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The impacts of international migration  
on the developmental convergence of  
Mexican municipalities

Jaime Garcia-Gomez



## **ABSTRACT**

Since 1950, the developmental convergence between Mexican municipalities decreased every year, however at the beginning of the 1980's when the massive international migration started, the development gaps between municipalities became more deeply each year. In this context, this dissertation tested, with the use of econometric analysis, the relation between international migration increase and the convergence dynamic of the Mexican municipalities. Given the data and time period analyzed, the final outcome suggests that the international migration has helped to dim the development differences that exist within regions and federal states, by increasing the convergence speed of the municipalities participating in the migratory movements. The key factors behind the impact of international migration on the development convergence are migratory tradition, remittances, migratory intensity and women's empowerment. In this way, the international migration has become a relevant factor to increase the freedom and welfare of the people; and at the same time, is helping to decrease the developmental gaps that characterize the Mexican context, at least for the entities that participate in migratory movements.

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## **INTRODUCTION**

In the last decade of the 20<sup>th</sup> century a non pecuniary based theory of development was proposed by Amartya Sen (1999), who puts the human beings at the center of the welfare policies, from his perspective, welfare and development are not strictly related to markets, income, technology or costs; development is about the people, their living standards, their quality of life and their advance as members of a society. From an empirical perspective, Sen has proposed three indispensable capabilities that are the proximate determinants of the basic freedoms, they are, health, education and income. So, in order to increase the freedoms in a society and the opportunities of the individuals the strategy must be based, at least, on the improvement of these basic capabilities.

Among, the variables affecting the development dynamics, international migration is a phenomenon that has direct effects on health, education and income levels at an individual level; and on the other hand, is an event of big dimensions and macro perspectives, principally in terms of policies, demographic trends, monetary flows, social changes and labour markets. However, the majority of these changes of residence from one country to other are not only the outcomes of an individual decision but, as the literature has reported, a familiar strategy to maximize the incomes and minimize the risks of the household.

In this way, the international migration implies not only a behavioral change for the immigrant but also their families are big participants of the phenomenon, before, during and after the movement, changing their behavior and adapting their decisions under the migratory circumstances. But, besides the family, in this migratory condition, the local networks or migrant associations in both sides of the border can affect the outcomes and reaches of the immigrant communities. Consequently, international migration involves many more people than the millions of persons that move each year, and the effects of it are observable in both, origin and destiny countries, not only at an individual and familiar level, but also at a local and national plane.

Given these two social issues I will refer to Mexico, a country that, during the last five years, scored the highest levels of annual net migration in the world; nearly 490,000 Mexicans changed their country of residence, 95 % to United States (US), according to the Population Division of the United Nations. The remittances sent by the Mexican migrants represented approximately 2.7% of the GDP like 27,136

millions of US dollars, ranking the country in a third place around the world by the total amount of flows. But, in terms of development, the regional differences, in Mexico, may be like night or day; the contrasts in the quality of life between members of the same nation are evident and quantifiable. At a municipal level, which is the smallest political administrative division in Mexico, development's levels can be similar to Sub Saharan Africa or as higher as Western Europe, according to HDI measures of UNDP. Historically, since 1950 the gap between regions decreased every year, however at the beginning of the 1980's when international migration increased its volume, the health, income and educative indicators slowly decreased their improvements, so the gap between municipalities became more deeply each year.

These theoretical backgrounds and social realities are the seeds of the hypothesis presented in this text, which consists in testing, with the use of econometric analysis, if the increase in the international migration affected the development's convergence of the Mexican municipalities. In other words, I will try to proof that the fact of being an entity with a higher participation in international migration could mean a different development's convergence dynamic in respect to other municipalities with less involvement in the demographic phenomenon. Therefore, this is an effort to elucidate, not only the effects of international migration over the development dynamics, but also, is the search at a local level, of the externalities produced by this demographic phenomenon in terms of the welfare of their entire populations.

The work is structured in this way: Firstly, I will define the development concept used in this dissertation and the theories behind the regional convergence. The second part is related to explain the interaction between the main development indicators and international migration at the origin place, specifying the mechanisms of this demographic process over the individual behavior of migrants, their families and their localities. The third part of this text is a brief description of the Mexican context in terms of regional development and international migration from the municipal perspective. The next step is the empirical approach, it consists in describe the data base, define the relevant variables and estimate the econometric models in order to probe the hypothesis of this academic dissertation. Finally, I explain the interpretation of the outcomes, the conclusions, the limits and scopes of this research; and the next stages of future researches.

## **HUMAN DEVELOPMENT**

The meaning of development and its measurement is not so obvious but, since last fifty years, the economic growth has been proposed by developmental scholars as the best indicator of development, occupying the central position in development's strategies. In general, economic growth is the change in time of aggregate production's value for a specific region. World Bank's definition of economic growth is: "Quantitative change or expansion in a country's economy. Economic growth is conventionally measured as the percentage increase in gross domestic product (GDP) or gross national product (GNP) during one year." explained Soubotina (2000, 96). From the point of view of the neoclassical economic theory, the economic growth is only the income's change in an economy, so the base of these

economic models is determinate by a production function which relates the factor endowments and the productivity capacity of the economy.

The main conclusions of these neoclassical growth models in terms of the dynamics of income, is a double convergence property that represents a benchmark in economic analysis. These convergences, absolute and conditional, are predicted consistently by the neo-classical models and its derivations. Conditional convergence is the positive relation between economic growth rate at a given income level and the distance from this income level to its own steady state; meanwhile, absolute convergence implies that the initial level of income in an economy determines the magnitude of the economic growth in relation to other economies with different levels of initial income, for instance, poor economies tend to grow faster than rich economies, and as Barro (2004, 461) indicates the poor tend to “catch up”, so the dispersion in income levels between different economies tends to decline in the time. These theoretical properties of the neo classical model have had a great impact on economic theory and development studies; even if the observed behavior of the economies is not congruent with the models, as many empirical researches have proof.

Strictly speaking, the absolute convergence is not empirically clear between countries or in cross-country approaches, mainly because of their differences in terms of all the factors, conditions and variables that can affect their income dynamics. However Barro and Sala-i-Martin (2004, 466), have been able to test the absolute convergence within a country or an homogeneous region. In fact, as they said, inside a country the differences in technology, preferences, resources,

policies and culture are smaller than those across countries; and the movements of productive factors have fewer restrictions than those existing in the international spheres. Consequently, this level of homogeneity increases the likelihood of absolute convergence, reaffirming the validity of the economic growth model, at least within countries. In despite of the controlled conditions and general assumptions used in the design of this empirical approaches and econometrical tests, the outcomes of these researches have been very useful in the understanding of the income determinants and the dynamics of the economies at a more micro level.

On the whole, the economists are still trying to improve the theory about the determinants of economic growth and income dynamics, especially in terms of its empirical testing and predictive power. Some advances or general conclusions have been achieved, like the ones in the research of Rodrik, Subramanian, and Trebbi (2002), their perspective takes into account other factors that have influence over the income of an economy, like geography, trade integration and institutional arrangements. Or the work of Acemoglu, Johnson and Robinson (2001) based in the use of institutional arrangements to explain most of the income dynamics. In contrast, Sachs (2003) has based his research in the supremacy of geography over the other factors. But in spite of the actual academic debate, is clear that the economic growth theory and its social repercussions have evolved from an explanation based only on production factors and technology, to a wider understanding of the physical environment constraints and social arrays that determine the final outcomes of the economies.



This transformation in the economic growth and developmental theories represented a new opportunity to propose other explanations, not only about the dynamics of income and the preponderance of economic growth in the economies; but also, about the idea of development and wellbeing in the modern society. In this way, Amartya Sen proposed his most famous argument, which consisted in defining the development as a process of increasing the freedoms of the people, shortly Development as Freedom (DAF), in order to build enough social opportunities for the empowerment of individuals and enlarge the ability to shape their own destiny. Essentially, human development puts the human being at the center of the development processes. Is not about countries, markets or income; development is for the people, their living standards, their quality of life and their advance as members of a society.

From a human development perspective, economic growth and income are just part of one of the many conditions that are needed in order to expand the freedom of the persons, because the basic objective of development is to increase the people's opportunities and not only the accumulation of physical resources. In terms of measurement and empirical approaches, the most general approximation of DAF is the UNDP Human Development Index (HDI). The HDI goes from 0 to 1, where a higher value represents a higher level of human development. The index is based on three dimensions, health, education and income; or as they called it, A long and healthy life, knowledge and a decent standard of living. Each one is calculated according to the following indicators: Life expectancy at birth is used for the health dimension; adult literacy rate and gross enrolment ratio are the inputs of

the education dimension; and GDP per capita (PPP US\$) is the measure for the income dimension. Since 1990 other complementary indexes have been proposed to complete the HDI measurement in terms of inequality, like the Human Poverty Index, the Gender Related Development Index, or the Gender Empowerment Measure.

Finally, the message about human development is clear, although the mechanisms to achieve it and procedures to measure it are still ambiguous; but without doubt, is true that the end of modern society and its institutions, primordially the democratic State, is the maximization of human wellbeing. However, the theorists are still trying to conciliate the models with the empirical observations in response to the imperfect understanding of the development dynamics and the factors that are affecting the welfare outcomes. In this academic journey, the classification of income and economic growth as means and no longer as the ultimate ends of the development seems to enrich the development debate with new sophisticate and multidimensional approaches, more according to the modern society and the real world. Besides, the redefinition of development as a process of increasing the human freedom and individual choices has helped to generate more successful development strategies at a global level, as the available reports and researches have found. In this context, I will focus the next chapter in explain the relations between international migration and the main variables of human development, in order to have a better understanding of the complex mechanisms behind human development and its convergence trends.

## INTERNATIONAL MIGRATION

The migratory phenomenon is composed by four elements that characterize the diversity of the event: geography, temporality, motive and selectiveness. For instance, migration involves a change in residence for one or more persons, so there is a geographic implication in the migratory process; however, this geographical condition may have different perspectives because the migratory movements may be regional, national, or international; from urban environments to other cities, from rural towns to urban settlements or vice versa. There is also a temporal factor in the migratory movements, so the migration may be circular or permanent; short or long term, and also may be a non enduring condition. As a result of these contrasts the migration is a set of “separate, generally unconnected theories, rather than a cumulative sequence of contributions” as Arango (2000,283) explained, making its prediction, estimation and study a very intricate task.

The consequences of migration are as diverse as the nature of the phenomenon, the characteristics of the migrants and the contexts of the destiny and origin places are strong determinants of migration's final outcomes. In this way, the relationship between income and international migration is the most studied of all, mainly because the first researches of migration focused on the economic motives and wages differentials between origin and destiny places as the principal triggers of residence's change. Precisely, the neoclassical school theory developed a theoretical background and mathematical models in order to explain the international migration as a labour mobility topic or as a reallocation of productive inputs derived from an unbalance between host and origin markets. As Massey

(1994, 701) said, "According to neoclassical theory, flows of labor move from low-wage to high-wage countries, and capital (including human capital) moves in the opposite direction."

In general, Hicks (1932), Roy (1951), Sjaastad (1962), Todaro (1969), Borjas (1987), just to name a few of the most influential neoclassical researches, synthesized the migration as a cost-benefit optimization problem. For instance, in the neoclassical theory, the individuals maximize their utility according to the future earnings derived by migrate, discounting the costs and uncertainties of moving. This model predicts that emigrants should go to the country that guarantees the highest expected earnings. Like all neoclassical models there are some assumptions that delimit and justify the operation of the model, in this case the neoclassical models usually assume perfect information, flexibility of wages, competitive markets, free mobility of productive factors and an economic rationality of the individuals.

Given these assumptions the existence of remittances is anomalous, because as Massey (1993) explained, the neoclassical model predicts the utility maximization in the host country and not a spending at the origin place. In fact, the neoclassical theory is ignoring the social interaction and family dynamics behind the migratory movements. Boswell (2008) said, "individuals' decisions may be influenced by the characteristics or actions of those around them." the migratory decisions don't come from an isolated and individualistic optimization process; the migrant is part of a family, social network or community. In this way, a new theoretical approach is

appealing to concepts like social capital, risk pooling, interdependence, contextual effects, and networking to improve the study of migration.

As a result, the remittances can be explained as the outcome of a household's income maximization that starts with the election of the member with the highest likelihood of succeed in the migratory movement, Hanson (2003) found that in most of the cases the member with the higher education was also the migrant; then, families are spreading risks between labour markets and maximizing their expected income, as Stark (1991) and Paulson (2000) explained. However, the uses of remittances are also affected by other contextual factors like the financial structure of the origin place; or the urbanization level of the community according to Cohen and Rodriguez (2004); the structure of the local markets; the quality of local policies and bureaucracy constraints as Durand (1996) explained; the initial allocation of assets for the household as Taylor (2005) described; or the presence of migration clubs and target policies, like the Mexican program 3x1 as Janvry (2007) wrote. So the spending, investment and saving processes of the remittances are determined by the characteristics of the origin place and the strategies of the households.

In terms of health, the impacts of international migration are originated by changes in consumption, timing and habits. In fact, the use of remittances for health expenditures and best nutritional consumption are the most obvious outcomes of the effects of migration on health indicators at origin place. Amuedo-Dorantes and Pozo (2004) described that, at individual level, the main motivation of 76% of the migrants is based on nutritional and health investments. A sound result of the

remittances' income effect and its corresponding rise in consumption is the increase in the eating of proteins derived from meat and milk. Consequently, the dietary change is an important factor that impacts the migrant household's health. The researches of Acosta and Lopez (2007) and Hildebrand and McKenzie (2005) have found that the children from remittances recipient families scored higher weight and height at birth than the rest of their community. Also, Lopez-Cordova (2005) discovered a negative relation between infant mortality rate and the proportion of migrant households receiving remittances.

As respect to adults health, the benefits of remittances dilute with the increasing costs of elder's illness and the unhealthier habits of grown up population who are victims of obesity, diabetes and cardiovascular complications as the rest of the population; however, there are some studies like the ones of Diaz Guerrero (2002) or Aguilera Guzman (2004) about mental health of the migrant's family that related the absence of the family as a source of high levels of stress and depression, but because of the nature of the illness the research is very limited. However, as it was explained in last sections, the remittances are also used to improve the physical characteristics of the house, like floor materials, facilities and kitchens; in addition, remittances can be used to improve the local infrastructure, including energetic, sanitary and disposal services, boosting the hygienic conditions of the household members and their communities according to Conway and Cohen (1998).

In relation to the migratory stages and the temporal factors, Kanaiupuni and Donato (1999), found a time dependence between the health's family and the stages of migration, in the early periods of the movement, the health of the family

might worsen because of the lost of the most productive family member; however, when remittances flows become larger and stable the family improves their health scores. This mechanism is clearly identified in the infant mortality rates of the migrant households, where there is a deterioration of the rates at the beginning of the migrant process, but when the income flows grows and become a reliable part of household's family the likelihood of surviving outperforms the average infant mortality rates of the population. Therefore, the effects of migration on health are relatively determined by the uncertainty and initial costs of migration, in this way, is comprehensible that the benefits of migration need certain time and stability to be materialized by the household, as a typical mid or long term investment.

The other fundamental factor shaping the health of migrant households is the change of familiar habits; this modification of the family behavior is produced by knowledge transmission and women's empowerment. This knowledge transmission process can be seen in the fertility health practices of women with migratory partners who showed more knowledge about contraceptive practices than the population's average as Hildebrand and McKenzie (2005) explained. However, the knowledge transmission also implies a copy of the values and trends of the destiny place, affecting the preferences of the household, like the substitution of breast milk with formula; or the traditional food for fast food. Moreover, the changes of women's role also transforms the habits of the household members, because of the new power position of the women, now they are the decision makers of the households, changing the priorities of the familiar

expenditures to support health, nutrition and education; but in contrast, the women have less time to take care of their children because of the new responsibilities.

Concerning of the effects of international migration on education outcomes, the research and the empirical tests are not as categorical as with the other human development variables. From a basic perspective, education decisions are affected by the educative levels of the adult household members and family income levels; empirically, the data shows that the migrant households have higher education levels than their origin community's average; and the remittances flows boosts the income of the household increasing the likelihood of human capital investments. So the expected outcome should be an increase in the educative levels of the household. However, education decisions of the migrant households are also affected by the probability of future migration and the expected net benefits of education on the origin and possible destiny places. As a result, the migratory effects on education are related to the structure of the family and the probability of migrate.

For instance, Duryea (2005) found that children in families with migratory precedents are scoring between 0.7 and 1.7 more schooling years than non migratory households. But some bias have been found, Hanson (2003) discovered that the empowerment of women as household decision makers produced more benefits to the education of the girls than the boys, because the firsts are supposed to stay and lead a family and the others are more able to migrate. In fact, Rapoport and McKenzie (2006) noticed that the income effect of remittances is related to an increase in the basic and middle school attendance of the youngest members of



the family; but the education of the boys between sixteen and eighteen years old is truncated as a consequence of the probability of migrate or the need to work to complete the familiar income. In fact, the low cost of migrate for families with migratory antecedents and the knowledge of the kind of skills required to obtain a job in the destiny place are huge determinants of the education investment decisions.

At a community level, the effects of migration on schooling suggest an equalizer role; in this way, Cuecuecha (2006) has discovered that the migration helped to decrease the schooling inequalities of the origin places. But this reduction of educative inequalities is because of the lack of interest of migrant families to increase the educative levels of their migrant candidates; so even if at the beginning of the migratory movement they outperformed the schooling rates of their community, in further stages of the phenomenon the expected benefits of migrate are larger than the expected benefits of more human capital investment at the origin place, consequently they lose their educative advantage. In sum, the remittances and the migratory precedents may have contradictory effects on the schooling rates; as Cox and Ureta (2003) reported, remittances can increase school attendance rates; but after controlling by gender and age, the households are more willing to invest their resources on the migration of its young members.

Following the arguments of the last paragraphs the impacts of migration on the human development variables are more complex than just an increase in monetary income. International migration shapes individuals, households and communities, through modifications on habits, consumptions and hierarchies; subject to familiar

characteristics, social structures, political constraints, financial conditions or labour markets. Even further, these effects might be completely contradictory if the stages of migration differ, adding a temporal factor in the balance. For these reasons, is very important to take into account the contexts and the specific contrasts of the divergent realities that surround the origin place, in order to obtain an accurate study of the relations between international migration and human development dynamism. In this way, the next chapter consists in a deep description of Mexican context at municipal level in terms of the contrasts and trends of the international migration and human development trends.

## **MEXICAN CONTEXT**

A municipality is a set of neighborhoods that fill all the legal requirements of the constitutional norms from the State, in total there are 2448 municipalities in Mexico. As Borja (2003) explained, the parts of the municipalities are territory, population and government. But from the point of view of the public administration, the Mexican municipality is a decentralized organism, with the function of execute the governmental programs in order to satisfy the needs of their population. Then municipalities are the smallest expression of the state and the nearest to the people, in this way, is the first institutional instance which is responsible of maintain the basic conditions for the cooperation, certainty, security and development of the society.

As for the human development highlights, the 20 municipalities with the lower level come exclusively from the South-Southeast region<sup>1</sup>. These geographical relations change for the health factor, at least for the worst 20 entities, where half of them are from the Northeast, the rest are from the South-Southeast region; the 20 higher remain the same as the general HDI. In reference to the education factor, the 20 higher are equally from the Center, South-Southeast and Northwest; while the lower levels come from the South-Southeast region. The regional distribution of the income factor is the same as the general index, for the higher and lower levels.

In respect to human development dynamics, and according to available data, from 1950 to 2005 the human development variables at federal state level have converged between entities; however, since 1980 the convergence rate decreased and the dynamic happened to be more slowly, specifically for the alphabetization rate, infant mortality rate and life expectancy at birth; but the convergence trend almost disappeared for the income variable and scholar attendance, coincidentally, this period is the beginning of the mass outmigration of Mexican to the United States. Anyway, the regional dispersion of the HDI has been growing since the last 30 years driven by the inequalities of economic growth and the abandon of young people's education. These dynamics are important because they mean that the possibilities and capabilities of the people, their freedoms, are different between geo-political entities. Therefore, the regional inequalities in the access to income, assets, services and goods are diminishing and constraining the individual and social sets of possible choices.

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<sup>1</sup> In the National Plan of Development 2000-2006 of the federal government, the country is divided in 5 regions according to their geographical and cultural characteristics. (See Appendix 1)

In sum, the statistics are showing a divergent development progress that is following the trends suggested by theory; there are statistical evidences, like the larger changes in development indicators for the less developed regions, supporting the convergence theory. Besides, in more developed zones has been an increase in the inequalities of the regions that became more visible at the moment of study the HDI by its three factors. The statistics are also consistent with the literature when concerning to the diminishing returns of health investments, this effect is related to the low costs of increasing the health indicators, which are constrained to certain levels, but once that high levels are achieved is more costly and harder to obtain larger scores. For the income and educative factors their study requires more specific and complex numerical techniques than the plain descriptive statistics. Besides, in order to avoid the bias of the aggregate data, the analysis needs to go beyond the regional level to a more focused perspective to observe the different dynamics of these development factors.

According to the National Census (2000) and National Population Count (2005) INEGI's data, during the time period 2000-2005, the number of households with an international migrant grew from 96,304 to 124,030 households at national level from a total universe of 22,238,395 households. At regional level, the Center was the one with the higher growth of migrant households from 2000 to 2005, with an increase of 8.49%; in the rest of the regions the numbers stayed almost the same as the 2000 year. As for the total number of migrant households, the Center and Center-Occident are the leaders with 49,002 and 40,725 respectively; the Northwest is the region with the lowest number of migrant households, only 4,158.

The proportion of migrant households in relation to the total number of households is leaded by the Center with 1.56%, while the region with the lowest proportion is the South-Southeast with 0.3%.

Speaking of remittances, from 2000 to 2005 at national level, the monetary flows moved from 6,572 millions of US dollars to 21,688 millions of dollars, a raise of 230%<sup>2</sup>. The first channel used by the migrants to move their money from one country to other consisted in electronic transferences, in 2000 was 71% followed by money orders with 21%, but in 2005 the electronic transferences were 91% of all operations. The total number of annual operations increased from 18 millions to 65 millions of operations from 2000 to 2005. However, the average amount transferred, by operation, decreased from 365.24 US dollars to 333.66 US dollars. Though not all the flows are equally distributed, the states of Michoacan and Guanajuato, both at the Center-Occident region and two of the states with more migrant precedent or high migratory tradition, gained the 11.3% and 8.7% of total remittances flows; but Baja California Sur in the Northwest only obtained 0.12% of the flows. This relation between remittances flows and regions seems to be very steady, at least during this time period, because the proportion of remittances for each entity remained almost the same.

Once that have been specified the principal characteristics of human development and international migration at Mexican municipalities, the next phase consists in merge both phenomenon in order to make a more precise picture of the regional and municipal contrasts. In this way, the approach proposed consists in a graphic

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<sup>2</sup> Estimations from Mexican central bank, Banco de Mexico.

technique based on the social network analysis, mainly because of the need to show the similarities and dissimilarities of a large volume of data and their distribution between the Mexican municipalities; in essence, this method resulted very efficient to represent and visualize the main trends and dynamics described in the last paragraphs for each one of all the municipalities and regions. According to Batagelj (2004, 5), “a network is based on two sets – set of vertices (nodes), that represent the selected units, and set of lines (links, ties), that represent relations between units. They determine a graph.” Applying this concept to the regional context, the technique allowed the characterization of the municipal human development index distribution within the Mexican regions and its migratory attributes.

Specifically, the graphic technique used is a core - periphery diagram, also known as a circular network, energized with a Kamada – Kawai algorithm to optimize the visualization of the nodes. The first input data is the gap between the most developed municipality and the other municipalities for each region, so in the center of the diagram, or in the core, is located the most developed entity; and the rest of the municipalities are graphed according to their human development's proximity to the leader for the 2005 year. The second statistic used is the migratory intensity, represented in the size of the nodes; the diameter of each point corresponds to the proportion of migrant households in each municipality. The third statistic is development performance, which consists in the change of the HDI between 2000 and 2005 periods; in this way, the color of the nodes are related to the performance of the development indicators, the green ones means an

improvement in the human development and the red nodes a decrease in HDI levels for the five years period. Finally, the municipalities are sorted by geographic localization, so the closeness of the nodes means comparable development levels and similar localization (See Appendix 2).

From the graphic approach it can be seen that the South-Southeast and the Center, two regions that are in average at the bottom of the human development rankings, were the ones with the best performance during this time period; in contrast, the Northeast and Northwest, the two regions with the higher average levels of HDI, are the zones with the lower performance in terms of improvements. As for the migratory intensity and human development distribution, the municipalities with the higher levels of migratory intensity are in the zones with the lower development levels in relation to the leader; except for the Center-Occident region, where the migratory intensity between municipalities is more homogenously distributed. In respect to the relation between migratory intensity and geographical distribution it seems that there are some migratory clusters; in other words, some zones are more likelihood to have higher level of migratory intensity than others.

In short, even though the Mexican municipalities are sovereign entities, equally defined by law and that share the same policy tools, the developmental characteristics of Mexican municipalities are very diverse and disperse; there is not a homogenous developmental score at regional level. However, the statistical evidence suggests that the development dynamics tends to a convergence pattern, as the convergence theory explained; but there is a clear differentiation of trends between regions, not only in the pace of the convergence but also in the

developmental factors that are converging, like health, education and income indicators, this differentiation in convergence patterns started at the beginning of the boom of Mexican outmigration to the United States. So, in this diverse developmental context the international migration is also adding more diversity in the characteristics of the municipalities. In this way, the benefits and costs of international migration are not equally distributed between municipalities; because these entities are diverging, from a migratory perspective, in volume, in quality and historical tradition.

## **EMPIRICAL APPROACH**

Once that the diverse ties between development dynamics and international migration have been explored from a theoretical and contextual perspectives; the next step consists in use the available data to empirically proof the main hypothesis of this dissertation. The empirical testing is based on a data set of 2418 municipalities and two time periods (2000 and 2005); the structure of the data set is related to the availability of the data. The econometric model is a panel data linear regression; specifically, there are four core models designed to test the effects of international migration on the regional dispersion of human development between the Mexican municipalities. The dependent variables are the gaps in the developmental indicators between the municipalities and the most developed entity within their respective federal state, in this way, the developmental differences are focused on smaller, but more homogenous, geographical areas than the regional divisions described in the last chapter. Consequently, as Barro and Sala -i- Martin explained, the econometric model is controlled by the intrinsic characteristics of the



regions, like culture, ethnicity, industrial structure, state regulations or policies; which in the case of Mexico, these differences between states can be very significant, and as a result, disturb the convergence analysis.

The econometric process is as follows, the first model is build only on neoclassical theory variables, this procedure is to have a benchmark on the data's fitting; and is controlled by the diminishing returns of development improvements, by incorporating the development level of the corresponding indicator and its square. The next three models are the ones that test the explanatory power of international migration variables on the development's dispersion; each model is based on the core structure of the first model, but each one of them tests one of the three main channels used by international migration to affect development variables. In addition to the testing on the aggregate human development indicator, the models can also be used to check the relation between the proposed international migration variables and the three main components of HDI, which are health, education and income indexes.

In this way, the analysis can be focused on the different faces of human development that are measured by the human development index and their connections with the migratory variables proposed in this econometric exercise. This is relevant because, as the literature and theory shows, each migratory variable can affect the human development by different ways, so dissecting the HDI by component is a natural step in to the testing procedure of this complex relation between human development dispersion and international migration. Therefore, in the next paragraphs I will describe and classify the independent and

dependent variables<sup>3</sup>; define the econometric models and summarize the highlights of the outcomes.

## **Independent Variables**

### Neoclassical Variables (NV)

- Gross Domestic Product (GDP): Is the value of the goods and services produced in the municipality during a year. It measures the size of the entities economy. Source: INEGI data.
- Labour Force (LF): Is the proportion of the total population that is enrolled in a productive activity during the year of measurement. It measures the dependence ratio or the magnitude of the labour force for each municipality. Source: Own calculations with INEGI data.
- Physical Capital (PK): Is the proportion of the municipal GDP used in physical capital investments in the municipalities for the main economic sectors (agriculture, industry, commerce, construction and mining). It measures the relative size of the private investments in productive inputs at a municipal level. Source: Own calculations with INEGI data.
- Human Capital (HK): Is the average schooling level of the economically active population at the municipalities. It measures the educative levels of the population between 12 years old and 64 years old. Source: Own calculations with INEGI data.

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<sup>3</sup> Each group of independent variables was tested for multicollinearity and the result was negative.

- Latitude: Is the geographic coordinate of the municipality in decimal system. It measures the physical position of the municipal head town in respect to the North. Source: INEGI data.
- Rural: Is the proportion of the total population living in a locality with less than 2,500 people, which is the rural classification of INEGI. It measures the intensity of the rural environments in the municipalities. Source: Own calculations with INEGI data.
- Poverty (Poverty): Is the proportion of the total population that is living under the poverty line, which is of two times the official minimum wage in Mexico City. Source: CONAPO.
- Social Expenditure (SE): Is the proportion of the municipal budget expended in basic infrastructure, health clinics, educative centers and anti-poverty programs. It measures the propensity of local governments to the improvement of the citizens' wellbeing like, energy, water, asphaltting, drainage, health clinics, shelters, and other social and public activities. Source: Own calculations with INEGI data.
- Family Size (Fam): Is the average number of family members living in the household. Source: INEGI data.

#### International Migration Variables (IMig)

- Migratory Intensity (Migint): Is the proportion of the total number of households with at least one international migrant member at municipal level for the 2000 – 2005 time periods. It measures the spreading of the

international migratory phenomenon among the households of the municipalities. Source: Own calculations with INEGI data.

- Female Head Households (Femalehh): Is the proportion of the total number of households headed by a woman. It measures the increase in the roll of females as decision takers in the municipalities. Source: Own calculations with INEGI data.
- Remittances (Remitt): Is the amount of remittances received per year expressed as a proportion of the municipal GDP. It measures the importance of the monetary flows originated by international remittances for each municipality in relation to the size of their economy. Source: Own calculations with CONAPO and Banxico data.
- Migratory Tradition (Trad): Is a dummy variable that is equal to one if the municipality is classified as a traditional migratory entity; or zero if the municipality is new in the migratory movements. The classification is made by CONAPO and is based on the stability and volume of the migratory flows during the last twenty years. Source: Own calculation with CONAPO data.

### **Dependent Variables**

- Developmental gap (DvGap): Is the gap between the municipal HDI level and the highest level of HDI scored in their corresponding federal state. It measures the difference of the developmental indicator between a municipality and the most developed entity within a federal state. Source: Own calculations UNDP data.

- Developmental gap Education (DvGapE): Is the gap between the municipal education index (EI) level and the highest level of EI scored in their corresponding federal state. It measures the difference of the developmental indicator between a municipality and the most developed entity within a federal state. Source: Own calculations UNDP data.
- Developmental gap Health (DvGapH): Is the gap between the municipal health index (HI) level and the highest level of HI scored in their corresponding federal state. It measures the difference of the developmental indicator between a municipality and the most developed entity within a federal state. Source: Own calculations UNDP data.
- Developmental gap Income (DvGapI): Is the gap between the municipal income index (II) level and the highest level of II scored in their corresponding federal state. It measures the difference of the developmental indicator between a municipality and the most developed entity within a federal state. Source: Own calculations UNDP data.

For the econometric analysis some assumptions and definitions need to be clear; therefore, because of the characteristics of the data set, particularly that the individual characteristics of each municipality may have an influence over the predictor variables, and the statistical inference obtained from the Hausman's test; the functional form proposed is a linear regression model adjusted by fixed effects. In this way, the core model assumed is a linear regression model with fixed effects; however, taking into account that the data set is composed of only two time periods, then the model is mathematically equivalent to a first differences lineal

regression model, which is the functional form finally used for the econometric analysis; and consists in the use of the first differences of the independent variables as the inputs of the model. The use of a first differences model is driven primordially because the main concern of the dissertation is focused on the change and dynamism of the developmental and migratory variables, and this interpretation can be easily obtained from this functional form.

$$\Delta y_{it} = \beta_1 \Delta x_{it} + v_{it}$$

$\Delta x_{it}$  = first differences of independent variables

$v_{it}$  = Error term

$i = 1 \dots 2418$

$t = 2000, 2005$

The first regression uses DvGap as the dependent variable and the Neoclassical Variables as the inputs, the total number of municipalities is 2418, the confidence levels of the model and its adjustment suggests a good estimation. Is important to remember that the outcomes derived from the functional form used in these econometric exercises are based on changes, specifically of changes in the gap, from one time period to the other; in other words, if the change is positive for municipality  $i$ , it means a reduction in the gap between the most developed municipality and the municipality  $i$ , given the same federal state. Consequently, the positive signs of the estimated coefficients are associated with reductions in the gaps, and the opposite is for the negative signs.

Table 1.- Econometric outcomes. Prob. t in brackets. Own calculations with the software STATA 10.

Variables	Model 1	Model 2	Model 3	Model 4	Model 5
	DvGap	DvGap	DvGapE	DvGapH	DvGapI
Dev Indicator	0.0331921 (0.002)	0.0383951 (0.001)	0.1465452 (0)	0.1581267 (0)	-0.088527 (0)
Dev Indicator <sup>2</sup>	-0.0435571 (0.001)	-0.0441811 (0.001)	-0.1683246 (0)	-0.135647 (0)	0.0284986 (0.24)
GDP	0.0286502 (0)	0.027169 (0)	0.0006181 (0.525)	0.002831 (0.107)	0.0744868 (0)
SE	0.0289902 (0)	0.0268527 (0)	0.0157685 (0)	0.0328485 (0)	0.0194837 (0.015)
Rural	-0.0059188 (0.111)	-0.0056608 (0.118)	-0.0013137 (0.634)	-0.0303153 0	0.0132267 (0.099)
Poverty	0.0995747 (0)	0.1064154 (0)	-0.0545149 (0)	0.2901966 (0)	0.0815261 (0)
HK	0.0019642 (0.469)	0.0031769 (0.25)	0.0100659 (0.005)	-0.0099903 (0.105)	-0.016133 (0)
Latitude	-0.0005707 (0)	-0.0006127 (0)	-0.0002065 (0.099)	-0.0021066 (0)	0.0010249 (0.002)
LF	0.0109312 (0.323)	0.0136332 (0.224)	-0.0455142 (0.001)	0.0259944 (0.226)	0.0454557 (0.117)
PK	-0.00000018 (0.781)	-0.000000206 (0.744)	-0.000000872 (0.113)	-0.00000308 (0)	2.98E-06 (0.026)
Femalehh		0.0291592 (0)	0.0019346 (0.865)	0.0736528 (0)	0.0125539 (0.377)
Remitt		0.0010784 (0)	0.0002084 (0.393)	0.0029417 (0)	0.0001395 (0.647)
Migint		-0.0006515 (0)	-0.0000198 (0.871)	-0.0018759 (0)	-0.000596 (0.211)
Trad		-0.0013248 (0.159)	-0.005846 (0)	-0.0065758 (0.001)	0.0079019 (0)
Fam	-0.0043071 (0)	-0.0038152 (0)	-0.0002953 (0.768)	-0.0144879 (0)	-0.002674 (0.155)
R <sup>2</sup>	0.5536	0.5624	0.5048	0.5588	0.6015
N	2418	2384	2384	2384	2384

In terms of the variables, HDI and its square are both significant, and their signs are, according to the assumption of diminishing returns in the HDI, so every time is more hard and costly to increase the levels of HDI, especially if they are already high at the beginning of the process. The effects of the economic growth are statistically significant and positive as expected by the literature; the same outcome is achieved by the social expenditure variable, so better social and basic infrastructure helps to improve the HDI level in relation to the most developed entity (See Table 1).

The family size and the latitude variables are both significant but with negative sign, this means that the municipalities at the south of the country and the municipalities with small families are having bigger changes in the reduction of the developmental gap. The poverty measure is significant and with a positive effect over the changes in the gap, this means that the municipalities with the higher proportion of poor people can move faster in to the reduction of the gap than the richer entities, mainly because is cheaper to improve the lowest development levels than the most developed. The rural, labour force, human and physical capitals are not statistically significant in this model (See Table 1).

The second model includes the international migration variables and keeps DvGap as the dependent variable. In this case, the changes in the migratory intensity are statistically significant and negatively correlated with the changes in the development gap; so an increase in the proportion of migrants is making more difficult for the municipality to move forward in the development level in relation to the development leader. As for the other migrant variables, remittances and



proportion of women's heading households, both are statistically significant and positive correlated with the changes in the development gaps. This means that an increase in the proportion of women taking decisions in the households decreases the developmental differences between the municipalities and the development leader. The same applies to the increment of the remittances as a more influential factor in the local economy. At the same time, the outcome of migratory tradition dummy is not statistically significant. The outcomes of the neoclassical variables, in terms of the sign and the statistical significance are the same as in the model 1 (See Table 1).

The model three uses DvGapE, educative gaps, as the dependent variable, and the independent variables are the same as the last model. In this case, the municipalities with more tradition in the migratory movements tend to have a statistically significance and negative relation with the educative gap's dynamic. The rest of the migratory variables are not significant. As for the neoclassical variables, the economic growth is not significant, but the human capital, as expected for this model, is significant and positive related to the dependent variable, the educative gaps decreases if you have a more educated population. In contrast, the significance and sign of the Labour Force and Poverty variables indicates that the proportion of people that is working and the proportion of poor people are negatively related with the dependent variable, so an increase of these variables means an increase in the gap (See Table 1).

The fourth model focus on the health gaps,  $DvGapH$ , in this case the four migratory variables are showing statistical significance, but they diverge in their signs. The changes in the proportion of households headed by women and the importance of remittance's flows in the municipal economy are both positive related with the improvements in the health indicator. On the contrary, an increase in the proportion of families with migrant members and the municipalities with migrant tradition are inversely correlated with the decrease in the health gaps. As for the neoclassical variables, human capital and labour force are no longer significant; the rest of the variables behave as the model 1. Except for the rural variable that shows a negative relation and statistical significance, so a change augmenting the proportion of the people living in rural environments increases the distances between the municipalities and the entity leader (See Table 1).

The fifth model refers to the income indicator,  $DvGapI$ , in this exercise only the migratory tradition is statistically significant and positive related with the changes in the reduction of the income gap. In reference to the neoclassical variables, human capital, is negatively related with the dependent variable and is statistically significant; in contrast, physical investment is positive related and is also statistically significant, showing that the structure of the economy and its activities are more capital intensive and employees low skilled labour. Other difference is that the outcomes of the model suggest increasing returns, because of the higher returns of capital in relation to the labour. The rest of the variables behave as described in the model 1 (See Table 1).

In sum, according to the econometric outcomes, international migration affects the developmental differences between municipalities; however these influences are produced through different channels, like migratory intensity, remittances flows, migratory tradition and women's empowerment; in this way, the effects can be divergent or involve only some specific aspects of the human development. Explicitly, the migratory variables seem to affect more directly the health indicator; remittances flows and women's empowerment are positive related with the shrinking in the developmental differences; but migratory intensity and migratory tradition are increasing these differences. In absolute numbers, between the migratory variables, the changes in women's role are the main driving forces behind the developmental "catch up", only comparable to the effects of the economic growth; but the poverty level is the factor with the highest influence over the developmental gaps. However, given the data and time period analyzed, the final outcome suggests that the international migration has helped to dim the development differences that exist within regions and federal states, by increasing the convergence speed of the municipalities participating in the migratory movements.

## **CONCLUSIONS**

As explained in last chapters, the impacts of migration on the human development variables are more complex than just an increase in monetary income. International migration shapes individuals, households and communities, through modifications on habits, consumptions and hierarchies; subject to familiar characteristics, social structures, political constraints, financial conditions or labour

markets. As for the municipal context, the statistical evidence suggests that the development dynamics tends to a convergence pattern, as the absolute convergence theory explained; but there is a clear differentiation of trends between regions, not only in the pace of the convergence but also in the developmental factors that are converging, like health, education and income indicators.

In this diverse developmental context the international migration is adding more variety in the characteristics of the municipalities. Clearly, the benefits and costs of international migration are not equally distributed between municipalities; since these entities are diverging, from a migratory perspective, in volume, in quality and historical tradition. However, there are four main channels or mechanisms behind the effects of international migration on the developmental scores and its convergence that have been tested in this dissertation, they are migratory tradition, remittances flows, migratory intensity and women's empowerment; their main mechanisms are based in increasing the certainty of the monetary flows; changing the role of women; and, altering the consumption and investment decisions of the migrant households, shifting the economical and developmental patterns of their municipalities. Finally, there are enough econometrical evidences to proof the importance of international migration as an explicative factor behind developmental convergence.

In sum, these changes in the consumption trends, adjusted by the perception of risk and preferences of the decision takers, seem to be, from an aggregate point of view, a positive response in terms of the developmental dynamic of the municipalities. However, even if the econometric analysis and its respective

statistical tests didn't report any statistical flaw, there are some constraints that limit the analysis presented in this dissertation and may diminish the predictive power of the proposed models and their respective accuracy; in fact, other numerical techniques or econometrical approaches may offer a better understanding of the mechanisms behind international migration and development dynamism at this level, but the scarcity of data is restricting their implementation, at least at municipal level. These data restrictions limit the level of detail and confidence of the econometric models, from both, temporal and quality perspectives.

In terms of availability, most of the data used in this dissertation comes from census and national population counts; this is a warranty of accuracy because of the value and representativeness of this data collecting method. However, the fact that there are only two time periods is constraining the precision of the models and its predictor power; moreover, even though mostly of the data consists in basic indicators of wealth that have been registered since 20 or 30 years, some of the data, at this level of disaggregation, is only available for these two periods, like the information about the municipal economies and its productive specifications, or the migratory attributes of households. In this way, as literature suggests, there are temporal factors that may affect the migratory dynamics and development outcomes, like the economic cycles of each country or national policies in both sides of the border; so the time constraints prevent these models to control for changes in costs, risks and benefits structures outside of the analyzed time period.

Other data restriction is the unavailability of information about local institutional arrangements, both formal and informal, for the totality of the Mexican

municipalities. In terms of formal institutions, the Mexican municipalities diverge in key features like security, democracy, corruption, rule of the law, and governance, these factors are relevant because not only have effects over economic growth, like Rodrik (2003, 3) explained, but also may affect the human development trends and migratory behaviors. But, there is not enough actualized data with a large national coverage about institutional quality at municipal level, like Garcia (2005) showed. The SE variable may solve some of the missed institutional features, but is a short-sighted indicator when concerning about the specific characteristics of institutional arrangements at municipal level.

Finally, given the data and time period analyzed, the final outcome suggests that the international migration has helped to dim the development differences that exist within federal states. In this way, the international migration has become a relevant factor to increase the freedom and welfare of the people; and at the same time, is helping to decrease the developmental gaps that characterize the Mexican context, at least for the entities that participate in migratory movements. However, even if the econometric outcomes and statistical analysis are robust and in concordance with other researches, the study of the international migration and its interactions with the developmental dynamics is still unfinished, further studies and other outlooks need to be realized in order to increase the accuracy of this dissertation and reach a better understanding of international migration and developmental dynamics from a long term perspective.

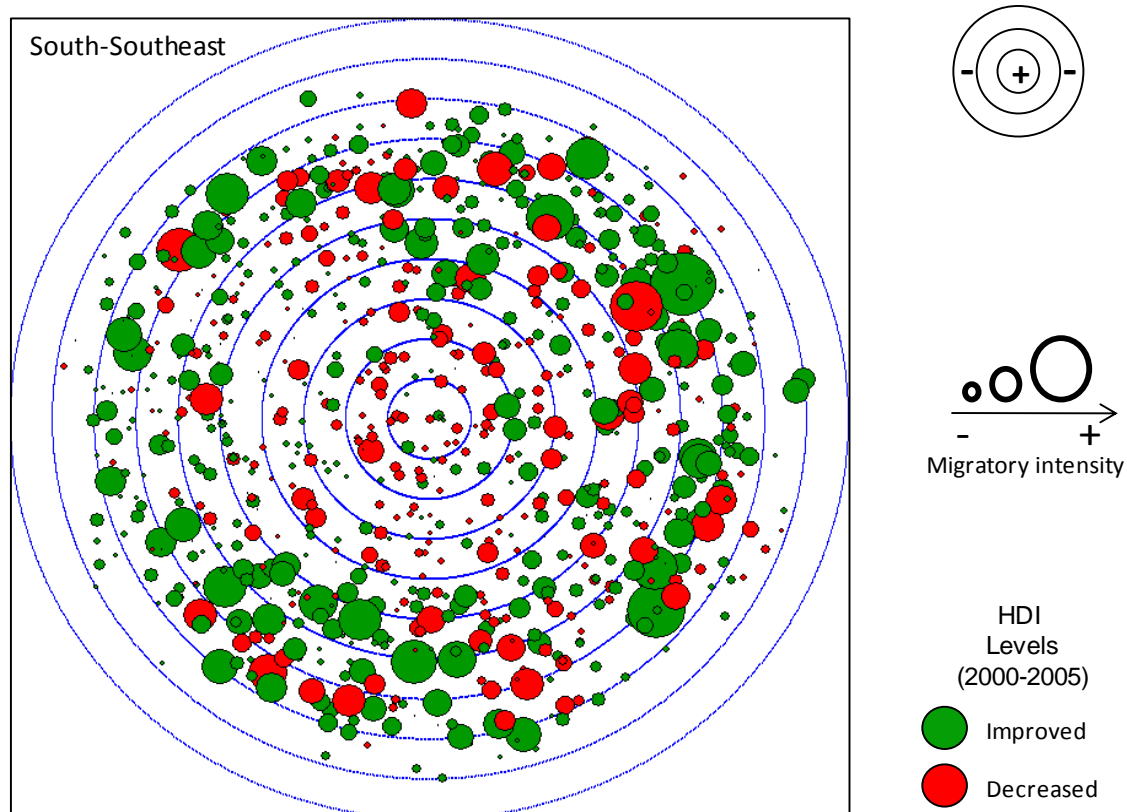
## APPENDIX 1.- Mexican Regions

Region	Population 2000	Population 2005	Municipalities
Centre	32,900,000	34,600,000	544
Centre-Occident	21,000,000	21,900,000	436
Northeast	13,400,000	14,400,000	234
Northwest	7,665,221	8,359,942	100
South-Southeast	22,400,000	23,600,000	1,104

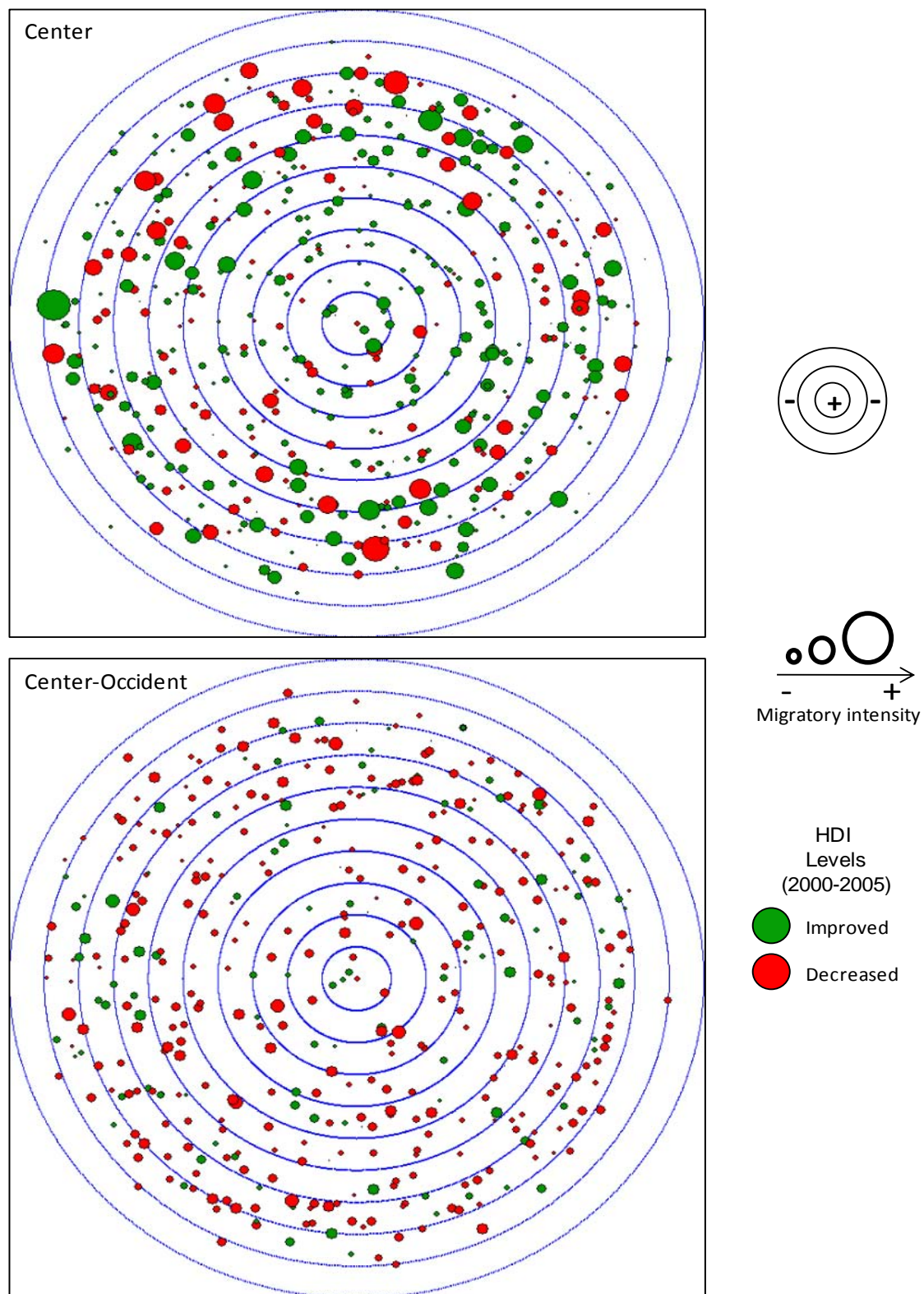
Table A1.1.- Own calculations with INEGI data.

## Appendix 2.- Developmental gaps of Mexican municipalities by region.

Own calculations with UNDP data and the software Pajek 3.1

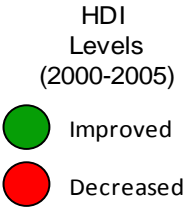
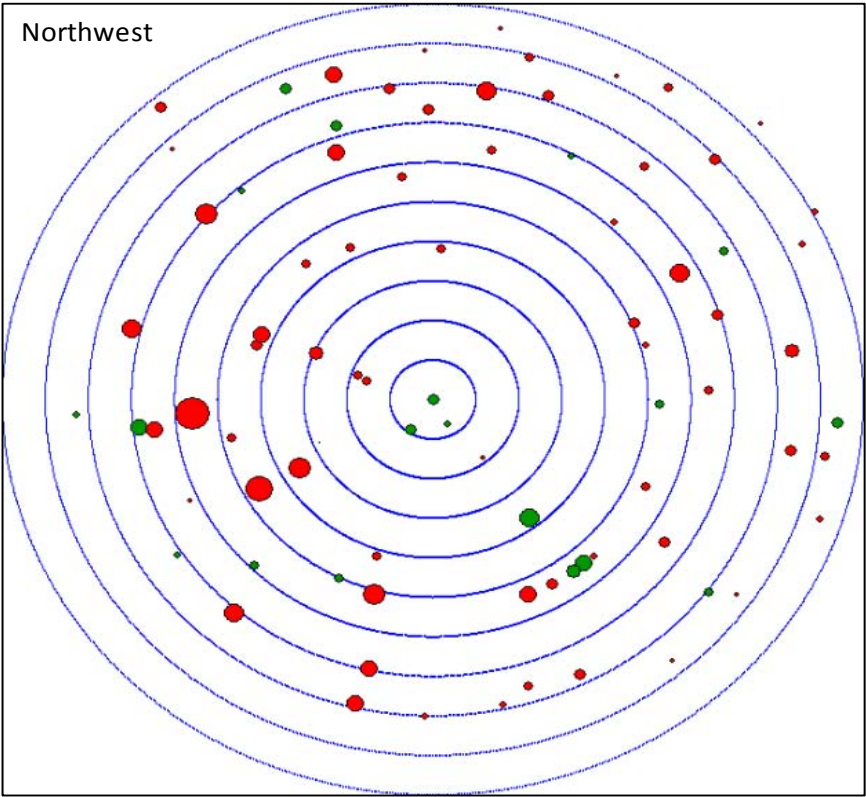
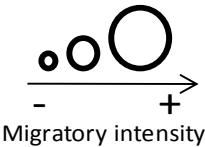
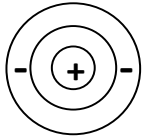
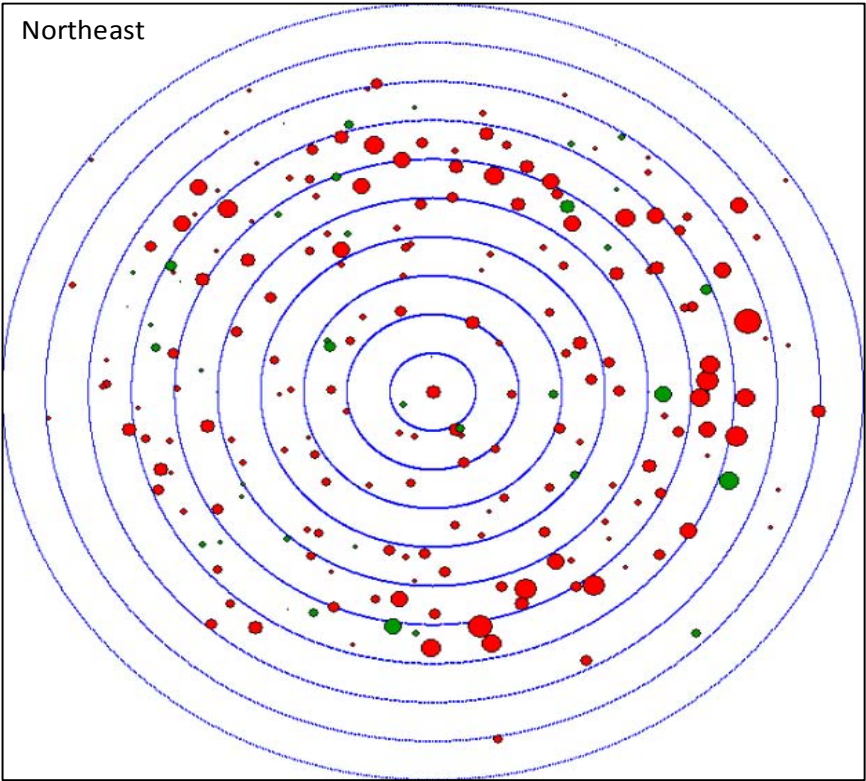


**Appendix 2.- Developmental gaps of Mexican municipalities by region.**  
Own calculations with UNDP data and the software Pajek 3.1





**Appendix 2.- Developmental gaps of Mexican municipalities by region.**  
 Own calculations with UNDP data and the software Pajek 3.1



### APPENDIX 3.- Statistical description of variables.

Table A3.- Own calculations with INEGI and CONAPO data.

<b>2000</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Minimum</b>	<b>Maximum</b>
GDP (US \$)	344,000,000	1,420,000,000	345,527	17,900,000,000
SE	0.172	0.095	0.000	0.455
Rural	0.739	0.343	0.000	1.000
Poverty	0.730	0.166	0.184	0.989
HK (years)	5.398	1.563	1.000	12.000
Latitude	20.020	3.350	14.233	32.667
LF	0.066	0.072	0.000	0.907
PK	0.000	0.001	0.000	0.037
Femalehh	0.245	0.088	0.026	0.855
Remitt	0.026	0.058	0.000	0.730
Migint	0.006	0.009	0.000	0.078
Trad	0.209	0.407	0.000	1.000
Fam	0.788	0.409	0.000	1.000
DevGap	0.136	0.075	-0.013	0.456
DevGapE	0.132	0.091	-0.024	0.624
DevGapS	0.098	0.063	-0.017	0.401
DevGapI	0.177	0.089	-0.070	0.437
<b>2005</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Minimum</b>	<b>Maximum</b>
GDP (US \$)	436,000,000	1,730,000,000	399,929	22,900,000,000
SE	0.190	0.081	0.000	0.455
Rural	0.729	0.348	0.000	1.000
Poverty	0.667	0.180	0.117	0.990
HK (years)	5.736	1.299	2.000	15.000
Latitude	20.020	3.350	14.233	32.667
LF	0.065	0.068	0.000	0.839
PK	0.000	0.000	-0.004	0.011
Femalehh	0.211	0.055	0.044	0.556
Remitt	0.067	0.122	0.000	1.645
Migint	0.007	0.009	0.000	0.114
Trad	0.209	0.407	0.000	1.000
Fam	0.654	0.326	0.000	1.000
DevGap	0.142	0.069	0.000	0.444
DevGapE	0.119	0.083	-0.021	0.571
DevGapS	0.133	0.071	-0.019	0.639
DevGapI	0.175	0.079	-0.070	0.415

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