A QUANTITATIVE ASSESSMENT OF FACTORS CONTRIBUTING TO THE ECONOMIC GROWTH OF MICHIGAN REGIONS

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Abstract

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Many studies in regional development and economic geography are focused on factors that determine regional growth. In this paper a review of existing studies of regional growth is presented. The explanation power of the most recent studies is tested using the case of Michigan economy. In particular, the impact of high-tech industries, social attractiveness factors and regional economic development policies on the per capita income growth rate for Michigan counties is studied. Finally, the difference in effect of the policy and other factors in rural and metropolitan areas is assessed. The results of this work might be helpful in setting priorities using different development policy instruments.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION

An economy is developing constantly. The rapid expansion of knowledge base and technologies, historical events, social and geographical factors cause changes in our society and have strong influence on the path of economic development. Changes in economic structure and the growth rate are the most transparent indicators of that permanent movement. Some industries are born and experience a boom, while others experience decline. The effect of economic adjustments on changes in society is not spread evenly over time and space. As a result, economic characteristics of a country such as the U.S. are not uniform, either in time, or in space, therefore, the characteristics of a region deviate substantially from the national averages.

This diversity provides the U.S. an important set of advantages over other developed countries in facilitating economic growth and development. Those advantages are brought by:

1) lower factor cost in the more extensive U.S. periphery;
2) a city-building dynamic in the South and West that generates abundant profit opportunities …;
3) a geographical and political diversity that offers ample opportunities for the … industrial restructuring (Carol Heim, cited by Norton, 1986: p. 25).

One dimension of the U.S. diversity is difference in income level and rate of growth. This paper reviews some historical background as well as theories

explaining difference in growth rate with focus on the midwestern economy. The reasons why this regional economy should be distinguished from economy of the other U.S. regions and the country in a whole are discussed in the first part of paper. Special attention is paid to structural characteristics of regional economies and to role of development policies in facilitating economic growth.

In part two the case of Michigan is considered to show that differences in socio-demographic, geographic and economic background might be an explanation of differences in growth rates between Michigan counties. Finally, econometric analysis tests whether theories reviewed in the previous parts provide an explanation of Michigan counties' income growth rate. In particular, the impact of Michigan economic development policies on personal income growth is assessed. Also, the impact of social attractiveness factors and structure of local economy on the growth is studied.

Besides the quantitative assessment of the policies and testing the modern theories of growth the paper puts finding of previous studies in a common framework based on neoclassical theory of growth. Additional attention is paid to spatial correlation in growth model.

1. SPACE AND DEVELOPMENT OF THE U.S. ECONOMY

Development of the U.S. economy is viewed in the professional literature in a few dimensions. The main three are time, space and structure. Respectively three areas of science try to analyze economic processes. These areas are economic history, economic geography and economics. Wealth and income distribution are not and have never been uniform in those dimensions. And so, region specifics should be taken into account while analyzing the growth and development patterns and policymaking. For this purpose this chapter begins with a description of the unique features of the main U.S. regions. A description of structural changes using the case of the midwestern economy is then provided. Next, a review of the response of economic development policy to changes in the economy in time and space dimensions is provided. Finally, different ways of assessing the economic development policies are described.

1.1. WHERE ARE THE ROOTS OF REGIONAL UNIQUENESS?

a) American Regions

The U.S. territory exhibits uneven development. Historically, economically and culturally a few regions can be distinguished. They are Northeast, Mid-Atlantic, Midwest, South, West and Mountain states. Different authors define slightly different borders and the number of regions. A precise definition of the regions is outside of the scope of this paper. Instead the focus is on the region-determining features.

Three main things determine the differences between the U.S. regions: cultural issues, history of the region's formation and settlement (Page, 1991), and the resource endowments. These factors mostly determine the set of industries and a level of their development, and also the development path of a region as a whole.

The "take-off" theory adds another set of factors explaining the difference in the regions growth. The theory purports that the economic revolutions of the North after the Civil War, Texas since 1945, and the Pacific Rim at the end of the 20th century (Norton, 1986) play the key role in the determination of development path.

Due to the above-mentioned factors each region by the first half of the 20th century had its own path of development different from the other regions. The path of growth changed during the 20th century.

Historically the more industrialized Northeast, Mid-Atlantic and Midwest states, which also are called the manufacturing belt or core, had higher rates of

growth and income level than the other states, or periphery, until the 1960-70s (Norton, 1986). By the 1950s, the U.S. North become “hyperindustrialized”. ‘[But] the technological changes, that weakened the North’s industrial role, created a profit generating disequilibrium in the South and especially the West’ (Norton, 1986). ‘The de-industrialization of the North since the late 1960s has … reflected import substitution in the South and West, as goods formerly imported from the North were increasingly produced locally’ (Norton, 1986, p. 25).

The rate of growth of the Southern states increased starting in the 1930s. Changes in federal regulations of labor markets were a main contributor to this process (Wright, 1987). The additional boost was given during 1940-50s by the invention of the “smokestacks chasing” policy (Wright, 1987) and rapid development of the service sector (Kirn, 1987). As a result, the peripheral states achieved a higher level of diversification (Keinath, 1985), while the core continued to specialize in manufacturing. The difference in the growth rates leads to convergence in income levels between different regions of the country.

Norton (1986, p.26) showed that through the 1940-1980 the ‘regional shares of U.S. manufacturing employment approached regional population share’. So, the manufacturing tends to be spread evenly. New sources of regional economic growth formed in Northern and Midwestern states by the end of the 1990s. One of these sources is a specialization in export-oriented industries (first of all industrial services and high tech) and local services and amenities providing for export oriented industries (Kirn, 1987).

Considering the above-mentioned factors, the second quarter of the 20th century can be thought as the beginning of regional economic restructuring, which determined the convergence in income level between the regions. Few main factors caused that change. By the beginning of the 20th century acquisition of new land stabilized (Page & Walker, 1991), the Great Depression led to redistribution of capital and power, new regulation of labor markets in the 1930s and 1940s changed their structure and migration patterns (Wright, 1987). The consequences of these events might be considered as the first wave of restructuring. The driving force of regional growth during that time was manufacturing and the states chased factories and manufacturing jobs. The result was the higher industrial specialization of the core and more diversified economic structure of the periphery.

The second wave was driven by rapid growth of the service sector during the 1950s through the 1970s (Kirn, 1987), and the third one was determined by the diversified growth of the regions starting 1970s (Keinath, 1985). As a result, the per capita income of the Southern regions rose from about 50 percent of the national average at the beginning of the century to about 80 percent by the end of 1970s (Wright, 1987).

The rapid growth of southern and western states (which formed the so-called Sunbelt) was accompanied by reduced development of the traditionally faster growing states of the manufacturing belt. The contribution of different industries to regional growth also changed.

b) American Midwest[1]

In this work the focus is on the analysis of the midwestern economy. The sources of the economic and social uniqueness of the American Midwest should be highlighted first to be able to recognize the trends in this economy and to suggest policy approaches for its development.

During almost all of its history the American Midwest experienced rapid economic growth, and by the middle of 1970s it became the world largest industrial center (Page & Walker, 1991). But at the end of the century it fell into recession. The economic crisis of 1970s and 1980s hurt manufacturing the most and so, the midwestern economy, which was over dependent of manufacturing. The path of midwestern development is unique and very different from the rest of manufacturing belt (Page & Walker, 1991). The uniqueness and the source of the midwestern growth lay primarily in its internal sources.

> [It did] not grow merely by trading or attracting economic activity, based on its natural endowments; rather, it industrialize[d] by producing commodities in demand, improving production methods, multiplying its division of labor, reinvesting capital in further expansion, and remaining competitively viable (Page & Walker, 1991, p. 282).

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[1] For purpose of this paper **Midwest** is defined as a group of following states: Michigan, Ohio, Indiana, Illinois, Minnesota, Wisconsin, Iowa, Missouri, North and South Dakota, Nebraska and Kansas. This area coincide with the Midwestern area defined by the U.S. Bureau of Labor Statistics and also corresponds jointly to the areas of the Grand Lakes and the Plaines zones of the U.S. Bureau of Economic Analysis.

The three “stones” determined the uniqueness of the midwestern development: the society of free family farmers (Page & Walker, 1991), good land, and simultaneous development of manufacturing and agriculture during settlement. These two sectors had synergistic effects on their joint development. The above-mentioned factors created necessary conditions for agro-industrialization of the second half of the 19th century and became the powerful internal source of growth. The uniqueness of the midwestern territorial production complex also rests on a large number of small industrial towns, a dense network that emerged around the region during that period of time (Page & Walker, 1991). The towns and countryside were joined in one complex by the agriculture and natural resources processing industries.

The important boost during agro-industrialization was using steam power and rapid expansion of the transportation system through steamboats on Mississippi and the creation of railroads and canals. Those factors allowed the Midwest to become a big supplier of foodstuffs for North and foreign demanders.

The machinery and metal industries developed mostly due to the high demand from agriculture and the above-mentioned processing industries. The final catalyst in forming the world’s largest industrial complex was given by the emergence of the car-industry at the beginning of the 20th century. Further development of midwestern industries was mostly due to widespread adoption of mass production systems and new marketing technologies. This in turn stimulated rapid development of consumerism. The agro-industrial revolution of

the second half of the 19th century increased dramatically labor productivity in farming and many food and natural resources processing industries.

Page and Walker (1991) mentioned food-processing industries as the leading sectors of midwestern growth. Among them flour milling, meatpacking, brewing, and distilling were national leading industries in output and productivity during 1850-1905. Other important industries were lumber and wood products, leather tanning and leather products, as well as mining, and agricultural machinery production. The Midwestern machinery production accounted for 25.5 percent of value of all U.S. machine production in 1870 (Page & Walker, 1991). The manufacturing of iron was mostly oriented toward agriculture supplies and machinery. By the 1900 the Midwest produced about 44 percent of the U.S. machine tools (Page & Walker, 1991). During 1860-90 the midwestern share of total U.S. value added in manufacturing increased from 19 percent to 33 percent (Page & Walker, 1991).

c) Rural Versus Urban

Another dimension of spatial characteristics is rural versus urban. The U.S. experiences the same tendencies in rural areas as the most developed countries (Pezzini, 2000): farming is still important in terms of land use, but growth in employment and income is attributed to other industries (such as public sector, tourism, industrial services, food processing); rural population in many regions is aging due to outmigration of young and inmigration of retirees. In addition most rural areas do not have a critical mass of activities to support the infrastructure necessary for business and entrepreneurship development.

As a result the disparity between metropolitan and rural areas, noted by Leatherman and Marcouiller (1996) during the 1980's, is increasing. The U.S. per capita income in metro areas[2] was $31,332 by 2000, while in the non-metropolitan areas it was $21,847 (Newman, 2002).

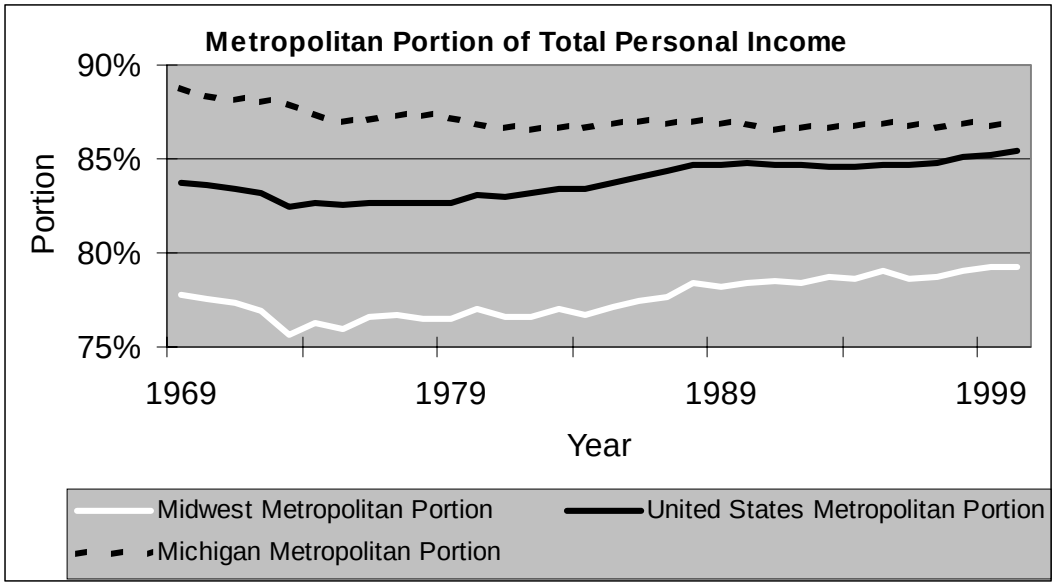

Figure 1.1. Metropolitan Portion of Total Personal Income

Data: Bureau of Economic Analysis, U.S. Department of Commerce.

The role of metropolitan areas differs by regions. For the American Midwest the history of agro-industrialization and development of the processing industries in small towns (Page & Walker, 1991) decreased the metropolitan portion of personal income (Figure 1.1). At the same time hyper-industrialized states such as Michigan have much higher metropolitan portions. About 85

[2] Based on the Bureau of Census definition of metro and non-metro areas.

percent of personal income in 2000 was created in the metropolitan areas (Newman, 2002), while they occupy less than 6 percent[3] of Michigan territory.

The development of rural areas is often tied to diversification (Pezzini, 2000). Both exogenous factors, such as relocation of manufacturing and services to rural regions, and endogenous, such as development of small and medium size enterprises' (SME) clusters and rural tourism, diversification of agro-industries, play important role in this process. Improving of transportation links plays a crucial role in a process of rural development (Hilhorst, 1990).

Another important source of rural development is changing patterns in residential location decisions. People are becoming more and more concerned about the quality of life, where the environmental factor plays an important role (and usually rural areas are sought for such natural amenities). As an example, enormous growth of Detroit's suburbs can be observed during the last part of the 20th century. Due to those tendencies metropolitan adjacent and not adjacent areas are viewed some times separately, while no distinction is made in the following analysis.

Before turning to the analysis of the growth determining factors for the current state of the midwestern economy a short review of the economic structure and its changes during the 20th century presented.

[3] Based on the Census 2000 data.

1.2. ECONOMIC STRUCTURE AND STRUCTURAL CHANGES

Three main sectors: agriculture, manufacturing and services, are considered in this section. In different time periods and in different regions the contribution of these sectors in the economic development of the U.S., and the Midwest particularly, was different. This section starts with description of agricultural sector as the leading one at the beginning of the 19th century. Then the roles of the manufacturing and service sectors are reviewed. Finally the new tendencies of economic growth of the end of the 20th century, such as the diversified and internal growth, are considered.

Historically, development of many regions started with the mechanization of agriculture followed by growth in manufacturing and service. As mentioned in the previous section, in the midwestern economy agriculture and manufacturing started their development simultaneously. But starting the middle of the 19th century manufacturing started playing a more and more important role. Already '[d]uring 1850s, agricultural processing industries grew faster than agriculture as a whole' (Page & Walker, 1991, p. 294). By the end of the 19th century - the beginning of the 20th century American manufacturing experienced a boom, providing a high rate of growth for the whole economy.

During the same time the development of agriculture was not as rapid and its share shrank both in terms of income produced and labor employed. As David (1967) noted the tendency toward stagnation in American agriculture started during the first part of the 19th century. By the beginning of the 20th century the traditional agricultural regions, like the American South, experienced the lowest

growth and the highest level of unemployment (Wright, 1987). Simultaneously, new technologies in agriculture significantly increased the productivity of labor and yield, allowing the lower number of workers to serve the growing needs of population. At the end of the 19th century the agricultural sector of the Midwest become more regionally specialized: 'Wisconsin become known as America's Dairyland … Minneapolis become the world leader in the flour milling' (Mondale, 1998, p. 1). Big and medium-scale farms became dominant (Mondale, 1998).

The agriculture played a more important role during the 20th century in the midwestern economy than in the economy of other U.S. regions[4] (Figure 1.2). But by the end of the 20th century agricultural sector contributed approximately the same share to the Midwestern and to the U.S. total personal income. During the century the income share from agriculture shrank from approximately 13 percent to 1.5 percent of total personal income in the Midwest.

The agro-industrialization of the Midwest of the 19th century became the unique feature of its manufacturing development. '[M]idwesterners developed the arts of agro-processing to new heights as they revolutionized meatpacking, flour milling, brewing, distilling, and lumber milling in the nineteenth century' (Page & Walker, 1991, p. 306). Rapid development of agriculture machinery followed the processing industries. Their development together with the development of transportation system stimulated growth of heavy industry. As a result 'the Midwest's share of [manufacturing] was substantial and rising. By 1860, the

[4] It is hard to compare with the U.S. total, because the Midwestern agriculture has high influence on the U.S. total. In 1929 the personal income from the Midwestern agriculture was 38.6% of total income from agriculture. By the end of the century its role decreased and it contributed about 20% of the total personal income from agriculture.

Midwest already accounted for 19 percent of total U.S. value added from manufacture … and 33 percent in 1890' (Page & Walker, 1991, p. 294).

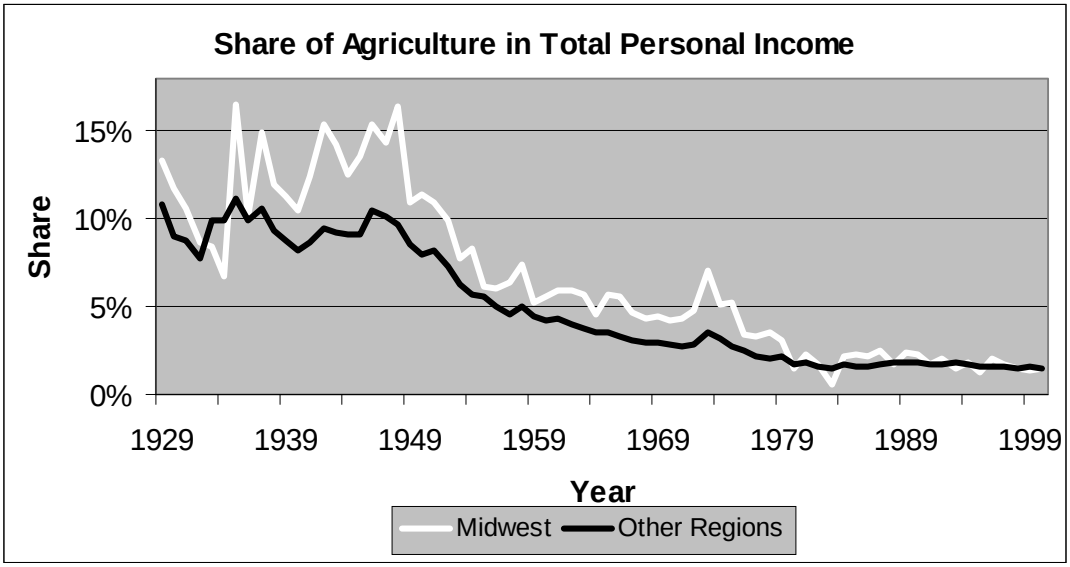

Figure 1.2. Share of Total Personal Income from Agriculture

Data: Bureau of Economic Analysis, U.S. Department of Commerce.

Emergence of the car industry and mass production raised Midwestern manufacturing to new heights and by the middle of the 20th century, 'the Midwest had become more than the heartland of America; it was the industrial core of the capitalist world' (Page & Walker, 1991, p. 309). Norton (1986) presented, that during 1955-1985 the total manufacturing employment increased from approximately 16 to 19 million. But at the same time the share of the manufacturing belt decreased from 10 to 8 million and the South and West employment in manufacturing increased dramatically from 6 to 10 million. But even so, the Midwestern economy has been dependent on manufacturing much more than the other U.S. regions during the whole 20th century (Figure 1.3).

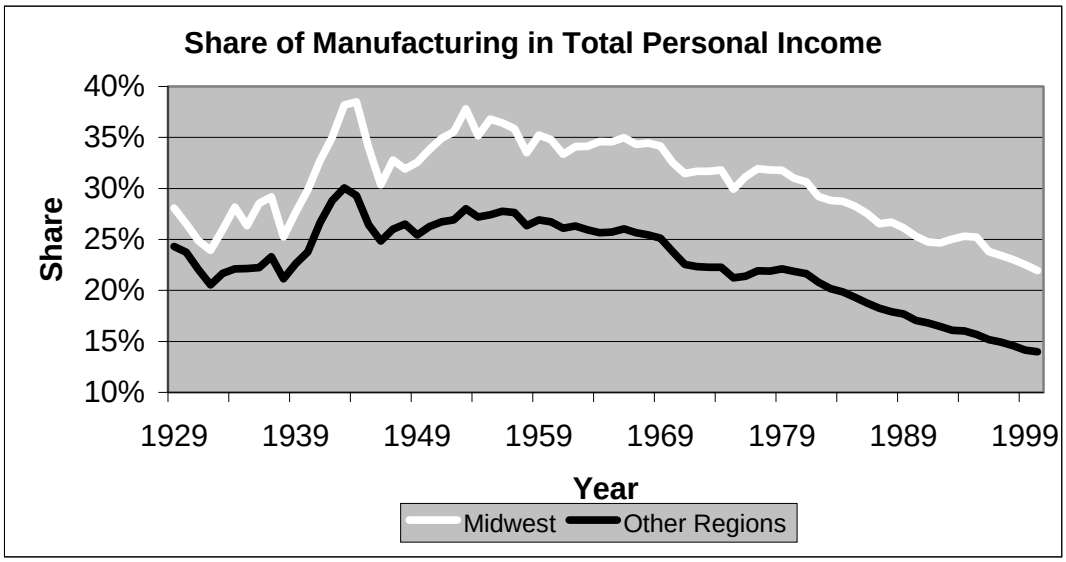

Figure 1.3. Share of Total Personal Income from Manufacturing

Data: Bureau of Economic Analysis, U.S. Department of Commerce.

Indeed, manufacturing contributed the biggest share of income to the Midwestern economy until the end of the 20th century (Figure 1.4). Manufacturing was the engine of the region's growth during the first half of the 20th century. But beginning in the 1970s this overdependence had negative consequences. During the recessions of the 1970s-80s the Midwestern economy was hit the hardest among the regions.

During the 1970s the manufacturing belt experienced the lowest rate of growth in its history (Keinath, 1985). During 1980s the percentage of U.S. employment from manufacturing shrank from 18 percent to 13 percent, while earnings shrank from 25 percent to 18 percent (Black & Chandra, 1996). During the same period the average annual earnings per manufacturing worker

increased from 35 thousand dollars to 38 thousand dollars, which resulted mostly by moving low paid unskilled jobs abroad (Black & Chandra, 1996).

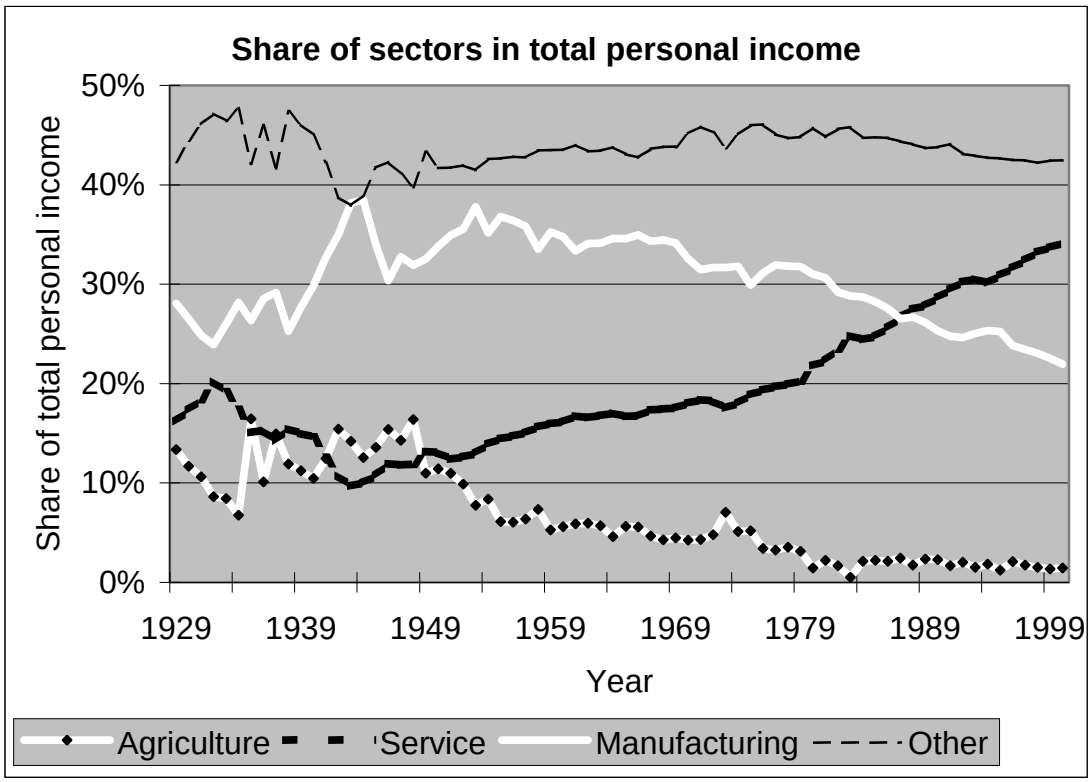

Figure 1.4. Contribution of Different Sectors to Total Midwestern Personal Income

Data: Bureau of Economic Analysis, U.S. Department of Commerce.

Note: data for the SIC Divisions is used. Agriculture includes farm income and income from Agriculture services, forestry and fishing. Manufacturing equals the manufacturing SIC division. Service includes the SIC service and finance, insurance, and real estate divisions. Other includes mining, construction, transportation and public utilities, wholesale and retail trade, and government and government enterprises.

The U.S. was not the only country experiencing these changes in economic structure. The most developed countries had the same kinds of

changes (Norton, 1986). The difference was that European industrial stagnation was much more severe. In particular, while 'Europe's job count [in manufacturing] has been flat…the U.S. added some 30 million new jobs' (ibid, p. 3) during the 1970-1985. The source of the U.S. strength, as Norton views it, is in significant regional diversity of the U.S. economy.

Regional economic restructuring, mentioned in the previous chapter, changed not just the spatial characteristics of the U.S. economy, but, and first of all, the structural ones. The service sector started playing the dominant role in economic growth. It contributed more than 35% of total personal income by the end of 1990th (Figure 1.5.) The origins of such a change are rooted in the 19th century. '[T]he biggest [Midwestern] cities reached their peak of importance in manufacturing by 1870… [later their] growth was based principally on their dominance in mercantile and service functions…' (Page & Walker, 1991, p. 302).

The rapid development of service sector was mostly due to a growth of producer services. The growth of business and professional service, finance, insurance and real estate industries was the most rapid among producer services. The growth in consumer services mostly reflected the growth in population and income level, and reflected an important shift in consumer priorities from quantity to quality of life. 'The decentralization of manufacturing activity [of 1958-1967] … stimulated the demand for producer services in [small towns]' (Kirn, 1987, p. 369). As a result the service sector became distributed more evenly across the urban hierarchy during 1958-1977 (Kirn, 1987). The

implication is that development of the service sector contributed significantly to the development of rural areas.

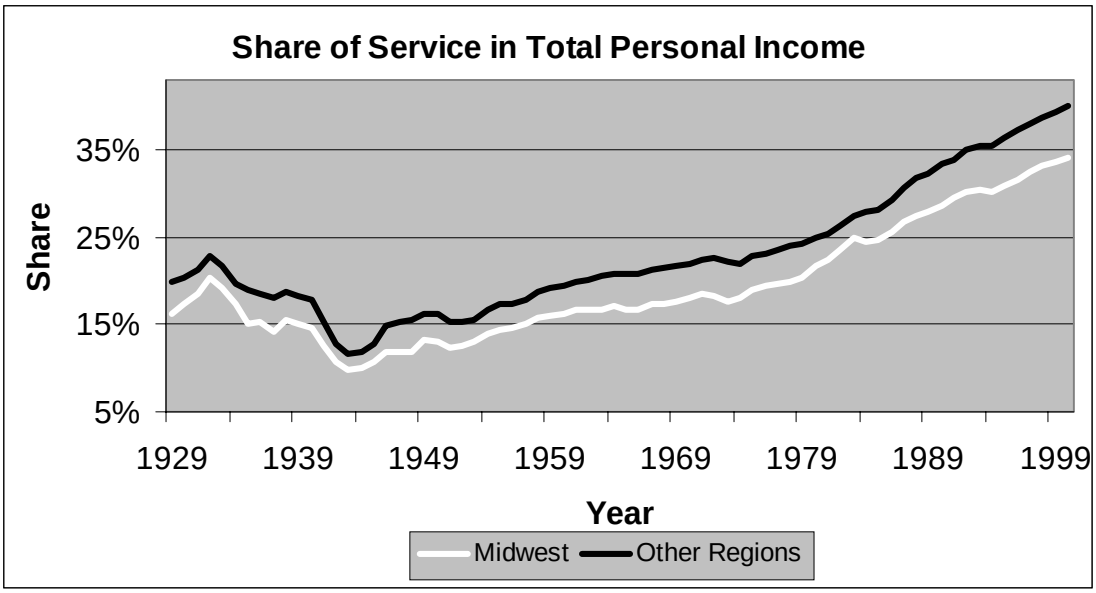

Figure 1.5. Share of Total Personal Income from Service

Data: Bureau of Economic Analysis, U.S. Department of Commerce.

The regional redistribution of service activity changed as well.

> In 1958 the Northeast had the highest employment shares for [the service sector]; this region was followed by the West, North-Central and South, respectively. By 1977, however, the South had developed a strong component of these services, the North-Central [which is associated with the Midwest] had become the last well-endowed region. …The North-Central had difficulty in expanding its base of producer services as its manufacturing base declined (Kirn, 1987, p.369).

Kirn also (1987, p. 370) concludes that at the end of 1970s:

> the North-Central may have the poorest prospects for growth, at least in the short term, given its relatively low concentration of business, professional and finance services and its large employment shares in slowly growing manufacturing industries …

Norton (1986) also stated, that the share of service sector in GNP has not changed too much during 1960s-1970s, and the increase in the service employment was in general due to growth of industrial services out of the manufacturing sector. But, in the same publication Norton mentions that aggregate national statistics hides the restructuring processes on the regional level.

During 1960s and 1970s the role of the service sector significantly increased. The share of employment in this sector increased from 60-65 percent to 70-75 percent (Kirn, 1987). This sector was developing most rapidly in Southern states (Kirn, 1987). The share of service sector in the midwestern region employment increased from 59.8 percent in 1958 to 67.8 percent in 1977 (Kirn, 1987)[5]. In both periods the service share in this region was the smallest across the regions. During the same time the Midwest's share of manufacturing was the biggest among the regions.

During the 1970s and 1980s the number of jobs in service sector continued to grow. It increased from above 35 million to more than 60 million (Ticknor, 1988).

[5] Kirn (1987) provides the data for the four statistical regions and data for the North-Central is used as a proxy for the Midwest.

Different authors analyzed the growth patterns with respect to the sectoral contribution. Norton (1986) found a significant dependence of manufacturing employment on four factors during the 1970s. They are “anti-union” law presence, market potential, change in a state’s relative labor cost, and the distance from the old industrial core. The hypothesis that the periphery had a higher growth rate in manufacturing was confirmed. The set of two variables: presence of “anti-union” law and labor cost, - serve as a proxy of the business climate. The results show that the better the climate (presence of the law and low cost of labor), the higher the growth. This finding confirms Olson’s (1983) business climate theory. For that stage of U.S. economic development this finding was a strong argument against equity policies, which work against the business climate and structure of labor force, decreasing the mobility of low quality labor. On the other hand the policies offering business opportunities and decreasing labor cost facilitate the growth.

The conclusion about the climate is right just for a particular stage of regional economic development. As the opposite example, the changes in the minimum wage regulations increased labor costs during 1930s-1950s but were among major causes of the industrial revolution on the South (Wright, 1987).

Keinath (1985), studying the U.S. regional economy during the same period, confirmed Kindleberger’s maturity theory. It implies that mature industries, such as in the manufacturing in the 1970s, have lower rate of growth than the newer ones, like in the service sector. Keinath (1985) also found that during the 1970s the local economies specialized in manufacturing are associated with a

growth rate below average, while those with the specialization in service grew faster and the agriculture specialized economies had consistent growth.

Norton (1986, p.5) stated that during the 1970s there was a ‘regional revolution, marked by the decline and fall of America’s industrial heartland’. And Keinath (1985) found that the economic structure of peripheral states was more diversified during the 1970s (Figure 1.6) showing a higher growth rate, while the more specialized core exhibited slower growth. This finding is confirmed the findings of Tress and Shear, cited by Keinath (1985).

The regional diversity enforced a rapid adjustment in the U.S. economy over 1970-1985 (Norton, 1986). Rapid development of small businesses during the same period increased the variety of industries within the regions.

Recent study by Blakely (2001) recognized an important difference in current economic development patterns from what many authors thought previously. For most of the regional economies the proportion of global market oriented firms in a local economy and the level of development of local services providers becomes the main attribute of regional economic growth and development. Two important issues changed the growth patterns and have to be taken into account: globalization, which is increased by new communication technologies; and the high speed of technical progress.

Those factors make a distance less important for firms in their decisions about location of their facilities (Blakely, 2001). Firms become concerned about few main factors while choosing a location for any of its branches. Those factors

are quality of infrastructure, access to technologies the firm needs, and quality, price and accessibility of a labor force, able to deal with that new technology.

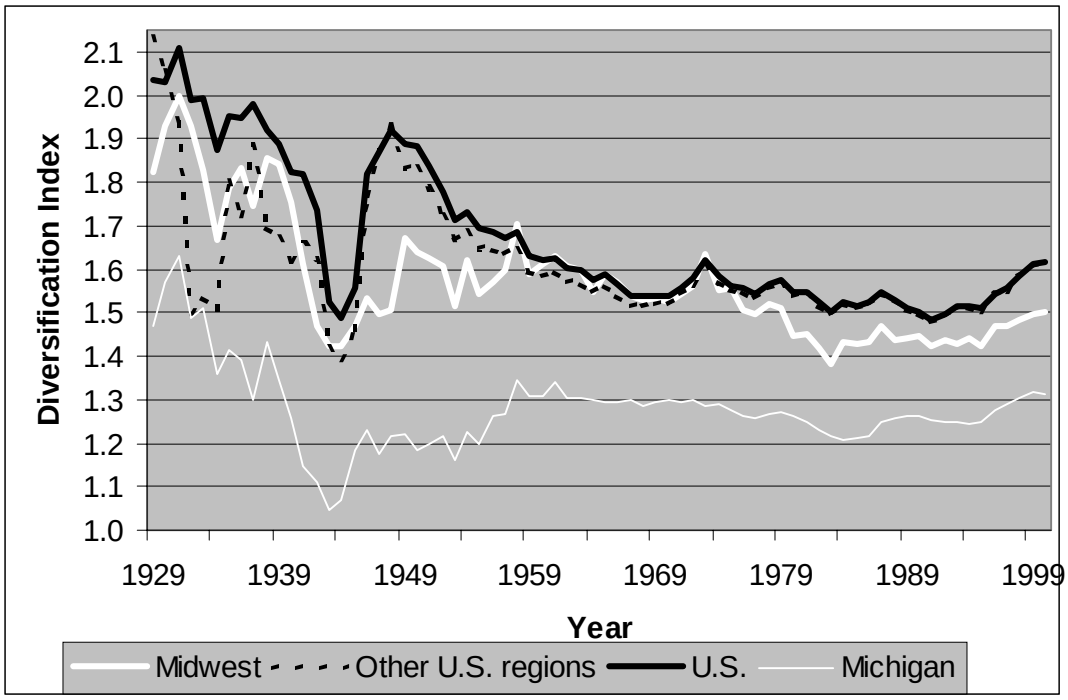

Figure 1.6. Diversification Index

Data: Based on the Bureau of Economic Analysis, U.S. Department of Commerce data for personal income.

Note: The diversification index is computed as one divided by sum of absolute deviations of shares of personal income earned in different sectors of economy from their equal shares (one divided by the number of industrial sectors). The higher the index, the more diversified the regional economy.

This implies that a region's comparative advantage by now lies in its ability to attract new technology hubs (Blakely, 2001) and skilled labor to its territory by providing the world's best infrastructure for some particular technology and by creating "strong social capital" (by developing education and health care

systems, creating cultural and entertainment centers). It seems that quality of social infrastructure has a direct impact on the quality of labor force (highly educated people usually prefer to live and work in locations with good infrastructure). Business infrastructure and developed service systems also play important roles. But the natural resource endowment and direct government support plays less and less of a role in the location decision of a firm.

Thus, development of technologies becomes another dimension of local economic development. Without specialization in some technology it becomes hard to attract the technology supporting and the technology developing industries in the region and create the hub.

As it was shown the economic growth is not homogeneous in space. A deviation of local economies from the national economy path is significant (Tolbert and Sizer, 1996; Pezzini, 2000; Beyers, 1980). Many factors are responsible for that: resources endowment, previous economic history, access to market, etc. But people in any place want to be wealthy and they pay taxes for such an opportunity. A review of economic development policies, designed to facilitate local economic growth, is presented in the next section.

1.3. REGIONAL ECONOMIC DEVELOPMENT POLICIES

A government has different tools to influence the economic and social development of a region. In general they are divided in two categories: policies and government services. All of them together are a part of the environment

facilitating or suppressing development. A set of policies and other government actions, used in order to ensure sustainable growth of particular region, is usually called a regional economic development policy. The design and use of the development policies vary in time and space. It is highly determined by the goals and strategies of local development policy-makers and the state of a local economy. In this chapter a review of development policies and stages of their development is presented.

The set of policy instruments depends of the priorities between different objectives and development strategy chosen. In particular, Hilhorst (1990: p. 207) mentions that in forming a development strategy a government faces five tradeoffs:

1) [economic and social] growth [and development] versus distribution [of wealth and guaranteeing the minimum living standards];
2) functional versus territorial integration;
3) private sector-led versus public sector-led development;
4) concentration versus dispersion;
5) migration versus capital aid.

The history of development of regional policies shows how the importance of those options changed over time (Norton, 1986; Kantor, 2000).

One clear description of policy changes over time is given by Ross and Friedman (1990). Three waves of the economic development policies are distinguished.

The first wave

The first wave began in the 1950-60s in the South (Ross & Friedman, 1990). It is also known as “federal era” because it was mostly financed by the federal government (Clarke & Gaile, 1992) and was mostly associated with the "smokestack chasing” policies and subsidizing of target industries. Economic developers tried to attract manufacturing companies to their states by providing different types of cost lowering opportunities (incentives). Using this policy allowed narrowing the income gap between South and the industrial core after World War II (Ross and Friedman, 1990). But a reduced growth rate in manufacturing at the end of the 1970s and beginning of the 1980s decreased the effectiveness of this policy significantly (Ross & Friedman, 1990). Another reason is that by the 1980s the structure of different regions becomes more even and diversified. The regions become more “self sufficient” and development policies, such as the “smoke stake chasing”, were significant contributors. Despite its decreased effectiveness, most states continue to allocate resources to smoke stake chasing.

The second wave

The second wave began in early the 1980s (Ross and Friedman, 1990). It was closely tied with new understanding of the endogenous nature of growth. The main tools in the development policies during that period aimed to facilitate growth of local businesses, providing start up loans, different types of training programs, and other infrastructure support. This change in the policy approach was accompanied by reduction of federal support (Clarke and Gaile, 1992).

The main limitations of state-run programs were (Ross and Friedman, 1990):

- the lack of scale (government was able to serve just very small part of the local business' real needs);
- the fact that those services were fragmented (the different programs were loosely connected to each other and did not serve all the needs);
- programs lacked accountability (it was hard to measure the real quality, quantity and the efficiency of the programs) and, finally,
- the missing link with the "customer" (they often didn't reach people most in need).

While understanding the importance of local entrepreneurship development, accelerating labor training and retraining programs, chasing outside firms and development of target industries continued to play an important role. But in addition to manufacturing, some developers started targeting service sector (especially tourism and industrial service) and attracting offices of big companies (Ticknor, 1988).

The third wave

The emergence of the third wave at the end of the 1980s – beginning of the 1990s was tied with overcoming the limitations of the previous wave of the development policies (Ross and Friedman, 1990; Clarke and Gaile, 1992). Leaving the focus on local business development, government changed the organization of service provision; instead of being a monopolistic provider it created a market for development services. So, different public and private

organizations became providers of those services, competing with each other for customers and government support. Thus, the government left itself the role of supervisor in the development “game” and the guarantor that all the required services are provided, and let the market power and competition to solve the limitations of the second wave policies.

New tendencies in the growth patterns, caused by development of communication technologies and globalization of labor markets, brought a new challenges to economic developers.

The new wave

The new wave in the development policy starts emerging at the beginning of the new century (Blakely, 2001; Pezzini, 2000). As a response to new tendencies for technology-based globalization and specialization the new policy focuses on attracting to the local areas new hubs of technologies and professionals from the industries that trade globally. Another focus area for economic developers becomes important. It is making a local area more attractive for professionals and other people with high levels of income.

A new set of policy instruments began to emerge. They are creating the world’s best infrastructure for some particular technology: providing ‘strong package of amenities, goods and services’ were necessary (Blakely, 2001, p. 138). Providing personal tax breaks and home loans for young professionals, developing communications infrastructure, improving education, health care and amusement systems is the way to attract high paid residents to the region (especially those who can work from home).

During the last 50 years different development policies and programs were established. Development efforts of various states also were different and the efficiency of this activity changed over time. For example Michigan economic development initiatives were considered pioneering. In particular, Michigan started relying on the “second wave” policies of business retention and small business development much earlier than other states, in the early 1970s (The evolution of economic development in Michigan, 2000). Later on, during late 1970s and 1980s, development programs in Michigan were not successful enough due to ‘recession and changing administrations’ (The evolution of economic development in Michigan, 2000, p.5). As a result, by the end of 1980s Michigan was one of the least attractive states for new business development.

Switching to the “third wave” policies initiated by Governor Blanchard followed by improvement of business climate initiated by Governor Engler changed the situation significantly and by the end of the 1990s Michigan became one of the most attractive states for business expansion (The Michigan Economy 1991-2000, 2001). Active use of the “new wave” policies such as “Smart Zones” for high-tech industries development, “Link Michigan” and others facilitate the previous efforts. As a result by 2000 Michigan become one of the leading states in the high-tech industries development. In the part two of this paper the example of the Michigan regional development policies used during 1990 will be considered in more detail.

1.4. SPECIFICS OF RURAL AREA DEVELOPMENT POLICIES

As described in a previous section, regional development policies changed over time. In this section a short review of rural area development policies is presented with some emphasis on specific features of rural development.

Just as urban area development policies were targeted on manufacturing industries, rural development policies before the 1980s were mostly agriculture oriented. Among the most common policy instruments were subsidies and government purchases. Deviation from an industry oriented approach to a region-oriented approach earlier in the 1980s caused formation of new policy instruments, which are quite similar to the urban counterparts. There are many examples of “special” development zones in different regions of the U.S. and other countries.

Hilhorst (1990: p.225) reviews three main models of region-oriented rural economic development. Those models are selective spatial closure by Stouhr and Toudtling (as cited by Hilhorst, 1990: p.225), agropolitan development by Friedman and Douglass (as cited), and integrated rural development. Each of those models treats a region as a unit of development and relies on different institutions as the source of development, like local government access to production means etc. First two models treat those institutions as the exogenous factors (or preconditions), while the third one consider them as the endogenous ones, and thus more realistic (Hilhorst, 1990: pp.230-31). The Integrated Rural Regional Development model emphasizes development “from below”, or creating

opportunities for poor to be involved in productive activity and to ‘stimulate the realization of all human potential in society’ (Hilhorst, 1990: p.239).

It is interesting to note that almost the same tendencies are observed in other developed countries. As Pezzini (2000) noted, the main features of successful rural development policies in OECD countries are the following. The focus of development policies shifts from development of target industries (such as farming) to development of target regions. The administration of the development efforts changed significantly (the development initiative devolved from national to a local level, while the coordination function was given in most cases to inter-ministerial working groups; important role in development services providing started playing private and non-profit organizations).

One important aspect of sustainable development of rural and urban areas might be noted. All the regions are facing the same problems of overspecialization (agriculture, manufacturing or mining), underdeveloped social and business infrastructure, weak institutions and inefficient stimulus of entrepreneurship. And the means of solving those problems do not differ too much between rural and urban areas.

Of course, the implementation of development strategies is different in rural and urban areas. The source of that difference is the low population density and relatively longer distance (between providers and consumers, workers and places of work) in rural areas. Those features increase dramatically the transportation cost and lower the accessibility of goods and services in rural areas. Developing the communication and transportation system is a well-known

way to overcome those limitations. An example of a policy aimed to deal with such a problem might be Michigan Transportation Economic Development Fund Grants (Survey, 2001) and Link Michigan Program to expand broadband access to the Internet (LinkMichigan, 2002).

Local and federal governments use a broad variety of different policies and policy tools. Some of them are successful, some not. Attempts to assess the efficiency of development policies are reviewed in the following section.

1.5. EFFICIENCY OF DEVELOPMENT POLICIES

In previous sections the term “efficiency” has been mentioned to evaluate the development policy. How efficient is local and regional economic policy? In this section this issue will be discussed in more detail.

Different authors approach this problem from different points of view. The first question is to determine if policymakers and economic developers are obstructing or facilitating the natural process of economic development and restructuring. The debates about this issue are mostly the same as about Keynesian and Neoclassical approaches to economic policies. While such debates are outside the scope of this paper, one comment should be made. The directions of the economic changes should be recognized. The development policies become more efficient when they facilitate the process of change observed in a country or global economy on a current stage of development. In

such a case a government helps a local economy to minimize lagging from modern trends by providing resources for restructuring.

Even so, there are different arguments in support and against different types of policies (Black & Chandra, 1996), the main question in evaluating the policy impact on economic growth may be stated as: Whether the spending on the policy paid off by the results. There are cases, when some of the policy instruments, used against natural trends, were just a waste of resources and time (Kantor, 2000). Among such instruments often are subsidies, most types of direct incentives and trade barriers. On the other hand, the instruments, which facilitate a restructuring, are of great importance. Among such instruments are “smokestack chasing”, improving of business infrastructure and retraining programs.

Let’s turn to a more formal analysis of economic development policies. There was a lack of precise efficiency measurement efforts by the end of the 1980s. The most common measures of the local policy success (Clarke & Gaile,1992) are ‘changes in per capita income and local employment per resident’. Each of those approaches has some limitations in explaining the real state of well-being of inhabitants due to few things. First of all, the official statistics use official administrative boundaries, which do not coincide with economic regions, while the effect of the policy is distributed around the whole region. Commuting approaches facilitate this dispersion. To deal with this limitation a commuting zone (Tolbert & Sizer, 1996) as a unit of analysis might be used.

Another concern is the distribution of wealth, which can be affected by the policies in different ways. As an example, Leatherman and Marcouiller (1996) evaluate the impact of development of some target industries on income and redistribution income among households in the Wisconsin rural areas in the 1990s. Selected industries, important for typical midwestern rural areas, were analyzed using a Social Accounting Matrix approach. While the results might be not quite accurate because some data were estimated, the study shows that the development of industries like agricultural processing industries and tourism have higher effects on income than some others, like forest production. The authors also found that development of agricultural processing industries and tourism raise the income of the poor households more rapidly (5-6% of extra earnings) than the development of other industries. It was also found that the main share (57-63%) of additional income, received from expanding a target industry, went to high-income families. Another conclusion is that this policy (developing of target industries) has limited influence on income distribution (Leatherman & Marcouiller, 1996), and in some cases may cause recession in other industries (Black & Chandra, 1996).

Black and Chandra (1996) examined the efficiency of another policy tool – the direct incentives. Authors conducted a regression analysis of its influence on increasing of earnings in Kentucky counties from the 1985 to the 1993. A significant and permanent impact on earnings was found.

Clarke and Gaile (1992) studied the effects of 2nd and 3rd waves policies in comparison with the first one at the end of the 1980s for 178 metropolitan areas.

Their result shows a higher job growth rate associated with using "entrepreneurial strategies" of the 2nd and 3rd waves. Also using of those strategies associates with higher proportion of fast growing companies, 'significantly lower taxes, expenditures and lower levels of city government employment' (Clarke and Gaile, 1992, p. 173).

Démurger et al. (2001) tried to assess the influence of economic policy factors as well as geographical ones on income using the case of the Chinese economy. They found that found that both groups of factors are significant.

In the remaining parts of the paper the case of State of Michigan is used to test some of the theories and empirical findings reviewed in this part. In particular, the significance of diversification level of local economies in explaining a growth rate is tested. Also, the claim about importance of attractive social and business climates is verified. The contribution of Michigan development policies to income growth is viewed in long and short run perspectives. The statistical significance of policy effects on income growth is viewed as one of efficiency measure for Michigan development policies.

Prior the empirical analysis, Part two describes diversity of social, geographic, economic and other factors among Michigan counties. Those factors are considered as determinants of local economy capacity to grow.

2. MICHIGAN ECONOMIC GROWTH RATE ANALYSIS

It was shown in the previous part that the growth at the current stage of economic development is highly influenced by the level of diversification, the level of business and social infrastructure development and government policies. But also, there are a number of studies examining dependence of income and growth levels on a variety of other factors. Among them are geographical, such as average slope and elevation of a territory (Demurger et al., 2001). Another group is social and institutional factors, such as a level of democracy and property rights development (Barro, 1998), social capital and income inequality (Rupasingha et al., 2002) and many others. In this part of the paper the case of the Michigan economy with respect to counties is considered to test the explanatory power of the findings mentioned above.

Michigan county economies are diverse. As an example, in the year 2000 per capita income ranged from $15,417 in Oscoda County to $45,872 in Oakland County, while the state average was $29,127. A source of the difference lies in the historical path of each county's economy, geographic, economic, policy, and social background. This part highlights the diversity of those characteristics of Michigan counties (Also see "Michigan in Brief"). Special attention is paid to income level and income growth rate in Michigan counties.

Note: Michigan in Brief

Geographic information[6]*:*

Michigan has 57,022 square miles of land (Ranked 22nd among the 50 states) and nearly 40,000 square miles of water. Its shoreline is 3,288 miles long. Among 83 Michigan's counties 68 are in the Lower Peninsula and 15 are in the Upper Peninsula. Among the counties, 40 counties border the Great Lakes.

Natural resources endowment:

'Natural resources of Michigan include fertile soil, rich mineral deposits [primarily natural gas, petroleum, iron and copper ore], widespread forests, plentiful water, and abundant plant and animal life' (The World Book Encyclopedia, 2000).

[6] Based on Michigan General Information (2002) and Michigan Facts and Links (2002)

2.1. BACKGROUND OF THE INCOME GROWTH DIFFERENCE

Many factors determine a steady state of an economy. Among them are the education level of the labor force, demand for consumer goods, and level of market infrastructure development, other social, political and geographic features of a region. Those factors serve as a background determining a growth rate. In this section some of them are described using the most recent data. Among those factors are demographic characteristics of Michigan and its counties, some structural characteristics of the economy and characteristics of development policies. In the next chapters some additional factors will be considered for the purpose of the analysis.

Demographic factors[7]:

In 2000, the Michigan population was 9.952 million (Ranked 8th among the 50 states), accounting for 3.5 percent of the U.S. population (The Michigan economy, 2001) and 15.4 percent of the Midwestern population. During 1989-1999, the population increased by 6.1 percent (611,000) while the average U.S. growth was 9.6 percent (The Michigan economy, 2001). In the year 2000 the growth rate (0.6%) was also lower then the U.S. average of 1.1 percent, but whole the Midwest grew at the rate of 0.6 percent.

In Michigan the most populated counties in the year 2000 were Wayne, Oakland and Macomb (Figure 2.1). While the least populated were Keweenaw, Luce, Ontonagon.

[7] Based on BEA data

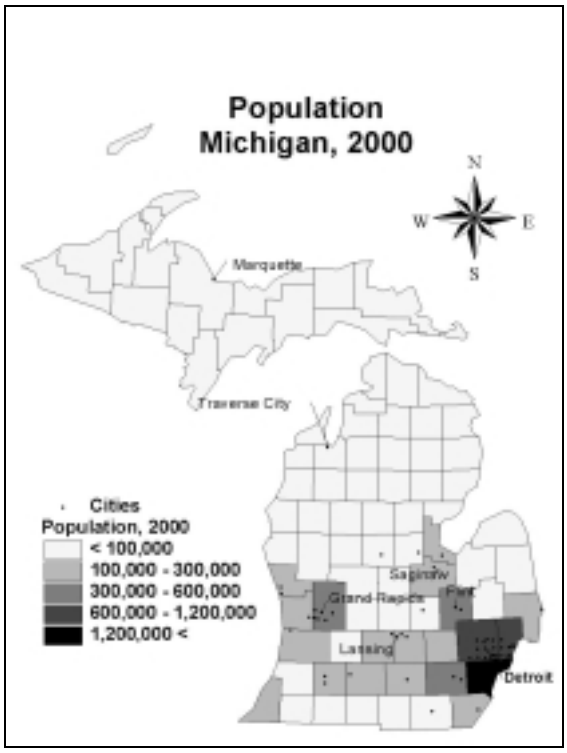

Figure 2.1. Michigan County Population, 2000

Data: Bureau of Economic Analysis

The population density ranged from about 4 persons per square mile in Keweenaw county to more than 3,350 persons per square mile in Wayne county. The average state density was 175 persons per square mile.

The population growth rate was highest in Lake county (5.6%), The lowest rate was in Alger and Presque Isle counties (-1.0%) (Figure 2.2).

According to the population density and a proportion of urban population in a county the ten-point Beale code is used to describe the rurality of a county (Measuring Rurality: Codes, 2000). Among 83 Michigan counties 25 are metropolitan (Beale codes 0-3) (Appendix 11). Among the rural counties 16 are metro area adjacent (Beale codes 4, 6 and 8).

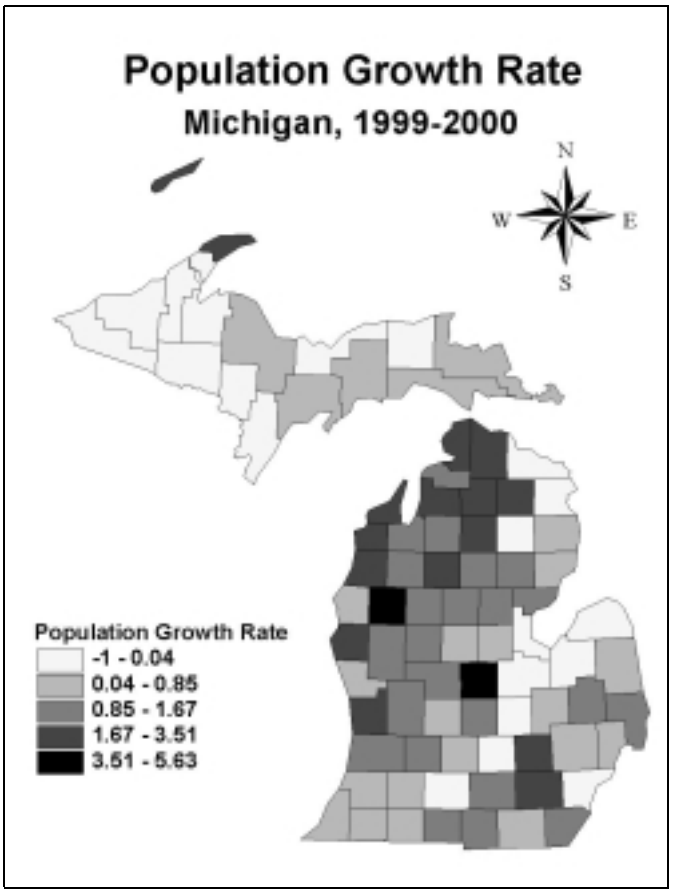

Figure 2.2. Michigan Population Growth Rate, 2000

Data: based on Bureau of Economic Analysis data

Among 318 cities, Michigan has 7 metropolitan areas. They are:

- Benton Harbor (MSA)
- Detroit--Ann Arbor--Flint (CMSA)
- Grand Rapids-Muskegon-Holland (MSA)
- Jackson (MSA)
- Kalamazoo-Battle Creek (MSA)
- Lansing-East Lansing (MSA)
- Saginaw-Bay City-Midland (MSA)

Among them Detroit is the biggest metropolitan area and manufacturing center.

The commuting patterns play an important role in the distribution of economic activity and wealth. Michigan had 21 commuting zones[8] (Tolbert and Sizer, 96) in 1990 (Appendix 12).

Educational attainment is characterized a percentage of population 25 years and over (adults) with less than 9 grades of schooling completed and by a percentage of adult population with bachelor's degree or higher. Michigan has 21.8 percent of adults with a bachelor's degree or higher and 4.66 percent with fewer than 9 grades of schooling completed. By these characteristics Michigan is ranked 35^{th9} and 8^{th10} among the 52 states and 6$^{th\ 4}$ and 2$^{nd\ 5}$ among the midwestern states. The counties with the highest percent of the population with bachelor's degree or higher are Ingham (33%), Oakland (38.2%) and Washtenaw (48.1%) (Figure 2.3). The counties with the highest percent of the population with fewer than 9 grades of schooling are Oscoda (7.91%), Presque Isle (9.16%) and Huron (9.71%)

Economic factors:

In terms of Gross State Product (GSP) manufacturing, services and finance-insurance-real estate (F.I.R.E.) are the leading industry groups,

[8] Commuting zone is a 'group of counties with strong commuting ties' (Tolbert&Sizer, 96), so the most people leave and work within the same zone.
[9] In descending order
[10] In ascending order

accounting respectively for 26.27 percent, 19.93 percent and 14.27 percent of the total GSP. Comparing to the midwestern economy, those industry groups were 21.36 percent, 19.98 percent and 16.67 percent of the regional GSP, respectively (Table 2.1). The most important single industries for the Michigan economy are Motor Vehicles Manufacturing, Retail Trade, and State and Local Government.

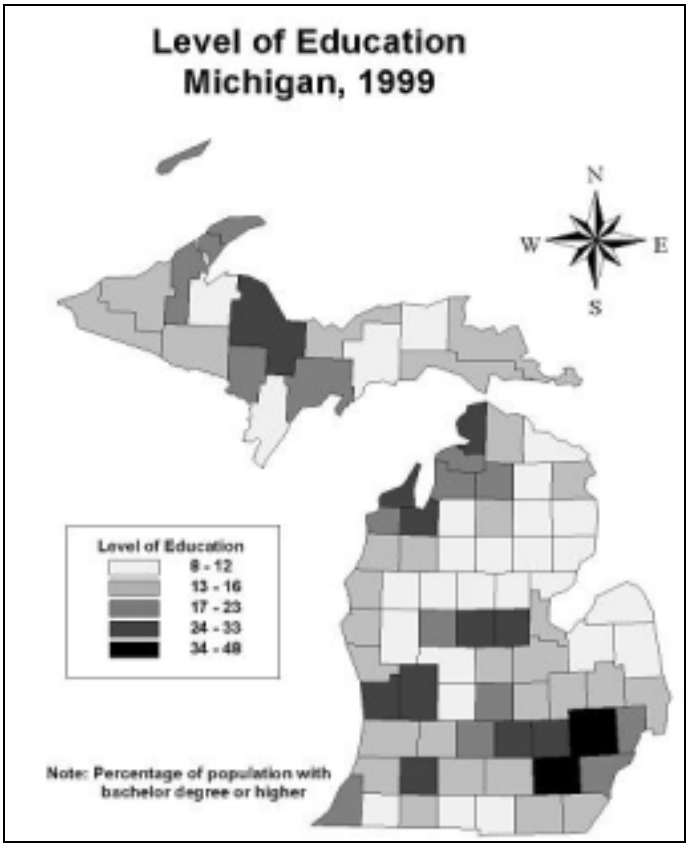

Figure 2.3. Percentage of population with bachelor degree or higher, 2000

Data: Census 2000, Census Bureau

Manufacturing, services and government are the most important industry groups generating personal income for the Michigan economy. Respectively

31.26 percent, 24.05 percent and 13.98 percent of the total income are made in those industries. For the Midwest those shares, respectively, are 23.62 percent, 24.63 percent and 15.45 percent.

Table 2.1. Contribution of the industry groups to total earnings, employment and gross state product in 2000.

Standard Industrial Classification (SIC) Divisions	Percent of total Compensation of Employees (Personal Earnings)	Percent of total Employment	Percent of total GSP
Agriculture, forest., fish	0.75%	2.28%	0.89%
Mining	0.20%	0.25%	0.27%
Construction	5.14%	5.32%	5.11%
Manufacturing	31.26%	17.78%	26.27%
Transportation & utilities	4.65%	3.72%	6.56%
Wholesale trade	6.64%	4.50%	7.24%
Retail trade	8.29%	17.13%	9.23%
F.I.R.E.	5.06%	6.75%	14.27%
Services	24.05%	30.24%	19.93%
Government	13.98%	12.05%	10.23%

In terms of employment, services (30.24%), manufacturing (17.78%) and retail trade (17.13%) are the biggest industry groups in the year of 2000.

Employment in all sectors, except manufacturing, grew in Michigan between 1989 and 1999. The service sector has shown the largest gain [38%]. By 1991, it employed more people than the manufacturing sector. The highest growth in metropolitan area employment was in the Ann Arbor area (91.2%), while the lowest was in the Lansing – East Lansing metropolitan area (4.1%) (The Michigan economy, 2001).

Even though the proportions of different sectors of Michigan economy changed over time (Figure 2.4), the diversification index was quite stable during

the last quarter of the 20th century, and almost all that time it was below both Midwestern and US indexes, so Michigan economy was more specialized (Figure 1.6).

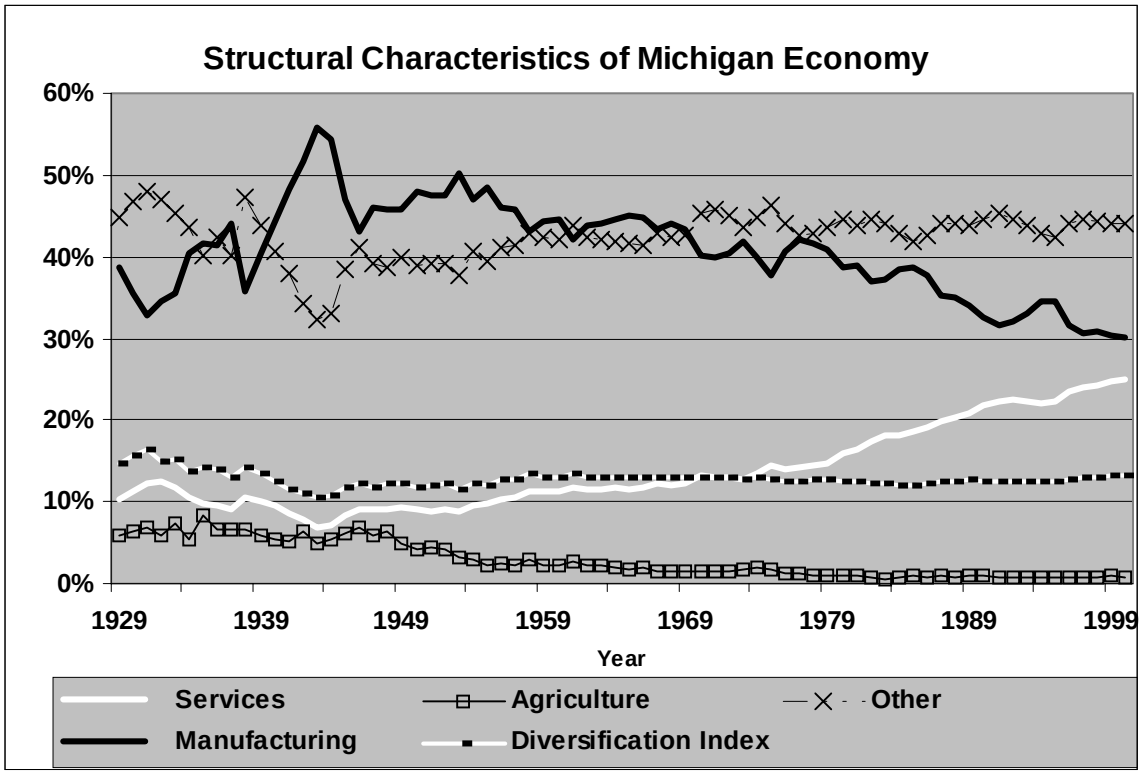

Figure 2.4. Diversification Index and Structure of Total Personal Income, Michigan

Data: Based on the Bureau of Economic Analysis, U.S. Department of Commerce data for personal income.

Note: Diversification index is scaled down by 10 for representation purposes.

In 2000, the total Michigan labor force was 4,926,463 people (49.5% of the total population); 5.8 percent of them were unemployed. At the same time the Midwest experienced 5.1 percent of unemployment and U.S. had 5.8 percent of labor force unemployed.

In Michigan the highest level of unemployment was in Montmorency (12.4%), Cheboygan (14.2%) and Mackinac (14.7%) counties. On average, the unemployment rate in rural counties was higher than in metropolitan areas – 6.6 percent versus 5.6 percent. Among rural counties, metropolitan adjacent ones experienced lower unemployment rate (5.7%) than the counties that are not adjacent (7.2%).

The highest drop in the unemployment rate during 1989-1999 was in the Detroit and the Grand Rapids-Muskegon-Holland metropolitan areas (3.2 points). The Upper Peninsula's unemployment rate increased by (0.6 points) during the same period (The Michigan Economy, 2001).

According to Site Selection Magazine (The Michigan Economy, 2001), Michigan is highly ranked in the categories of new development & expansion, Technology/R&D and Venture Capital among the U.S. states.

Economic development policies.

The modern phase of development policies started in the post World War II period. In general, it followed the national path, described in part one. By the end of the 20th century Michigan had more than 40 programs and policy tools and its economic development efforts were recognized as one of the best in the country (The Evolution of Economic Development in Michigan, 2000; Survey of Economic Development Programs in Michigan, 2001).

Development policies can be arrange into following groups: 'tax incentives for business expansion and relocation, worker training and recruitment support, ombudsman services, infrastructure support for local communities to aid

development efforts, technology and research support, and image building' (The Evolution of Economic Development in Michigan, 2000, p. 1). Different programs are of different importance for different regions and types of business, but a few of them economic development experts consider as the most important. Among them are[11]:

- Michigan Economic Growth Authority (MEGA), offering a reduction in taxes for medium and large companies planning to locate or expand facilities in Michigan;
- Renaissance Zones, providing selected communities a zero tax regime for firms and individual residents;
- Empowerment and Enterprise Community Zones, providing a federal grant and employer tax credits for selected communities;
- Conditional Land Transfers (425 Agreements), allow communities to share property tax revenue generated by a business unit which uses land and services such as sewerage in more than one community;
- Brownfield Development Authorities, allowing local units to use tax increment for re-development of "blighted" and "functionally obsolete" sites;
- Tax Increment Finance Authorities (TIFA), allowing to use tax increment to finance development efforts;
- Downtown Development Authorities, allowing to use tax increment to finance a downtown infrastructure development efforts.

[11] A more detailed description of the programs is presented in the Appendix 1

In addition, an effectiveness of the development programs in a particular region depend a lot on the activity of local developers. In the following chapters an attempt to estimate the influence of the above-mentioned programs on income growth rate is made.

2.2. STRUCTURAL AND SPATIAL CHARACTERISTICS OF MICHIGAN PERSONAL INCOME

As the focus of this paper is on Michigan personal income growth, the distribution of it is described in more detail in this section. The choice of personal income as a key variable allows to rely on results of other recent studies of U.S. economy (Rupasingha et al., 2002) and, as it was mentioned earlier, is traditional in policy analysis.

During 1989 –1999 the Michigan personal income per capita grew from $18,276 to $27,854 and the average growth rate was 5.2 percent (Figure 2.5), ‘outpacing the national average annual growth rate of 4.5 percent’ (The Michigan Economy, 2001, p.3). That growth was not distributed evenly across Michigan counties (Figure 2.6). The highest and lowest growing counties are presented in the Table 2.2.

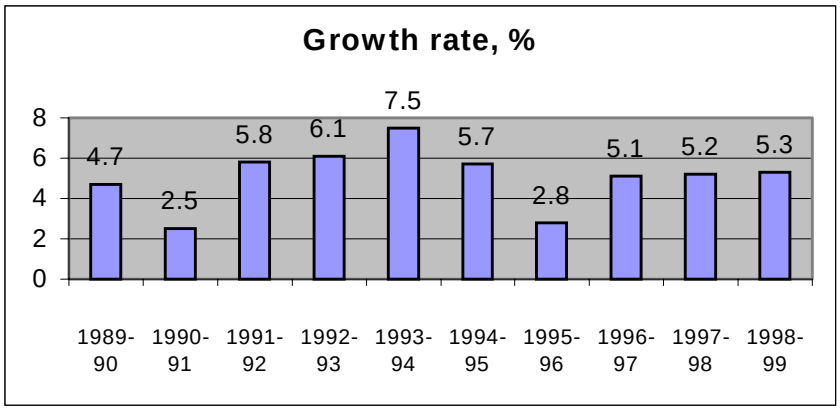

Figure 2.5. The Growth Rate of Michigan Personal Income, 1989 – 1999

Data: Based on the Bureau of Economic Analysis, U.S. Department of Commerce data for personal income.

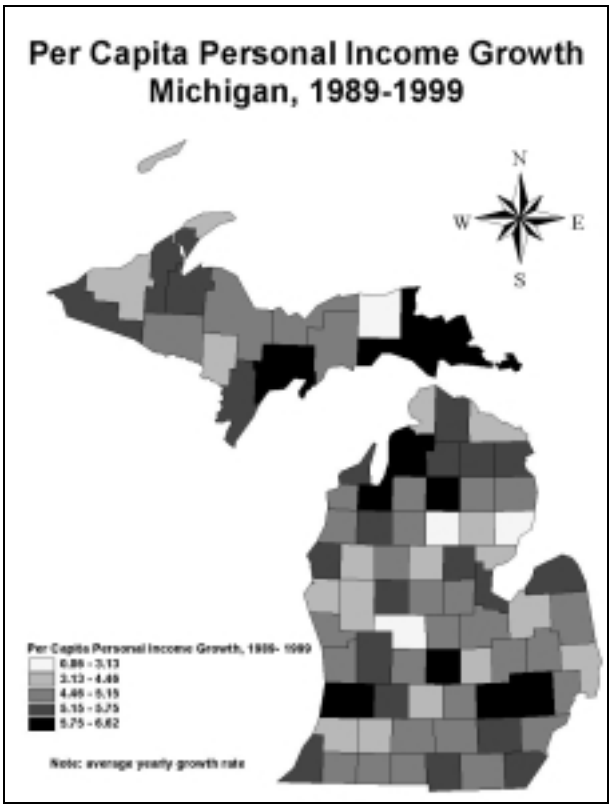

Figure 2.6. Michigan growth rate, 1989-99

Data: Based on the Bureau of Economic Analysis, U.S. Department of Commerce data for personal income.

Table 2.2. The Michigan counties with highest and lowest income growth rate, 1989-99

Counties with lowest growth rate, percent		Counties with highest growth rate, percent	
• Luce	0.86	• Charlevoix	6.17
• Iosco	2.76	• Clinton	6.21
• Roscommon	2.84	• Allegan	6.53
• Montcalm	3.13	• Antrim	6.56
• Oceana	3.53	• Grand Traverse	6.62

In 1999, Michigan was ranked 17th in the U.S. by the level of per capita personal income and 3rd in the Midwest[12]. In 1989, it was 21st in the U.S. The counties with highest and lowest level of per capita personal income in the 1999 are presented in the Table 2.3. The geographical distribution of per capita personal income in Michigan in 1999 is shown on Figure 2.7.

Table 2.3. The Michigan counties with highest and lowest Per Capita Income Level, 1999

Counties with lowest level, $		Counties with highest level, $	
• Oscoda	14,378	• Macomb	29,754
• Lake	15,701	• Midland	30,547
• Ogemaw	16,466	• Livingston	32,620
• Kalkaska	16,639	• Washtenaw	34,623
• Luce	16,751	• Oakland	43,342

[12] Based on the Census 2000 data

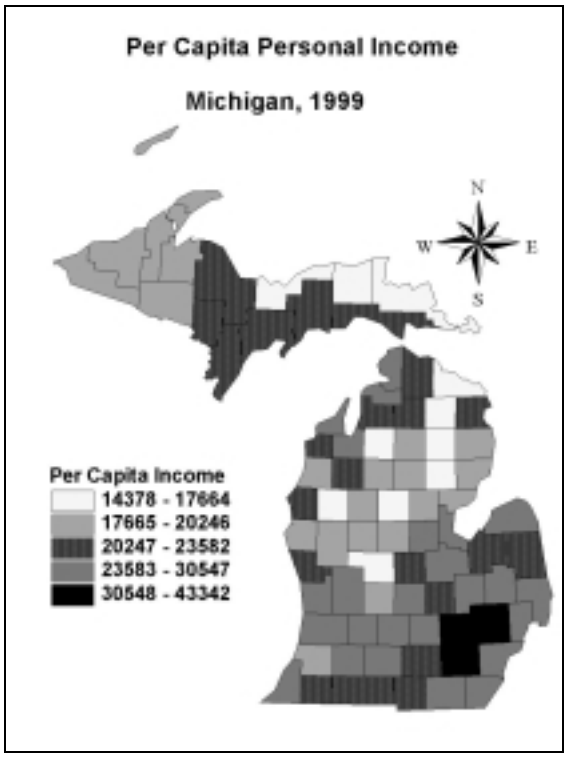

Figure 2.7. Per Capita Personal Income in Michigan, 1999

Data: Based on the Bureau of Economic Analysis, U.S. Department of Commerce data for personal income.

During the period 1999 – 2000 Michigan per capita income grew with the rate of 4.57 percent[13] while the U.S. average was about 5.84 percent[8]. The counties with highest and lowest growth rate in the 1999-2000 are presented in the Table 2.4. The spatial distribution of growth in Michigan during the 1999 - 2000 is shown on Figure 2.8.

[13] Based on the Bureau of Economic Analysis data.

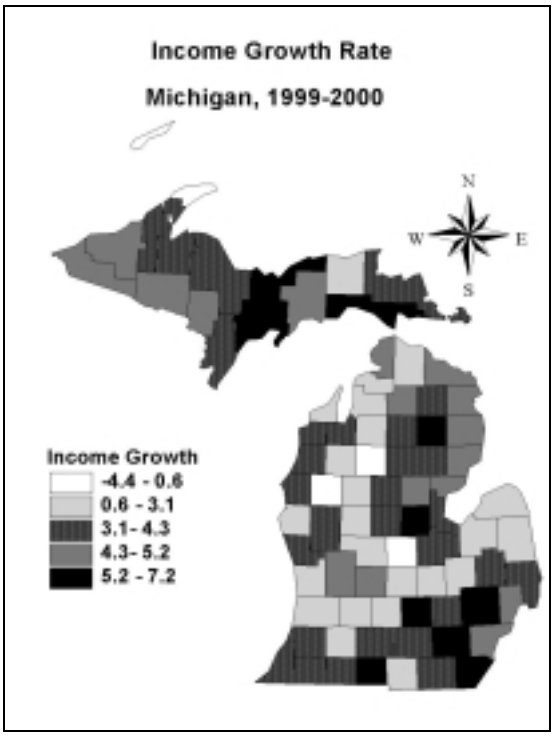

Figure 2.8. Per Capita Personal Income Growth in Michigan, 1999 - 2000

Data: Based on the Bureau of Economic Analysis, U.S. Department of Commerce data for personal income.

Table 2.4. The Michigan counties with highest and lowest income growth rate, 1999 - 2000

Counties with lowest rate, Percent		Counties with highest rate, Percent	
Gratiot	-4. 4	Monroe	5.7
Missaukee	0.6	Oakland	5.8
Keweenaw	0.6	Alger	5.9
Lake	0.6	Washtenaw	5.9
Antrim	1.3	Oscoda	7.2

Another characteristic of income distribution is the level of inequality (Gini Index). It represents how even the income distributed between different shares of population (Economic Indicators, 2000). The modified version of the Gini Index, constructed for the Michigan counties on the basis of Census 2000 data, is presented in Figure 2.9. It is modified so that counties with more equal

distribution of income have higher index. The counties with highest and lowest value of the index are presented in Table 2.5.

Table 2.5. The Michigan counties with highest and lowest level of income inequality, 1999

Counties with lowest index value (higher level of inequality)		Counties with highest index value (lower level of inequality)	
Wayne	0.303	Allegan	0.339
Clare	0.310	Eaton	0.342
Saginaw	0.311	Clinton	0.343
Lake	0.312	Ottawa	0.344
Genesee	0.312	Livingston	0.347

Poverty rate is another dimension of the income distribution. It presents a percentage of people whose income is below the poverty level. Distribution of poverty in Michigan counties is presented in Figure 2.10. The counties with highest and lowest poverty rates are presented in Table 2.6.

The issue of income distribution is not addressed directly in the following analysis. But it is controlled in the cross-sectional model.

Table 2.6. The Michigan counties with highest and lowest poverty rate, 1999

Counties with lowest poverty rate		Counties with highest poverty rate	
Livingston County	3.4	Mecosta County	16.1
Clinton County	4.6	Wayne County	16.4
Lapeer County	5.4	Houghton County	16.8
Leelanau County	5.4	Lake County	19.4
Barry County	5.5	Isabella County	20.4

Note: poverty rate as percent of population for whom poverty status is identified

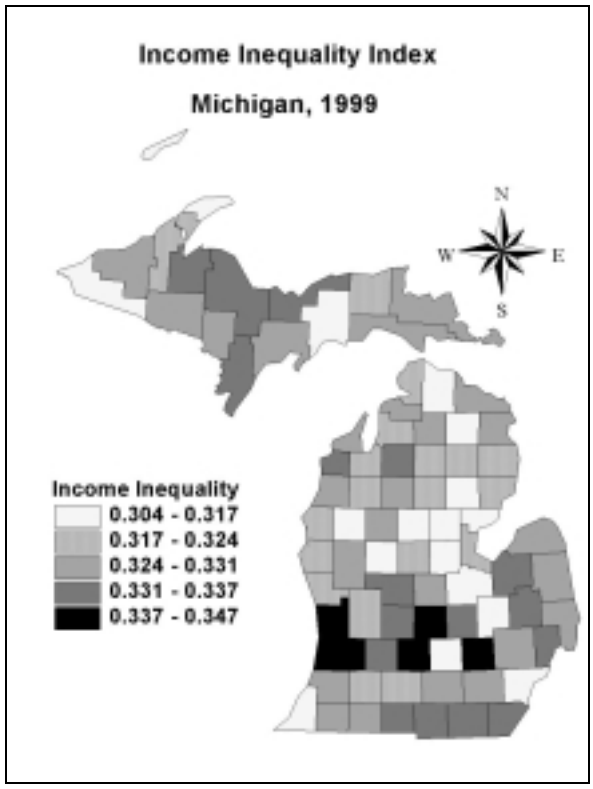

Figure 2.9. Michigan income inequality, 1999

Data: Census 2000, Census Bureau.

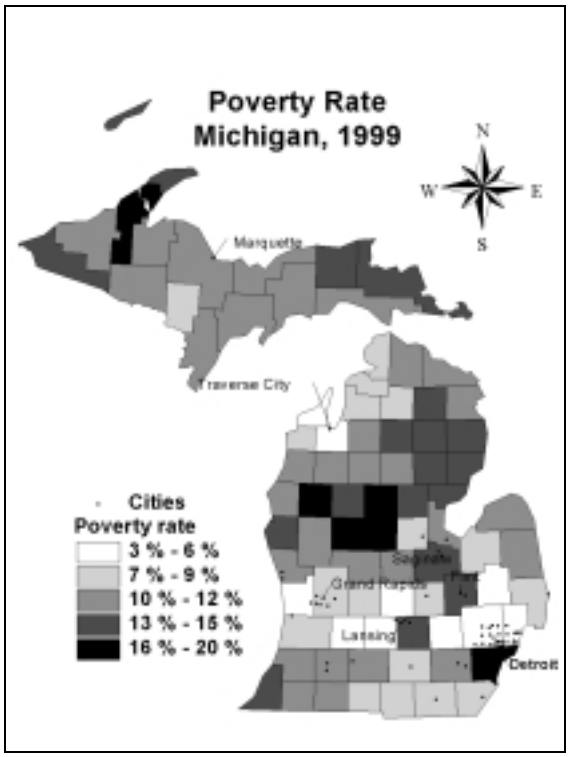

Figure 2.10. Poverty Rate, 1999

Data: Census 2000, Census Bureau.

The next part presents empirical analysis of how theories presented in part one explain income growth rate in Michigan counties controlling for geographic, demographic and other characteristics of a region.

3. MICHIGAN ECONOMIC DEVELOPMENT: EMPIRICAL ANALYSIS

As it is presented in the previous section, average income level and growth rate differ from one Michigan county to another. Theories reviewed in part one explain this diversity by different level of diversification of local economy, different condition of social and business environments, impact of development policies and influence of other geographic, economic and social factors.

To proceed with empirical analysis of the presented theories, the factors mentioned above are viewed in a neoclassical framework. A conditional convergence model (Barro, 1998) is used to test hypotheses stated below. The model suggests that a growth level is negatively related to initial level of capital, conditioned by the environmental variables. Those variables, in turn, determine a steady state of an economy. The model used for the analysis is described in more detail in section 3.2. The focus on the state economy allows eliminating a lot of unobservable factors in the environmental structure, such as differences in a state law and some cultural differences.

Following propositions are tested in this section:

- That the reviewed theories do provide an explanation of the difference in growth rates between Michigan counties. In particular, that the diversification level, level of high-tech industries development and “social attractiveness” are positive and significant in the Michigan growth equation.

- Regarding the rural versus urban dimensions of development, a statement is tested that the influence of development policies and social attractiveness factors on growth is statistically different in rural and urban areas.
- And finally, that a set of Michigan development policies has a significant and positive impact on per capita income growth.

An econometric model and the variables used for hypothesis testing are presented, and results of an econometric analysis are discussed. All regressions are run using STATA 7.0 econometric software.

3.1. UNIT OF ANALYSIS

Economic growth is viewed in the literature at different levels: countries, geographical regions, states/provinces, and counties. Each of these approaches has its own advantages and disadvantages. Having a lot of variation in some factors, cross-country and cross-state studies tend to omit many factors from the analytical model. Those factors might be cultural (institutional and historical) differences as well as the differences in legislature and natural environment. In addition, large regions are typically not uniform across the entire area. Using smaller units, like counties, for countrywide study eliminates the above-mentioned problems, but only to some extent. The problem with small geographic regions is that it is quite hard to get consistent data for all units used in the analysis. Usage of different geographical units (census tracts, school districts), different methods and standards to report statistics across the region of study contribute to that problem.

One way to avoid the above-mentioned difficulties is focusing on a smaller geographic region, for example a state, and studying it with respect to its subdivisions. The disadvantage of such an approach is usually the small number of observations (subdivisions) and lower variation of dependent and explanatory variables. This approach is used in this paper to analyze patterns of economic growth in Michigan. It allows performing the analysis within the same federal and state legislative environment, approximately the same cultural and historical background, and can track the geographical differences if needed. Smaller spatial divisions such as Minor Civil Divisions and U.S. Bureau of Census tracts cannot be used for the purpose of our analysis due to the lack of data at this level.

3.2. MODEL AND FACTORS

The starting point in this analysis is a neoclassical growth model modified by Barro (1998). In his model per capita GDP growth rate is determined by initial level of capital y (both physical and human), conditioned on a set of environmental variables y^* determining a steady state of a local economy. This set includes variables describing quality of life, population growth, power of law and democracy level, business environment and inflation. The author tried different approaches to estimate the model parameters and found that the results from cross-section analysis are the most informative due to the smaller (in most cases) standard error and measurement error bias (Barro, 1998, pp. 39-41).

Barro also indicates that the results suffer from the measurement error and omitted variables problems.

To address those limitations and decrease the degree of bias of the estimates, other authors add other variables to the model. Rupasingha et al. (2002) found positive correlation between per capita income growth rate and ethnic diversity. Positive correlation was also found with number of non-government/ not-for-profit organizations as a proxy for a level of social capital. Negative correlation was found with a level of income inequality. The authors also found strong correlation in time and in space.

Démurger et al. (2001) found a significant influence of geographic factors and economic policy on income growth in Chinese provinces. Among the geographic factors they consider the distance from the coast and percentage of a province population living within 100 km of coastline as a proxy for ability to participate in sea-based international trade. The percentage of area within a province with a slope greater than 10 percent, the average slope of a province, and average elevation were used as proxies for topology factors. A dummy for the preferential policy within a province, weighted by a level of the economic freedom provided, presents the policy influence. The authors found that the geographic factors are as important as the policy for Chinese provincial economic growth, and that the geographic influence has a longer time lag.

Traditionally growth is conditioned on geographic factors. Such factors as access to markets through sea-based trade, has roots in Adam Smith's "Wealth of Nations" (Sachs et al, 2001.) Other geographic factors influencing steady state

of an economy are climate, land quality and other natural endowments. Most often geographical factors are controlled through regional dummies in studies of the U.S. economy.

To summarize, all of these factors can be put in five groups: one for initial level of capital and four for environmental conditions. They are: geographic, economic, socio-demographic and economic development policy factors (Table 3.1.) A model describing income growth in Michigan counties should consider impact of factors mentioned above. And so, it takes the form:

$$PCI\_gr = \beta_0 + \beta_1 log(PCI) + \beta_2\ Bachgrad + \beta_3\ Bachgrad * log(PCI)$$
$$+ \mathbf{x}\beta + \beta_4\ Lttd + \beta_5\ Lngd + u \qquad (1)$$

Where dependent variable *PCI_gr* is county per capita income growth, *log(PCI*) and *Bachgrad* present initial level of capital. Variable *log(PCI*) is a natural logarithm of initial level of per capita income. It is used as a proxy for level of physical capital. *Bachgrad*[14] is the percentage of adult population with bachelor degree or higher; this variable is used as a proxy of human capital. Both variables are measured as deviation from sample mean.

The **x** represents a vector of environmental factors in the growth equation. The way to control for impact of those factors is discussed below.

[14] Whenever it is available the data for the year 1999 is used. When the data for 1999 is not available the value for the closest year is used (in most cases it is either 1990 or 2000).

Table 3.1. Conditional factors for a growth rate

Study/ country/ time period	Dependent variable/ geographic unit of study	Initial capital	Geographic	Economic and business	Socio-demographic	(Development) policy	(Adj.) R^2
Barro/ cross-country/ 60-90	Per Capita GDP Growth Rate/ country	Per Capita GDP (log) (-1); Human capital (male schooling) (+1); Their interaction (-1)	Quality of life (log(life expectancy)) (0); Population growth (log(fertility rate)) (-1)	Terms of trade change (0); Inflation rate (-1); Government consumption ratio (-1)	Democracy index (+1);	Rule of law index (+1);	.76
Rupasingha et al. / U.S./ 90-97	Per Capita Income Growth / county	Per Capita Income Level (log) (-1) Educational level (human capital) (+1);	Access to highways (+1); Labor force (+1); Rural/ urban area (-/+ 1); Multi-state geographical regions (0); Longitude/ latitude Instrumental variable for autocorrelation control (1)	Local Tax Level (+0)	Social Capital (+1); Inequality (-1); Ethnic diversity (+1)	Right-to-work law (0); Infrastructure development spending (spending on highway construction) (+0)	(0.426)
Demurger et al. / China / 79-98	Growth of per capita province GDP / province	Initial GDP level (-1); Education level(+1)	Ability to participate in sea – based trade (+1); Transportation cost (0)	Share of agriculture (+1); Share of state sector (0)		Open economic zone policy (+1);	.89

Note: 0 – found non significant statistically and practically;
1 – found significant;
+/- - positively/negatively related to the dependent variable.

The variables *Lttd* and *Lngd* are the geographical latitude and longitude of a county center respectively. They are used to control for spatial correlation (Treating of spatial correlation will be discussed later in more detail).

To verify whether the theories discussed earlier have explanation power in Michigan income growth equation the variables presenting effects mentioned in those theories are included in the original model. In particular the following hypotheses are tested.

1. The first one is whether *the level of diversification has a statistically significant influence on regional economic growth in Michigan*. For this purpose the model (2) is used.

$$PCI\_gr = \beta_0 + \beta_1 capl + \boldsymbol{X}\beta + \beta_3 Lttd + \beta_4 Lngd + \beta_5 divers + u \qquad (2)$$

In the model (2) and later *capl* is a set of variables presenting initial level of capital. In the model *divers* is a proxy for diversification level of a county economy and is computed following Keinath (1985) using the formula:

$$\text{divers} = \frac{1}{\sum_{i=1}^{N} | 1/\text{N} - \text{I}_\text{i} |}$$

Where *N* is number of industrial sectors in economy, I_i is a share of personal income earned in a sector *i*. The denominator is a sum of absolute deviations of industry portions in total income from equal shares. In his work Keinath (1985) makes a conclusion that the index works well while as few as three major categories are used.

The diversification index is constructed in a way that more diversified economies have higher value of index. The following thirteen industry groups are used to construct the index.

- Agriculture,forestry,fishing and hunting, and mining
- Construction
- Manufacturing
- Wholesale trade
- Retail trade
- Transportation and warehousing,and utilities
- Information
- Finance,insurance,real estate,and rental and leasing
- Professional,scientific,management, administrative,and waste management services
- Educational,health and social services
- Arts,entertainment,recreation,accommodation and food services
- Other services (except public administration)
- Government and government enterprises
- Public administration

Those groups correspond a new North American Industry Classification System used in the Census 2000.

The tested hypothesis is that the *divers* has positive effect on growth.

2. Impact of high-tech industries and “social attractiveness” of a region on income growth is tested using model (3.).

$$PCI\_gr = \beta_0 + \beta_1 capl + \boldsymbol{X}\beta + \beta_3 Lttd + \beta_4 Lngd + \beta_5 htech + \beta_6 satt + u \qquad (3)$$

Where *htech* is a proxy for high-tech industries constructed as a share of the Information industry and the Professional, Scientific, and Technical Services industry in a county employment[15]. In the model (3) "social attractiveness" *satt* is a set of factors that attracts professionals to live in a particular area. In general it is a level of social infrastructure development.

Following variables are included in *Satt*:

i) Quality of school education –the percentage of Michigan Educational Assessment Program (MEAP) Test Composite Passing is used as a proxy;

ii) Crime rate;

iii) Availability of consumer services – a share of consumer service industries in total employment is used as a proxy. The following industries are considered as the consumer services: Educational, Health and Social services; Arts, Entertainment, Recreation, Accommodation and Food services; Other services (except public administration);

iv) Availability of childcare – the number children enrolled in child care centers and preschools per thousand of population under 5 years is used as a proxy;

v) Availability of higher education – a number of students enrolled to colleges and universities per thousand of population 18 years old and over is used as a proxy;

vi) Quality of medical care – infant mortality rate is used as a proxy;

[15] Based on the Census 2000 data.

vii) Other factors – a median housing value is used as a proxy.

Two approaches are used to represent *Satt* in the equation (3). First, principal component might represent the effect of the whole sat of *Satt*. Second, a subset of the variables might be chosen to represent the whole set. Comparison of these two approaches is presented later.

To summarize a *hypothesis that the share of high-tech industries and "social attractiveness" index have positive influence (or at least are jointly significant) on the personal income growth* is tested.

3. Regarding the rural versus urban dimension of the development a hypotheses *that the impact of the factors, mentioned previously, on growth have statistically significant difference in rural and urban areas is tested*. The following model is estimated.

$$PCI\_gr = \delta_0 + \beta_1 capl + \boldsymbol{X}\beta + \beta_3 Lttd + \beta_4 Lngd + \delta_5 satt + \delta_6 h\_tech + \delta_7 divers + \delta_8 rur + \delta_9 h\_tech*rur + \delta_{10} satt*rur + \delta_{11} divers*rur + v \quad (4)$$

Where *rur* is dummy variable, taking 1 if a county is outside the metropolitan area's commuting zone (Beale codes 5, 7, 9).

4. The joint significance of a set of Michigan development policies in the growth equation is tested as the next hypothesis. The following model is considered.

$$PCI\_gr = \beta_0 + \beta_1 capl + \boldsymbol{X}\beta + \beta_3 Lttd + \beta_4 Lngd + \beta_5 mega + \beta_6 ren + \beta_7 eez + \beta_8 a425 + \beta_9 brn + \beta_{10} tifa + \beta_{11} dda + u \quad (5)$$

The following proxy variables are used to represent the policy treatment:

- *mega* represents number of jobs created by Michigan Economic Growth Authorities per 1,000 inhabitants of a county;
- *ren* is a proxy for the Renaissance Zones influence. The area of a Zone is normalized by the population.
- *eez* is a proxy for the Empowerment and Enterprise Community Zones influence. The area of a Zone is normalized by the population.
- *a425* is a proxy for the Conditional Land Transfers (425 Agreements) influence. The number of agreements signed per 1,000 inhabitants of a county is used;
- *brn* is a proxy for the Brownfield Development Authorities influence. The number of authorities in a county approved per 1,000 inhabitants of a county is used;
- *tifa* is a proxy for the Tax Increment Finance Authorities influence. The number of authorities, approved before the program was closed, per 1,000 inhabitants of a county is used;
- *dda* is a proxy for the Downtown Development Authorities influence. The number of authorities approved per 1,000 inhabitants of a county is used.

The policy variables are normalized in a way that the policy treatment per 1,000 of population is compared. In addition the difference in the policy effect in rural and urban areas is estimated.

Finally, all the models include a set of variables **X** representing impact of geographic, social and economic factors on steady state of a local economy. The

studies of Barro (1998), Rupasingha et al. (2002) and Démurger et al. (2001) show the significance of those factors. Also correlation between those factors and variables of interest is assumed. And so, their effect should be controlled. Some of the variables, like the democracy index and the rule of law index are purposely left out of the scope of the model due to their low variation among Michigan counties. The set of variables used to control for the environment effect are presented in Table 3.2.

Table 3.2. Environmental Factors Controlled in the Model

Geographic factors	
Hway	Miles of highway per thousand of inhabitants
Pop_gr	Population growth
Markt	Depth of local consumer markets
Economic	
Tax	Local property tax level
Unemp	Unemployment
Socio-demographic	
Labor	Labor force participation
inequal	Income inequality
Ethnic	proportion of ethnic groups (or ethnic diversity)

Note: more details are presented in Appendices 2, 3; policy impact is studied as separate hypothesis.

As in the case with variables in “social attractiveness” set, two ways of presenting control variables in econometric model are considered.

3.3. DATA DESCRIPTION

Many sources of data were used (Appendix 2) to estimate the models described above. Among them are the Bureau of Census, the Bureau of Economic Analysis, State of Michigan government and non-government agencies. County level data for the years 1999 and 2000 is used for OLS

estimation. This data set has a few problems. As indicated by the source agencies, the data could contain measurement errors. Some of those errors, for example the MEAP, are systematically correlated with other variables, like income level. In addition, the summary statistics (Appendix 4) indicate the presence of outliers. These are Gratiot, Oakland and Isabella counties. Also, a presence of heteroskedasticity is detected.

Using heteroskedasticity robust regressions and dropping the observation for the Gratiot County solve the last two problems. Gratiot County has relatively low income growth rate in the 1999-2000 period possibly because of a measurement error in population counting. The other outliers remain in the sample because the variables exhibiting this do not affect the results as much as the observation from Gratiot County.

For panel data analysis county level data is used for the years 1990 – 2000. Many variables available in the year 2000 from the Census of Population are not available annually. Due to this restriction panel data model is used to test just the last hypothesis.

3.4. ESTIMATION PROCEDURE

First, all the hypotheses are tested using an OLS estimation procedure. Then impact of development policies on income growth is estimated with a panel data model.

Many factors are controlled in this analysis. Due to the relatively low number of observations (83 counties), a problem with small number of degrees of freedom is expected.

Two approaches are used to decrease number of variables. First, principal components are used (Kennedy, 1998) to control for effect of original level of capital, environmental conditions (geographic, economic and socio-demographic factors) and social attractiveness of a county.

Following that procedure the Kaiser criterion (Eigenvalues > 1) was used (Coakley, 2001) to choose the number of components to represent a group of factors. It turned out, that in most cases more than one principal component should be used to represent a group of variables. This fact does not allow increasing significantly the degrees of freedom using this approach.

Another approach is using proxy variables to represent the influence of the groups of factors. Variables were chosen among those in the groups.

Each of the approaches has its benefits and drawbacks. In the first case controlling for large number of factors might reduce omitted variables bias in the coefficients of interest. But on the other hand, the estimated coefficients on indexes constructed are more difficult to interpret for policy purposes. And, what is more important, the model specification cannot be justified by comparing with other studies.

Using fewer original variables as proxies for the effect of the factor groups defined at the beginning of this study, puts us back to the original problem – how to decrease the bias. But on the other hand it gives meaningful interpretation of the results and allows increasing degrees of freedom. Nevertheless, both approaches are used and results are compared in the next section.

Regarding panel data analysis for the last hypothesis testing a ten-year time period (1990-1999) is considered. A slight modification of the original model is required due to the data availability restriction. The variables used together with policy variables as controls are presented in the Table 3.3.

Table 3.3. Specification of the economic model

Capital	Controls
• Physical capital • Human capital • Effective capital = (Physical capital)*(Human capital)	• Employment rate • Crime rate • Population density • Population growth • Property tax • Highway infrastructure • Share of income from manufacturing in total personal income • National activity index

The national activity index is used to control for the trend in the national economy. The share of manufacturing is used as a proxy for local economy structure. Also fewer policy variables are available.

The following procedure is used:

1. To avoid problems in the OLS estimators, POLS is used for 10 one-year time periods for 83 Michigan counties. The result is also thought to be biased due to presence of unobserved effects. The wrong sign on the coefficients and the result of Breusch-Pagan test are treated as the evidence of that problem.

2. One way to decrease the unobserved effect bias is using the random effect model. But the results are also questionable. The Breusch-Pagan test indicates the presence of correlation between unobserved factors

and idiosyncratic error (Kennedy (1998), Wooldridge (2001)). In addition the Hausman test for specification returns the significant difference between fixed and random effect results (Kennedy (1998), Wooldridge (2001)). Thus the conclusion is made that the fixed effect model provides more consistent results. So the fixed effect model is used to test the effect of the economic development policies on the income growth.

3. Ten one-year time periods were used to estimate the short run effect and two five-year time periods (1990-94 and 1995-1999) were used to estimate the long run effect of the policies. One might argue that this model suffers from spatial correlation and measurement error. But the assumption is made that most of that problems are caused by factors constant over time. And so, the fixed effect model solves that kind of problem.

4. The urban vs. rural effect of the policies is tested. Both short and long run effect are estimated with respect to the rurality factor. In the panel data model with unobserved fixed effect, population density is used as a measure of rurality. It is measured as a deviation from sample mean by year.

One possible source of bias in OLS estimators is a spatial dependence between some variables and the error term. It generates a correlation between variables along the same “spatial trend”. For example employment and income levels in two neighbor counties are mutually dependant. Using of longitude and latitude allows controlling for such a “spatial” trend and to reduce a correlation over space with omitted variables. As an example, variables with high spatial

correlation are unemployment rate, consumer services availability and highway mileage per inhabitant of a county.

Another way to treat a spatial dependence is to use of dummy variables for regions with some unique features. In case of Michigan those dummies might be set for the Upper Peninsula counties or western counties of the Lower Peninsula, or for rural counties.

Each of the approaches has some advantages and drawbacks. Using of longitude and latitude allows controlling for almost any kind of spatial trends, but it is hard to provide an interpretation of the estimated results. On the other hand, the above mentioned dummies might provide a way to control for some unique geographic or economic features of the regions mentioned above. But dummies cannot control for the effects like dependence in distribution of income between metropolitan and metropolitan-adjacent rural counties or distribution of economic activities due to the land quality. Some additional attention to this issue will be paid at the beginning of the next section and a proper way to control for spatial dependence will be justified.

Another variable deserves a special attention before turning to the hypothesis testing. It is a population growth rate. This variable captures two effects. First one is natural population growth, which is an excess of births over deaths. The second effect is migration.

The first effect is expected to have negative correlation with per capita income growth. Simple algebra shows that, holding income level fixed, an

increase in population lowers the income per capita. Barro (1998) in his cross-country study uses fertility rate and life expectancy to control for this effect.

On the other hand, migration has strong positive correlation with income level (Helliwell, 1996). And so, it should have positive correlation with income growth (increase in income level should attract more immigrants).

The lump effect of those two components heavily depends on the scale of the analysis. At a country level regions can be treated as closed economies. The effect of international migration is reduced highly by distortions such as visas and work authorizations. And so, the negative effect dominates and it is confirmed by empirical findings of Barro (1998). On the other hand, at the level of regions the effect of migration should dominate (which increases efficiency of distribution of labor across a country). With reduction of a size of unit of analysis the effect of migration decreases but commuting patterns start playing role in distribution of labor, income and growth (people who migrated to a faster growing region might settle in metropolitan adjacent rural areas and commute to work in a central city).

The assumption that population growth does not correlate with some omitted variables is not realistic. Moreover it suffers from simultaneity bias in growth equation. But population growth cannot be dropped from the model without increasing a bias, because it strongly correlates with income, unemployment and tax levels as well as some other variables (Helliwell, 1996). So, the coefficient on the population growth rate is expected to be biased, but it is kept as a control.

3.5. CONTROLLING FOR SPATIAL DEPENDENCE

The issue of proper control for spatial dependence should be reviewed prior to hypothesis testing. The regression model used to test the second hypothesis is considered for that purpose and a case with proxy variables is used (Appendix 5).

Regression (1) uses the original approach, where longitude and latitude are used. In the regression (2) dummies for the Upper Peninsula and western counties of the Lower Peninsular are used, while in regression (3) a dummy for coastal counties is used instead of the dummy for the western counties. In regression (4) a dummy for rural counties is used as the control. And, finally, in the regression (5) none of the mentioned above variables is used.

It turns out that none of the variables suggested as controls for spatial dependence jointly or independently is statistically significant. Moreover, dropping them does not make any significant difference in the estimated effects of other variables as long as other control variables correlated over space are present in equation. Also dropping of spatial controls saves degrees of freedom. Assuming that variables like unemployment rate and population growth control for most of the spatial dependence, the other variables considered above as controls for spatial correlation are not used further.

3.6. ECONOMETRIC RESULTS

Returning to the hypothesis testing, two approaches are used. First, the original models are estimated using principle components of environmental variables as controls.

Proxy variables are used then to represent each group of factors. Level of initial capital is controlled using natural logarithm of per capita income. Percentage of population with a bachelor degree or higher is used to represent human capital and the interaction of that two terms represents effective capital. The geographic, social and economic factors are controlled by variables: population growth, unemployment and tax levels are used as proxies.

No proof for significance of the level of diversification in explaining the income growth was found testing the first hypotheses (See Table 3.4. and Appendix 6 for details). The same conclusion can be made by comparing Figure 3.1 to income and growth maps presented earlier: the areas with high level of diversification do not have systematically higher or lower growth rate or income level.

This result was expected. As it was mentioned in part one, economic development at the current stage is driven primarily by specialization in high-tech industries. Another explanation might be that the OLS model does not control for some unobserved factors and so the result might be biased.

Table 3.4. Impact of Diversification Level

Dependent Variable:	(1) pci_gr	(2) pci_gr	(3) pci_gr	(4) pci_gr
divers	**0.136 (0.17)**	**-0.432 (0.42)**	**-0.248 (0.32)**	**-0.643 (0.63)**
divers_r		**1.098 (0.71)**		**0.754 (0.51)**
Observations	82	82	82	82
Adjusted R-squared	0.14	0.13	0.20	0.18

Note: Robust t statistics in parentheses; Regressions (1) and (2) include principal components; (3) and (4) use proxy as controls; *divers_r* represent a difference in diversification level impact in rural and urban areas.

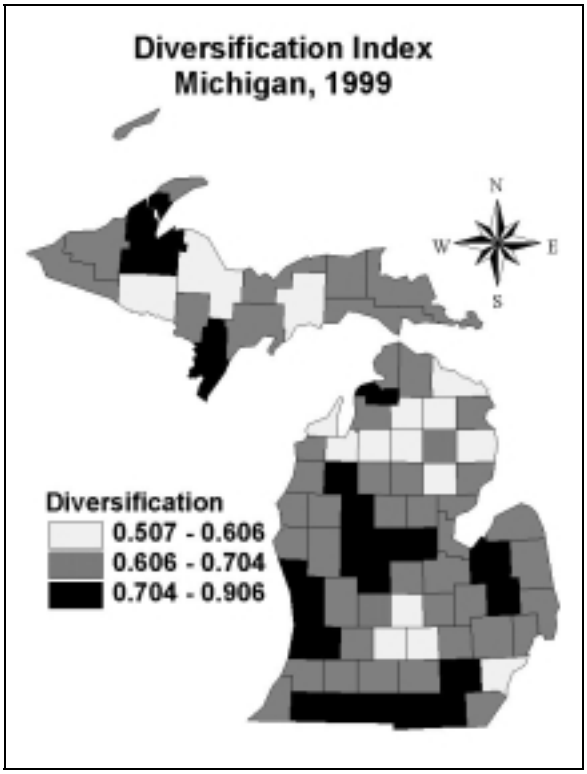

Figure 3.1. Diversification Index

Data: Based on BEA data for personal income

The results of testing the second hypothesis are presented in Table 3.5. (See also Appendix 7). The regressions (1), (2) and (3) are processed using

principal components of control variables. In regressions (4), (5) and (6) proxy variables are used. In regressions (1) and (4) the effect of social attractiveness factors is presented with principal components, while in regressions (2), (3), (5) and (6) the share of consumer services in total income is used as a proxy for social attractiveness factors. Finally, regressions (3) and (6) estimate the difference in social attractiveness factors and the high-tech industries effects in rural and urban areas.

Table 3.5. Effect of social attractiveness factors and the high-tech industries on growth

Dependent Variable:	(1)	(2)	(3)	(4)	(5)	(6)
	pci_gr	**pci_gr**	**pci_gr**	**pci_gr**	**pci_gr**	**pci_gr**
cust_sv		-1.225 (0.50)	-1.283 (0.49)		6.654 (1.69)+	7.477 (1.55)
satt_1	0.137 (0.51)			0.359 (1.42)		
satt_2	-0.090 (0.67)			0.176 (0.93)		
satt_3	0.185 (0.66)			-0.052 (0.27)		
satt_4	-0.094 (0.42)			-0.028 (0.22)		
hightech	12.209 (0.72)	17.187 (1.07)	22.725 (1.33)	1.795 (0.12)	7.906 (0.58)	4.525 (0.32)
rur			-0.643 (0.32)			-1.386 (0.74)
cust_s_r			1.953 (0.39)			1.793 (0.40)
h_tech_r			-7.717 (0.31)			9.371 (0.37)
Observations	82	82	82	82	82	82
Adjusted R-squared	0.12	0.14	0.11	0.19	0.21	0.19

Note: Robust t statistics in parentheses; Observations: **82;**

+ significant at 10%; * significant at 5%; ** significant at 1%

Suffix **r**_ means that the variable is an interaction of a variable and rural dummy.

No evidence for joint significance of social attractiveness factors and the high-tech industries was found. But, there is some weak evidence supporting this

hypothesis. Social attractiveness (in the proxy model setup) and share of high-tech industries practically has a positive effect, although evidence of their statistical significance is weak. The difference in the influence of social attractiveness factors and high-tech industries between urban and rural areas is not statistically significant.

Considering the policy analysis, the estimation results are presented in Table 3.6. (See also Appendix 8). Regression (1) is processed with principal components as controls, while in regression (2) proxy variables were used. For most of the policies the results are quite similar in both cases. The association between Michigan Economic Growth Authorities (MEGA), Empowerment and Enterprise Community Zones (EEZ) and Conditional Land Transfers (425 Agreements) and growth is found to be statistically significant.

Table 3.6. Development Policies

	(1)	(2)
Dependent Variable:	**pci_gr**	**pci_gr**
mega	0.005	0.007
	(1.09)	(1.74)+
ren	3.476	2.913
	(0.76)	(0.58)
eez	-0.113	-0.131
	(1.59)	(1.81)+
a425	5.973	5.376
	(2.59)*	(2.25)*
brn	-0.122	1.563
	(0.07)	(0.83)
tifa	-3.687	-0.957
	(0.51)	(0.13)
dda	-1.367	-4.116
	(0.38)	(1.37)
Observations	82	82
Adjusted R-squared	0.16	0.25

Robust t statistics in parentheses; + significant at 10%; * significant at 5%; ** significant at 1%

The practical effect is also interesting. Evaluating at average level among the counties with the policy treatment, MEGAs are associated with an increase in the growth rate of 0.26 percent, while the association with 425 agreements is 0.31 percent. Renaissance Zones (REN) increase the growth rate on average by 0.14 percent.

The effect of the development policies was also tested separately (See Appendix 9 for details) as well as the difference of the policy effect between urban and rural areas was estimated (See Table 3.7 and Appendix 10). Tested separately, policies' effect has not changed significantly.

In analyzing policy effects in urban and rural areas, a couple more results can be added. The association between Downtown Development Authorities (DDA) and growth becomes statistically significant but negative and the difference between effects on rural and urban growth is statistically significant. The effect of Downtown Development Authorities in rural areas practically is less negative. The same statement is true about Renaissance Zones - logically one would expect a negative association with growth as these are targeted towards areas experiencing decline. The impact of Empowerment and Enterprise Community Zones and 425 Agreements becomes less significant when rural and urban areas are assessed separately.

Table 3.7. Development Policies (Rural/Urban)

Dependent Variable:	(1) **pci_gr**	(2) **pci_gr**	(3) **pci_gr**	(4) **pci_gr**	(5) **pci_gr**	(6) **pci_gr**	(7) **pci_gr**
mega	0.009 (1.76)+						
mega_r	-0.007 (0.98)						
ren		-26.064 (1.79)+					
r_ren		27.481 (1.86)+					
eez			-0.531 (0.03)				
r_eez			0.434 (0.03)				
dda							-10.782 (1.93)+
r_dda							9.443 (1.45)
tifa						-0.861 (0.07)	
r_tifa						1.641 (0.10)	
brn					-1.358 (0.27)		
r_brn					2.032 (0.39)		
a425				4.636 (1.48)			
r_a425				2.969 (0.55)			
Observations	82	82	82	82	82	82	82
Adjusted R-squared	0.19	0.18	0.20	0.22	0.17	0.17	0.20

Note: Robust t statistics in parentheses; Observations: 82; Prefix **r**_ means that the variable is an interaction of policy variable and rural dummy. Such variables are used to estimate difference in policy effect in rural and urban areas. + significant at 10%; * significant at 5%; ** significant at 1%

Even though statistical and practical significance is observed, results should be interpreted with a fair amount of skepticism. First, the unbiasness cannot be proved. Second, the policy variables might be endogenous and capture the effect of other factors rather than policy. Also selection bias presents. For example, faster growing areas might need more 425 agreements to facilitate

already existing growth. On the other hand, the Brownfield and Downtown Development authorities might capture the effect of disadvantaged zones. Also, growth may “cause” policies as places that are growing might have better capacity to access state economic development programs. Moreover, the factors mentioned above might have effect on the long-term growth rather than the short run.

The results improve significantly when a panel data model (POLS) with fixed effect is used. Estimating the POLS model with the fixed effect returns the results that correspond the findings of other authors (See Table 3.1.) for the variables used as controls.

The estimation result for the policies impact in the short and long run is presented in the Table 3.8 (see also Appendix 13). Evidence of positive statistically and practically significant impact of Michigan Economic Growth Authorities on income growth in the short run was found. The effect is interpreted in the following way. The increase in number of the authorities by one per thousand of population increases a growth rate by 0.24 percent over a year or on average by 0.1 percent per year during five-year period, holding the other factors fixed. But one note of caution should be given. It is not known whether the presence of the policy effects business decision while choosing a new location, or whether this decision is conditioned on other socio-economic characteristics of the region.

The impact of Brownfield Redevelopment Authorities is quite interesting. It changes from unrealistically big and negative statistically significant in a short run

to positive practically and statistically significant in a long run. One possible explanation is that in a short run the variable might capture the effect of abundant, blighted and obsolete properties instead of the policy effect.

Table 3.8. The policy effect in short and long run

Dependent Variable:	**Short run** pcigr	Dependent Variable:	**Long run** pcigr5
mega_cn	**0.240 (1.77)+**	**mega_n5**	**0.001 (0.70)**
ren_ma	**-0.291 (1.15)**	**ren_ma5**	**-0.002 (1.30)**
eez	**-0.002 (0.02)**	**eez5**	**-0.000 (0.17)**
brn	**-9.844 (1.67)+**	**brn5**	**0.171 (1.78)+**
a425	**7.883 (1.74)+**	**a425_5**	**0.034 (0.73)**
Observations	830	Observations	166
Adjusted R-squared	0.05	Adjusted R-squared	0.23
Number of cntyfips	83	Number of cntyfips	83

Note: Robust t statistics in parentheses; + significant at 10%; * significant at 5%

Suffix **5** indicates that the variable is five year average.

The conclusion about presence of selection bias and/or endogenaity of the policy variables can be made looking at the rest of the results. Similar to OLS results, in the current setup it seems that the policy variables capture the effect of other socio-economic factors rather than the policy.

Table 3.9. presents the policy effect with respect to population density, which is used in the fixed effect model as a measure of rurality.

The current setup of the model does not allow estimating the change of the policy effect with respect to population density in a short run. The possible cause is selection bias of the policy variables, multicolinearity and lag dependency of some variables like population density.

Table 3.9. The policy effect with respect to population density

Dependent Variable:	**Short run**	Dependent Variable:	**Long run**
	pcigr		**pcigr5**
mega_cn	**0.140 (0.85)**	**mega_n5**	**-0.002 (0.98)**
mega_r	**0.401 (0.56)**	**mega_r5**	**-0.000 (0.18)**
ren_ma	**-0.399 (1.49)**	**ren_ma5**	**-0.004 (1.99)+**
ren_r	**0.001 (0.37)**	**ren_r5**	**-0.000 (0.13)**
eez	**-0.525 (0.64)**	**eez5**	**0.001 (0.12)**
eez_r	**-0.033 (0.64)**	**eez_r5**	**0.000 (0.14)**
brn	**-2.277 (0.16)**	**brn5**	**0.698 (2.93)****
brn_r	**0.430 (0.51)**	**brn_r5**	**0.032 (2.31)***
a425	**5.603 (0.48)**	**a425_5**	**-0.060 (0.55)**
a425_r	**-0.227 (0.25)**	**a425_r5**	**-0.010 (1.14)**
Observations	830	Observations	166
Adjusted R-squared	0.05	Adjusted R-squared	0.27

Note: Absolute value of t statistics in parentheses; + significant at 10%; * significant at 5%; ** significant at 1%; Suffix **_r** means that the variable is and interaction of policy variable and rural dummy. Such variables are used to estimate difference in policy effect in rural and urban areas. Suffix **5** indicates that the variable is five year average.

The long run effect is statistically significant in two out of the five policies. They are Renaissance Zones and Brownfield Authorities. As before, the result is thought to be bias. (See Appendix 14 for more details). The results indicate that the effect of Brownfield Authorities in urban areas is higher and this difference is statistically significant.

CONCLUSIONS

Many authors find that economic growth is currently driven by the high-tech industries and factors making a region socially attractive. Regional economic development policies also play an important role in the development process.

The literature also shows that many geographic, social and historical factors make a path of local economic development distinguished from the path of other regions. In this sense local development policies account for local specifics better than federal ones, and so they become better targeted than the federal counterparts and, as a result, are more efficient.

This paper tests empirically how well the theories reviewed explain economic growth in Michigan. The impacts of the diversification level, social attractiveness factors, high-tech industries and development policies on per capita personal income were examined using county level data for the years 1999 and 2000. A cross-sectional model was used with controls for the level of initial capital, geographic, economic and social factors.

Social attractiveness factors and some of the policies were found to be statistically and practically significant in explaining income growth, while no support was found to justify the significance of other factors of interest. This is partly due to data limitations and partly due to the weaknesses of cross-sectional models. To overcome some of these problems the contribution of Michigan

economic development policies to personal income growth was studied using panel data model with unobserved fixed effect for the years 1990 - 1999.

The contribution of Michigan Economic Growth Authorities to county personal income growth was found to be positive and significant in the short run. The effect of Brownfield Redevelopment Authorities is found to have positive and significant effect in the long run, and the effect of this policy is found to increase with population density. It is found, that Conditional Land Transfer Agreements (policy facilitating existing growth) have the highest effect in a short run, while Brownfield Authorities (policy targeting improvement in land use and environmental quality) have the highest impact on the long run growth. The effect of the other policies cannot be tested precisely in the current setup due to selection and endogeneity biases in the policy variables. Also some of the control variables are thought to be lag dependant, bringing additional problems.

An attempt to fix selection bias in the Renaissance, Empowerment and Enterprise Community Zones was made, but it is found to be not feasible due to the low number of observations with the policy treatment. Fixing other above-mentioned problems might be a direction for future research. For that purpose the following steps may be taken:

- The hypothesis about impact of diversification, high-tech industries and social attractiveness on growth could be tested with panel data from the 1980, 1990 and 2000 Census data.

- Fix the endogeneity and lag dependency in the control and policy variables by using instrumental variables. The further lags of the variables can be used as instruments (Papke, 1994; Barro, 1998);
- Fix the endogeneity and selection bias of policy variables by Tobit Models (Wooldridge, 2001) conditioning on socio-economic characteristics of a county in 1990 like a poverty rate;
- Estimate also the difference of the policy influence over time (Papke, 1994);
- The effect of Brownfield Authorities can be improved by controlling for the number of brownfield sites.

An implication of the findings mentioned earlier is that factors attracting professionals and wealthy residents to a local area play significant role in regional growth. Among those factors are availability and quality of consumer services as well as public services. Policies targeted development of those services together with development of export-oriented high-tech industries should be of the primarily attention to policymakers and economic developers. Another important vehicle of growth is a group of policies facilitating existing growth and improving environmental conditions.

Michigan government has taken important steps in that direction. Establishing Smart Zones to accelerate development of high-tech clusters and Link-Michigan to improve accessibility of the Internet represent some of those steps. Other possible steps in that direction may be providing low interest mortgages to young professionals and specialists moving to Michigan.

Regarding rural development, improving quality and accessibility of consumer and public services, like fire protection, medical services and communication, are of primary importance.

Most of the policies analyzed in this paper do not have income growth as a primary purpose. Rather they target employment growth or use of land. To proceed with the policy study some other methods such as benefit-cost analysis may be used.

Many other important problems were outside the scope of this paper. Among them are how different policies influence the income distribution among different segments of the society, what factors influence the development of particular industries, and what influences the migration and commuting patterns of different groups of the labor force. Those questions can be explored in future research. The current work is an attempt to improve understanding of those problems and the nature of economic growth in Michigan.

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APPENDICES

APPENDIX 1.

ECONOMIC DEVELOPMENT PROGRAMS

Michigan Economic Growth Authorities

The Growth Authorities are granted Single Business Tax and Income Tax Credits for terms ranging from 8 to 20 years. The program targets “large-scale investment and job creation, as well as attraction of technology-intensive business” (Survey, 2001, p. 20). It was started in the 1995 and by the end of 1999 there were 74 authorities which directly and indirectly created 82,389 jobs. The distribution of the job effect is presented in Figure A.1.

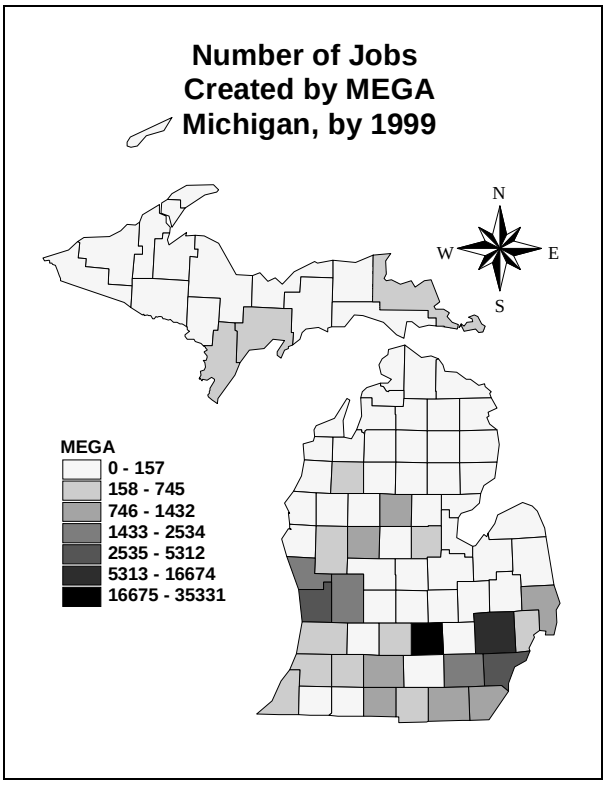

Figure A.1. Jobs Created by MEGAs by the End of 1999

Data: Michigan Economic Development Corporation

Renaissance Zones

The program was established in 1996 and 11 zones were created for terms ranging from 10 to 15 years (Figure A.2). It provides a waiver of all state and local taxes for businesses and individuals moving to the zone (Survey, 2001).

Figure A.2. Michigan Renaissance Zones

Data: Michigan Economic Development Corporation

Empowerment and Enterprise Community Zones

The program provides federal grant and employer tax credits for distressed areas. It became effective in 1995 and Michigan got one

Empowerment (the City of Detroit) and four Enterprise Community Zones (Clare County, City of Flint, Lake County and City of Muskegon Heights).

Conditional Land Transfers (425 Agreements)

"The Conditional Land Transfer Act of 1984 allows municipalities to share … property tax revenues generated by conditional land transfer for the purpose of economic development" (Survey, 2001, p. 45). This program "is commonly used when a business entity seeks to expand operations but cannot be accommodated for lack of real estate or adequate utility infrastructure". By the beginning of the 1999, more than a hundred agreements were set between different municipalities (Figure A.3).

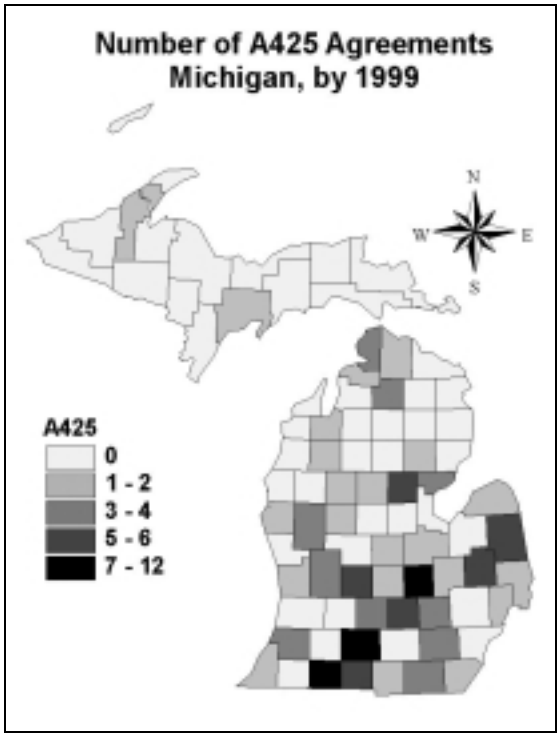

Figure A.3. Number of Conditional Land Transfer Agreements

Data: Citizens Research Council of Michigan

Brownfield Development Authorities (BDA)

"The program allows local units of government to establish brownfields authorities and use tax increments financing for environmental remediation … [The B]rownfields Authorities are eligible for Single Business Tax credits" (Survey, 2001, p. 31). Michigan adopted the program in 1996 and by the end of 1999 there were 145 BDAs (Figure A.4).

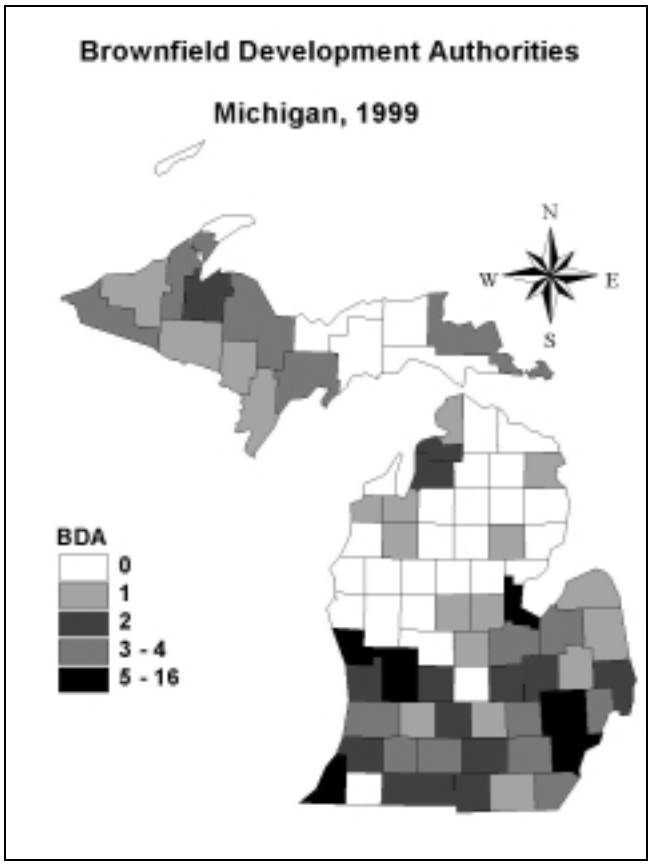

Figure A.4. Number of Brownfield Development Authorities by the End of 1999

Data: MSU Extension, Victor Institute for Responsible Land Development and Use

Tax Increment Finance Authorities (TIFA)

The program allows local government to capture non-local taxes from TIFAs and use the tax increment to finance local development efforts of TIFAs. The distribution of TIFA is presented in the Figure A.5. The program is closed for new applicants since 1987.

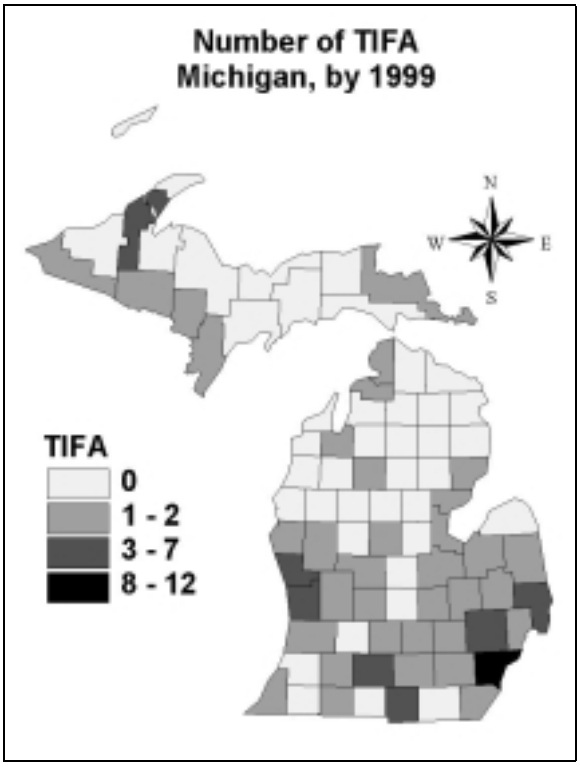

Figure A.5. Number of Tax Increment Finance Authorities

Data: Citizens Research Council of Michigan

Downtown Development Authorities (DDA)

DDA "legislation allows local units of government in Michigan to establish an authority in designated downtown areas. Established DDAs are eligible for tax increment financing public and private grants, and have taxing power." (Survey, 2001, p. 35). The distribution of DDAs is presented in the Figure A.6.

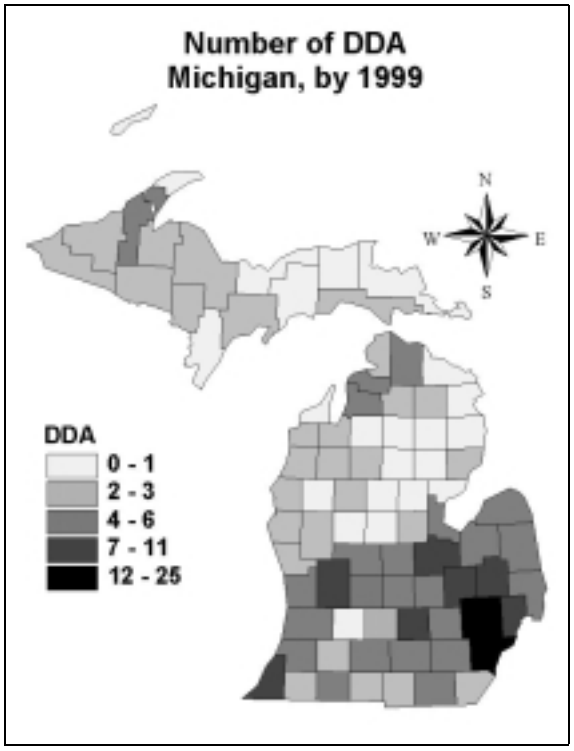

Figure A.6. Downtown Development Authorities

Data: Citizens Research Council of Michigan

APPENDIX 2.

VARIABLES AND DATA SOURCES

Variable name	Description	Time period	Units	Data source	Method of construction
Geographic					
Lttd	Latitude			Census Bureau	Original data
Lngd	Longitude			Census Bureau	Original data
Rur	Rurality	1990		ERS	Original data
Pop	Population	1990-2000		BEA	Original data
Markt	Depth of local consumer markets	1999		Census Bureau	County population + population of neighboring counties
Area	Land Area		Sq. miles	Census Bureau	Original data
Hway_m	Miles of highway, total	1990-2000		MDOT	Original data
UP	Dummy for Upper Peninsula counties				
Coastal	Dummy for counties boarding Great Lakes				
Economic					
PCI	Per Capita Income	1990-2000		BEA	Original data
Divers	Diversification index	1999		Based on BEA data	Sum of deviations from equal shares in personal income
Tax	Local property tax level	1990-2000		Michigan Treasury	Original data
Unemp	Unemployment	1999	%	Census Bureau	Original data
empl	Employment	1990-2000		Based on BEA data	Employment as percent of total population
cfnai	National activity index	1990-2000		Chicago Federal Reserve Bank	
manuf	Share of manufacturing	1990-2000		Based on BEA data	Share of manufacturing in total personal income
htech	proxy for high-tech industries share	1999		Based on Census 2000	Share of the Information industry and the Professional, Scientific, and Technical Services industry in a county employment
Development Policy					
mega_j	Number of jobs, created by Michigan Economic Growth Authorities (MEGAs) in a county	1990-2000		MEDC	Original data
ren_a	Total area of Renaissance Zones in a county	1990-2000	Acres	MEDC	Original data
eez_a	Total area of Improvement and Enterprise Community Zones	1990-2000	Sq. miles	CRC	Original data

a425_n	Number of Conditional Land Transfer Agreements (425 Agreements) signed	1990-2000		CRC	Original data
Brn_n	Number of Brownfield Development Authorities, approved	1990-2000		MSUE	Original data
tifa_n	Number of Tax Increment Finance Authorities (TIFA), approved prior the program was closed	1999		CRC	Original data
dda_n	Number of Downtown Development Authorities, approved prior to the year 2000	1999		CRC	Original data
Socio-demographic characteristics					
Labor	Labor force participation	1999	%	Census Bureau	Original data
Bachgrad	Percentage of adult population (25 and over) with more then bachelor's	1999	%	Census Bureau	Original data
inequal	Income inequality	1999			0.5-Gini[16]
Housv	Housing value, median	1999		Census Bureau	Original data
Kids5	Population under 5 years old	1999		Census Bureau	Original data
Adult18	18 years and over (2000)	1999		Census Bureau	Original data
Adult	Population 25 years and over	1999		Census Bureau	Original data
infmor	Infant mortality rate	1999		MI Department of Community Health	Original data
Ethnic	proportion of ethnic groups (or ethnic diversity)	1999		Based on Census 2000	Sum of squared proportions of ethnic groups
Crime_n	Number of indexed crimes in 2000	1990-2000		MI Police Department	Original data
MEAP	The percentage of Michigan Educational Assessment Program (MEAP) Test Composite Passing	1999		Standard& Poor's	Original data
Cust_sv	Proxy for availability of consumer services	1999		Based on Census 2000	Share of Educational, Health and Social services; Arts, Entertainment, Recreation, Accommodation and Food services; Other services (except public administration) in a county employment
Chld_enr	Nursery school, preschool enrollment (2000)	1999		Census Bureau	Original data
Coll_enr	College or graduate school enrollment (2000)	1999		Census Bureau	Original data

[16] Gini index is approximated for family income using the data from Census Bureau Demographic Profiles.

APPENDIX 3.

CONSTRUCTION OF SOME VARIABLES

Variable	Method of construction	Comments
Initial capital (*capl)*		
lPCI	*log(PCI*)	
Capital	*Bachgrad * log(PCI*)	
Geographic factors *(geo)*		
Pop_gr	*(Pop_(i) - Pop_(i-1))/ Pop_(i-1)*	Population growth (modified)
Hw_a	*Hway/Area*	Level of road infrastructure development
Development policy factors (policy)		
mega	*mega_j/ Pop*1000*	proxy for the Michigan Economic Growth Authorities influence
ren	*ren_ma/Pop*1000*	proxy for the Renaissance Zones influence
eez	*eez_a/Pop*1000*	proxy for the Empowerment and Enterprise Community Zones influence
a425	*a425_n/ Pop*1000*	proxy for the Conditional Land Transfers (425 Agreements) influence
brn	*brn_n/ Pop*1000*	proxy for the Brownfield Development Authorities influence
tifa	*tifa_n/ Pop*1000*	proxy for the Tax Increment Finance Authorities influence
dda	*dda_n/ Pop*1000*	proxy for the Downtown Development Authorities influence
"Social attractiveness" index (satt)		
Crime	1/(crime_n/Pop*100,000)	Influence of crime rate (modified)
Chld	Chld_enr / *Kids5*	Proxy for availability of child care
Hedu	Coll_enr/Adult18	Proxy for availability of higher education
rur	*=1 when Rur_90 takes 5,7 or 9*	Proxy for rural counties non adjacent to metropolitan areas
Dependent variables		
PCI_gr	PCI*_(i)*- PCI*_(i-1)*/ PCI*_(i-1)*	Per capita income growth

APPENDIX 4.

SUMMARY STATISTICS, 1999

Variable	Obs	Mean	Std. Dev.	Min	Max		z-Min	z-Max	County-outlier
Pci_gr	83	3.705	1.566104	-4.3524	7.2263		-5.14487	2.248446	Gratiot
lpci_99	83	0.0000	0.1925	-0.4128	0.6906		-2.1449	3.5877	
capital	83	1.0299	2.4719	-0.8127	15.0786		-0.7454	5.6834	Oakland
pop_gr	83	0.0093	0.0102	-0.0191	0.0353		-2.7822	2.5502	
bachgrad	83	0.0000	7.2535	-8.5651	31.7349		-1.1808	4.3751	
hw_a	83	371.6857	260.5037	33.7988	1226.1890		-1.2971	3.2802	
markt	83	764602.9	1064376	38317	5047358		-0.68236	4.023724	
area	83	684.3834	259.0114	321.3134	1821.051		-1.40175	4.388485	
divers	83	0.66977	0.069621	0.50729	0.90598		-2.33377	3.3928	
tax	83	3.860241	1.165033	2.3	6.6		-1.33922	2.351658	
unemp	83	6.887952	2.42474	3	14.8		-1.60345	3.26305	
cust_sv	83	0.342065	0.058257	0.25036	0.54636		-1.57415	3.50682	
hightech	83	0.045347	0.018578	0.01937	0.13		-1.39826	4.556667	
labor	83	60.45038	6.804166	44.3489	72.4627		-2.36641	1.765436	
inequal	83	0.326217	0.008784	0.3035	0.34683		-2.58615	2.346626	
housv	83	92674.7	28492.91	39700	187500		-1.85922	3.328031	
ethnic	83	0.143026	0.11466	0.03241	0.5538		-0.96473	3.582525	
meap	83	52.53614	5.684137	34.7	66.5		-3.13788	2.456637	
infmort	83	7.084699	2.753054	0	15.22		-2.5734	2.95501	
rur	83	0.506024	0.503003	0	1		-1.00601	0.982054	
crime	83	2722.12	1260.893	621.6188	6749.243		-1.66588	3.193866	
chld	83	0.242057	0.035037	0.168414	0.407871		-2.10187	4.732587	
hedu	83	0.064024	0.055419	0.020939	0.349478		-0.77744	5.150842	Isabella

Summary statistics for policy variables, 1999

Variable	Obs	Mean	Std. Dev.	Min	Max		z-Min	z-Max	County-outlier
mega	30	37.6188	40.6930	0.9683	145.9037		-0.9007	2.6610	
ren	14	0.0484	0.0691	0.0003	0.2249		-0.6959	2.5563	
eez	5	5.3771	7.3731	0.0089	14.6045		-0.7281	1.2515	
a425	41	0.0582	0.0548	0.0023	0.1942		-1.0205	2.4832	
brn	53	0.0792	0.0797	0.0069	0.4010		-0.9073	4.0406	
tifa	43	0.0249	0.0208	0.0023	0.0831		-1.0881	2.7957	
dda	79	0.0735	0.0541	0.0115	0.2550		-1.1468	3.3545	

APPENDIX 5.

REGRESSION MODEL WITH SPATIAL CORRELATION CONTROLLED

	(1)	(2)	(3)	(4)	(5)
Dependent variable:	pci_gr	pci_gr	pci_gr	pci_gr	pci_gr
lpci_99	2.156	2.256	2.202	2.274	2.339
	(1.10)	(1.18)	(1.11)	(1.24)	(1.24)
bachgrad	-0.079	-0.083	-0.093	-0.101	-0.093
	(1.15)	(1.50)	(1.73)+	(1.76)+	(1.72)+
capital	0.195	0.181	0.198	0.204	0.202
	(2.35)*	(2.05)*	(2.25)*	(2.53)*	(2.45)*
pop_gr	-50.200	-45.524	-45.537	-46.987	-47.728
	(2.96)**	(2.78)**	(2.77)**	(3.13)**	(3.19)**
unemp	-0.026	-0.044	-0.031	-0.025	-0.023
	(0.29)	(0.52)	(0.36)	(0.28)	(0.26)
tax	0.122	0.183	0.131	0.190	0.120
	(0.72)	(1.08)	(0.81)	(1.09)	(0.78)
cust_sv	6.624	5.856	6.035	8.390	6.833
	(1.20)	(1.23)	(1.28)	(1.81)+	(1.68)+
hightech	5.596	9.460	11.670	9.387	9.014
	(0.36)	(0.74)	(0.89)	(0.74)	(0.69)
lttd	**0.012**				
	(0.07)				
lngd	**0.062**				
	(0.50)				
up		**0.228**	**0.266**		
		(0.54)	**(0.61)**		
rur				**-0.356**	
				(0.98)	
coastal			**0.003**		
			(0.01)		
coastl_w		**-0.321**			
		(0.88)			
Constant	6.012	1.225	1.093	0.359	0.994
	(0.76)	(0.85)	(0.78)	(0.22)	(0.74)
Observations	82	82	82	82	82
Adjusted R-squared	0.19	0.20	0.20	0.21	0.21

Robust t statistics in parentheses; + significant at 10%; * significant at 5%; ** significant at 1%

APPENDIX 6.

IMPACT OF DIVERSIFICATION LEVEL

Dependent variable:	(1) **pci_gr**	(2) **pci_gr**	**Dependent variable:**	(3) **pci_gr**	(4) **pci_gr**
capl	0.356 (3.51)**	0.362 (3.27)**	pci_99	0.000 (1.28)	0.000 (1.18)
			bachgrad	-0.019 (0.62)	-0.016 (0.51)
			capital	0.150 (1.84)+	0.146 (1.69)+
e_1	0.108 (0.92)	0.131 (0.73)	pop_gr	-56.618 (3.57)**	-57.114 (3.51)**
e_2	-0.279 (3.26)**	-0.276 (3.01)**	unemp	0.065 (0.84)	0.066 (0.82)
e_3	-0.345 (2.32)*	-0.350 (2.26)*	tax	0.129 (0.77)	0.138 (0.75)
divers	**0.136 (0.17)**	**-0.432 (0.42)**	**divers**	**-0.248 (0.32)**	**-0.643 (0.63)**
divers_r		**1.098 (0.71)**	**divers_r**		**0.754 (0.51)**
rur		-1.776 (0.84)	rur		-1.192 (0.55)
Constant	3.598 (2.99)**	4.488 (3.09)**	Constant	2.162 (1.33)	2.797 (1.49)
Observations	82	82	Observations	82	82
Adjusted R-squared	0.14	0.13	Adjusted R-squared	0.20	0.18

Robust t statistics in parentheses; + significant at 10%; * significant at 5%; **

significant at 1%

APPENDIX 7.

IMPACT OF SOCIAL ATTRACTIVENESS AND HIGH-TECH

Dependent variable:	(1) pci_gr	(2) pci_gr	(3) pci_gr	Dependent variable:	(4) pci_gr	(5) pci_gr	(6) pci_gr
capl	0.200 (1.12)	0.222 (1.36)	0.191 (1.07)	pci_99	0.000 (0.91)	0.000 (1.27)	0.000 (1.29)
				bachgrad	-0.108 (1.60)	-0.086 (1.69)+	-0.099 (1.72)+
				capital	0.202 (2.11)*	0.169 (2.02)*	0.198 (2.12)*
e_1	0.245 (1.14)	0.170 (1.30)	0.228 (1.28)	pop_gr	-52.795 (2.95)**	-48.119 (3.24)**	-47.509 (3.04)**
e_2	-0.297 (2.52)*	-0.269 (2.63)*	-0.218 (1.86)+	unemp	0.013 (0.15)	-0.024 (0.27)	-0.020 (0.22)
e_3	-0.474 (1.84)+	-0.390 (2.55)*	-0.394 (2.34)*	tax	0.194 (1.10)	0.123 (0.80)	0.190 (1.09)
cust_sv		-1.225 (0.50)	-1.283 (0.49)	cust_sv		6.654 (1.69)+	7.477 (1.55)
satt_1	0.137 (0.51)			satt_1	0.359 (1.42)		
satt_2	-0.090 (0.67)			satt_2	0.176 (0.93)		
satt_3	0.185 (0.66)			satt_3	-0.052 (0.27)		
satt_4	-0.094 (0.42)			satt_4	-0.028 (0.22)		
hightech	12.209 (0.72)	17.187 (1.07)	22.725 (1.33)	hightech	1.795 (0.12)	7.906 (0.58)	4.525 (0.32)
rur			-0.643 (0.32)	rur			-1.386 (0.74)
cust_s_r			1.953 (0.39)	cust_s_r			1.793 (0.40)
h_tech_r			-7.717 (0.31)	h_tech_r			9.371 (0.37)
Constant	3.248 (4.17)**	3.440 (3.08)**	3.323 (2.68)**	Constant	1.329 (0.63)	-1.123 (0.43)	-1.431 (0.51)
Observations	82	82	82	Observations	82	82	82
Adjusted R-squared	0.12	0.14	0.11	Adjusted R-squared	0.19	0.21	0.19

Robust t statistics in parentheses; + significant at 10%; * significant at 5%; ** significant at 1%

APPENDIX 8.

DEVELOPMENT POLICIES

	(1)	(2)
Dependent variable:	**pci_gr**	**pci_gr**
capl	0.369 (3.44)**	
e_1	0.177 (1.37)	
e_2	-0.285 (3.07)**	
e_3	-0.285 (1.59)	
pci_99		0.000 (1.30)
bachgrad		-0.041 (1.16)
capital		0.181 (2.11)*
pop_gr		-52.617 (2.92)**
unemp		0.090 (1.13)
tax		0.266 (1.63)
mega	0.005 (1.09)	0.007 (1.74)+
ren	3.476 (0.76)	2.913 (0.58)
eez	-0.113 (1.59)	-0.131 (1.81)+
a425	5.973 (2.59)*	5.376 (2.25)*
brn	-0.122 (0.07)	1.563 (0.83)
tifa	-3.687 (0.51)	-0.957 (0.13)
dda	-1.367 (0.38)	-4.116 (1.37)
Constant	3.723 (11.15)**	0.679 (0.37)
Observations	82	82
Adjusted R-squared	0.16	0.25

Robust t statistics in parentheses; + significant at 10%; * significant at 5%; ** significant at 1%

APPENDIX 9.

DEVELOPMENT POLICIES (SEPARATELY)

Dependent variable:	(1) **pci_gr**	(2) **pci_gr**	(3) **pci_gr**	(4) **pci_gr**	(5) **pci_gr**	(6) **pci_gr**	(7) **pci_gr**
lpci_99	1.647 (1.30)	1.462 (1.18)	1.213 (0.99)	1.509 (1.20)	1.471 (1.17)	1.452 (1.16)	1.534 (1.26)
bachgrad	-0.027 (0.83)	-0.021 (0.68)	-0.028 (0.89)	-0.013 (0.41)	-0.022 (0.68)	-0.021 (0.66)	-0.026 (0.82)
capital	0.169 (2.21)*	0.172 (2.28)*	0.198 (2.64)*	0.172 (2.32)*	0.174 (2.33)*	0.172 (2.25)*	0.170 (2.23)*
pop_gr	-57.208 (3.78)**	-54.583 (3.20)**	-51.510 (3.46)**	-57.523 (3.79)**	-54.912 (3.52)**	-55.507 (3.59)**	-58.853 (3.81)**
unemp	0.061 (0.80)	0.062 (0.81)	0.060 (0.77)	0.086 (1.07)	0.064 (0.83)	0.064 (0.82)	0.074 (0.96)
tax	0.155 (0.94)	0.110 (0.68)	0.115 (0.73)	0.126 (0.84)	0.113 (0.71)	0.112 (0.72)	0.167 (1.02)
mega	0.005 (1.72)+						
ren		0.860 (0.20)					
eez			-0.097 (1.01)				
dda							-2.939 (1.20)
tifa						0.300 (0.04)	
brn					0.318 (0.24)		
a425				5.319 (2.19)*			
Constant	3.079 (5.26)**	3.279 (5.78)**	3.259 (5.73)**	2.934 (5.21)**	3.248 (5.48)**	3.269 (5.37)**	3.228 (5.74)**
Observations	82	82	82	82	82	82	82
Adjusted R-squared	0.21	0.20	0.22	0.23	0.20	0.19	0.21

Robust t statistics in parentheses; + significant at 10%; * significant at 5%; ** significant at 1%

APPENDIX 10.

DEVELOPMENT POLICIES (RURAL/URBAN)

Dependent variable:	(1) **pci_gr**	(2) **pci_gr**	(3) **pci_gr**	(4) **pci_gr**	(5) **pci_gr**	(6) **pci_gr**	(7) **pci_gr**
lpci_99	1.596 (1.21)	1.199 (0.92)	1.159 (0.92)	1.544 (1.13)	1.378 (1.07)	1.363 (1.05)	1.273 (1.01)
bachgrad	-0.029 (0.86)	-0.018 (0.57)	-0.027 (0.82)	-0.017 (0.51)	-0.021 (0.66)	-0.020 (0.57)	-0.030 (0.95)
capital	0.171 (2.20)*	0.171 (2.26)*	0.196 (2.56)*	0.180 (2.29)*	0.171 (2.24)*	0.171 (2.18)*	0.167 (2.24)*
pop_gr	-54.518 (3.21)**	-54.581 (3.17)**	-51.690 (3.38)**	-57.554 (3.70)**	-55.018 (3.48)**	-55.506 (3.34)**	-56.856 (3.69)**
unemp	0.073 (0.90)	0.063 (0.78)	0.063 (0.77)	0.083 (0.99)	0.067 (0.82)	0.068 (0.84)	0.056 (0.66)
tax	0.125 (0.63)	0.130 (0.74)	0.126 (0.72)	0.102 (0.59)	0.135 (0.75)	0.129 (0.75)	0.131 (0.74)
rur	0.045 (0.12)	-0.163 (0.46)	-0.059 (0.17)	0.025 (0.06)	-0.188 (0.44)	-0.109 (0.25)	-0.457 (0.97)
mega	0.009 (1.76)+						
mega_r	-0.007 (0.98)						
ren		-26.064 (1.79)+					
r_ren		27.481 (1.86)+					
eez			-0.531 (0.03)				
r_eez			0.434 (0.03)				
dda							-10.782 (1.93)+
r_dda							9.443 (1.45)
tifa						-0.861 (0.07)	
r_tifa						1.641 (0.10)	
brn					-1.358 (0.27)		
r_brn					2.032 (0.39)		
a425				4.636 (1.48)			
r_a425				2.969 (0.55)			
Constant	3.045 (4.81)**	3.295 (5.28)**	3.229 (5.23)**	3.018 (4.95)**	3.263 (4.74)**	3.236 (5.01)**	3.809 (4.78)**
Observations	82	82	82	82	82	82	82
Adjusted R-squared	0.19	0.18	0.20	0.22	0.17	0.17	0.20

Robust t statistics in parentheses; + significant at 10%; * significant at 5%; ** significant at 1%

APPENDIX 11
MICHIGAN COUNTY BEALE CODES

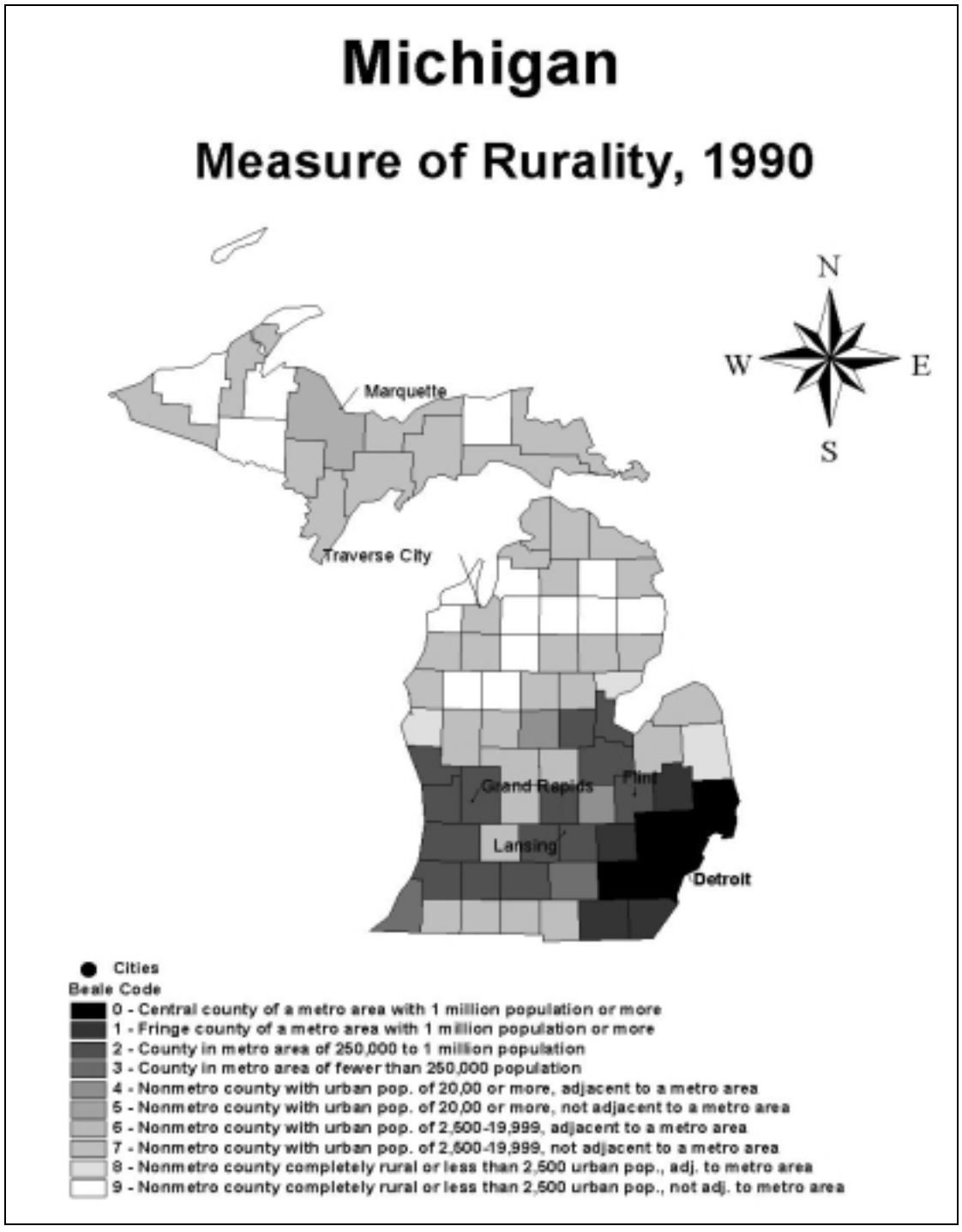

Figure A.7. Michigan County's Beale codes

Data: Economic Research Service. U.S. Department of Agriculture

APPENDIX 12.

COMMUTING ZONES

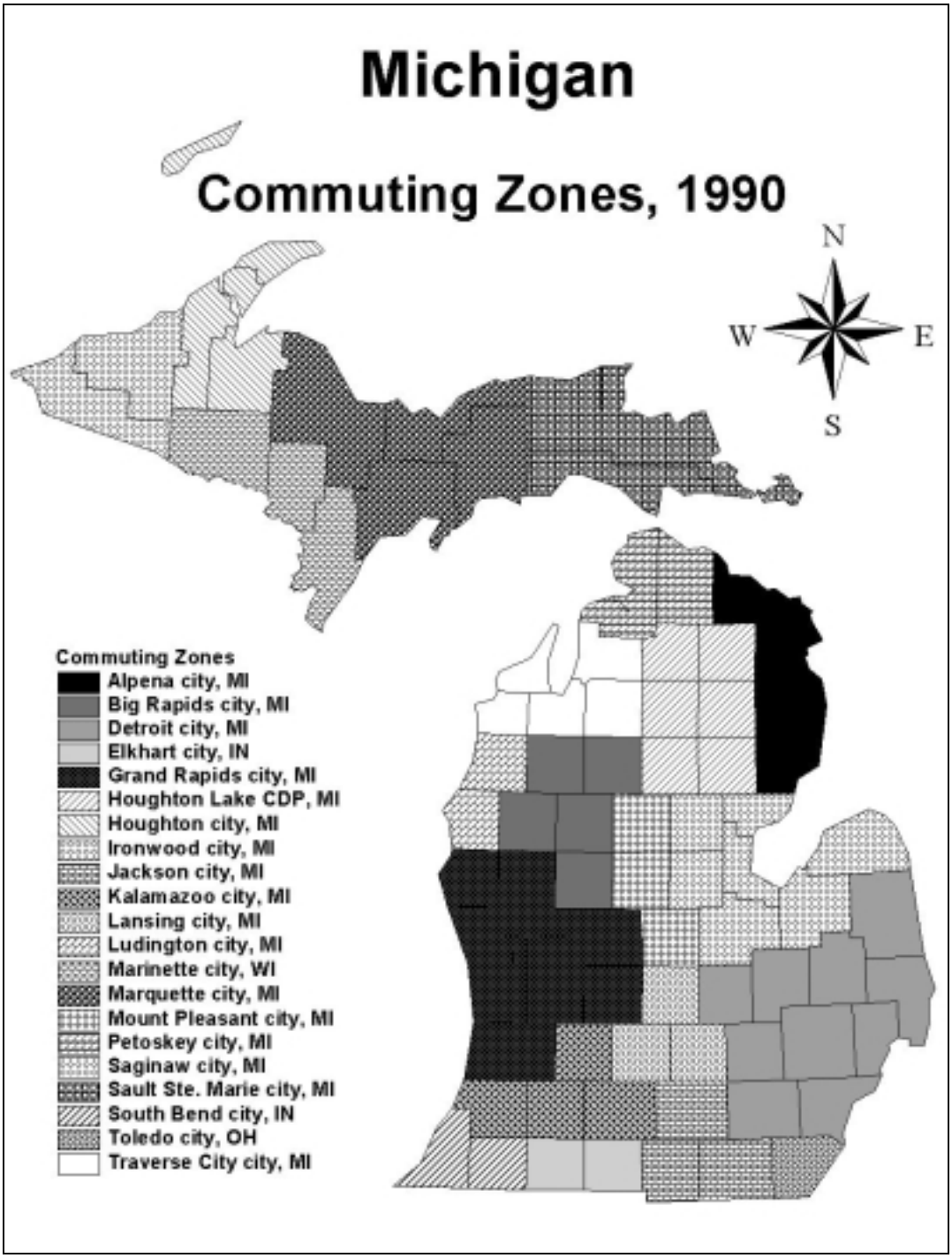

Figure A.8. Michigan Commuting Zones

Data: Tolbert and Sizer (1996)

APPENDIX 13.

POOLED ORDINARY LEAST SQUARES RESULTS FOR THE POLICY EFFECT IN SHORT AND LONG RUN

	Short Run		Long Run
Dependent variable:	**pcigr**	**Dependent variable:**	**pcigr5**
lpci	-22.779 (6.40)**	lpci	-0.260 (8.59)**
bachgrad	0.305 (1.67)+	bachgrad	0.000 (0.25)
capital	-0.241 (0.62)	capital	0.004 (0.95)
empl	2.896 (0.50)	empl5	0.227 (3.53)**
crime	0.035 (2.20)*	crime5	0.000 (1.23)
hway_a	0.011 (3.84)**	hway_a	0.000 (1.84)+
proptax	0.122 (5.83)**	proptax5	0.000 (0.69)
manuf	-0.098 (1.63)	manuf5	-0.001 (0.63)
dens	0.183 (1.48)	dens5	0.000 (0.07)
year	0.112 (1.40)		
cfnai	1.056 (3.51)**	cfnai5	-0.032 (2.26)*
mega_cn	**0.240 (1.77)+**	**mega_n5**	**0.001 (0.70)**
ren_ma	**-0.291 (1.15)**	**ren_ma5**	**-0.002 (1.30)**
eez	**-0.002 (0.02)**	**eez5**	**-0.000 (0.17)**
brn	**-9.844 (1.67)+**	**brn5**	**0.171 (1.78)+**
a425	**7.883 (1.74)+**	**a425_5**	**0.034 (0.73)**
Constant	-228.837 (1.43)	Constant	-0.106 (2.79)**
Observations	830	Observations	166
Adjusted R-squared	0.05	Adjusted R-squared	0.23
Number of cntyfips	83	Number of cntyfips	83

Absolute value of t statistics in parentheses; + significant at 10%; * significant at 5%; ** significant at 1%

APPENDIX 14.

POOLED ORDINARY LEAST SQUARES RESULTS FOR THE POLICY EFFECT IN SHORT AND LONG RUN (RURAL/URBAN)

short run / pcigr		**long run /** pcigr5	
lpci	-23.652 (6.51)**	lpci	-0.252 (8.35)**
bachgrad	0.264 (1.41)	bachgrad	-0.000 (0.23)
capital	-0.225 (0.56)	capital	0.008 (1.61)
empl	3.402 (0.58)	empl5	0.242 (3.82)**
crime	0.036 (2.24)*	crime5	0.001 (2.08)*
hway_a	0.012 (3.94)**	hway_a	0.000 (2.50)*
proptax	0.121 (5.64)**	proptax5	0.000 (1.37)
manuf	-0.100 (1.65)+	manuf5	-0.001 (0.73)
dens	0.228 (1.59)	dens5	0.001 (0.75)
year	0.116 (1.42)		
cfnai	1.044 (3.44)**	cfnai5	-0.020 (1.40)
mega_cn	**0.140 (0.85)**	**mega_n5**	**-0.002 (0.98)**
mega_r	**0.401 (0.56)**	**mega_r5**	**-0.000 (0.18)**
ren_ma	**-0.399 (1.49)**	**ren_ma5**	**-0.004 (1.99)+**
ren_r	**0.001 (0.37)**	**ren_r5**	**-0.000 (0.13)**
eez	**-0.525 (0.64)**	**eez5**	**0.001 (0.12)**
eez_r	**-0.033 (0.64)**	**eez_r5**	**0.000 (0.14)**
brn	**-2.277 (0.16)**	**brn5**	**0.698 (2.93)****
brn_r	**0.430 (0.51)**	**brn_r5**	**0.032 (2.31)***
a425	**5.603 (0.48)**	**a425_5**	**-0.060 (0.55)**
a425_r	**-0.227 (0.25)**	**a425_r5**	**-0.010 (1.14)**
Constant	-237.209 (1.45)	Constant	-0.141 (3.39)**
Observations	830	Observations	166
Adjusted R-squared	0.05	Adjusted R-squared	0.27
Number of cntyfips	83	Number of cntyfips	83

Absolute t statistics in parentheses; + significant at 10%; * significant at 5%; ** significant at 1%