- GUS, (2008a), *Informacja o rozmiarach i kierunkach emigracji z Polski w latach 2004 – 2007, Notatka informacyjna*, Warszawa Główny Urząd Statystyczny GUS, Departament Badań Demograficznych, Lipiec.
- GUS, (2008b), *Informacja o badaniach zasobów imigracyjnych w Polsce w 2008 r., Notatka informacyjna*, Warszawa, Główny Urząd Statystyczny, Departament Badań Demograficznych, Grudzień.
- GUS, (2009a), *Regiony Polski 2009*, Warszawa, Główny Urząd Statystyczny, Departament Badań Regionalnych i Środowiska.
- GUS, (2009b), *Rocznik województw 2009*, Warszawa, Główny Urząd Statystyczny, Departament Badań Regionalnych i Środowiska.
- Head, K., and Mayer, T., *Market Potential and the Location of Japanese Investment in the European Union*, *The Review of Economics and Statistics*, November 2004, 86(4): 959-972.
- Head, K., Mayer T., *The Empirics of Agglomeration and Trade*, 2003, *Handbook of Regional and Urban Economics*, vol. 4.
- Hering, L., Paillacar, R., (2008), *On the relation between market access, migration and wages: An empirical analysis*. Available at <http://team.univ-paris1.fr/teamperso/paillacar/>.
- Iglicka, K., (2009), *Powroty Polaków w okresie kryzysu gospodarczego. W pętli pułapki migracyjnej. Raport z badań, Raporty i Analizy NR 1/09*, Centrum Stosunków Międzynarodowych.
- Iguchi, Y., (2004), *Country Report, Japan, International Migration and Labor Market in Japan, Growing Intra-regional Trade, Investment and Migration*, Kwansai Gakuin University, 339-370.
- Iguchi, Y., (2006), *Country Report, Japan, International Migration and Labor Market in Japan, With the economy improving and the Japanese population declining*, Kwansai Gakuin University.

- Ishikawa, Y., (1995), *Jinko ido no keiryo chirigaku*, Kokonshoin.
- Jacob, J. de V., Nijkamp P., Rietveld P., (2000), *Alonso`s General Theory of Movement*, Tinbergen Institute Discussion Papers 00-062/3, Tinbergen Institute, (2000).
- Jauhiainen, S., (2010), *Studies on Human Capital Flows and Spatial Labor Markets*, University of Jyvaskyla, (Jyvaskyla Studies in Business and Economics 94), University Library of Jyvaskyla (2010).
- Jauhiainen, S., (2005), *Regional Concentration of Highly Educated Couples*, European Regional Science Association, ERSAs conference papers series.
- Kaczmarczyk, P., (2006), *Współczesne migracje zagraniczne Polaków – skala, struktura oraz potencjalne skutki dla rynku pracy*, raport, FISE, Warszawa.
- Kaczmarczyk, P., (2007a), *Polska i hiszpańska polityka migracyjna – cechy wspólne i różnice. Tworzenie całościowej europejskiej polityki migracyjnej – szanse i wyzwania*, Ośrodek Badań nad Migracjami, Uniwersytet Warszawski, Panel: „Europejska polityka migracyjna – wyzwania i możliwości.”, 7 maja.
- Kaczmarczyk, P., (2007b), *Migracje a polski rynek pracy*, Ośrodek Badań nad Migracjami, Uniwersytet Warszawski, Konferencja: „Perspektywy i warunki wzrostu zatrudnienia i podniesienia jego wartości.”, Ministerstwo Rozwoju Regionalnego, 17 maja.
- Kaczmarczyk, P., (2007c), *Ruchy migracyjne ludności a rynek pracy – przypadek Polski*, Ośrodek Badań nad Migracjami, Uniwersytet Warszawski, Konferencja inauguracyjna „Transgraniczne centrum wsparcia rynku pracy.”, Lublin, 28 czerwca.
- Kaczmarczyk, P., Tyrowicz, J., (2008), *Migracje osób z wysokimi kwalifikacjami*, BIULETYN nr 3 styczeń.
- Kawaguchi, D., (2009), *Determining the Cause of Increasing Non-Regular Employment and Long Working Hours*, in: *The Labor and Unemployment*, RIETI Report No. 104 March 31, 2009.
- Kerr, W., A., Gaisford, J., D., (2006), *Handbook on International Trade Policy*, MPG Books Ltd., Bodmin, Cornwall, (2006).
- Khashbat, D., Aoyama, Y., Nakagawa, D., Karatani, Y., (2005), *Study on the migration in Mongolia affected by transferring to the market economy*.

- Komisja Europejska Dyrektoriat Generalny ds. Sprawiedliwości i Spraw Wewnętrznych (VIII 2004), *Konstytucja Europejska Integracja traktatów unijnych*, Jednostka Informacyjno-Komunikacyjna.
- Komisja Europejska Dyrektoriat Generalny ds. Sprawiedliwości i Spraw Wewnętrznych (VIII 2004), *W kierunku wspólnej polityki imigracyjnej UE*, Jednostka Informacyjno-Komunikacyjna..
- Krugman, P., Layard, R., Blanchard, O., Dornbush, R., (1992), *East-West Migration. The Alternatives*, The MIT Press, United Nations University.
- Kupiszewski, M., (2004), *Changes in population dynamics, People in Motion, Focus on demography*, ACADEMIA, No. 2 (2) (2004).
- Kupiszewski, M., Kupiszewska, D., (2009) *DEMIFER, Demographic and migratory flows affecting European regions and cities, Applied Research Project, Deliverable 4 Multilevel scenario model*, The ESPON 2013 Programme, 2013/1/3.
- Kupiszewski, M., Kupiszewska D., (1999) *Forecasts of regional structures of the elderly population in Central and Eastern Europe*, paper presented at the UN ECE Conference “Status of the older population: Prelude to the 21st century”, Sion.
- Kurita, K., (2008), *Chiho ni mita Tai no kokunai jinko ido - rodoryoku chosa deta ni motozuku mikuro jissho bunseki*, Ajia taiheiyo tokyu No. 11.
- Kurota, T., (1976), *Showa 50 nendai ni okeru jinkogaku no kadai*, in: *Jinkou mondai kenkyujo nenpo*, no. 20, National Institute of Population and Social Security Research.
- Larsson, J., Soderlind, A., (2008), *European Migration, A study of the migration flows in the European Union*, Jonkoping International Business School, Jonkoping University, (2008).
- Leamer, E.E., and Levinsohn, J., *International Trade Theory: The Evidence*, NBER Working Paper Series, Working Paper No. 4940, Cambridge, November 1994.
- Lorentz, E., Lundvall, B-A., (2010), *Accounting for Creativity in the European Union: A multi-level analysis of individual competence, labor market structure, and systems of education and training*, Cambridge Journal of Economics, vol. 35 (2), Oxford University Press.

- Mainardi, S., (2004), *Regional Disparities and Migration: Linear and Switching Model Estimations for Poland*, *Regional Studies*, vol. 38 (7), (October 2004), 767-781.
- Malmberg, B., Tamas, K., Bloom, D., Munz, R., Canning, D, *Various studies on the policy implications of demographic change in national and Community policies, Global Population Ageing, Migration and European External Policies*, Bo Malmberg Institute for Futures Studies Stockholm Sweden, Final report, Contract VC/2005/0637, Nov. 2006.6.2.
- Ministry of Internal Affairs and Communications, Statistics Bureau, (2003), *Report on the International Migration in Japan: Summary of Results in 2002*, March 14, 2003.
- MG, (2007), *Wpływ emigracji zarobkowej na gospodarkę Polski*, Warszawa, Ministerstwo Gospodarki, Departament Analiz i Prognoz.
- Mishra, P., (2007), *Emigration and Brain Drain: Evidence from the Caribbean*, *The B.E. Journal of Economic, Analysis & Policy Topics*, Volume 7, Issue 1, Article 24.
- Muenez, R., (2007), *Aging and Demographic Change In European Societes: Main Trends and Alternative Policy Options*, Discussion Papers, The World Bank.
- Mukkala, K., (2009), *Knowledge Spillovers: Mobility of Highly Educated Workers within the High Technology Sector in Finland*, in: *Migration and Human Capital*, Poot et al. (2010).
- Naersen van, T., Spaan, E., Zoomers, A., (2008), *Global Migration and Development*, Routledge, New York.
- National Institute of Population and Social Security Research, (1996), *The Fourth Migration Survey, 1996*.
- Nawata, Y., (2008), *Sengo nihonnno jinnkoidoto keizaiseichoritsu*, *Daisan tokubetsu chosa*, *Keizai no purizumu* No.54 2008.5.
- Otake, F., (2000), *Shotoku kakusa o kangaeru*, in: *Yasashii keizaigaku, Nihon Keizai Shimbun*, 29.2.2000.
- Otake, F., (2007), *Shotoku kakusa no jittai to ninshiki, Reality and Awareness of Income Inequality in Japan*, Osaka University.
- Okólski, M., Koryś, P., (2004), *Czas globalnych migracji. Mobilność międzynarodowa w perspektywie globalizacji*, Instytut Studiów Społecznych UW, Warszawa.

- Pacek, M., (2005), *Polska polityka migracyjna na tle rozwiązań i doświadczeń Unii Europejskiej*, Centrum Europejskie Uniwersytetu Warszawskiego, Studia Europejskie, 4/2005.
- Pacho, W., Garbicz, M., (2008), *Wzrost gospodarczy a bezrobocie i nierówności w podziale dochodu*, Szkoła Główna Handlowa, Warszawa, 2008.
- Pons, J., Paluzie, E., Silvestre, J., Tirado, D., A., (2007), *Testing the New Economic Geography: Migration and Industrial Agglomeration in Spain*, Journal of Regional, vol. 47 (2), (2007), 289–313.
- Poot, J., Waldorf, B., Wissen, L. van, (2010), *Migration and Human Capital*, Edward Elgar Pub (March 2009).
- Rossi, P. H., (1955), *Why Families Move: a study in the social psychology of urban residential mobility*, Glencoe, IL: Free Press.
- Rządowa Rada Ludnościowa, (2008), *Sytuacja demograficzna Polski. Raport 2007-2008*, Warszawa.
- Sjaastad, L., A., (1962), *The Costs and Returns of Human Migration*, The Journal of Political Economy, vol. 70 (5), Part 2: Investment in Human Beings (October 1962), 80-93.
- Stillwell, J., (2005), *Inter-regional Migration Modeling: A Review and Assessment*, Paper presented for the 45th Congress of ERSAs, Amsterdam.
- Stillwell, J., Congdon, P., (1991), *Migration models: macro and micro approaches*, Belhaven Press, London.
- Stolarick, K., Florida R., (2006), *Creativity, connections and innovation: a study of linkages In the Montreal Region*, Environment and Planning A, vol. 38, (2006).
- Stouffer, (1940), *Intervening Opportunities: A Theory Relating to Mobility and Distance*, Sociological Review, 5 (December 1940), 845-857.
- Straubhaar, T., Fischer, P., (1998), *Why do People Stay? The Insider Advantages Approach. Empirical Evidence from Swedish Labor Markets*, Research & Seminars, vol. 4, Number 4, October.
- Tabuchi, T., Thisse, J-F., (2002), *Taste heterogeneity, labor mobility and economic geography*, Journal of Development Economics 69, (2002), 155-177.
- Takashima, Y., Nagasawa, T., (2008), *Jinko ryushutsu no yosoku ni tsuite - Iwate ken no deta ni yoru jissho bunseki jirei*.

- Tomas, D., S., (1938), *Research Memorandum on Migration Differentials*, Social Science Research Council, New York.
- Tomita S., Hayashi Y., (2006), *Spatial analysis of centralization and decentralization in the population migration network*, Asia Pacific Symposium on Information Visualization, Tokyo.
- Tsukuda, Y., Miyakoshi, T., (1999), *The Japanese Labor Markets: Unemployment and Vacancies*, Journal of the Japanese International Economies 13, (1999).
- UN, (2006), *Levels and Trends of International Migration to Selected Countries in Asia*, ST/ESA/SER.A/218 United Nations Publications.
- UP, (2009), *Ranking zawodów deficytowych i nadwyżkowych w mieście stołecznym Warszawa w I półroczu 2008 r.*, Warszawa, Urząd Pracy m. st. Warszawy, Listopad.
- Waldorf, B., (2005), *The Emergence of a Knowledge Agglomeration: A Spatio-temporal Analysis of Intellectual Capital in Indiana*, Paper presented at the 45th Congress of the European Regional Science Association, Amsterdam (August 2005).
- Yorimitsu, M., (1987), *A Review of Recent Population Changes in Japan, A Review on determinants of Migration*, Hitotsubashi Journal of Social Studies, vol. 19 (1), (1987), 15-30.

<http://www.obserwatorium.up.podlasie.pl/default.aspx?docId=4476&newsId=10>

http://mplm.pl/index.php?option=com_content&task=view&id=1

<http://www.bezrobocie.org.pl/x/398802>

<http://www.mirem.eu/research/schools/neo-classical-new>

<http://www.biuletynmigracyjny.uw.edu.pl>

http://www.stat.gov.pl/gus/5840_677_PLK_HTML.htm

<http://www.mpips.gov.pl/index.php?gid=32>

<http://www.ukba.homeoffice.gov.uk/workingintheuk/eea/wrs/>

http://www.stat.gov.pl/gus/5840_1630_PLK_HTML.htm

<http://www.nbp.pl/home.aspx?f=/statystyka/bazowa/bazowa.htm>

<http://epp.eurostat.ec.europa.eu/tgm/table.do?pcode=tsieb010&tab=table&language=en&plugin=1&init=1>

http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/search_database

http://europa.eu/legislation_summaries/other/c10611_en.htm

<http://www.csiss.org/classics/content/90>

http://globalgeography.aag.org/Migration1e/ConceptualFramework_Jan10/ConceptualFramework_Jan104.html

<http://www.ipss.go.jp/syoushika/tohkei/suikai07/suikai.html>