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## Three essays on the role of amenities as an economic development strategy

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**THREE ESSAYS ON THE ROLE OF AMENITIES  
AS AN ECONOMIC DEVELOPMENT STRATEGY**

A Dissertation

Submitted to the Graduate Faculty of the  
Louisiana State University and  
Agricultural and Mechanical College  
in partial fulfillment of the  
requirements for the degree of  
Doctor of Philosophy

in

The Department of Agricultural Economics and Agribusiness

by  
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# TABLE OF CONTENTS

ACKNOWLEDGMENTS .....	ii
LIST OF TABLES .....	vii
LIST OF FIGURES .....	ix
ABSTRACT .....	x
 CHAPTER 1. INTRODUCTION .....	 1
1.1. Introduction .....	1
1.2. Preliminary Understanding of an Amenity .....	3
1.2.1. Concept of an Amenity .....	3
1.2.2. Categories of Amenities .....	4
1.2.3. Characteristics of Amenities .....	5
1.3. Relationship of Interest .....	7
1.3.1. Environmental Degradation in Amenity-driven Economic Growth .....	7
1.3.2. Indirect Policy to Valorize Amenities .....	10
1.3.3. Relationship between an Amenity and Rural Development .....	11
1.4. Identification Strategy .....	13
1.4.1. Meta-analysis .....	13
1.4.2. Cultural Industry: A Derived Consumption of an Amenity .....	14
1.4.3. Economic Instrument Targeted to Film Industry .....	16
1.5. Summary .....	19
1.6. References .....	20
 CHAPTER 2. META-ANALYTIC REVELATION OF THE ROLE OF AMENITIES IN A REGIONAL ECONOMY .....	 23
2.1. Introduction .....	23
2.2. Literature Review on Meta-analysis .....	25
2.3. Method and Data .....	27
2.3.1. Method: Meta-analysis .....	27
2.3.2. Data .....	28
2.4. Estimation and Results .....	36
2.5. Discussion .....	48
2.6. Concluding Remarks .....	52
2.7. References .....	54
 CHAPTER 3. MEASURING REGIONAL COMPETITIVENESS IN SITE LOCATION FOR THE U.S. FILM INDUSTRY .....	 57
3.1. Introduction .....	57
3.2. Literature Review .....	58
3.2.1 Amenities and Regional Economic Growth .....	58
3.2.2. The Supply Chain of the Movie Industry .....	61
3.3. Methodology .....	63
3.3.1. Amenity Index: Principal Component Analysis .....	63

3.3.2. Panel Data Regression .....	65
3.4. Data .....	65
3.5. Estimation and Results .....	74
3.5.1. Measurement of Amenities over the U.S. Counties .....	75
3.5.2. Results of Panel Data Regression .....	78
3.6. Conclusions .....	83
3.7. References .....	84

CHAPTER 4. AN ANALYSIS OF TAX SUBSIDY POLICY ON LOCAL ECONOMIES: A CASE OF THE RISING STATES IN THE FILM INDUSTRY IN THE UNITED STATES .....	89
4.1. Introduction .....	89
4.2. Tax Incentive Program for the Film Industry .....	91
4.2.1. Louisiana's Tax Incentive Program for the Film Industry .....	92
4.2.2. New Mexico's Tax Incentive Program for the Film Industry .....	93
4.3. Literature Review .....	94
4.3.1. Literature on a Quasi-experimental Approach .....	94
4.3.2. Literature on a Film Industry in an Economic Development .....	97
4.4. Methodology .....	100
4.4.1. Matching Method .....	100
4.4.2. Difference-in-Differences Equation .....	103
4.5. Results .....	110
4.5.1. Results of Matching .....	110
4.5.2. Results of Difference-in-differences Regression .....	113
4.6. Conclusions .....	122
4.7. References .....	125
CHAPTER 5. CONCLUSION .....	128
5.1. Summary .....	128
5.2. Policy Implications .....	130
5.3. Limitations and Suggestions to Future Research .....	131
5.4. References .....	132
APPENDIX I. PCA INDEX SCORES OF EACH STATE .....	134
APPENDIX II. RESULTS OF MATCHING: CANDIDATES OF CONTROL GROUP TO LOUISIANA AND NEW MEXICO (RESPECTIVELY) .....	135
APPENDIX III. LIST OF CENTRAL COUNTIES OF MOVIE PRODUCTION AND THEIR NEIGHBORING COUNTIES IN LOUISIANA AND TENNESSEE .....	137
APPENDIX IV. LIST OF CENTRAL COUNTIES OF MOVIE PRODUCTION AND THEIR NEIGHBORING COUNTIES IN NEW MEXICO AND OKLAHOMA .....	138
APPENDIX V. GEOGRAPHICAL ILLUSTRATION OF COUNTIES OF MOVIE PRODUCTION IN LOUISIANA AND TENNESSEE , 2000 (UPPER) AND 2005(BELOW).....	139

APPENDIX VI. GEOGRAPHICAL ILLUSTRATION OF COUNTIES OF MOVIE PRODUCTION IN NEW MEXICO AND OKLAHOMA , 2000 (UPPER) AND 2005 (BELOW) .....	140
VITA .....	141

## LIST OF TABLES

Table 1.1. The Relationship between Rural Amenity and Development .....	11
Table 2.1. Summary of the Articles Included for the Meta-Analysis Data Source .....	30
Table 2.2. Descriptive Statistics of Dependent Variables in Each Regression Equation .....	32
Table 2.3. Descriptive Statistics of Independent Variables in Each Regression Equation .....	33
Table 2.4. Results of Fixed Effects Approach and Random Effects Approach in Panel Data Regression .....	38
Table 2.5. Results of Ordinary Least Squares Regression .....	39
Table 2.6. Results of dPROBIT Regression Using Partial Observations .....	41
Table 2.7. Results of dPROBIT Regression Using Full Observations .....	43
Table 2.8. Results of Natural Amenity Regression .....	45
Table 2.9. Results of Man-made Amenity Regression .....	46
Table 2.10. Comparison of Percentages of Significant Coefficients in Spatial Correction Model Augmented Literatures .....	50
Table 2.11. Comparison of Percentages of Significant Coefficients in Spatial Correction Model Non-augmented Literatures .....	51
Table 3.1. Composition of Commercial Infrastructure Index and a Basic Descriptive Statistics of Subvariables .....	67
Table 3.2. Composition of Cultural Goods Index and a Basic Descriptive Statistics of Subvariables .....	70
Table 3.3. Composition of Cultural Assets Index and a Basic Descriptive Statistics of Subvariables .....	71
Table 3.4. Composition of Agland Index and a Basic Descriptive Statistics of Subvariables ....	73
Table 3.5. Composition of Conservation Index and a Basic Descriptive Statistics of Subvariables .....	73
Table 3.6. Composition of Water Assets Index and a Basic Descriptive Statistics of Subvariables .....	73



Table 3.7. Composition of Temperature Index and a Basic Descriptive Statistics of Subvariables .....	74
Table 3.8. Distribution of both MSA and non-MSA Counties by the Categorical Rankings in Man-built Amenities .....	76
Table 3.9. Descriptive Statistics of Variables in Panel Data Regression .....	79
Table 3.10. Results of Panel Data Regression on Number of Films .....	81
Table 4.1. Sample Industry Multipliers, Louisiana .....	98
Table 4.2. Description of Explanatory Variables of Difference-in-differences Equation .....	108
Table 4.3. Results of Matching: M-measure and Similarities in Economic Dynamics .....	112
Table 4.4. Basic Descriptive Statistics of Location Quotients for Louisiana and Tennessee ....	114
Table 4.5. Basic Descriptive Statistics of Location Quotients for New Mexico and Oklahoma .....	115
Table 4.6. Difference-in-differences Estimation Results on Employment Location Quotient ..	118
Table 4.7. Difference-in-differences Regression Estimation Results on Small Size Establishments' (hiring 5 - 9 employees) Location Quotient .....	119
Table 4.8. Difference-in-differences Regression Estimation Results on Large Size Establishments' (hiring 500 -999 employees) Location Quotient .....	120

## LIST OF FIGURES

Figure 1.1. Environmental Kuznets Curve Adapted to the Realm of Amenity-based Development .....	9
Figure 1.2. Relationships between an Amenity and Rural Development .....	13
Figure 1.3. Relationship between Amenities and Rural Development in Meta-analysis .....	13
Figure 1.4. Tax Incentive Program Targeted to Relationship between Amenities and Rural Development .....	17
Figure 1.5. Regional Development Influenced by Local Public Policy to a Derived Consumption of Amenities in a Cultural Industry .....	19
Figure 3.1. Distribution of Man-made Amenities: Man-made Infrastructure, Cultural Goods, and Cultural Assets .....	75
Figure 3.2. Distribution of Natural Amenities: Ag-Land, Conservation Land, Water, and Temperature .....	77

## **ABSTRACT**

It is well known that an amenity is a key driving engine to regional economic growth. However, the site-specific nature of an amenity can characterize them as public goods. Due to this characteristic, local governments have difficulty optimally supplying amenities. This dissertation tries to find relationships between an amenity and economic growth. Three empirical papers comprise the original research in this dissertation.

The findings of the meta-analysis in the first essay suggest little methodological diversity exists among researchers linking amenities to economic growth., I do find that employment growth is more likely related to man-made amenities even in research on rural areas than natural amenities. Further, incorporating spatial estimators into amenity research improves modeling performance while reducing the net impact of amenities on economic growth.

The second essay indicates a distinctive distribution between man-made amenities and natural amenities over counties of the United States. While man-made amenities are agglomerated in urban areas, natural amenities show heterogeneous dispersion. Both agricultural land and conservation land show an inverse relationship to man-made amenities across space. From an analysis using a local government's public policy along with an areas' physical attributes, I find government tax policy having the greatest effect on film location decisions with natural amenities having little impact.

The third essay analyzed the impact of a tax incentive program targeted to film industries on local economies using a quasi-experimental approach. This last essay provided three findings. First, this chapter found meaningful methodological specifications that should be considered in regional studies using a quasi-experimental approach. They are appropriate consideration of control periods, spatial units of comparison, and validities of dummy variables representing extraneous shocks. Second, the impact of the film industry tax program on local economies is

insignificant for most industries. Third, the influence of tax subsidy policy on local economies is limited to a central area but is not beneficial to its adjacent areas.

# **CHAPTER 1**

## **INTRODUCTION**

### **1.1. Introduction**

This study seeks to understand which characteristics in one's place influence its economic growth. It may be obvious to historians that an area near a river basin is an origin of an ancient town or city. Cairo, Egypt, is one of the birth places of ancient civilization and it is located along the Nile River. Chicago, Illinois, took advantage of being the center of the Great Lakes region and became a hub city of transportation in the Midwest. From the two examples of Cairo and Chicago, it seems that people's economic needs played an important role in both the birth and development of cities. When agriculture was a major industry in ancient times, people wanted to take advantage of the regular floodplain of the river and cultivated their prime grains or foods in these areas. When manufacturing industries dominated economic activity, having a comparative advantage in low cost energy supply or cheap labor gave a geographic place a comparative advantage.

Today, it is ascertained that a different type of place emerges as a good place to live and work. It may be a fragile argument to present a list of the best ten cities to live in because everyone has distinctive tastes and preferences for places. However, if we believe in Thiebout's hypothesis that people "vote with their feet", migration patterns to places in warm climates and occupied with recreation and tourism opportunities become attractive places (Frederick, 1993, Marcouiller, et al., 2004, Nzaku and Bukenya, 2005). A main question to answer in this study is whether these amenities, especially natural amenities, as quality-of-life measures, lead to economic growth in rural areas.

If we consider Sen's point of view about development, consuming amenities might complete people's choice on what freedom to choose. He argued that development can be seen as a process of expanding the real freedoms that people enjoy (Sen, 1999). Shaffer, et al., (2004) discussed that "development was sustained progressive change to attain individual and group interests through expanded, intensified, and adjusted use of resources." Regional development, if Sen's viewpoint is reflected, is a progressive adjustment to dissipate unfreedom and allow a region to surpass its past capabilities. Development frequently implies the creation of more, but it can also mean less. These contradictory characteristics of development, a head and a tail of one coin, emerged after many developing nations reached economic growth targets in 1950s and 1960s, but the standards of living of its people remained unchanged or even decreased (Todaro and Smith, 2006).

From the disproportionate economic accomplishment, an alternative viewpoint to development such as Sen's freedom was proposed and economists suggested new targets for development such as elimination of poverty, inequality, and unemployment. As an advocate of the new view point of development, the World Bank (1991) ventured a broader terminology for economic development: quality-of-life. In its World Development Report in 1991, it claimed:

The challenge of development ... is to improve the quality-of- life. Especially in the world's poor countries, a better quality-of- life generally calls for higher incomes-but it involves much more. It encompasses as ends in themselves better education, higher standards of health and nutrition, less poverty, a cleaner environment, more quality of opportunity, greater individual freedom, and a richer cultural life (WorldBank, 1991).

This research discusses whether natural characteristics in an area contribute to its economic growth. Then, why do we focus on natural characteristics? Why do we focus on natural

amenities which are not easily transformed in the production process? Is it worth emphasizing the importance of natural amenities in economic activities? A main aim of this research is to answer these questions. Particularly, this chapter briefly explains the role of amenities in economic growth within three frameworks: the preliminary understanding of an amenity, a relationship of interest, and the identification strategy.

## **1.2. Preliminary Understanding of an Amenity**

The causal relationship between natural amenities and economic growth is not quite clear. Even though there are a growing number of quality empirical research studies on amenities, it is difficult to address the extent, impact, and causes of natural amenity-driven economic development (Marcouiller, et al., 2005). A main reason for these difficulties to generalize empirical results and to derive political inference is a lack of a conceptual base. Therefore, it should be addressed what components constitutes amenities, what characteristics define amenities as economic goods, or what perspectives on the relationship between the natural environments and economic growth exist.

### **1.2.1. Concept of an Amenity**

The first citation on amenities might be Mill's observation (Mill, 1848, pp191). John Stuart Mill observed that human beings were satisfied with natural amenities as described below.

Nor is there much satisfaction in contemplating the world with nothing left to the spontaneous activity of nature; with every rood of land brought into cultivation, which is capable of growing food for human beings; every flowery waste or nature pasture ploughed up, all quadrupeds or birds which are not domesticated for man's use exterminated as his rivals for food, every hedgerow or superfluous tree rooted out and scarcely a place left where a wild shrub or flower could grow without being eradicated as a weed in the name of improved agriculture.

Since the first observation that amenity resources have played a role in the economic growth debate, rural amenities have been extensively, but often vaguely defined (Krautkraemer, 2005). However, the common characteristics in rural amenities are immobility, non-substitutability, and specific societal or economic value (OECD, 1999, Power, 1988). OECD (1999) provides examples of rural amenities: wilderness, cultivated landscapes, historical monuments, and even cultural settlements. Green, et al. (2005) put an additional emphasis on recreation areas for amenities. Recreation areas are a typical example of how public policy can intervene in supplying amenities (Beale and Johnson, 1998, Bergstrom, et al., 1990).

As quality-of-life, amenities can expand people's freedom and right to choose their places. This definition is compatible to Power's because amenities are defined as qualities of a region that make it an attractive place to live and work (Power, 1988). Freedom, a new concept in amenities which is developed by Sen (1999), can be understood as 'free of money-oriented narrowness' and enables people to expand the range of their choice (Lewis, 1963). Enlarged human choice may allow them the freedom to choose more leisure, to earn more goods and services, or to forfeit these material needs and choose a life of tranquility. A desirable phase of economic development should reflect well-balanced combination of increase in basic necessities and an expansion of the economic and social choices including, for example, better education or more leisure.

### **1.2.2. Categories of Amenities**

It is useful to categorize amenities because categorization provides insights, and to what extent, amenities can be instrumental in a development strategy. Amenities can be categorized by a degree of human contribution. OCED (1999) suggests three categories, based on three different levels of human contribution:

- almost intact nature,



- interaction between nature and man, and
- man-made.

People derive the amenity value from the absence of human intervention in the “almost intact nature”. Examples would include native forests, desert wilderness, or high mountains.

Man-made amenities are referred to the traditions or culture symbolized in historical monuments, village festivals, or traditional crafts. In the middle category, interaction between nature and man is found in most rural areas, particularly Europe and East Asia.

### **1.2.3. Characteristics of Amenities**

Amenities are unique qualities which distinguish one place from another. OECD categorizes four economic values of rural amenities. They include use value, option value, existence value, and bequest value (OECD, 1999). The last three are said to be non-use value because they have utility without being “used” nor “consumed” in a physical sense. Use value is appreciated when people visit or live in places where amenities are located. Option value occurs when people know one can visit an amenity in the future. The fact people simply know that an amenity exists generates existence value. Bequest value exists because of the possibility of passing on an amenity to future generations. Since the non-use value tends to be increased by conservation, rural development strategies based on amenities face many challenges.

Natural amenities such as forests, prairies, lakes, and rivers have their current forms as a result of a long history of human activities. What we see in natural amenities today is a small part in the long line of the temporal transition of nature. A small touch to the natural amenities today might bring a big change in a neighborhood some decades later. Once a change in natural amenities occur, it may be impossible to reverse it back to the original stage. An action leading to a change of the value of an amenity is called ‘irreversibility’ (OECD, 1999).

From the supply side of natural amenities, production of natural amenities is restricted. It is termed as ‘non-producibility’ (Green, 2001). This concept is similar to irreversibility, but is somewhat different in that production at an initial level is also difficult. It is only by a limited gradual or incremental degree that natural amenities experience their transformation. By the term ‘limited’, we know that there are mechanisms available to increase the regional capture of amenity values. According to Marcouiller and Clendenning (2005), a good example of the mechanism is a resource management practice. It can sensitively affect the usage of a resource and has an opportunity to affect amenity values. Amenities are in practice produced when public parks, forests, and other forms of open space are created.

Another feature on the supply side is its ‘nontradability’ (Marcouiller and Clendenning, 2005). Natural amenities, much like land itself, exist as fixed assets of a region. Nontradability is primarily important from the standpoint of a general production process. Because of the nontradability of amenities as a primary factor input, a consumer’s amenity value is linked to the region in which the amenities exist and so much amenity-related literature discusses population or migration. A community is distinctive from the amenity inputs of other regions. However, it directly competes with other communities for people to be attracted into an area with similar types of amenity values. This nontradability can benefit rural areas and a good example of this benefit is factor oriented manufacturing (Shaffer, et al., 2004). For example, forests have the potential to generate volumes of lumber which can be used in additional production processes. Because of the high transportation cost due to its bulkiness, its initial processing typically occurs in rural areas near the forest resource instead of near markets in urban areas due to high transportation costs. Rural areas, in this case, take advantage of the nontradability of natural amenities.

On a demand side of natural amenities, the most prominent aspect is its ‘high income elasticity of demand’ (McFadden and Leonard, 1993). In other words, natural amenities are assumed to be luxury goods<sup>1</sup>. The demand for environmental goods as amenities tends to increase more rapidly as income increases. Walker and Fortmann (2003) raised public issues that the feature as luxury goods of amenities could bring; a long-time residency might be at stake by a new-comer in pursuit of high amenity values. Conserving and enhancing aesthetics and wilderness can in some cases be used to disguise exclusivity, especially exclusion of the poor (Marcouiller, et al., 2005).

Another feature of amenities can be the degree to which they are a public good. Public goods are characterized by non-excludability and non-rivalry in consumption. Non-excludability refers to the fact that the consumer (or the producer) of a certain public good cannot exclude other consumers from consuming the particular good. Non-rivalry means that an additional consumption of a public good leads to no subtraction from any other’s individual consumption of that good (OECD, 1994).

### **1.3. Relationship of Interest**

This section, relationship of interest, discusses environmental concerns in economic growth and how these issues lead to an amenity-driven development plan. In addition, I introduce the main elements of this dissertation: amenities, rural development, and local government’s public policy.

#### **1.3.1. Environmental Degradation in Amenity-driven Economic Growth**

The main topic discussed in this dissertation is reconciling economic development with an amenity. An amenity, whose optimal supply is hardly achieved in a regular market system, is

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<sup>1</sup> Even though this theoretical basis has been confirmed in numerous empirical studies, there is a disagreement on the extent of the empirical relationship. For example, research on European-based contingent valuation studies found that the income elasticity of demand for amenity values was less than unity (Kristrom and Riera, 1996)

demand by people who value them but in many cases, do not use/consume them directly. In one context, preservation of amenities is a key perspective in economic development. The reason why preservation of amenities is important is from both a demand by future generations and uncertainty (OECD, 1999). There are changing patterns in consumption/appreciation of amenity resources. The altered patterns are led by increasing disposable income along with high income-elasticity of demand for amenities and, therefore, people's increased demands for high quality residential living providing higher quality-of-life attributes (Shaffer, et al., 2004).

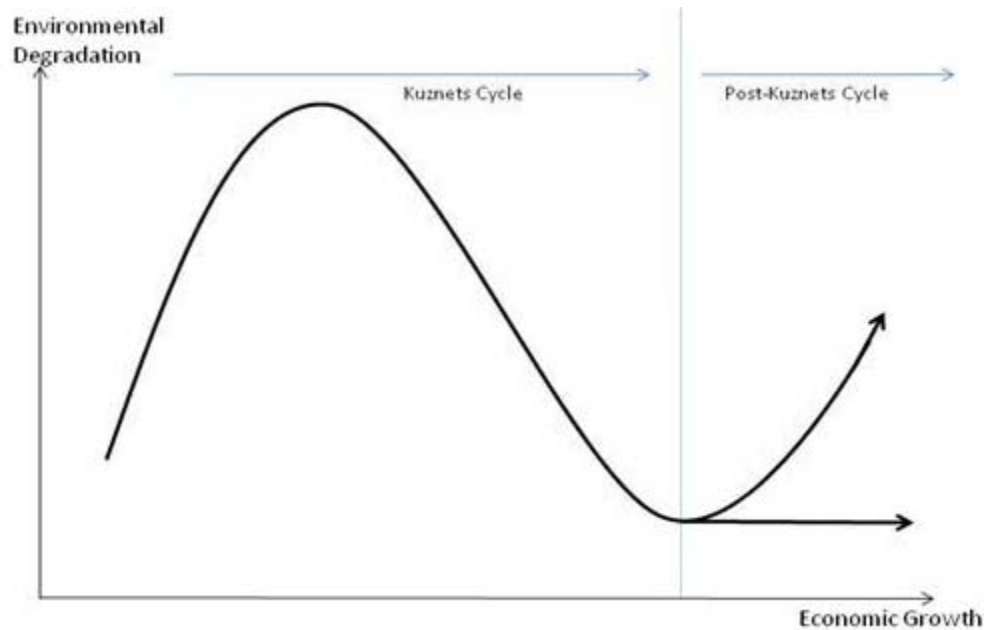
Environmental degradation is an important issue whether it occurs in developed, developing, or under-developed countries. Especially, in a process of economic growth, economic necessities might allow communities to unconsciously destroy or exhaust the natural resources in developing countries. Rising pressures on environmental resources in developing countries can have severe consequences for self-sufficiency, income distribution, and future growth potential in the developing world (Todaro and Smith, 2006).

The most popular logic describing the relationship between economic growth and the natural environment may be the Environmental Kuznets Curve. This adapted theory posits a curvilinear relationship between levels of economic growth and environmental degradation (Grossman and Krueger, 1995). We can recognize a clear and predictable pattern between growth and environmental quality in the logic of the Kuznets relationship between growth and income distribution in Figure 1.1<sup>2</sup>. Starting from the subsistence level of economies with little environmental degradation, an area may experience more pollution and environmental degradation as the economy grows. However, there exists a demand for environmental

---

<sup>2</sup> A direct interpretation of the Environmental Kuznets Curve may be an oversimplification of a more dynamic and complex interaction between trade and environmental policies and growth, but the general pattern appears to hold (Copeland and Taylor, 2004). A source of the Figure 1.1 is Marcouiller and Clendenning (2005, pp12).

protections at some higher income level threshold. A progress in technologies and demand for environmental protection lead to policies addressing environmental degradation.



**Figure 1.1 Environmental Kuznets Curve Adapted to the Realm of Amenity-based Development**

Marcouiller and Clendenning (2005) adapted the logic of the Kuznetz curve in order to develop a conceptual framework for amenity-driven development. Were this research to adopt the vertical axis of the framework of the Kuznets curve to capture the inverse of amenity demand (or values), it could have a conceptual understanding of an amenity-based phase of economic growth. In an initial stage of development with low levels of income, the demand for amenities is neutral. That is, people are indifferent to qualities or quantities of amenities. In a process of economic growth and development, people are willing to tradeoff amenity values for monetary income. As economies grow, that tradeoff increases. As the tradeoff increases and production technologies along with preferences change, amenity-based management becomes a social

priority at some point. Current policies and future development initiatives around amenity-based management would determine how these relationships tend to move onward.

### **1.3.2. Indirect Policy to Valorize Amenities**

According to OECD (1999), the main objective of the majority of contemporary amenity policy is “to exploit the value of amenities for rural development.” Whereas conserving natural assets is a primary aim of environmental policy, OECD (1999) puts additional restrictive emphasis on the subsidiary role of amenity policy. Therefore, a role of amenities in rural development should be understood beyond conservation. The goal of amenity policies, above conservation, is to help rural governments or rural territories to valorize their amenities and, thereby, to exploit crucial resources for development (OECD, 1999). Since the territorial nature of amenities has a comparative advantage, policies should inspire amenity-rich regions to realize their amenity value. This encouragement will, in turn, promote development and lead to a balance between less populated rural areas and growing urban areas.

Since the public good character of amenities hinders rural regions from selling their amenities, they often search for other development strategies. The development strategies are considered to have characteristics that exploit their territories in a way that enables them to sell marketable goods. Examples of these strategies include mining, logging, hydroelectricity production, and mass tourism (OECD, 1994). These examples might be considered as ‘exports’ of amenities because the value of amenities is appreciated by the people living outside the amenity-dense areas. This dissertation discusses one of strategies that convey the value of amenities to people living outside these areas. This dissertation discusses an alternative way of consuming amenities besides enjoying use values and non-use values; that is, a derived

consumption. A derived consumption<sup>3</sup> occurs often in the media industry and is deemed to be part of the subset of cultural industries.

### 1.3.3. Relationship between an Amenity and Rural Development

OECD (1999) presents three types of relationships between amenities and rural development. Those relationships are determined by the degree to which amenities are preserved.

- Synergy: Preserving amenities supports development.
- Antagonism: Preserving amenities prevents development.
- Interdependence: Economic stagnation negatively affects amenities (OECD, 1999).

As these three relationships are shown, both synergy and antagonism have a point of view that amenities affect development and preserving amenities drives development. On the contrary, interdependence has a standpoint that economic status determines a level of amenities. These three relationships were derived from case studies over the world as presented in Table 1.1.

**Table 1.1. The Relationship between Rural Amenity and Development**

	The preservation of amenities is accompanied by	The destruction of amenities is caused by
By economic development	<b>CASE 1: SYNERGY</b> French Regional Nature Parks Swiss Border Trail	<b>CASE 2: ANTAGONISM</b> Certain Austrian Alpine areas of excess tourism
By economic stagnation	<b>CASE 2: ANTAGONISM</b> Asuka region in Japan	<b>CASE 3: INTERDEPENDENCE</b> Mountain areas where declining agriculture threatens the landscapes

Source: OECD, 1999, p. 32

In case 1 of synergy, the preservation of amenities shows a harmony with economic development in a strategy of tourism development and the sale of labeled products. On the contrary, preservation of amenities causes an economic stagnation as introduced in the Asuka region in case 2. In Asuka, Japan, local farmers could not capitalize the value of the landscape areas where agriculture is the major industry.

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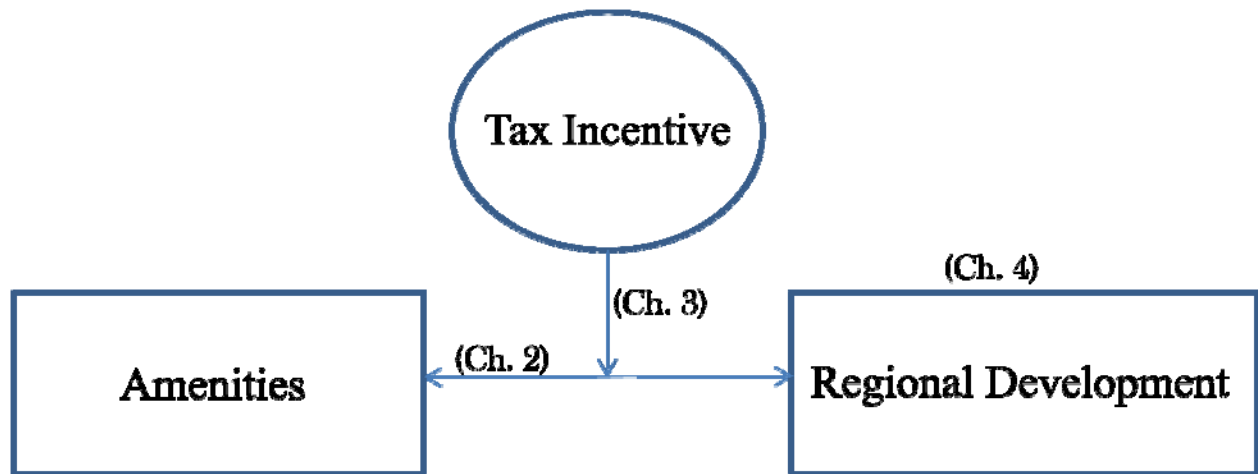
<sup>3</sup> A derived consumption is a process when the value of an amenity is transmitted to consumers through either the media or a product that embodies amenity value (OECD, 1999).

Cases which exhibit antagonistic relationships between amenities and economies are found in some Austrian mountain area cases. A settlement level of threatening resources is found in some Austrian Alpine areas with strong growth in population and demand in housing. Hence, as in case 2, economic development occurs with a destruction of amenities. In contrast, as in case 3 of interdependence, other mountain areas experienced out-migration due to the withering of agriculture.

As shown in Table 1.1, preservation of amenities depends on agricultural activities being maintained in areas. Furthermore, whether it is a preserving or a destructing of the regulatory management of amenities, a dichotomy of economic outcomes might occur: economic development versus economic stagnation. What can we infer from these case studies? Can we derive a reasonable relationship between amenities and economic development? If amenities have restrictive characteristics such as nonproducibility or nontradability, do we need either direct or indirect economic instruments linking amenities and economic development? Answers to these questions are main topics of this dissertation. A brief explanation to these questions is presented in Figure 1.2.

In Figure 1.2, there are three elements which are discussed in this dissertation: amenities, rural development, and tax incentives. Arrow lines linking those elements represent hypothetical causal relationships which are imposed and analyzed in this dissertation. It will be discussed whether there are relationships between amenities and rural development in chapter 2. Then, in chapter 3, I discuss the impact of a tax incentive program of local governments targeted to one of a valorizing method of amenities, a derived consumption in a media industry. In chapter 4, given that most U.S. states adopt economic growth strategies related to a derived consumption of amenities, it will be discussed whether and how local economies are influenced by these economic strategies.





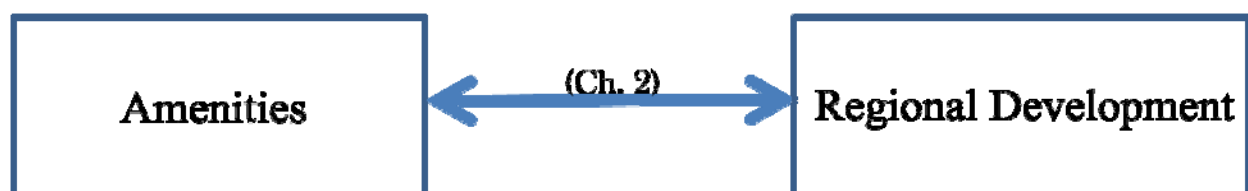
**Figure 1.2 Relationships between an Amenity and Rural Development**

#### **1.4. Identification Strategy**

In this section, identification strategies, two topics are discussed with the intention of analyzing how an amenity can be linked to an economic growth strategy: through applying a meta-analysis and analyzing cultural industries. Meta-analysis is a statistical method to review past literature and is used to reveal systematic relationships between amenities and economic growth in chapter 2. The other topic, a cultural industry, is chosen in this dissertation because of two reasons: (1) its usage of amenities as an (latent) input factor, and (2) its popularity as a local government economic growth strategy.

##### **1.4.1. Meta-analysis**

In chapter 2, a relationship between amenities and economic growth is analyzed by applying meta-analysis. An illustrative diagram of the hypothesis being tested by the studies used in this meta-analysis is presented in Figure 1.3.



**Figure 1.3 Relationship between Amenities and Rural Development in Meta-analysis**

Known as an analysis on analysis, meta-analysis provides statistical summaries of a common hypothesis or model in empirical research (Cook, et al., 1992). Dissimilar control variables in differential modeling schemes are chosen based on each researcher's judgments and this distinction in researcher's judgment is a probable source for mixed results over literature. On the contrary, multivariate statistical analysis on varied empirical results can generate more consistent implications than a single research study can provide. Consequently, the results of meta-analysis can provide meaningful policy implications beyond subjective judgment, preferences, and biases of the individual research.

By using a meta-analysis and approximately six hundred observations obtained from ten research studies, it can be understood whether different modeling specifications in amenity research can lead to differential impacts on economic growth. Furthermore, it can be analyzed whether different types of amenities (natural amenities and man-made amenities) play differential roles in diverse economic growth such as population growth or income growth.

#### **1.4.2. Cultural Industry: A Derived Consumption of an Amenity**

Cultural industries, also called 'creative industries', produce goods and services with sufficient artistic content to be considered creative and culturally significant (Towse, 2003). Contents of cultural industries that rural development planners might be interested in are not only in results from the employment of trained artists but also historically accumulated region-specific cultural or natural environments. Christopherson and Righor (2009) introduced several related economic goals with the 'creative agenda,' which became a promising principle for urban economic development, the revitalization of central business districts, job creation, community building, and skill development. Furthermore, the 'creative class' in a creative industry is drawn to places and communities where many outdoor activities are prevalent, both because they enjoy

these activities and because their presence is seen as a signal that the place is amenable to the broader creative lifestyle (McGranahan and Wojan, 2007).

Among creative industries, the entertainment media industries are attractive economic development targets because they are considered as ‘clean and knowledge-based job creating industries’ (Morawetz, et al., 2007). A repeated exposure of an area to media can bring the area benefits from an enhanced ‘image’ as well as for attracting tourists. Tourists are entertained by the presence of film crews. The resulting movies or TV shows may help regional development planners market the areas where the scenes were shot (Christopherson and Righthor, 2009, Morawetz, et al., 2007). Furthermore, making shots for films or TV shows does not need to extract natural resources as other traditional industries do, resulting in less environmental degradation.

Therefore, a portion of this dissertation is focused on the circumstances that immobile natural environments of one area can be conveyed through the media. This indirect way of transferring values of amenities is referred to as ‘derived consumption’ (OECD, 1999). As a media industry conveying values of amenities, this dissertation selects the film industry for two reasons. The film industry is less related to natural environmental deterioration and more related to knowledge-based job creation, the ‘creative class’ (Christopherson and Righthor, 2009; ERA, 2006). Yet, attracting film industries might not sound familiar to amenity-driven economic development planners. OECD (1999) presents two types of policy along with several types of instruments. The first policies are “designed to stimulate direct co-ordination between amenity providers and beneficiaries, either through the market or through cooperation among agents acting collectively” (OECD, 1999, p.34). The second policies are “designed to change the economic ground rules so as to encourage individual acts that increase or maintain the supply of

amenities. Amenities that are amenable to this kind of policy are mainly those with public good characteristics and/or externalities” (OECD, 1999, p.34)<sup>4</sup>.

Film industries are not directly related to amenities, particularly in terms of amenity-related policy in regional authorities. However, they use natural or man-made amenities in a chain of production processes. In the movie, ‘Star Wars’, Luke Skywalker and Obi Wan Kenobi met each other for the first time in a desert of Tataouine of which the scene was actually shot in Tunisia. In another movie, ‘The Fugitive’, Dr. Kimble proved his innocence of the murder of his wife during a stunt action scene at the Chicago Hilton & Towers. Both examples show that natural or man-made environments play an input role in a process of movie production. Those environments – the desert in Tunisia and the hotel in Chicago – did not substantially change their shapes. Whether they are amenities or not, film industries shot scenes against them and had minimal amenity degrading impacts.

#### **1.4.3. Economic Instrument Targeted to Film Industry**

It is found that making films has occurred outside Los Angeles, the historical center of movie production in 1970s and 1980s; so called “Runaway production” (Christopherson and Clark, 2007). Increased film shots outside Los Angeles are due to a rise in demand for media entertainment products such as a commercial television in global markets and home videos in domestic markets. This increasing demand spurred differentiated products which are produced by a growing number of either independent producers or mid-size firms. Independent film makers, who were using television production methods and technologies, were both more alert at and free from the risky cost of film-making than major film studios. Being more mobile, film

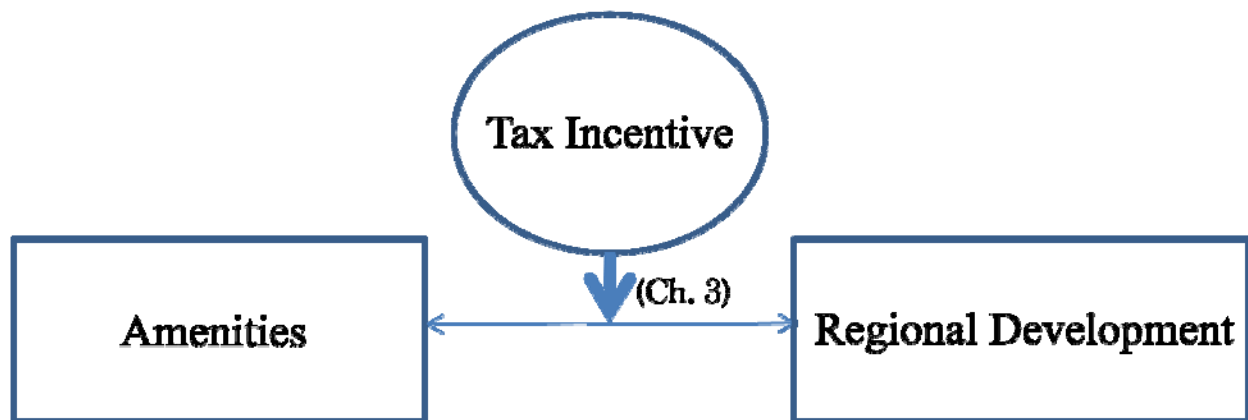
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<sup>4</sup> Accordingly, OECD (1999) also presents case studies of amenity-related policies. They include support for amenity-based enterprises in Greece, support for nature-based small scale enterprises in Finland, Regional Forest Agreement (RFA) process of the Australian government, land use regulation under the Asuka law in Japan, or maintaining traditional practices as a source of an attractive landscape in Japan, among many others.

crews were able to be more independent from studios of film conglomerates. Film crews were able to take advantage of both the creative possibilities to differentiate products and the lower costs of shooting “on-location” (Christopherson and Clark, 2007).

In fact, responding to this “runaway production” trend, most state governments in the United States have had tax-based subsidies targeting film industries to reshape their regional economies since the late 1990s (Christopherson and Righor, 2009). A basic mindset behind the tax-based subsidies is that the creative economy such as media production promotes economic development and injects millions of dollars into a state’s economy. This tax-based subsidy to attract film crews became an additional, but crucial, factor in the production decision function. Christopherson and Clark (2007) suggest examples of the typical subsidy package; inexpensive accommodations for film crews, tax breaks for using local business, such as catering, and construction, and easy permitting to use locations including public spaces.

Chapter 3 analyses local government’s role through a tax incentive program targeting film industries as illustrated in Figure 1.4. Along with the tax incentive program, an area’s physical topographies such as man-made infrastructure and natural environment are controlled in the analysis.



**Figure 1.4 Tax Incentive Program Targeted to Relationship between Amenities and Rural Development**

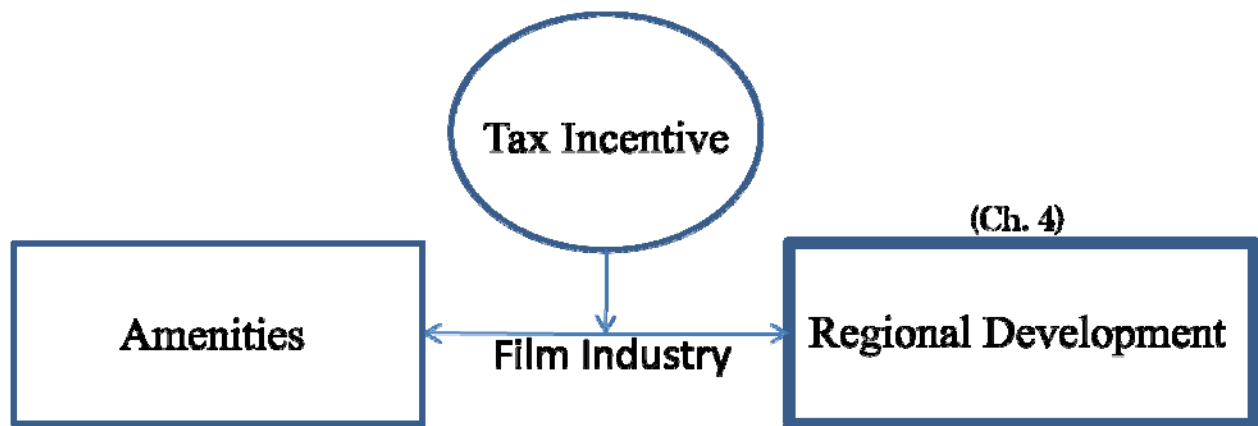
These three factors which might affect shooting “on-location” decisions of film industries are included as control variables in panel-data regression analysis. Proxies for “on-location” decisions include the total number of films shot in a state.

While socio-economic infrastructure such as lodging, transportation, or financial services would play a substantial role to attract on-location shooting into one area, natural environments are not negligible. For example, a chase scene in a mountain hill covered with snow cannot be shot in Florida. Likewise, it is likely for film crews to be more concerned with less precipitation because shooting on-location occurs mostly outside. In addition to a socio-economic condition and a level of natural amenities, financial considerations can be crucial in making films. Making films needs a few superstars and many low-skilled laborers accompanying large quantities of equipment in the production process. In addition to labor and capital, film production managers should find a story that can bring ‘financial’ success and acquire rights to use it. A location manager should arrange all the processes of shooting “on-location” in order to finish every step of shootings at designated paces. Even though all these considerations are met, there are no guarantees of financial success for a given movie. Therefore, movie producers want to lower cost as much as possible.

In chapter 4, it is discussed what changes in local economies occurred due to increased number of “on-location” shootings. A basic question is asked whether local governments’ public policy targeted to film industries along with its usage of amenities results in local economic development as illustrated in Figure 1.5.

Once the tax-incentive package has been accepted and filming activities begin in an area, whether attracted film crews and the on-location shooting activities are significantly affecting regional economies is questionable and is the main topic in chapter 4. As we described in an

anecdotal way above, location plays a distinguished role in films and this influenced the popular perception of a place.



**Figure 1.5 Regional Development Influenced by Local Public Policy to a Derived Consumption of Amenities in a Cultural Industry**

However, this enhanced ‘image’ of a place is implicitly perceived by movie audiences and tourists. Chapter 4 analyses impacts of state tax incentive programs targeted to film industries on diverse industries in the region. It uses a quasi-experimental approach and compares changes of employment and establishments of counterpart states which did not adopt the tax incentive program during the research period. By comparing what would have happened without the policy, it can be inferred whether and how the policy impacts regional economies.

### **1.5. Summary**

This dissertation discusses a role of amenities in economic development strategies. Since amenities are an ambiguous input factor in view of conventional production processes, its relationship needs to be further analyzed based on the mixed results of past literature about the role of amenities in the context of regional economic growth (Chapter 2). After a review of past literature, one method of valorization of amenities will be discussed, derived consumption. Derived consumption is realized when media conveys diverse facets of amenities to consumers. It may be a new concept in estimating the value of the natural environment, but with new

technologies and increased income, people are more frequently exposed to this indirect consumption in cultural industries.

Among cultural industries, this dissertation is focused on film industries as a media industry which allows people to consume natural or man-made amenities indirectly. Factors affecting the on-location shooting decision are analyzed. Physical environments such as historic buildings or scenic rivers as well as economic incentive schemes of regional government are considered (Chapter 3). In addition to a location decision analysis, an impact of economic incentives to lure a film industry is discussed (Chapter 4). As a core creative industry, the film industry is filled with knowledge-based jobs. The creativity of the industry is assumed to accelerate the reshaping process of regional economies. Furthermore, an indirect way to increase value of amenities is also recognized. The new concept of derived consumption can be an alternative strategy in amenity management that can increase this value.

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## **CHAPTER 2**

### **META-ANALYTIC REVELATION OF THE ROLE OF AMENITIES IN A REGIONAL ECONOMY**

#### **2.1. Introduction**

This study seeks to address whether and how amenities affect regional economic growth by using meta-analysis. Amenities were first theoretically discussed as a quality-of-life factor (Roback, 1982). Since then, they have been found to be a key factor in a firm's location decision and people's migration decisions (Dissart and Deller, 2000, White and Hanink, 2004). A meta-analysis on amenities can statistically summarize empirical results of past research and provide objective implications that underlie the research topics (Lipsey and Wilson, 2001). A meta-analysis is performed to identify the key elements that underlie the connection between amenities and economic development. The key elements that I will be focused on are socio-economic factors considered influential in the research literature on amenities.

No matter how amenities are defined or no matter what examples of amenities are suggested, the role of amenities in regional development has recently been regarded as important as other economic factors in local areas. In literature from regional science, there is a notion that amenities in general are playing an increasingly important role in migration decisions (Greenwood, 1985). Since there has appeared the first argument by Graves about a significant relationship between amenities and migration patterns (Graves, 1983), a growing number of studies have evaluated the important role of an amenity as a deterministic role of migration (Deller, et al., 2001, Knapp and Graves, 1989, Nord and Cromartie, 1997, Porell, 1982), literature about relationships between amenities and wages or housing rents (Hoehn, et al., 1987, Roback, 1988), and literature about amenities and unemployment (Deller and T.S.H.Tsai, 1999). Arguably, not all studies provide an implication that a natural amenity has a positive correlation

with rural economic development (Duffy-Deno, 1998, Keith and Fawson, 1995, Lewis, et al., 2002). A probable reasoning of these conflicting results is that there is an ambiguous causal relationship between amenities and economic growth; that is, do amenities induce economic growth into an area or an economically prosperous area produces amenities as a by-product of its economic growth.

Since a meta-analysis summarizes results of past research in a statistical manner and tests sensitivities of them with regard to each methodological specification, a meta-analysis on amenities can provide an intermediate consensus on point estimates of amenities and suggest an ideal direction of using proper methodologies for the research (Jeppesen, et al., 2002). This chapter uses parameter estimates of natural (or man-made) amenities obtained from ten research studies. By applying meta-analysis which incorporates the parameter estimates of the aforementioned studies, this chapter seeks to find an answer whether and how amenities impact local economic development, and in particular, induce a more consistent economic policy implication of amenities on rural development.

The findings of the meta-analysis in this chapter suggest little methodological diversity exists among researchers in the field of amenities. However, I find an importance of considerations of amenities' spatial boundaries in research on amenities, particularly for amenity research on rural areas. Additionally, as an economic growth specification, employment growth is more likely related to man-made amenities even in research on rural areas than natural amenities.

The remainder of the paper will begin with a literature review of meta-analysis followed by theoretical/empirical considerations of meta-analysis from methodology. The paper will end with the main results from comparing analyses of regression equations and key conclusions of the analysis.

## **2.2. Literature Review on Meta-analysis**

There is a growing meta-analytic literature being applied to regional economic research questions (Simons and Saginor, 2006, Smith and Huang, 1995, Smith and Kaoru, 1990). In regional science, there are multiple contributions that have applied meta-analysis: the distance effect on bilateral trade (Disdier and Head, 2008) as well as the relationships between environmental regulations and new plant location decisions (Jeppesen, et al., 2002). In the following section, I will focus on those regional studies and environmental studies which used meta-analyses.

Smith and Kaoru (1990) identified what characteristics of an area and which type of human behaviors are deterministic on demand for recreational site decisions. By applying meta-analysis that used 77 estimates out of approximately 200 published/unpublished studies, they identified the types of decisions that influence on an organized relationship between the estimates and the features of the empirical models from travel cost demand studies.

Smith and Huang (1995) identified a coherent relationship between the marginal willingness to pay for reducing particulate and hedonic property values. They reviewed 37 studies that provided 86 estimates for the marginal willingness to pay for lowering air pollution in a meta-analytic framework. Results from the meta-analysis suggest that procedures in the hedonic models were important to the estimates of the marginal willingness to pay. In addition to an emphasis on the procedures in methodological specifications, summaries from meta-analysis indicated lower deviations from extreme results than those from empirical models in the original literatures. One of the findings from the meta-analysis of Smith and Huang (1995, pp 224) was that given a systematic method to adjust for local conditions, empirical models in the original studies could play a complementary role to applied policy analyses.

Simons and Saginor (2005) analyzed different methodological implications on a study of residential property values in the United States. By applying a meta-analytic framework that used a data set of 290 observations out of 75 peer-reviewed journal articles as well as case studies, they identified several methodological specifications congruent with past studies such as contamination types, amenities, selected economic regions, and a distance from the source of contaminations. In addition to the findings related to methodological specifications, they found that different results tend to be obtained according to research methods.

Disdier and Head (2008) reviewed 103 papers that provided 1,467 distance effects in a meta-analytic framework and attempted to analyze relationships between bilateral trade and distance. They compared each variance in the parameter estimates of original research based on disparate attributes of each research in order to reveal which features of estimation methods are influential on the distance effect. They found negative impacts of distance on trade high since 1950s.

Jeppesen, et al. (2002) uncovered which methodological specifications matter in studies of environmental regulations affecting new manufacturing plant location decisions by using a meta-analysis which examined data from 11 studies that provided more than 365 observations. Their study was motivated by an ambiguous conjecture that “severe environmental regulations are opposed to equilibrium capital flows” and a question of “an existence of unresolved empirical results in the area due to the disparate methods found in the literature” (Jeppesen, et al., 2002).

From their findings, it was suggested that methodological considerations in each separate research study can generate differing estimates. Variables specifying each of four broad categories – empirical specification, data, definition of regulatory variables, and included control variables – have a considerable influence on the coefficient estimate. This information may

prevent policymakers from simply relying on one parameter estimate when formulating policy. In addition, researchers should understand that elasticity estimates are sensitive to slight modeling changes.

In summary, comparing and contrasting diverse types of results from alternative empirical studies can be challenging because of varying model specification, researchers subjective judgment, or data uniqueness with respect to spatial and temporal perspectives. The above meta-analytic studies in environmental and regional studies tried to overcome this vulnerability of individual empirical estimation and found more differentiated and sophisticated findings than conventional review procedures which rely on qualitative summaries.

## **2.3. Method and Data**

### **2.3.1. Method: Meta-analysis**

The methodology this chapter uses is meta-analysis. Known as an analysis on analysis, “meta-analysis provides a statistical synthesis of empirical research focused on a common hypothesis or model (Cook, et al., 1992)”. In the social and behavioral sciences, research cannot be executed in an organized and predicted way as the biological, physical, and natural sciences, because it is quite often difficult and complicated to understand human behavior. Therefore, research environments are difficult to control, typical definitions are not available, and methods, techniques, or variables change from study to study. It is rare for a single experiment or study to provide sufficiently definitive answers on which a political implication is to be based (Hedges and Olkin, 1982). As a result, conflicting results are likely to be obtained and these conflicting results can lead to non-acceptable answers to guide policy for the problems posed (Wolf, 1986).

Meta-analysis is one approach to accumulate knowledge: a culmination of results across studies to establish facts. Therefore, it is the resolution of the basic facts from a set of studies that all bear on the same relationships (Hunter and Schmidt, 1990). Most such analyses have

summarized empirical results or have evaluated the evidence from test results across a variety of different types of experiments. The empirical results or test results of diverse research are compared in the meta-analysis and, therefore, they should take standardized units such that meta-analysts can compare diverse literature: effect-size. According to Hunter and Schmidt (1990), an effect-size is a standardized unit such that meta-analysts can compare diverse literature. Choosing an effect measure may be dependent on the characteristics of studies.

Since this chapter seeks to identify a relationship between amenities and economic growth, elasticities are obtained from amenity estimates in equations of original literature. The parameter estimates of amenities on right hand side of the original equations are moved to left hand side of the regression analysis in this study as introduced in equation (2.1) below.

In addition to an explanation where the elasticities come from and where they are analyzed in our equation in this chapter, it should be noted that the elasticities are scale free unit for a legitimate comparison among various amenities in past literature.

### **2.3.2. Data**

I use parameter estimates reported in the past literature concerning econometric relationships that represent the effect of an amenity on economic growth. Variables representing economic growth are growth rates of population, employment, and income. In sum, I gathered parameter estimates from ten articles that provide 637 observations. These ten articles were obtained through an on-line search engine for academic literature in economics, 'EconLit'. Originally, forty three articles were searched by three key words; 'rural', 'amenity', and 'development'. Out of forty three articles, thirteen articles providing parameter estimates<sup>5</sup> that can be used as effect-sizes or can be transformed to be an effect-size were filtered and chosen.

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<sup>5</sup> Parameter estimates of amenities of the regression equations in research literatures are percentage change in each categories (for example population, employment, income, etc.) with respect to amenities. As described below, these parameter estimates have different measuring scales. The issue of measurement scale is solved by transforming those into scale-free elasticities.



As a further sorting step, the literature generating unclear region-specific effect-sizes were deleted. For example, Marcouiller, et al., (2004)'s study region is the US lake states (Minnesota, Wisconsin, and Michigan) but parameter estimates from this study do not specify whether they are for rural areas or urban areas.

In this case, they do not help in explaining whether rural areas' amenities are more influential on economic growth than urban areas' amenities. This exclusion may present an answer to a hypothetical question on which regional area is relatively more sensitive by amenity-driven economic studies, rural areas or urban areas. A brief summary of important features of the literature from which the meta-data were obtained is presented in Table 2.1.

In order to perform an appropriate understanding of the relationships between amenities and economic factors, I adopted an unbalanced panel-data regression model based on Jeppesen et al. (2002). The estimated model<sup>6</sup> is given by

$$(2.1) E_{ij} = \alpha_i + \beta X_{ij} + \varepsilon_{ij}.$$

$E_{ij}$  denotes elasticities which were transformed from study  $i$ 's  $j^{th}$  parameter estimate of the effect of an amenity on macroeconomic variables and  $X_{ij}$  is a set of explanatory variables<sup>7</sup>.

Next, I supplement a limited dependent variable model in order to investigate whether each methodological specification meaningfully generates significant estimates of amenities' effect on economic growth. The estimated model, the dPROBIT model, is given by equation (2.2).

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<sup>6</sup> This analysis uses a subset of literature introduced at Table 2.1, because the subset of literature provides proper mean-values which can be used in a calculation of parameter estimates into the elasticity-type effect-size. This subset does not include all literature which used amenity index created by using the aggregate factor score approach. It is not possible to analyze how the aggregate factor score approach plays in amenity-research in this elasticity-type comparison regression. However, since the next regression equation does not require the dependent variable to be an elasticity-type effect-size, it may be useful to keep in mind that some past research used the aggregate factor score approach.

<sup>7</sup> Explanatory variables are mostly binary variables exhibiting methodological specifications in each literature

**Table 2.1. Summary of the Articles Included for the Meta-Analysis Data Source**

Article	Dependent Variable	Amenity Factors	Methodological Specification
Nzaku and Bukenya, (2005)	Regional changes in per capita income, employment, and population / 1990-1999	ERS's(1999) amenity scale, Developed recreation facilities, Land, and Crime	Regional Adjustment Model( Carlino-Mills 3-D equation system)
Beckstead, et al., (2008)	Percentage change in employment in city / 1980-2000	Amenity index derived by inverse-hedonic pricing, Heating degree days, and Cooling degree days	Regional Adjustment Model (1-D equation)
Ferguson, et al., (2007)	Percentage change of population /1991-2001	Modern amenity(crime rate, distance to hospital, distance to school, distance to police station, distance to ski facility), Natural amenity(forest coverage, proximity to coast or lakes, characteristics of mountains or hills, precipitation, snowfall, January sunshine, January temperature, July humidity)	Utility maximization model
Monchuk, et al., (2007)	Growth rate of TCI(: total county income) /1990-2001	Normalized combined amenity index (Rails-to-trails miles, National Resource Inventory recreational land acres, National Resource Inventory water acres, State park amenities, and Number of designated swimming areas on U.S. Army Corps of Engineers water projects)	Economic Growth Model
Artz and Orazem, (2006)	Log differences of county employment, population, and average wages between 1970 and 2000 /1970 – 2000	Topography, January average temperature, January average sunlight, July average temperature, and July average humidity	Regional Adjustment Model (Carlino-Mills 3-D equation system)
Carruthers and Mulligan, (2007), Working paper	Log of rate of change for population density, employment density, and the average annual wage /1982-97	Natural amenity scores, Entertainment establishments, Public spending on parks and recreation, and Eating and drinking establishments	Regional Adjustment Model (Carlino-Mills 3-D equation system)
Deller and Lledo, (2007)	Region's change in population, employment, and per capita income /1989-1999	Climate, Land, Water, Winter recreation, and Developed recreational infrastructure	Regional Adjustment Model( Carlino-Mills 3-D equation system)
Deller, et al., (2001)	Region's change in population, employment, and per capita income /1985-1995	Climate, Developed recreational infrastructure, Land, Water, and Winter	Regional Adjustment Model( Carlino-Mills 3-D equation system)

**Table 2.1. Continued**

Article	Dependent Variable	Amenity Factors	Methodological Specification
Kim, et al., (2005)	Change rates of population, retail and service employment, per capita income, and distributional profiles(Gini index) /1980-1990	Land, River, Lake, Warm weather, and Cold weather	Dynamic economic development model
Bosker and Marlet, (2006), Discussion Paper	Total population growth rate in EU and non-EU between 1991 and 2001	Sunny hours per day, Rainy hours per year, Average temperature in coldest month, and average temperature in warmest month	Linear regression generating estimates of the partial correlation of each variable within a certain sub-categories

$$(2.2) \quad B_{ij} = \delta \cdot Z_{ij} + \varepsilon_{ij}$$

where  $B_{ij}$  denotes whether study  $i$ 's  $j^{th}$  parameter estimates of amenities are significantly different from zero at the  $p < 0.10$  level. If it is significantly different from zero, then  $B_{ij} = 1$ , otherwise  $B_{ij} = 0$ . Here,  $\beta$  are estimated response coefficients;  $Z_{ij}$  is identical to  $X_{ij}$  in equation.(2.1), and  $\varepsilon_{ij}$  are *i.i.d.* error term with zero mean and constant variance  $\sigma_{\varepsilon}^2$ .

#### ■ Dependent Variables ( $E_{ij}$ and $B_{ij}$ )

Effsz (effect-size:  $E_{ij}$ ), the dependent variable of equation (2.1), denotes elasticities which were transformed from study  $i$ 's  $j^{th}$  parameter estimate of the effect of an amenity on the percentage change in the respective macroeconomic variable in the  $i^{th}$  study. Bi-effsz ( $B_{ij}$ ), a dependent variable of equation (2.2), denotes binary variables whether parameter estimates in the literature of Table 2.1 are significant at 90 % confidence level or not. Therefore, if the parameter estimates are significant at 90 % confidence level, Bi-effsz has a value of unity. If not, it has a value of zero. There basic descriptive statistics are presented at Table. 2.2<sup>8</sup>.

<sup>8</sup> Note that there are some parameter estimates that cannot be transformed into the forms of elasticities. Because of this reason, the number of Effsz is less than that of Bi-effsz.

**Table 2.2. Descriptive Statistics of Dependent Variables in Each Regression Equation**

Dependent Variable	Number of Observations	Mean	Standard Deviation	Min	Max
Effsz(effect-size: $E_{ij}$ )	383	0.6457	19.4829	-24.97	378.17
Bi-effsz ( $B_{ij}$ )	637	0.3799	0.4857	0	1

### ■ Independent Variables ( $X_{ij}$ and $Z_{ij}$ )

This section describes explanatory variables of  $X_{ij}$  in the equation (2.1) and  $Z_{ij}$  in the equation (2.2). They are in fact identical and have been identified on the basis of a systematic examination of the literature where all parameter estimates were obtained. Except the fact that the number of observations for  $X_{ij}$  is smaller than that of  $Z_{ij}$  due to limitations in the ability to calculate an elasticity, model characteristics are identically classified into five categories: (A) model specification, (B) regional specification, (C) temporal specification, (D) amenity-index specification, and (E) economic growth specification. Descriptive statistics for these characteristics are presented in Table 2.3.

First, model specification denotes binary variables (zero or unity) whether each article chose indicated equations (Model3d, Model1d, and Modeletc) for empirical regression models, whether each article was published in a peer reviewed journal (Journal), or whether each article incorporated spatial autocorrelation correction components into its equations (Spatial).

‘Model3d’ is an extended version of Carlino-Mills growth model (Carlino and Mills, 1987). It is a simultaneous equation system looking at growth in population, employment, and per capita income (Deller and Lledo, 2007). ‘Model1d’ is an equation explaining the change of one economic factor as a function of diverse socio-economic variables such as demography, human capital, or amenity. ‘Modeletc’ indicates a simple linear equation in which only one study was selected (Bosker and Marlet, 2006).

**Table 2.3. Descriptive Statistics of Independent Variables in Each Regression Equation**

	Explanatory Variables	$X_{ij}$ (Total Observations: 383)		$Z_{ij}$ (Total Observations: 637)	
		Mean.	Std. Dev.	Mean	Std. Dev.
Model specification	Model3d	0.2845	0.4518	0.4160	0.4932
	Model1d	0.7154	0.4518	0.4866	0.5002
	Modeletc	0	0	0.0973	0.2966
	Journal	0.7493	0.4339	0.7519	0.4322
	Spatial	0.2950	0.4566	0.2040	0.4033
Regional specification	Rural_spec	0.4751	0.5000	0.4709	0.4995
	US	0.3446	0.4758	0.4756	0.4998
Temporal specification	Age	22.6997	7.7784	21.5416	6.4328
	Duration	1.3473	0.7358	1.2088	0.5951
Amenity-index specification	Indxsum	0.1932	0.3953	0.1538	0.3610
	Indxfactor	0	0	0.1224	0.3280
	Indxetc	0.8067	0.3953	0.7237	0.4475
Economic growth specification	Population	0.7571	0.4293	0.6750	0.4687
	Employment	0.1462	0.3537	0.1773	0.3823
	Income	0.0966	0.2958	0.0989	0.2987

Second, regional specification denotes what regions were identified in each study.

‘Rural\_spec’ indicates whether the original study obtained data from a rural area or urban area (1 for urban areas, and 0 for rural areas)<sup>9</sup>. In addition to rural/urban division, I specified whether each literature’s research region is the United States or outside the United States in ‘US’ (1 for the United States, and 0 for foreign countries)<sup>10</sup>. The United States as a study region in the literature denotes entire counties/states of the US, US south region, US Midwest region, or Appalachian region.

<sup>9</sup> There are fifteen observations (i.e., parameter estimates) in Kim, et al., (2005) that do not explicitly specify whether the parameter estimates belong to rural areas or urban areas. Kim, et al., (2005)’s research is focused on three states (Michigan, Minnesota, and Wisconsin) and one third (72) counties out of total 242 counties are classified as urban counties according to USDA/ERS’s 2003 Rural-Urban Continuum Codes. Even though it leaves a debate whether it is appropriate to code these ambiguous counties as a rural county, the number of observations (15) of ambiguous rural specification is relatively small compared to the total number of observations (637). And, even this small number of ambiguous rural specification might as well follow the majorities in the three states of interest in their research; rural counties.

<sup>10</sup> There are 26 observations (out of 242 observations) that belong to Canadian cities in Beckstead et., al., (2008), but that not explicitly specify which parameter estimates of these is Canadian. The other observations are parameter estimates for amenities of the U.S. cities’. It may be reasonable to code these unspecified Canadian cities as U.S. cities least that we should lose majorities of U.S. cities.

Third, temporal specification represents time or year period from which each research study has obtained data. 'Age' represents how many years old that each study analyzes. For example, Beckstead, et al., (2008) analyzes total paid employment growth from 1980 to 2000; hence, 'Age' takes a value of 28 if that study's beginning year is twenty eight years old compared to the meta analysis study year (2008). The 'Duration' represents a categorical variable representing how many years time duration occurred in the study itself. If the duration of interest is from zero years to fifteen years, the categorical variable is '1'. If the time-period of interest is between sixteen years to twenty five years, the categorical variable is '2'. If the time-period of interest is longer than twenty five years, the categorical variable takes a value of '3'. For example, the time-period between 1980 and 2000 in Beckstead, et al., (2008) is 21 years and takes a value of 2 for this duration variable.

Fourth, the amenity-index specification denotes what method was used in each study selected for creating the amenity index. Amenity index types are divided three sub-groups according to the methods each study adopted for creating the amenity index: the summary index approach (Indxsum), the aggregate factor score approach (Indxfactor), and all other approaches (Indxetc). The most popular summary index approach is the one of McGranahan's ERS index (McGranahan, 1999). This variable (Indxsum) takes the value of '1' only when the study explicitly described that it used the summary index approach or McGranahan's ERS index. The aggregate factor score approach is a method of compressing a set of related variables into a single scalar measure. The most popular of these approaches, the principal component approach (PCA), creates an index of linear combinations of the original variables where the linear weights are the eigenvectors of the correlation matrix between the set of factor variables. In fact, this variable (Indxfactor) takes the value of '1', when the study explicitly describes that it used amenity index created by the principal component analysis method. Other approach (Indxetc)

takes the value of '1' when the effect sizes are coefficients of each individual natural amenity such as climate or the number of public parks, and the effect size is a coefficient of other amenity index except the two explained above. There is only one amenity index in this category of other approach, and the other amenity index is created by the inverse hedonic pricing equation in Beckstead, et al., (2008).

In addition to a diversification in the method of creating amenity index, I attempted to divide the original parameter estimates of amenities into two groups - natural amenities and man-made amenities - in order to search for probable differential linkages to economic growth according to different types of amenities. The entire dataset of parameter estimates was segmented according to the two amenity types and then analyzed which economic factors (population, employment, or income) were impacted differentially. Natural amenities comprise climate, land, water, winter, and recreation facilities. Man-made amenities include police, hospital, police, school, and hotel/restaurant. Climate includes heating degree days (thirty-year average), cooling degree days (thirty-year average), precipitation, sunshine, temperature, or humidity. Land includes crop-land, conservation-land, pasture-land, and forested land. Water includes number of marinas, total river miles, or acres in streams. Winter includes international ski services, acres of mountains in counties with a given level of annual snowfall, or number of cross-country ski firms and public cross-country ski centers. Recreation facilities includes public spending on parks and recreation, entertainment establishments, developed recreational infrastructure, distance to nearest ski facility, sports and bicycle store jobs per capita. Police includes distance to police station. Hospital includes whether the regression model included distance to small acute hospitals or large hospitals, or the number of physicians. Police includes whether the regression model included distance to the nearest police station. School includes

distance to the nearest school including university. Hotel/restaurant includes the number of hotels and restaurants, or the visits to hotels and restaurants.

Lastly, economic growth specification denotes a binary variable that indicates in which equation the parameter estimates are obtained from: a population growth equation, an employment growth equation, or an income growth equation. For example, 0.0224 is the parameter estimate of recreation amenity in an employment equation where employment is one dependent variable in a 3-D equation system in Nzaku and Bukenya (2005, pp 96). In this case, the dummy variable for employment takes on a value of '1'. This economic growth specification is included in order to analyze which economic factors are highly related to which amenities.

Since in many meta-analysis studies there is no *a priori* expectation of the sign of the parameter estimates from the covariates because the meta-analysis is being conducted because there is no consensus in the literature on the research question. In this study, I put aside an argument about directional impact that amenities induce immigration or increase income, or whether high income areas spend more on man-made amenities than poorer regions. Given the identification with which type of amenities out of natural amenities or man-made amenities are more likely related to one of three economic growth specifications (population, employment, and income), regional policymakers are equipped with a broad implication to focus on which type of amenity to be invested.

## **2.4. Estimation and Results**

The fact that each original literature provides a different number of parameter estimates can justify the use of the panel-data regression model. Even though the parameter estimates are not exactly time-dependent variables, treating those variables as panel-type data would generate more efficient estimators than as a series of cross-sections with the same number of observations (Nijman and Verbeek, 1990). The  $\varepsilon_{ij}$  are assumed to be *i.i.d.* error terms with zero mean and



constant variance  $\sigma_\varepsilon^2$ . Additionally,  $E[\alpha_i] = 0$ ,  $E[\alpha_i^2] = \sigma_\alpha^2$ ,  $E[\alpha_i\alpha_h] = 0$  for  $i \neq h$ ,  $\alpha_i$  and  $\varepsilon_{ij}$  are orthogonal for all  $i$  and  $j$ .

The estimation procedure with panel data leads to a question of how to treat the first term in the right hand side of the equation,  $\alpha_i$ . This term reflects the effect of explanatory variables that are typical of the  $i^{th}$  study and that are constant within the study. Before explaining the decision procedures of which model to use, it is worthy of mentioning the implication of  $\alpha_i$ . This unobserved individual heterogeneity represents a ‘certain researcher’s effect (Jeppesen, et al., 2002, pp 25), because it differs from literature to literature and, therefore, is considered to represent specific features that the researcher used within the literature. Jeppesen et al., (2002, pp27) made an emphasis on this researcher effect: “it probably provides insightful implications about, for example, selection of the data, treatment of outliers, publication habits, or the regression approach, because they control the commonality within each study.” Based on a test whether to treat the constant term as a proper ‘researcher effect’, the discussion on whether to use panel-data regression or cross-sectional regression will be conducted.

Testing results whether to treat equation (2.1) as a panel data regression analysis are presented in Table 2.4. The most interesting issue in these tests is to find unobserved individual differences that the ordinary regression approach would have not found and, then, how to treat those unobserved individual differences. A Hausman contrast test<sup>11</sup> was conducted in order to test which approach would be appropriate in dealing with individual differences. All models with four sets of ascending explanatory variables (Model A, B, C, and D) through a pooled model

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<sup>11</sup> The test compares the coefficient estimates from the random effects approach to those from the fixed effects approach. A basic logic underlying the Hausman test is that both random effects and fixed effects estimators are consistent if there is no correlation between individual error term and the explanatory variables (Verbeek, 2004.). If both estimators are consistent, both estimates from random effects approach and fixed effects approach should be similar. On the contrary, if individual error-terms are correlated with any explanatory variables, random effects estimators are inconsistent, whereas the estimators from fixed effects approach are consistent.

with all the explanatory variables. Model E shows that random effects is inappropriate for this model. The conclusion from these statistics in Table 2.4 is that the random effects estimator is inconsistent and, therefore, it is better to use the fixed effects estimator or it is necessary to improve the model specification. However, the results of the following two tests – (1) F-test for the equalities of that all  $\alpha_i$  in equation (2.1), and (2) the Breusch and Pagan Lagrange Multiplier test – for the presence of individual researcher difference lead to a conclusion that it is better not to treat the constant term as a specific researcher's effect.

**Table 2.4. Results of Fixed Effects Approach and Random Effects Approach in Panel Data Regression**

	Model A	Model B	Model C	Model D	Model E
Hausman test	Chi2(2)=0.07 Prob>chi2 =0.7850	Chi2(2)=0.07 Prob>chi2 =0.9665	Chi2(4)=0.12 Prob>chi2 =0.9982	Chi2(5)=0.28 Prob>chi2 =0.9980	Chi2(6)=0.06 Prob>chi2 =0.9989
F-test for Equality of Individual Differences	F(5,376)=0.02 Prob>F=0.9999	F(5,375)=0.01 Prob>F=0.9999	F(5,373)=0.02 Prob>F=0.9997	F(5,372)=0.06 Prob>F=0.9980	F(5,370)=0.04 Prob>F=0.9989
Breusch and Pagan Lagrange Multiplier test for Random Effects	Chi2(1)=1.06 Prob>chi2 =0.3036	Chi2(1)=0.07 Prob>chi2 =0.3023	Chi2(1)=1.07 Prob>chi2 =0.2999	Chi2(1)=1.07 Prob>chi2 =0.3004	Chi2(1)=1.07 Prob>chi2 =0.3002

Note: Total number of observations is 383.

In sum, a combined result of the F-test and the Breusch/Pagan Lagrange Multiplier test implies that researcher-specific factors are insignificant. According to Jeppesen et. al. (2002), this finding implies that researchers in the literature are not conducting research in a manner fundamentally different from one another. Based on three test results, this chapter disregards researcher's effects and focuses on the results of OLS (Ordinary Least Squares) estimation.

Results of simple ordinary least squares estimations on different sets of variables for the equation (2.1) are presented in Table 2.5.

**Table 2.5. Results of Ordinary Least Squares Regression**

Dependent variables : Effsz	Model	(A)	(B)	(C)	(D)	(E)
	Variables	coefficients	coefficients	coefficients	coefficients	coefficient
Model specification	Model3d	26.2018***	26.5465***	23.0147***	24.4913***	21.1352**
	Model1d	(dropped)	(dropped)	(dropped)	(dropped)	(dropped)
	Modeletc	(dropped)	(dropped)	(dropped)	(dropped)	(dropped)
	Journal	27.1218***	27.2145***	19.1692*	16.6854*	16.3845
	Spatial	0.3793	0.3301	0.1130	-0.0171	-0.0057
Regional specification	Rural_spec		0.2061	0.0450	-0.3533	-0.3031
	US		-0.2092	5.2300	5.8258	11.5993
Temporal specification	Age			-1.0174	-1.2440	-1.1356
	Duration			5.5484	9.2916	8.6553
Amenity index specification	Indxsum				-7.6149	-7.5235
Economic growth specification	Population					6.4949
	Employment					(dropped)
	Income					1.6578
	Constant		-27.4256***	-6.5045	-3.4689	-11.0044
Test for heteroskedasticity (Breusch-Pagan / Cook-Weisberg test)		$\chi^2(1)$ = 5306.74 Prob > $\chi^2$ = 0	$\chi^2(1)$ = 5304.61 Prob > $\chi^2$ = 0	$\chi^2(1)$ = 5377.05 Prob > $\chi^2$ = 0	$\chi^2(1)$ = 5674.13 Prob > $\chi^2$ = 0	$\chi^2(1)$ = 6092.14 Prob > $\chi^2$ = 0
Multicollinearity test (VIF)		5.16	5.16	20.63	19.54	16.73
Prob > F		0.0000	0.0000	0.0007	0.0007	0.0011
R-squared		0.0621	0.0621	0.0647	0.0694	0.0752

Note: (1) 'Modeletc' was dropped out of regression to avoid perfect collinearity.

: (2) Total number of observations is 383.

: (3) \*\*\* indicates 1 % significance level.

\*\* indicates 5 % significance level.

\* indicates 10 % significance level.

Explanatory powers of each regression analysis are approximately six percent for all models. Whereas Breusch-Pagan / Cook-Weisberg test indicates no problems regarding heteroskedasticity in all five regression models, the Variance Inflation Factors (VIF) test indicates that only model A and model B do not have multicollinearity problems. The dependent variable of equation (2.1) is an effect-size representing how much the percentage change of income, employment, or population is caused by a one percentage change of the amenity.

Therefore, positive coefficients of explanatory variables in OLS estimation of equation (2.1) imply that inclusion of a methodological specification variable into the meta-analytic regression contributes to an explanation of the change of macro-economic variables such as income or employment<sup>12</sup>.

It is a category of a model specification that generates significant methodological specifications in a study of amenities. ‘Model3d’ is found to be significant in explaining amenity’s role in economic growth<sup>13</sup>. It implies that the three dimensional simultaneous equation system from Deller, et al., (2001) capturing interdependent relationships among “people”, “job”, and “income” is an proper estimation method in explaining the role of amenities in a context of economic growth. An emphasis on the simultaneous equation system in a study of amenities might be reasonable because amenities are not considered as a sole exogenous factor to economic growth.

The other variable that is found to be significant in explaining amenities contribution to economic growth literature is ‘Journal’. Even though the degree of significance lessens with more methodological considerations included into the OLS model, it is one of only two variables showing statistical significance. It might be a fair interpretation that peer-reviewed journals have more parameter estimates of amenities which had influential relationships to economic growth factors than unpublished/working papers

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<sup>12</sup> A notable point which might attract readers’ attention is the absolute value of coefficients, instead of the signs of the coefficients. Since some regions have a negative rate of economic growth, direction of explanatory dimension can be both positive and negative. Compared to the signs, the magnitude of absolute values of coefficients indicates how promptly or how sensitively economic impact of amenities responds to a selection of the methodological variables.

<sup>13</sup> We cannot distinguish ‘Model1d’ or ‘Modeletc’ from ‘Model3d’ in the OLS estimation, because parameter estimates deleted from the OLS estimation belong to ‘Model1d’ and ‘Modeletc’.

Next, in the dPROBIT model<sup>14</sup> in equation (2.2), a dependent variable is a binary variable indicating either 1 or 0. It takes 1 for the case that parameter estimates of original regression equations are significant at 10 % confidence level and it takes 0 for otherwise. The coefficient ( $\delta$ ) in equation (2.2) reflects a marginal effect of discrete changes of the explanatory variables with calculated at mean.

Positive values of parameter estimates of dPROBIT estimation indicate that the probability of significance increases with the particular methodological variables included. A pair of result tables of the dPROBIT estimation are presented in Table 2.6 and Table 2.7.

**Table 2.6. Results of dPROBIT Regression Using Partial Observations**

	Model	(A)	(B)	(C)	(D)	(E)
	coefficients	Marginal change	Marginal change	Marginal change	Marginal change	Marginal change
Model specification	Model3d	0.3227**	0.3094	0.5205**	0.4994**	0.4680*
	Model1d	(dropped)	(dropped)	(dropped)	(dropped)	(dropped)
	Modeletc	(dropped)	(dropped)	(dropped)	(dropped)	(dropped)
	Journal	0.0060	0.0659	0.4617*	0.5803**	0.5746**
	Spatial	-0.0913	-0.1130	-0.1080	-0.1013	-0.1016
Regional specification	Rural_spec		0.1437***	0.1400**	0.1648***	0.1644***
	US		0.1282	-0.2021	-0.2929	-0.2396
Temporal specification	Age			0.0699**	0.1014**	0.1013**
	Duration			-0.4103*	-0.7422**	-0.7426**
Amenity index specification	Indxsum				0.4325***	0.4354***
Economic growth specification	Population					0.0698
	Employment					0.0102
	Income					(dropped)
Predicted probability at X bar		0.3685	0.3642	0.3659	0.3683	0.3680
Likelihood Ratio Test		chi2(3) = 23.92	chi2(5) = 34.22	chi2(7) = 39.42	chi2(8) = 48.05	chi2(10) = 48.52
Prob > chi2		0.0000	0.0000	0.0000	0.0000	0.0000
Pseudo R2		0.0473	0.0676	0.0779	0.0949	0.0959

Note: (1) dPROBIT is a Probit regression reporting marginal effects.

(2) 'Model1d', 'Modeletc', and 'Income' were dropped out of regression to avoid perfect collinearity.

(3) Total number of observations is 383.

(4) \*\*\* : 1 % significance level

\*\* : 5 % significance level

\* : 10 % significance level

<sup>14</sup> Unlike the equation (2.1), dPROBIT estimation presents results from regression over the original number of observations (637). It could be possible because dependent variables in dPROBIT estimation are not required to be in the form of elasticities.

Two tables are presented because of an attempt to observe whether there is any change due to an inclusion of a PCA amenity index. The dPROBIT estimation using a smaller number of observations (383) does not include research which used PCA- amenity index (Indxfactor).

Among model specifications, using 3-D equation in the research heighten the probability that amenity-driven economic growth rate is significant. This collateral relationship is likely true based on the same reasoning discussed in the OLS estimation. With the regional specification included in model (B), a significant positive marginal change of ‘Rural-spec’ implies that if a research of amenities is focused on rural areas the possibility of obtaining significant estimates is fourteen percent higher than research on urban areas. This pattern of a higher percentage of significant results of amenities’ impact on economic growth of rural areas continues as more methodological considerations are included.

The next category, temporal specification, allows us to understand its methodological specifications in a composite way. All three different modes of (C), (D), and (E) show both positive marginal changes of ‘Age’ and negative marginal changes of ‘Duration’. This contrasting combination in signs may suggest that there is a higher possibility for a research whose initial year is older to generate more significant parameter estimates of amenities. At the same time, it may imply that a smaller time-gap between initial year and the ending year of economic growth change would generate more significant estimates of amenities.

Last, model (D) and (E) show significant positive coefficients of ‘Indxsum’, which implies that inclusion of McGranahan’s ERS index (McGranahan, 1999) into research on amenities increases the probability of obtaining significant results of amenities’ impact on economic growth. However, this result is somewhat modified when another type of amenity index is considered as represented in the below Table 2.7.

Table 2.7 shows results of dPROBIT estimation which used the full set of data. The major differences of dPROBIT regression using all observations from that of partial observations are the level of significance of ‘Spatial’, the negative marginal change of the additional amenity index (‘Indxfactor’), and two economic growth specifications’ positive marginal change.

**Table 2.7. Results of dPROBIT Regression Using Full Observations**

	Model	(A)	(B)	(C)	(D)	(E)
	coefficients	Marginal change	Marginal change	Marginal change	Marginal change	Marginal change
Model specification	Model3d	0.4494***	0.4561***	0.4289***	0.2106	0.2039
	Model1d	0.2410**	0.2708***	0.1404	-0.3085	-0.3331
	Modeletc	(dropped)	(dropped)	(dropped)	(dropped)	(dropped)
	Journal	-0.1154	-0.1093	0.0340	0.3883**	0.4052**
	Spatial	-0.1068*	-0.1131**	-0.1221**	-0.1480**	-0.1572**
Regional specification	Rural_spec		0.0926**	0.1057**	0.0491	0.0483
	US		0.0547	-0.0810	-0.2703*	-0.2174
Temporal specification	Age			0.0191	0.0692***	0.0704***
	Duration			-0.1067	-0.4452***	-0.4613***
Amenity index specification	Indxsum				0.0085	0.0196
	Indxfactor				-0.3107***	-0.3266***
Economic growth specification	Population					0.2079**
	Employment					0.1830*
	Income					0.1104
Predicted probability at X bar		0.3720	0.3706	0.3706	0.3705	0.3707
Likelihood Ratio Test		chi2(4) = 51.21	chi2(6) = 56.40	chi2(8) = 57.84	chi2(10) = 75.05	chi2(13) = 80.50
Prob > chi2		0.0000	0.0000	0.0000	0.0000	0.0000
Pseudo R2		0.0605	0.0667	0.0684	0.0887	0.0952

Note : (1) dPROBIT is a Probit regression reporting marginal effects.  
(2) ‘modeletc’ was dropped out of regression to avoid perfect collinearity.  
(3) Total number of observations is 637.  
(4) \*\*\* indicates 1 % significance level.  
\*\* indicates 5 % significance level.  
\* indicates 10 % significance level.

On the contrary to expected positive coefficients, ‘Spatial’ shows negative coefficients in all five regression models. This negative marginal change of ‘Spatial’ contradicts to the conventional notion that incorporating spatial autocorrelation correction components into the regression model disentangles spatial inter-relationships among economic factors because spatial components explicitly consider region-specific heterogeneity and spillover effect of those

heterogeneous characteristics in the regression models. However, the ‘Spatial’ term needs to be included in research on amenities and the reason is discussed in the next section.

Since an inclusion of additional type of amenity index (‘Indxfactor’) decreases the possibility of acquiring more significant parameter estimates of amenities in economic growth equations, there should be a doubt whether this amenity index is an appropriate method.

Last, growth changes in population and employment are more likely explained by inclusion of amenities than income growth. A simultaneous equation representing interdependence between “people” and “job” originates from Carlino and Mills (1987). An extended version of Carlino and Mills (1987) uses a three-dimensional simultaneous equation with “income” included (‘Model3d’) and an aggregate factor score approach (‘Indxfactor’) for creating the amenity index. This implication might be related to insignificant marginal changes of ‘Model3d’ and negative marginal change of ‘Indxfactor’ in (D) and (E). That is, both population and employment in the three dimensional equation are considered as more related to amenity-driven economic growth than income.

In addition to understanding factors explaining impacts on economic growth from an aggregate amenity index, I modified equation (2.2) and analyzed whether different types of amenities (natural amenities v.s. man-made amenities) would have differentiating effects on economic growth variables. The estimated model is given by,  $B_{ij}^k = \gamma \cdot z_{ij}^k + \varepsilon_{ij}^k$ , where,  $B_{ij}^k$  denotes study  $i$ ’s  $j^{th}$  10 percent confidence-level-parameter estimates of each amenity in each category for natural amenities ( $k = \text{natural}$ ) and man-made amenities ( $k = \text{manmade}$ )<sup>15</sup>. It can be hypothesized that rural areas are more related to natural amenities than urban areas. Alternatively, it can be hypothesized that spatial autocorrelation correction component is more

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<sup>15</sup> As mentioned in section 2.3.2 Data, Natural amenities are an aggregate of climate, land, water, winter, and recreation facilities. Man-made amenities are an aggregate of hospital, school, police, and hotel/restaurant.



powerful in explaining the relationships between economic factors. These interactive effects can be untangled by investigating linkages of dichotomous amenities to different economic factors and the results of the investigation are presented in Table 2.8 and Table 2.9.

**Table 2.8. Results of Natural Amenity Regression**

	Natural amenity					
	OLS (total observations : 237)		dPROBIT (total observations : 237)		dPROBIT (total observations : 425)	
	Version 1	Version 2	Version 1	Version 2	Version 1	Version 2
Model3D		3.4480		0.2353		0.3123***
Spatial	6.8756*	0.0546	0.0435	-0.0528	-0.0679	-0.1007
Rural_spec	-4.1271	-3.7087	0.1548**	0.1413	-0.0446	-0.0334
US		36.7436***		0.0570		0.1065
Age	-0.3718	-2.9873***	0.0223***	0.0167	0.0138***	0.0103*
Indxsum		24.4284		-0.1077		-0.1554
Indxfactor						-0.2045***
Population	-0.0573	6.4677			-0.0754	0.2055*
Employment	0.7165	-1.6453	-0.0947	-0.1144	0.0200	0.1966
Income	(dropped)	(dropped)	-0.1939*	-0.2232**	-0.1862 *	-0.0121
Constant	9.9916	48.9974**				
Test for heteroskedasticity	chi2(1) = 575.38 Prob > chi2 = 0.0	chi2(1) = 2566.01 Prob > chi2 = 0.0				
Test for multicollinearity : mean VIF	2.04	10.58				
	Prob > F = 0.3488	Prob > F = 0.0020	Likelihood Ratio Test, chi2(5) = 24.95 Prob > chi2 = 0.0001	Likelihood Ratio Test, chi2(8) = 28.47 Prob > chi2 = 0.0004	Likelihood Ratio Test, chi2(6) = 25.22 Prob > chi2 = 0.0003	Likelihood Ratio Test, chi2(10) = 60.12 Prob > chi2 = 0.0000
	R-squared = 0.0237	R-squared = 0.0999	Pseudo R2 = 0.0803	Pseudo R2 = 0.0917	Pseudo R2 = 0.0456	Pseudo R2 = 0.1087

Note: (1) All ‘dropped’ results are due to avoiding collinearity.

(2) \*\*\* indicates 1 % significance level.

\*\* indicates 5 % significance level.

\* indicates 10 % significance level.

First, overall model fitness is better in the man-made amenity regression than the natural amenity regression in Ordinary Least Squares estimation. In addition to this better explanation by overall composition of explanatory variables, the issue of multicollinearity is alleviated in the man-made amenity regression. On the contrary to the OLS estimation, overall modeling tests in

dPROBIT estimation indicate that the estimation using natural amenities shows better model fit than the estimation using man-made amenities<sup>16</sup>.

**Table 2.9. Results of Man-made Amenity Regression**

	Man-made amenity					
	OLS (total observations : 131)		dPROBIT (total observations : 127)		dPROBIT (total observations : 176)	
	Version 1	Version 2	Version 1	Version 2	Version 1	Version 2
Model3D		-16.3629***		-0.4085***		
Spatial	-1.0670*	0.1082	-0.1964	-0.1760	-0.2185*	-0.1724
Rural_spec	0.5395	0.2367	0.1844**	0.1735**	0.1349***	0.1274*
US						-0.8847***
Age	-0.0374	1.4218***	0.0154	0.2064	0.0395***	0.8102***
Indxsum						0.7616***
Population	(dropped)	(dropped)	0.0541	-7.71e-09	0.0488	-0.2442
Employment	1.1695	6.2153***				
Income	-0.1056	1.2921	(dropped)	(dropped)	0.3633	-0.1733
Constant	0.3894	-25.7220***				
Test for heteroskedasticity	chi2(1) = 176.64 Prob > chi2 = 0.0	chi2(1) = 509.66 Prob > chi2 = 0.0				
Test for multicollinearity : mean VIF	1.89	3.96				
	Prob>F = 0.3280	Prob>F = 0.0000	Likelihood Ratio Test, chi2(4) = 7.88 Prob>chi2 = 0.0962	Likelihood Ratio Test, chi2(5) = 8.31 Prob>chi2 = 0.1398	Likelihood Ratio Test, chi2(5) = 12.42 Prob>chi2 = 0.0295	Likelihood Ratio Test, chi2(7) = 3.67 Prob>chi2 = 0.0575
	R-squared = 0.0447	R-squared = 0.4511	Pseudo R2 = 0.0493	Pseudo R2 = 0.0520	Pseudo R2 = 0.0544	Pseudo R2 = 0.0598

Note: (1) 'Indxetc' was dropped out of regression to avoid perfect collinearity.

(2) All 'dropped' results are due to avoiding collinearity.

(3) \*\*\* indicates 1 % significance level.

\*\* indicates 5 % significance level.

\* indicates 10 % significance level.

Second, results of OLS estimation according to the two types of amenities (natural v.s. man-made) show that similar methodological specifications do not have same influences on each amenity. There are two methodological specifications which show different directional influences depending on types of amenities: 'Spatial' and 'Age'. The 'Spatial' variable increases

<sup>16</sup> Likelihood Ratio tests for the null hypothesis that all explanatory variables are equal to zero lead to a rejection of the null hypothesis at 1 % significance level for all versions of natural amenity dPROBIT estimation, whereas none of man-made amenity dPROBIT estimations lead a rejection of the same null hypothesis.

a natural amenity's impact on economic growth ( $\beta_{spatial}^{natural} = 6.8756$ ), while it dampens the degree of explanation of man-made amenities ( $\beta_{spatial}^{man-made} = -1.0670$ ). Opposite signs of 'Spatial' according to amenity-types might be due to different levels of geographic closeness of areas where either natural amenities or man-made amenities are abundant.

Furthermore, 'Age' shows conflicting influences on economic rate of changes between the natural amenity regression and man-made amenity regression. When the amenity-related research uses economic rate of change on the basis of older years, an impact of a man-made amenity ( $\beta_{age}^{manmade} = 1.4218$ ) is increased compared to a natural amenity ( $\beta_{age}^{natural} = -2.9873$ ). Positive coefficients of variables in the OLS regression indicate how much an amenity contributes to economic change. This leads us to imply that an area tends to experience more drastic changes due to man-made amenities in economies than due to natural amenities. Third, employment is more likely related to amenity-driven economic growth pattern when the amenity is man-made ( $\beta_{employment}^{manmade} = 6.2153$  for the OLS full model). This result may be capturing the effect of tourism and recreation-based regions that employ measurable amounts of low paying service jobs thereby increasing the employment effect but not the income effect.

On the contrary, natural amenities are found to be less significant in explaining economic growth change as represented in OLS model. The negative marginal effect of natural amenities in dPROBIT estimations does not necessarily imply that natural amenities decrease income growth in rural areas. However, it suggests that income changes in rural areas are not well explained by natural amenities. As stated previously, another explanation for lower income growth from natural amenities is that it brings in measurable low wage service oriented employment growth to exploit the natural amenities, for example service industry employment with the skiing industry in mountain regions.

Fourth, 'Rural\_spec' of man-made amenity's dPROBIT estimation shows all positive marginal changes, while that of natural amenity's dPROBIT estimation presents mixture of significance-level and signs. These positive coefficients of 'Rural-spec' might be understood along with the high linkages of man-made amenities to employment growth. Man-made amenities are considered to be an important factor in employment growth even in rural areas ('Rural\_spec' = 1).

## **2.5. Discussion**

From the meta-analysis of amenity's role in economic growth, I discovered three features which an amenity-driven economic growth strategy should take into consideration when interpreting research results from amenity-focused economic growth studies. First, research methodologies do not deviate much from the main stream and researchers follow their antecedents' peer-reviewed methodologies. Second, in some of these confirmed methodologies, spatial autocorrelation correction components yield contradictory results to conventional expectations. Finally, man-made amenities are highly interconnected with economic growth, especially in employment growth, and a rural area's income may not be well explained by increased natural amenities.

First, each researcher in the study area of amenities mostly follows the previous research methods. This result was, to a certain degree, expected from the beginning, because nearly ninety percent of effect-size was obtained from the parameter estimates of either the 3-D equation (41.6 %) or the 1-D equation (48.66%). Both 3-D equation and 1-D equations have their theoretic basis on endogenous growth theory. The endogenous growth theory focuses on the importance of economies of scale and agglomeration effects (Marcouiller, et al., 2004). Marcouiller, et al. (2004) referred to Button's argument that "economic growth tends to be faster in areas that have a relatively large stock of capital, a highly educated population, and an economic environment

favorable to the accumulation of knowledge”(Button, 1998). They extended the theory to include the natural amenity endowment in order for it to play an alternative and additional role in explaining the market force’s aggregate effect. The 1-D equation reflects that this aggregate effect of market forces causes one region to be concentrated with resources or outcomes (Marcouiller, et al., 2004). The 3-D equation, a simultaneous equation extended from Carlino and Mills (1987), explicitly addresses interacting relationships between “people”, “income”, and “jobs” (Marcouiller, et al., 2004, Steinnes and Fisher, 1974). Both the 1-D equation and the 3-D equation are constructed on the hypotheses that were derived from endogenous growth theory: growth is conditional on initial conditions, and growth is conditional on regional amenity factors. Therefore, even though there is a history of amenity research in economics since Graves (1983), methodological variations are rarely found in this area.

Second, it is unexpectedly notable that spatial autocorrelation correction components (‘Spatial’) show insignificant results which are contradictory to the conventional consensus in economic growth analyses. The signs of their coefficients in an estimation for the dPROBIT model using full observations are all negative. These negative coefficients imply that an inclusion of spatial autocorrelation correction components into the regression model weakens the significance of amenity factors. This conflicts to a conventional validity of spatial autocorrelation correction components; being distinctively distributed in one region, amenities are also highly correlated with close neighboring areas due to regional difference in climate, typography, and ecotype and this close proximity is successfully captured by employing geographically weighting components which correct spatial autocorrelation in the regression models (Kim, et al., 2005).

However, a further analysis beyond the relationships between amenities and economic growth rates presents a reasonable justification why amenity-driven economic growth research

should use spatial autocorrelation correction approaches in the regional economics. This statement can be clarified when I compare the percentage of other significant economic variables to that of significant amenity variables in one equation or in one research study. Percentages of significant coefficients of economic variables except amenities ( $P_{other,spatial}^{significant}$ ) and amenity variables themselves ( $P_{amenity,spatial}^{significant}$ ) in original equations which used spatial autocorrelation correction components are presented in Table 2.10.

To test a null hypothesis that the mean of the percentage of significant coefficients of other economic variables except amenity variables is not different from that of amenity variables, I conducted a simple one-sample mean-comparison test (t-test). The null hypothesis and alternative hypotheses can be written as a statistical notation as the following:

$$\left\{ \begin{array}{l} H_0 : \bar{P}_{other,spatial}^{significant} = \bar{P}_{amenity,spatial}^{significant} \\ H_1 : \bar{P}_{other,spatial}^{significant} > \bar{P}_{amenity,spatial}^{significant} \end{array} \right\}$$

**Table 2.10. Comparison of Percentages of Significant Coefficients in Spatial Correction Model Augmented Literatures**

Literature	Obs	Percentage of significant coefficients of economic variables except amenities ( $P_{other,spatial}^{significant}$ )	Percentage of significant coefficients of amenity variables ( $P_{amenity,spatial}^{significant}$ )
Kim, et al., (2005)	15	47.92	6.67
Artz and Orazem, (2006)	60	46.67	53.33
Ferguson, et al., (2007)	272	42.39	16.67
Carruthers and Mulligan, (2007)	36	66.67	58.33
Nzaku and Bukenya, (2005)	13	80.67	53.85

The p-value of one tail t-test on the equality of mean is 0.0413 and, therefore, I can conclude that the null hypothesis can be rejected at the 5 % significance level and, therefore, the percent of significant parameter estimates of other variables except amenities in each equation are higher than those of amenity variables themselves.

Additionally, a similar mean-comparison test was also conducted with respect to research that did not use spatial autocorrelation correction components. Null hypotheses and alternative hypotheses are presented in the next to Table 2.11.

$$(1) \left\{ \begin{array}{l} H_0 : \bar{P}_{other, non-spatial}^{significant} = \bar{P}_{amenity, non-spatial}^{significant} \\ H_1 : \bar{P}_{other, non-spatial}^{significant} \neq \bar{P}_{amenity, non-spatial}^{significant} \end{array} \right\},$$

$$(2) \left\{ \begin{array}{l} H_0 : \bar{P}_{other, non-spatial}^{significant} = \bar{P}_{amenity, non-spatial}^{significant} \\ H_1 : \bar{P}_{other, non-spatial}^{significant} > \bar{P}_{amenity, non-spatial}^{significant} \end{array} \right\}, \text{ and}$$

$$(3) \left\{ \begin{array}{l} H_0 : \bar{P}_{other, non-spatial}^{significant} = \bar{P}_{amenity, non-spatial}^{significant} \\ H_1 : \bar{P}_{other, non-spatial}^{significant} < \bar{P}_{amenity, non-spatial}^{significant} \end{array} \right\}.$$

**Table 2.11. Comparison of Percentages of Significant Coefficients in Spatial Correction Model Non-augmented Literatures**

Literature	Obs	Percentage of significant coefficients of other economic variables except amenities ( $\bar{P}_{other, non-spatial}^{significant}$ )	Percentage of significant coefficients of amenity variables ( $\bar{P}_{amenity, non-spatial}^{significant}$ )
Beckstead, et al., (2008)	21	52.63	42.86
Deller, et al., (2001)	18	50.88	72.22
Monchuk, et al., (2007)	2	51.11	100.00
Bosker and Marlet, (2006)	62	38.33	19.35
Deller and Lledo, (2007)	45	34.62	26.67

Percentages of significant coefficients of both socio-economic variables and amenity variables in the original regression equations without spatial autocorrelation correction components are presented in Table 2.11. The p-values of each test are (1) 0.6209, (2) 0.6896, and (3) 0.3104. Therefore, I conclude that the null hypothesis of equality in significance between other economic variables and amenity variables should be kept.

From the results of Table 2.10 and Table 2.11, and their corresponding t-test results, I conclude that even though spatial autocorrelations correction components do not play a

substantial role in generating significant coefficients of amenity variables, they are not entirely trivial to be disregarded in the regression analyses. A spatial autocorrelations correction component which reflects regional distribution effects of natural amenities indirectly contributes to higher frequency of significant socio-economic variables.

Lastly, man-made amenities contribute to an explanation of economic growth more than natural amenities and the contribution is better ascertained in the employment growth equation. Furthermore, even though research analyzes economic growth for a relatively long period, the contribution of natural amenities to economic growth is more trivial than that of man-made amenities. Man-made amenities such as hotel/restaurant, hospital, and school are more likely correlated with the emergence of high-technology based urban subpopulations, so called “bohemians” and “creative class” (Florida, 2002). Population increases in areas with natural amenities may be due to retiree immigration. Compared to urban subpopulations, retirees with high income levels are attracted to high-level natural amenities in rural areas (Deller and Lledo, 2007, Nzaku and Bukenya, 2005, Shields, et al., 1999). A differentiating result from the discussion can be derived: man-made amenities may be driving creative class growth, but natural amenity growth may be driving lower-wage employment growth.

## **2.6. Concluding Remarks**

Deducting appropriate conclusions by filling a gap among a perplexing magnitude of literature is important for researchers and policymakers. Under a circumstance that a theory is not yet clarified and theorists have plenty of previous studies on the subject of interest, meta-analysis can be useful in finding out what empirical relationships have been revealed in these studies so that they can be taken into account in theory construction. Furthermore, it is invaluable for policy makers who are interested in making optimal decisions to understand that consistent



relationship can be obtained from meta-analysis beyond each literature's various political implications. (Jeppesen, et al., 2002).

This chapter analyzed whether amenities have a consistently important role in regional economic growth by using a meta-analytic literature review. Using data from ten studies that provided approximately six hundred observations and their subset of observations, I suggest insights into possible explanations of diverse estimates reported in the literature. Given that no random researcher effect was found in existing literature, a pooled regression model derived using a diverse set of meaningful methodological diversity covariates helped draw some interesting conclusions.

Studies that incorporated spatial autocorrelation correction modeling might confuse readers and conflict conventional usages of spatial components, because there are reduced probabilities that amenity parameter estimates can significantly affect economic growth. However, the diffusion effects of amenities, especially natural amenities, are captured more significantly in explaining an effect of other variables except amenities themselves in the same regression equations. This compensating result suggests that research on amenities need to consider diffusion effects crossing jurisdictional boundaries and to include spatial autocorrelation correction components.

Man-made amenity parameters in employment growth equations were significantly larger than their population and income growth counterparts, whereas natural amenities are less related to income growth. This contrasting result gives us an inference that man-made amenities provide more employment opportunities and natural amenities attracts older generations with high income. I believe that some of the conflicting results to the role of amenities on economic growth have been addressed with this meta-analysis. I hope these results will better assist policymakers make decisions about amenity investments.

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## **CHAPTER 3**

### **MEASURING REGIONAL COMPETITIVENESS IN SITE LOCATION FOR THE U.S. FILM INDUSTRY**

#### **3.1. Introduction**

This chapter discusses local regions' competitiveness and local governments' role on an alternative approach to applying amenity values through the process of derived consumption. Even though the supply of an amenity is restricted in view of the traditional production process, people can enjoy its value without consumption. "A derived consumption" is the third aspect of consuming amenities besides enjoying use values and non-use values (OECD, 1999, p.7). This indirect way of consuming amenities occurs when the value of an amenity is transmitted to consumers through either the media or a product that embodies amenity value. An exposure of an amenity to media leads consumers to be aware of the amenity and enhances both use and non-use values. Consumers are attracted to visit the amenity and convinced of advocating for better managements.

This study seeks to analyze relationships between locally specific attributes and site decision of filming activities, so called 'on-location filmings'. 'On-location filmings' refers to a process of shooting film scenes as one part of the movie production supply chain.

Further, I attempt to measure both the physical attractiveness and an economic strategy for synthesizing the physical attributes. Given that local amenities are not flexible from the supply side but high amenities attract cultural or non-monetary benefits into an area, it is necessary to analyze how local governments use economic incentives to attract a media industry to realize a derived consumption of amenities. Based on this research premise, this chapter compares the influence of local areas' socio-economic conditions, natural environments, and a tax incentive targeted to film industries on the on-location filming activities.

Findings from this chapter indicate a distinctive distribution between man-made amenities and natural amenities. While man-made amenities are agglomerated in urban areas, natural amenities show heterogeneous dispersion. Both agricultural land and conservation land show an inverse relationship to man-made amenities. From an analysis using a local government's public policy along with an area's physical attributes, I find an overwhelming effect of local government's fiscal policy far exceeds natural and manmade amenities in influencing economic growth from the film industry.

Following the literature review about amenities' influence on regional economic growth and about a supply chain of the movie industry, the remainder of this chapter is composed of the following sections: methodology, data, estimation and results, and conclusions. The methodology is composed of a brief introduction of how man-made or natural amenities are transformed into indices and of econometric specifications to analyze the impact of local attributes on a film crew's site location decision. Data section discusses what local attributes comprise amenity indices at a more detailed level. The section on estimation and results provides a U.S. map showing distributions of each index and identifies the influence of economic subsidies by local governments to attract media industries.

## **3.2. Literature Review**

### **3.2.1 Amenities and Regional Economic Growth**

Location specific amenities have been considered a driving force for regional economic growth (Graves, 1980, 1983). There is a well-documented collection of literature reviewing the roles of cultural amenities and natural amenities in attracting high-skilled labor to a region (Currid, 2009, Dissart and Deller, 2000). Cultural amenities are geographically attractive forces that affect migration decisions of high skilled labor forces (Carr and Lisa, 2007) and offer high value added and aesthetically unique products to them (Brooks, 2000). Different age groups

show their distinctive tastes on natural amenities and constructed amenities (Clark, 2004).

Location-specific amenities are well studied in the literature about migration patterns (Beesley and Bowles, 1991, Greenwood, 1985, Heubusch, 1998, Porell, 1982, Reichert and Rudzitis, 1992, Roback, 1982, Rosen, 1979). However, it was pointed out that measurement of local attributes is not yet clearly defined (Bosker and Marlet, 2006, Ferguson, et al., 2007, Heubusch, 1998).

Amenity indices have been used in economic development literature (Barkley, et al., 1998, Deller and Lledo, 2007, Dorf and Emerson., 1978, English, et al., 2000, Henry, et al., 1997, Kim, et al., 2005, Wagner and Deller, 1998), and there are two main strategies on how to construct indices: a summary index approach and an aggregate factor score approach. Even though it's difficult to interpret the final measures (factor scores or principal component scores), the aggregate factor score approach is less subjective than the summary index approach and can allow researchers to examine multidimensional aspects of natural amenity attributes (Kim, et al., 2005).

The attempt to use an aggregate factor score approach in the amenity literature dates back to Miller (1976), who suggested an idea that sets of particular attributes can be compressed into a single scalar measure without loss of information of the original model. Dorf and Emerson (1978), in their analysis of plant location decisions, compressed more than 100 different variables into 16 components by using factor analysis. They then used these 16 compressed factors as fairly reasonable proxies of each of the original variables in questionnaire surveys for a location decision.

Henry, Barkley, and Bao (1997) compressed several blocks of variables into single regressor components and identified the influence of local quality-of-life attributes on the spread effects of metropolitan growth on surrounding rural areas. Wagner and Deller (1998) used principal component analysis and created five indicators representing regional economic

structure: markets, labor, taxes, amenities, and infrastructure. These five indicators were then used as control variables in a study of the influence of economic diversity on regional economic performance.

English et al. (2000) assigned all resource attributes to four groups that represent specific types of opportunities for recreation and tourism: urban resource, land resource, water resource, and winter resource. Then, in an estimation of relationship between jobs and income that are generated in non-metropolitan areas by recreation and tourism visitors from outside the county, they evaluated the effects of recreation and tourism development.

Kim, et al. (2005) provided a discussion comparing the summary index approach with the aggregate factor score approach in their research on investigating relationships between amenities and regional economic development. Their research used a principal component analysis method to create the aggregate factor scores of each amenity. They claimed that “an aggregate factor score approach reduces various natural attributes into multiple but similar measures, compared to the summary index approach condensing different attributes into a single scalar measure” (Kim, et al., 2005, p. 277). The summary index approach is criticized in that it is difficult to make the effective and practical supply of amenities correspond to county boundaries. This unsuccessful correspondence might result in an unclear understanding of the spatial spillover of amenities (Deller, et al., 2008, pp 8). According to Kim, et al (2005), the principal component analysis method is one approach that can be employed to produce smaller sets of factors, so called ‘principal components’ that can be used in subsequent modeling such as regression analysis.

Deller and Lledo (2007) designed a scheme about how to incorporate natural amenities into a rural economic growth model. They used the principal component analysis method and proposed five indices for amenity and quality of life attributes: climate, land, water, winter



recreation, and developed recreational infrastructure. Further, they adopted the reduced-form growth process in the framework of Carlino and Mills (Carlino and Mills, 1987). Their focus of the analysis was to obtain the coefficients of the subset of explanatory variables of research interest, for example, amenities. Their findings suggest that both climate and water have a relatively positive influence on population growth. However, an impact of natural amenities cannot be extended to income growth.

### **3.2.2. The Supply Chain of the Movie Industry**

In this section, first, I will briefly discuss the production chain characterizing the motion picture (film) industry and identify which stage in the film production chain regional economists may be interested. Regional economists are interested in which features in an area are more attractive to film production than other areas, given similar types of economic incentives offered by competing states. This discussion will lead to identifying which industries and which local attributes are data sources for creating indices of man-built infrastructure or natural amenities. Then, I will discuss detailed information such as sub-variables about identified data for five indices: Man-made Infrastructure, Agland, Conservation, Water, and Temperature.

In the film-making process, it is a series of arrangements and agreements that move the process of content creation from a funding source to production, distribution, and lastly to exhibition (ERA, 2006). The production stage is the one in which local attributes can contribute to film uniqueness. Three stages comprise the film production process: development, production, and marketing (Chisholm, 2003).

First, a film producer obtains rights to the original story on which the film is based. In addition, in this development stage, it is necessary to make arrangements with talent agents and the production studio, make arrangements with financing, and to hire and work with a writer.

Secondly, the production stage includes a pre-production phase, the actual production of the film, collaboration between the producer and director, and post-production editing and creation of the final 'negative' or print. It is at this stage 'the pre-production steps' that selection of locations is determined. Determination of locations can show a glimpse of realistic costs because logistics of an amount of crew with sufficient housing and catering is a major undertaking. One of contributing factors to the cost of a production of a film (Cleve, 2006), 'locations' is a potential marketing advantage in which one place is preferred to other places. Concerns in selecting perfect 'locations' includes closeness among different 'locations,' an easy use of mechanical special effects, easy access to public locations such as governmental buildings, streets, and parks, or a possibility to stage the scenes during times of little public traffic (Cleve, 2006). Therefore, local attributes composing attractive 'locations' to film makers are considered as key variables in this project.

Lastly, the marketing stage includes marketing the film, conducting market research, advertising, devising and implementing a foreign distribution strategy, and auditing and accounting for the revenues and costs associated with the three stages of this process (Lazarus, 1992).

In sum, from the perspective of financial constraints and physical making of shots for scenes, 'locations' in the pre-production stage is one factor that local governments may compete in order to attract movie makers. Since the film-making process is composed of complex steps and a high volume of equipment used, it is questionable whether natural topology solely has any attracting characteristics to on-location filming activities. Otherwise, film crews would crowd into an area where there are enough built facilities supporting movie production. It may be of interest to compare which factors in one region are more relevant to film-making process: natural

conditions, man-built facilities, or local area's economic institution. The next section discusses the basic methodological description about how this comparison is conducted.

### 3.3. Methodology

Since this chapter seeks to find a local government's strategy linking a fixed condition of amenities to economic growth in an area, the methodology section is composed of two parts. The first is a method of creating amenity indices representing an area's topographies including socioeconomic facilities and natural amenities. The second is a model analyzing the relationship between on-location filming activities, an area's topographies, and a local government's tax incentive to attract film industries.

#### 3.3.1. Amenity Index: Principal Component Analysis

In general, an individual geographic unit's superior economic performance to others is, whether implicitly or explicitly, determined by a complex assessment of diverse attributes of the individual geographic units. In regional economics, a region's characteristics cannot be evaluated without incorporating geographic space itself (Shaffer, et al., 2004). What is in that space (e.g., towns, cities, counties, or states) presents a blueprint for regional features.

In a simple mathematical representation, the above statement can be expressed as equation (3.1). Regional competitiveness ( $RgCom_n$ ) is determined by a complex assessment ( $f(\cdot)$ ) and the key domains determining the region n's competitiveness are several indices ( $IDX_i$ ,  $i = 1, \dots, I$ ).

$$(3.1) \quad RgCom_n = f(IDX_1, \dots, IDX_i, \dots, IDX_I)$$

Each index ( $IDX_i$ ) has its own elements,  $X^i = (x_1^i, \dots, x_p^i, \dots, x_P^i)$ , (where  $i = 1, \dots, I$ , and  $P$  varies depending on each index), which will determine the level of respective indices. Thus, the basic concept of  $RgCom$  can be realized in the following equation (3.2).

$$(3.2) RgCom_n = f(IDX_1(X^1), \dots, IDX_i(X^i), \dots, IDX_l(X^l))$$

This chapter uses the principal component analysis (PCA) method for creating indices measuring attributes impacting competitiveness. Principal component analysis is defined as a statistical tool that reduces the dimension of data and helps the understanding of the structure of an original data set with minimum loss of information (Dunteman, 1989). Jolliffe (1986) introduced a concept of a principal component; a new set of variables which was reduced and transformed the original variables by using principal component analysis. For example, a data set about natural amenities is composed of eighteen variables and it is difficult to identify which factor is the most contributing element in explaining an area's characteristics. However, PCA allows this explanation with a smaller number of variables, for example, the first principal component and the second principal component. The principal components are transformed to be uncorrelated with each other. In addition to a non-existence of correlation among principal components, the first few components such as the first, the second, and the third principal components are supposed to represent a substantial portion of variation in the original variables (Jolliffe, 1986).

While there is a limitation in interpreting principal components in terms of cause-and-effect relationships (Kusmin, 1994), an advantage of the principal component analysis is that it handles quite well regional data that are not free from "issues of multicollinearity and degrees of freedom" (Wagner and Deller, 1998, p.548). It is possible to ignore the issue of multicollinearity because the weights in linear combination are the eigenvectors of the correlation matrix of variables. Compared to other multivariate statistical procedures that reduce dimensionality such as a factor analysis, a discriminant analysis, or a canonical correlation analysis, the principal component analysis does not have an underlying statistical model of the observed variables and focuses on the maximum variance properties of principal components (Dunteman, 1989).

### 3.3.2. Panel-data Regression

This section discusses a basic idea beyond mathematical expressions analyzing relationships between on-location filming activities and an area's characteristics such as socioeconomic conditions, infrastructure, natural amenities, and an economic incentive policy. The reason for using a panel data regression is the constant characteristics of natural amenities. Even though natural amenities are treated as constant in economic growth research, other time-varying variables such as tax policy influences economic growth. Taking into account both time-varying socio-economic or policy variables and time-invariant natural amenities suggests a panel regression approach using fixed and/or random effects (Verbeek, 2004).

### 3.4. Data

Indices created in this chapter are designed to reflect the atmosphere or conditions of localities by which movie makers are attracted. Since the film industry is best characterized by the interaction between four elements of a local industry: infrastructure, labor force, markets, and stakeholders<sup>17</sup> (ERA, 2006), desirable indices being created in this chapter should represent these four characteristics distinctly and interactively. The labor force in film industries is dominantly composed of a mixture of 'superstars' cast in the movie and of directors of the movie (Hennig-Thurau, et al., 2007). The mobile feature of the superstar does not impact a region's competitiveness. Therefore, from the point of view that film industries' site location is affected by regional competitiveness, this study is more focused on areas' locally specific physical attributes, which is a type of fixed asset, such as infrastructure.

Considering construction of infrastructure indices for the film industry, infrastructure is broadly divided into two categories: man-made infrastructure and natural amenities. Because this

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<sup>17</sup> The first three categories are consistent to Duffy's findings: the most important determinant of manufacturing location among several measures is markets, labor ranks the second, and all other factors beyond markets and labor are relatively weak (Duffy, 1994)

study is focused on regions including rural areas in which natural amenities are assumed to be abundant, natural amenities are considered as one factor. First, man-made infrastructure for film industries can be divided into commercial infrastructure and cultural capital. Examples of commercial infrastructure include basic roads, airports, hotel capacity, and soundstages. Examples of a cultural capital<sup>18</sup> include historic buildings, historic streets, or churches.

It is easy to understand why commercial infrastructure is necessary in film production. It does not, specifically and solely, exist for film industries, but it can reflect overall business level in an area. However, it is ambiguous why cultural capital is another factor in man-made infrastructure. The concept of cultural capital is highly related to cultural activities. It has recently been quantified that in most developed countries, the cultural industries' share of GDP is around five per cent (Towse, 2003)<sup>19</sup>.

Let us start with the commercial infrastructure. The commercial infrastructure in this chapter is filtered to reflect greater linkages to film industries than other industries such as agriculture or automobiles as presented in Table 3.1. For example, once a location in which film shooting occurs is found, the location manager arranges location matters well ahead of an arrival-- matters that are essential for the shoot to work smoothly. Location managers acquaint themselves with the city government, making clear to them how much money the shooting company is bringing into the local economy in such categories as hotels, meals, local cars, and truck rentals, local hiring, etc (Houghton, 1992). Commercial infrastructure is indirectly related

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<sup>18</sup> The term cultural capital can be interchangeably used with man-made amenities such as historic churches or museums. However, as discussed later, cultural capital encompasses not only built structures but also institutional systems. Therefore, I use 'cultural capital' rather than man-made amenities in this chapter.

<sup>19</sup> In those countries, the growth rate of the 'creative economy' (usually defined as cultural industries plus the creative and performing arts) averages about five per cent per annum and is higher than that of 'traditional' manufacturing industries. It should be noted that these figures are vulnerable to institutional changes, such as the extension of copyright law as well as to alterations in statistical classification. For a discussion of these issues, see (Towse, 2001).

to film making in terms of creative activities, but directly related to a film crew's facilities or services.

**Table 3.1. Composition of Commercial Infrastructure Index and a Basic Descriptive Statistics of Subvariables**

Variable	Description (Data source)	Mean	Std.	Min	Max
REST	• Accommodation and Food Services (NAICS 2002: 72)	0	1	-0.8258	4.5731
AIR	• Air transportation (NAICS 2002: 481) • Support activities for air transportation (NAICS 2002: 4881) • Automotive equipment rental and leasing (NAICS 2002: 5321)	0	1	-0.7836	4.2569
ELEC	• Electrical power generation, transmission, and distribution (NAICS 2002: 2211)	0	1	-1.0566	4.8167
AD	• Advertising and related services (NAICS 2002: 5418)	0	1	-0.7446	4.3659
CONST	• Wood product manufacturing (NAICS 2002: 321) • Construction (NAICS 2002: 23)	0	1	-0.9600	4.1612
MISC	• Miscellaneous store retailers (NAICS 2002: 453)	0	1	-0.9074	4.1685
TRANSIT	• Transit and ground passenger transportation (NAICS 2002: 485)	0	1	-0.6946	4.8873
RETAIL	• Retail (NAICS 2002: 44)	0	1	-0.9033	3.9245

None of past literature on the film industry or cultural economics formally identified what types of infrastructure are commercial, not to mention cultural capital. However, in an analysis of performance of state incentives for the film industry in South Carolina, Hefner (2009) divided total spending of various sectors into goods (such as lumber, film, etc), services (car rentals, lodging, etc), and wages (salary for extras, electricians, etc).

This chapter follows his classification in selecting appropriate sub-variables to create a commercial infrastructure index. The selected classification adopted from Hefner (2009) includes the following: restaurant and lodging, air transportation and car rental, electrical services, advertising and related services, lumber and construction, specialized design services, miscellaneous retail, transit and ground passenger transportation, and retail. Sub-variables for an

index are the number of establishments for the corresponding NAICS (North American Industrial Classification System) codes in year 2002 from the County Business Patterns dataset of the U.S. Census Bureau (U.S. Census Bureau, 2002) and detailed elements for each sub-variable are provided in Table 3.1.

Second, understanding of cultural capital and construction of indices for cultural capital should follow in a way such that it is a driving force for economic growth in regions and it reflects a region's capacity to facilitate creative activities as well. Despite a lack of discussion on measuring scales and methods, identification of elements comprising cultural capital is supported by literature on the film-making process (Chisholm, 2003, Cleve, 2006, Houghton, 1992, Lazarus, 1992, Throsby, 2003).

Two types of indices are constructed for cultural capital in this project, a cultural goods index and a cultural assets index. Throsby, in his article in Towse (2003), identified a concept of cultural capital.

The concept of cultural capital has been extended into two aspects; cultural goods and cultural assets. Cultural goods are effort to recognize the distinctive features of art works. Cultural assets capture the ways in which such assets contribute, in combination with other inputs, to the production of future cultural goods and services. Cultural goods facilitate artists' creativity and expedite artistic transformation from natural symbolic meanings to some intellectual property. Cultural assets embody, store, or give rise to cultural value in addition to economic value they possess (Throsby, 2003).

Both concepts are not mutually exclusive, but play their role in human creative works interdependently. Let us take a historic church in an area as an example. When a film producer is exposed to a special story about the church and decides to write a scenario about it, the church



plays a role as a cultural good, because the sight of the church does not only bring happiness to the film producer but also accelerates his (her) creativity to make a film. In addition to this role, when some film shots are taken at the church or around the site, the church plays a role as a cultural asset, because the film generates a differential level of revenue from a hypothetical market-price of the church. Given the two aspects of cultural capital are attributed to being a driving force for economic growth in a region, cultural capital is related to the development stage in film production (Cleve, 2006). Therefore, all factors relevant in the development stage are included in constructing the cultural capital index and detailed elements for each variable for the two indices are provided in Table 3.2 and Table 3.3.

Following Throsby (2003)'s argument, cultural goods (Table 3.2) in film industries have characteristics of services to film crews. This practical function of supporting services support film staffs. According to Cleve (2006), a key factor in this stage is to acquire the rights to make a film from an original source.

Since obtaining an intellectual right is a financial issue and a producer must consult a legal assistant to ensure that rights are cleared and obtained (Cleve, 2006), sub-variables for cultural capital should reflect the legal or financial support system in some senses. The number of agent service, legal service, and financial service establishments is used and obtained from NAICS 2002. A next step in the development stage involves securing talent agents, production studios, and writers. It is relatively easier to obtain data about production studios than those about talent agents and writers, since talent agents and writers are not limited to a region but travel. The number of motion picture and video industries and sound recording industries are proxies to production studios and the number of those industries is collected through NAICS 2002.

**Table 3.2. Composition of Cultural Goods Index and a Basic Descriptive Statistics of Subvariables**

Variable	Description (Data source)	Mean	Std.	Min	Max
FINANCE	<ul style="list-style-type: none"> <li>• Automobile, Equipment, Machinery, Truck Finance Leasing (NAICS 2002: 522220)</li> <li>• Finance Company (i.e., unsecured cash loans) (NAICS 2002: 522291)</li> </ul>	0	1	-0.9596	3.7599
LEGAL	<ul style="list-style-type: none"> <li>• Legal Aid Service (NAICS 2002: 541110)</li> <li>• Mediation Product Service (except by lawyer, attorney, paralegal offices, family and social Services) (NAICS 2002: 541990)</li> </ul>	0	1	-0.7592	4.3343
AGENT	<ul style="list-style-type: none"> <li>• Agents, shipping (NAICS 2002: 488510)</li> <li>• Agents, real estate (NAICS 2002: 531210)</li> <li>• Agents, artist's (NAICS 2002: 711410)</li> <li>• Agents, laundry and dry-cleaning (NAICS 2002: 812320)</li> </ul>	0	1	-0.7564	4.4962
STUDIO	<ul style="list-style-type: none"> <li>• Studio equipment, radio and television broadcasting, manufacturing (NAICS 2002: 334220)</li> <li>• Film studios producing films (NAICS 2002: 512110)</li> <li>• Sound recording studios (except integrated record companies) (NAICS 2002: 512240)</li> <li>• Art studios, commercial (NAICS 2002: 541430 )</li> <li>• Photography studios, portrait (NAICS 2002: 541921 )</li> <li>• Photography studios, commercial (NAICS 2002: 541922 )</li> </ul>	0	1	-0.6091	5.4938
DESIGN	<ul style="list-style-type: none"> <li>• Specialized design service (NAICS 2002: 5414)</li> </ul>	0	1	-0.6976	4.4116

The other concept in cultural capital, cultural assets, in Table 3.3, reflects local features themselves, in which film scenes can be shot. It is directly relevant to ‘locations’ in film producing stages, because after the producer and director discuss and establish a clearer picture of how they envision the movie, they seek to find appropriate location sites (Cleve, 2006).

According to Cleve (2006), a location manager who is responsible for selection of the “right” location considers the following parts: the seasons during the year, the times of sunrise

and sunset, logistical accessibility, enough space for people and vehicles, pyrotechnics or stunts planned, private and public permits, contact with police and fire departments, and so forth.

**Table 3.3. Composition of Cultural Assets Index and a Basic Descriptive Statistics of Subvariables**

Variable	Description (Data source)	Mean	Std.	Min	Max
CREATIVE	Number of creative occupations (US Census Bureau)	0	1	-0.8508	4.5438
GALLERY	• Art galleries, art dealers, retailing art (NAICS 2002: 453920)	0	1	-0.7450	4.4591
PUB	• Prisons and Jail (NAICS 2002: 561210) • Museums and Galleries (NAICS 2002: 712110) • Hospitals and Medical Facilities (NAICS 2002: 622110, 622210, 622310, 623110, 623210, and 623220)	0	1	-0.9824	3.7879
INDUST	• Dams, Pumping Plants, and Water Treatment Facilities (NAICS 2002: 486110, 486210, 486910, 486990, and 221310) • Abandoned Structures and Vacant Lots (NAICS 2002: 531190)	0	1	-0.7349	4.6205
CARSERV	• Gas Station and Auto Repair Shops (NAICS 2002: 811111, 447190) • Parking Lots and Structures (NAICS 2002: 812930)	0	1	-0.8172	4.7413
RECRE	• Recreational Sports Club Facilities, Recreational Camps without Accommodation (NAICS: 713990)	0	1	-0.7412	3.9239
TRAIL	• NORSIS: ISTEAGW	0	1	-1.0981	4.1358
MARINA	• Boating Clubs with Marinas (NAICS: 713930)	0	1	-0.8047	4.1432
PARK	• NPSNPAC (NPS national park acres) and SPACRES (State park acres)	0	1	-0.5008	5.7643

This chapter adopts ‘subject categories of the California Film Commission’s location resource library’ which is presented in Cleve (2006) for variables used to construct a cultural asset index. Those variables include (1) residential, (2) commercial and retail, (3) public/government/municipal, (4) educational and religious, (5) industrial, (6) ranches and farms, (7) parks and recreation areas, and (8) transportation. The first two variables, ‘residential’ and ‘commercial and retail’, are deleted due to data inaccessibility and redundancy with the commercial infrastructure indices described prior. Furthermore, two other sub-variables in the

California Film Commission's location resource library, water/coastal areas and geography/geology, are left to the category of the natural amenity index. Out of six sub-variables, overlapped variables in each sub-variable are not included. For example, since hotels in the category of commercial and retail are counted in cultural goods index redundantly, they are deleted.

Next, the remaining region-specific topographical elements for the 'on-location' filming activities decision might be natural amenities such as climate or landscapes. The natural amenity index, in this chapter, reflects four features of natural conditions in each region (agriculture land, conservation land, water, and climate) and detailed variables for each index are presented from Table 3.4 to Table 3.7. A location specific amenity is the one of the driving forces to attract film crews into a place. If they need to make a shot of the Mojave Desert, they should be in the desert unless they use alternative computer designed scenes. If they need a shot of a habitat of mangrove wood, they need to be at swamps in southern areas.

In order to create natural amenity indices, this chapter uses a diverse set of data sources including USDA-NASS, NORSIS (The National Outdoor Recreation Supply Information System, U.S. Forest Service), and McGranahan (1999). The units of natural amenities vary according to data characteristics including such units as acres, miles, numbers, or Fahrenheit degrees.

While an issue regarding different units of diverse natural amenities is resolved by the standardization of the original variables, there still exists a problem of aggregating natural amenities. A common problem in interpreting occurs with temperature, especially summer temperature. In general, the larger number in such analyses represents increased quality or quantity. However, higher summer temperatures do not necessarily mean more desirable conditions to people. Therefore, temperate-related data are transformed in such a way that larger numbers indicate a more preferred temperature.

**Table 3.4. Composition of Agland Index and a Basic Descriptive Statistics of Subvariables**

Variable	Description (Data source)	Mean	Std.	Min	Max
CROP	• Total cropland (acres / USDA, NASS (2002))	0	1	-0.9609	3.1590
PASTURE	• Pasture land (acres / USDA, NASS (2002))	0	1	-0.5800	5.3316
WOOD	• Total woodland (acres / USDA, NASS (2002))	0	1	-1.1633	3.0520
ORCH	• Land in orchards (acres / USDA, NASS (2002))	0	1	-0.2547	6.4244

**Table 3.5. Composition of Conservation Index and a Basic Descriptive Statistics of Subvariables**

Variable	Description (Data source)	Mean	Std.	Min	Max
WET	• NRI wetland acres (acres, NRIWETL)	0	1	-0.7973	3.2640
CRP	• NRI conservation reserve program (acres, NRICRP)	0	1	-0.7627	3.4121
CRPWET	• NRI conservation reserve program wetland (acres, NRICRPWT)	0	1	-0.3376	5.0228
CRPWILD	• NRI CRP acres permanent wildlife habitat (acres, NRICRPWL)	0	1	-0.3863	4.9056

**Table 3.6. Composition of Water Assets Index and a Basic Descriptive Statistics of Subvariables**

Variable	Description (Data source)	Mean	Std.	Min	Max
WHTWATER	• AWA(American Whitewater Affiliation) total whitewater river (miles, AWAMILES)	0	1	-0.8702	2.8626
SCNRIVER	• National Wild and Scenic Rivers (miles, WSRALL)	0	1	-0.3654	4.4434
HISTRIVER	• NRI river miles with historic value (miles, RIVHISTV)	0	1	-0.9853	3.4476
VALUERIVER	• NRI Total river miles, outstanding value (miles, RIVMILES)	0	1	-1.4906	2.2773
LGLAKE	• NRI large lakes & streams (NA, NRIH2OLG)	0	1	-0.9192	2.9604
SMSTREAM	• NRI small lakes & streams (NA, NRIH2OSM)	0	1	-1.3329	3.7068
NPSRIVER	• NPS National Rivers acres (acres, NPSNRAC)	0	1	-0.4379	3.3627
RIVERELIGI	• NRI river miles with eligibility class scenic (miles, RIVSCEN)	0	1	-0.6505	3.8283

For example, the ‘Temperate summer’ indicates temperature gaps between January temperature and July temperature. According to McGranahan (1999), small temperature changes from January to July seem to be more desirable to individuals. He created this summer

temperature data variable by asking how much higher or lower the July temperature is given what one would predict on the basis of the January temperature (McGranahan, 1999).

**Table 3.7. Composition of Temperature Index and a Basic Descriptive Statistics of Subvariables**

Variable	Description (Data source)	Mean	Std.	Min	Max
JANTEMP	•January average temperature (°F, 1941-70 / USDA, ERS)	0	1	-2.6256	2.8387
JANSUN	•Average days of sun in January (Days / USDA, ERS)	0	1	-3.1084	3.4356
SUMMER	•Temperate summer (low winter-summer temperate gap / USDA, ERS)	0	1	-2.8484	6.4933
JULHUMID	•Inverse of July humidity (/ USDA, ERS)	0	1	-1.6445	2.8691

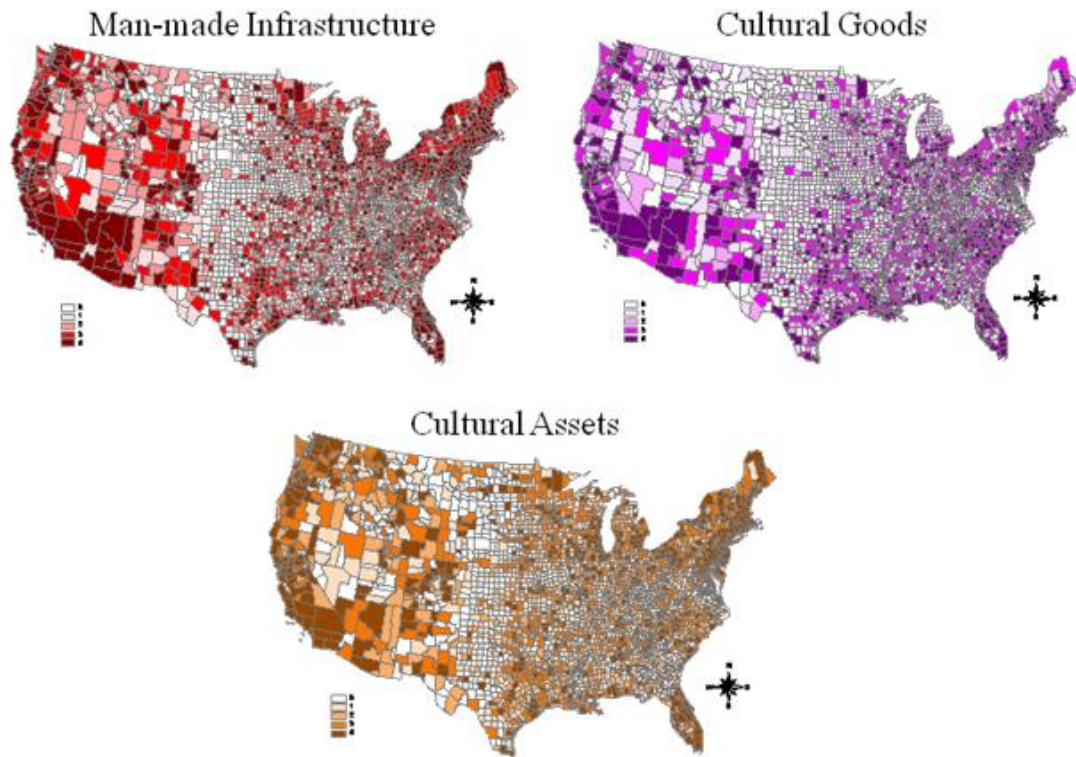
This study follows his approach. Unlike his approach of directly using residuals from a regression of July temperature on January temperature, this study applies all positive residuals. At the same time, this study assumes that small temperature gains are treated as more desirable. To do this, negative unity is multiplied to all residuals so that the observation of which residual was originally the smallest negative value has now been transformed to the largest positive value. This conversion adopted from McGranahan (1999)'s approach assigns the smaller temperature gains to the more desirable county. In a similar way, but not identically, 'Julhumid' is converted in such a way that lower humidity is more desirable to people. It is simply obtained by multiplying minus one to the original July humidity (percentage) from McGranahan (1999).

### 3.5. Estimation and Results

Since a main concern of this chapter is composed of regions' attractiveness to film industries, the results section is composed of two parts. The first is a result of measurement of U.S. counties' man-made amenities and natural amenities. The second is a panel data regression linking those amenities as well as economic incentive policy to film industries' on-location site decision.

### 3.5.1. Measurement of Amenities over the U.S. Counties

From the index scores calculated by using a principal component analysis, each of the 3,068 counties is assigned an ordinal ranking (from the 1<sup>st</sup> to 3068<sup>th</sup>) for seven indices. On account of space consideration, entire counties' rankings of each index are not presented. Instead, nationwide maps showing a distribution of each index score are presented in Figure 3.1 and Figure 3.2. Each county has one of five categorical ordering numbers according to its twentieth percentile position from the lowest ranking to the highest ranking<sup>20</sup>.



**Figure 3.1. Distribution of Man-made Amenities: Man-made Infrastructure, Cultural Goods, and Cultural Assets**

<sup>20</sup> That is, 0 is assigned to counties between the bottom and the 2455th, 1 for counties between the 2456th and the 1841st, 2 for counties between the 1842nd and the 1228th, 3 for counties between the 1229th and the 614th, and 4 for counties between the 615th and the first. The darker colors are assigned to the higher ranking counties.

From the maps in Figure 3.1, it is easily shown that the first three indices (man-made infrastructure, cultural goods, and cultural assets) have similar patterns of distribution over the counties. High ranked counties are located in large population areas in the East coast like such as New England and Florida, the West Coast around San Francisco, Los Angeles, and Seattle, and the Great Lake areas around Chicago. Even though both the cultural goods index and cultural assets index are designed to reflect supporting functions favorable to film industries, galleries and churches/temples are typically located in urban areas. This pattern that populated areas have measurable quantities of man-built infrastructure is confirmed by answering how many MSA counties are awarded the highest ranking number as presented in Table 3.8.

**Table 3.8. Distribution of both MSA and non-MSA Counties by the Categorical Rankings in Man-built Amenities**

Categorical Ranking	Commercial Infrastructure		Cultural Goods		Cultural Assets	
	MSA counties	non-MSA counties	MSA counties	non-MSA counties	MSA counties	non-MSA counties
4	512	101	503	110	473	140
3	159	455	173	441	185	429
2	86	527	90	523	101	512
1	47	567	45	569	47	567
0	16	598	9	605	14	600

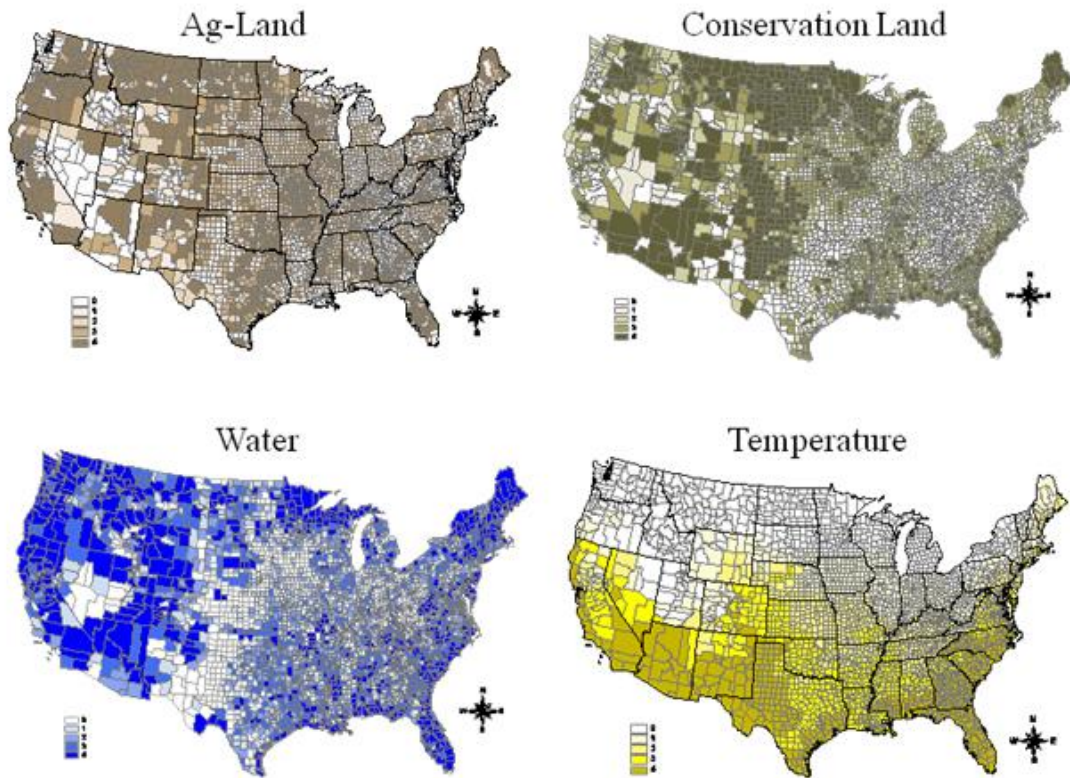
Note: The number of MSA counties and non-MSA counties are 820 and 2248, respectively.

In Table 3.8, each categorical ranking has approximately 614 counties allotted because the entire number of counties (3,068) is partitioned by the twentieth percentile. Two thirds out of the total MSA counties are awarded the highest ranking in each index. Since the MSA counties typically have densely populated areas of 50,000 population or greater or serve as commuting counties of these densely populated areas, man-built amenities are highly concentrated in core urban areas. On the other hand, it is quite notable that over ninety percent of zero-ranked counties for man-built amenities are in non-MSA counties.

The next four maps in Figure 3.2 show how natural amenities are distributed over the county. Before drawing natural amenities' maps, it was conjectured that the distribution of



categorical rankings of the natural amenities is inversely related to man-built amenities. The dark areas in the maps of man-built amenities are speculated to become bright in those of natural amenities.



**Figure 3.2. Distribution of Natural Amenities: Ag-Land, Conservation Land, Water, and Temperature**

This speculation is partially confirmed with two indices; Ag-Land and Conserve. Both indices indicate how many land acres are used for agriculture and are enrolled in a conservation program, respectively. Agland index in the Mountain West and Midwest are relatively higher than the rest of the United States. The conservation index shows a similar pattern with the Agland index, except that Texas and Oklahoma areas have fewer enrolled in the program.

On the contrary to the partial confirmation of the speculation, the Water index and Temperature index exhibit their own distinctive distributions. First, the Water index is relatively highly correlated to man-built indices such as the Cultural Goods index. This might be due to the historical path dependent locations where urban cores were formed; that is, in areas where there were sources of water for residents' needs. However, high ranked areas in the Colorado Mountains might be attributed to natural landscapes of those regions. Mountainous areas, in either ecological or topographical perspectives, have a tendency to generate more water resources. Second, the Temperature index exhibits incremental degrees of ranking from the Northeast to the Southwest and Florida. This pattern seems to be consistent with knowledge of many temperate climate regions of the Sun Belt.

Measuring a county's competitiveness in terms of man-built amenities and natural amenities generally shows distinctive distributions between the two amenities. Even though portions of agricultural land and conservation land are strongly related to a rural county's position, the water resource and temperature conditions indicate closeness to an urban area's location. Whether these proportions among man-built amenities and natural amenities do matter is hypothesized in the film-making process. In addition to local areas' physical attributes, economic institutional differences of regions are also considered as factors impacting film making in the next section.

### **3.5.2. Results of Panel Data Regression**

Unlike the previous section of the measurement of amenities, it should be noted that all data used in the panel data regression analysis in this section are at the state level. The reason for this change in a spatial-unit difference is due to data availability. An analysis on the influence of tax incentive policy along with an area's amenities on film industries uses the following total number of films whose shots were made in one area as the dependent variable for on location

filming activities. This variable (Filmings) was obtained from ‘The Internet Movie Database’ over the 48 continental U.S. states during the period 2000 to 2007<sup>21</sup>. Descriptive statistics on the ‘Filmings’ variable as well as PCA amenity indices and other explanatory variables at the state level are presented in Table 3.9.

**Table 3.9. Descriptive Statistics of Variables in Panel Data Regression**

Year	2000		2001		2002		2003	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Filmings	11.94	29.93	16.33	42.69	18.19	43.71	18.33	43.12
Gallery	121.15	147.34	124.96	151.42	134.94	167.21	134.94	167.21
Recreation	295.94	261.26	298.06	265	279.4	244.67	279.85	242.8
Studio	959.42	1454.04	985.96	1500.28	985.35	1504.97	982.25	1476.15
Temper_June	0	3.11	0	3.46	0	3.78	0	3.76
Agland PCA	0	0.96	0	0.96	0	0.96	0	0.96
Conservation PCA	0	0.75	0	0.75	0	0.75	0	0.75
Water PCA	0	0.62	0	0.62	0	0.62	0	0.62
Temperature PCA	0	0.6	0	0.6	0	0.6	0	0.6
Tax_duration	0.5	2.6577	0.5625	2.8427	0.6667	3.034	0.7708	3.2435
Year	2004		2005		2006		2007	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Filmings	22.48	54.35	30.35	72.53	32.85	81.06	35.06	77.7
Gallery	131.46	164.59	132.67	171.07	131.4	170.94	133.83	176.65
Recreation	290.31	249.75	297.38	253.94	298.98	257.21	314.85	270.57
Studio	1008.21	1496.01	1036.6	1562.94	1051.94	1606.71	1080.46	1655.08
Temper_June	0	2.93	0	4.93	0	2.72	0	3.26
Agland PCA	0	0.96	0	0.96	0	0.96	0	0.96
Conservation PCA	0	0.75	0	0.75	0	0.75	0	0.75
Water PCA	0	0.62	0	0.62	0	0.62	0	0.62
Temperature PCA	0	0.6	0	0.6	0	0.6	0	0.6
Tax_duration	0.8958	3.4655	1.1667	3.6805	1.5625	3.9025	2.0141	4.1165

<sup>21</sup> In the website of the Internet Movie Database (<http://www.imdb.com>), there is a search engine (‘IMDBPro’) that creates query of movie titles with respect to year of production, genre, location place, year, and etc.

Explanatory variables representing natural environments are ‘Temper\_June’, ‘Agland PCA’, ‘Conservation PCA’, ‘Water PCA’, and ‘Temperature PCA’. Among these, Temper\_June was created in such a way that smaller changes from January temperature to June temperature are assumed as more favorable to people (McGranahan, 1999). Original temperature data of two months over 2000 through 2007 were obtained at NOAA (National Oceanic and Atmosphere Administration) Satellite and Information Service. Unlike other PCA indices for natural amenities, this Temper\_June differs in every year.

This chapter includes three individual variables representing man-made infrastructure instead of PCA indices. The reason for using individual variables such as Gallery and Studio is due to high multicollinearity among man-made infrastructure PCA indices.

In addition to this disadvantage in regression analysis, the three variables are assumed to represent different characteristics in supporting film industries. The ‘Gallery’ symbolizes the overall cultural level in one area. ‘Recreation’ facilities are often referred to as an industry which receives benefits from natural amenities. ‘Studio’ is more directly related to film industries than the first two sectors.

In addition to the four natural amenity indices using the principal component analysis, ‘Tax\_duration’ is included as an explanatory variable. It indicates how many years each state has had its tax-related subsidy policy. It is calculated by subtracting the year of introduction of the tax policy from each year in the panel (‘year’ minus ‘the first year of tax policy’). Information on ‘the first year of tax policy’ was obtained by inquiries to film authorities of state governments. Most states initiated the tax-subsidy programs in 2006 or 2007, whereas Louisiana or New Mexico introduced their tax incentive programs 2002.

The “Tax\_duration” variable would be able to capture local governments’ effort to attract film industries into their areas. The larger values of the coefficient on ‘Tax\_duration’ indicate

that greater duration of a state's tax incentive policy would increase the number of on-location filming activities into the state.

In order to compare using PCA amenity indices to individual amenity variables, I run two versions of the regressions<sup>22</sup> and their results are presented in Table 3.10.

**Table 3.10. Results of Panel Data Regression on Number of Films**

Dependent Variables : Filmings	Version 1				Version 2			
	F.E.		R.E.		F.E.		R.E.	
Independent Variables	Coeff	Std. Dev.	Coeff	Std. Dev.	Coeff	Std. Dev.	Coeff	Std. Dev.
Gallery	0.1498***	0.0720	0.0418	0.0373	0.1499**	0.0719	0.0582	0.0454
Recreation	-0.1803***	0.0427	-0.1435***	0.0174	-0.1801***	0.0425	-0.1471***	0.0216
Studio	0.1704***	0.0116	0.0532***	0.0042	0.1703***	0.0116	0.0540***	0.0049
Temper_June	-0.0386	0.3879	0.5072	0.4121				
Agland PCA					(dropped)		0.9726	4.0878
Conservation PCA					(dropped)		1.3701	3.9904
Water PCA					(dropped)		-6.4892	5.5942
Temperature PCA					(dropped)		-3.3878	4.8464
Tax-duration	1.0692	0.8146	0.9225*	0.5529	1.0704	0.8132	1.3392**	0.6288
cons	-116.71***	13.6845	5.1912	3.6501	-116.7571	13.65***	2.8670	4.7568
R-sq within	0.5774		0.4841		0.5774		0.5001	
R-sq Between	0.921		0.9491		0.9211		0.9410	
R-sq Overall	0.8403		0.8702		0.8404		0.8642	
	F test F(47, 331) = 10.77 Prob > F = 0.0000				F test F(47, 331) = 11.67 Prob > F = 0.0000			
	Breusch-Pagan Test chi2(1) = 47.69 Prob > chi2 = 0.0000				Breusch-Pagan Test chi2(1) = 82.04 Prob > chi2 = 0.0000			
	HAUSMAN TEST chi2(5) = 233.16 Prob>chi2 = 0.0000				HAUSMAN TEST chi2(5)= 252.38 Prob>chi2 = 0.0000			

Note: (1) \*\*\* indicates 1 % significance level.  
 \*\* indicates 5 % significance level.  
 \* indicates 10 % significance level.

The estimation results for the within estimator, which is based on deviations from individual means, are given in the column of fixed effects (F.E.) approach in both versions. First

<sup>22</sup> Version 1 does not include any PCA indices, while version 2 uses PCA indices for natural amenities.

of all, it should be kept in mind that time-invariant variables are not deleted from the regression analysis in the fixed effect approach. For example, natural amenities such as Agland PCA or Water PCA were assumed constant over the eight years of the research period, 2000 to 2007.

Three man-made infrastructure variables show similar results in both versions. Both Gallery and Studio are significantly found to attract on-location filming activities into a state. Approximately six or seven more galleries or studios can bring one more filming activity into a region. However, recreation facilities do not appear to increase film activity. It may also be reasonable to consider natural amenities' results from a random effects (R.E.) model. Recreation facilities or tourism industries are the most likely sectors in which values of natural amenities are effectively realized (Marcouiller, et al., 2004). However, natural amenities are found to be insignificant in attracting movie industries in the random effects approach. This negative effect of natural amenities seems consistent with the negative impact of recreational facilities.

Second, the tax incentive program helps film industries attract on-location filming activities into a region. The magnitude of the tax policy approximately attracts one more movie's on-location shooting with each additional year the tax policy has been in effect. The tax effect is found to be more statistically significant in the random effects model in both versions. Since the random effects estimator is able to capture unobserved characteristics that are uncorrelated over time, coefficients of variables in the random effects approach sort out time-invariant individual effects. With the time-invariant effects (e.g., natural amenities) sorted out, the effect of tax incentive program was enhanced in version 2. Therefore, if we consider that two of the top states in the country for growth in film production (Louisiana and New Mexico) began their tax incentive programs earlier than most other states, their early mover advantage in tax policy may

have resulted in path dependent infrastructure investments that may allow them to continue to maintain a film production edge over states with younger tax policies.

### **3.6. Conclusions**

This chapter attempted to identify whether a local government succeeds in attracting a media industry to realize a derived consumption of amenities. A film industry was chosen as a subset of the media industry because it was assumed to generate high profile employment growth as well as cultural reshaping impacts on local economies.

A local area's competitiveness was measured by its man-made infrastructure including cultural capital and its natural amenities. Man-made amenities and natural amenities show an extreme discrepancy in distribution between urban and rural areas. Man-made amenities are agglomerated in urban areas. Natural amenities exhibited more heterogenous patterns compared to man-made amenities. Only the temperature index showed a gradual inverse relationship to its latitude. Further, Western Mountain areas including Colorado and Utah showed high scores in natural amenities as confirmed in previous research (Rudzitis and Johanse, 1989).

A state government's economic instrument to reshape its region, tax incentive policy, appears to have succeeded in attracting media industries. That is, film crews search for a site where it can alleviate risk in production costs with all other man-made and natural environments held constant. Further, as the duration of the tax policy grows, the economic impact grows as well.

A limitation of this study was its spatial unit of analysis, the state. One of the key variables, natural amenities, can vary greatly within a state, especially geographically large states. A smaller geographically defined area such as a county may be able to tease out greater linkages between amenities and on-location filming that is constrained in the state-based analysis. Further,

a county level analysis may be improved through the use of spatial econometric techniques that will control for spatial spillovers of nearby county/regional natural amenities.

Finally, future research at the sub-state level should analyze the role of tax subsidy policy of smaller units of government. Counties and municipalities within individual states that have aggressive film industry tax policy often add additional local tax benefits to lure filming activity. A within –state analysis or case study analysis of counties from different states with high levels of on-location filming may add difficult to quantify factors that make some regions more successful than others in combining state policy with local strategies.

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## **CHAPTER 4**

### **AN ANALYSIS OF TAX SUBSIDY POLICY ON LOCAL ECONOMIES: A CASE OF THE RISING STATES IN THE FILM INDUSTRY IN THE UNITED STATES**

#### **4.1. Introduction**

This chapter is focused on a film industry's performance in local areas. The film industry is one component of the larger media industry through which the value of amenities is transmitted to consumers. The typical performance metric of the film industry is box office revenue. However, from a regional economics and economic development context, one is more interested in the film industry's contribution to one or more local areas; that is, where contribution refers to economic growth as measured by employment or per capita income.

This chapter analyzes an effect of the tax incentive program targeted to film industries on regional economies of two states, Louisiana and New Mexico. These two states are selected because their respective climate conditions are favorable to outside filming activities and because Shreveport, LA, and Albuquerque, NM, are considered top filming locations in the country (Wood, 2008). More than the climate advantages, film industries in the two states might have taken advantage of the respective tax subsidy policies established by the two states in 2002. An empirical analysis is conducted by comparing the economic performance of each of these two states over two time periods (2000 and 2005) with control states. That is, one state which began the tax incentive program during the period (Louisiana and New Mexico, the treatment group) and a control state for each of the treatment group states which did not have the program during that period. The latter states serve as control group regions which would have happened without the policy. The technique comparing changes between before-policy and after-policy of two groups is called a 'quasi-experimental approach.'

The film industry is selected based on both economic and natural endowment considerations. Currently a large number of states subsidize the industry through various tax incentive programs. Additionally, the film industry uses both man-built infrastructure and natural amenities in its production process (i.e., the making of films) and uses the region's natural resource base without significant degradation of it. A media industry is known to deliver the value of natural amenities to consumers through its transmitting system, a derived consumption for natural amenities<sup>23</sup> (OECD, 1999). Beyond its implicit usage of natural landscapes, a film industry is known to create clean, knowledge-intensive jobs and to bring spinoff benefits in terms of tourism (Morawetz, et al., 2007). On account of these benefits, most states have enacted film incentive programs and most of these programs have been introduced since 2006. Taxing programs, such as those used to entice relocation of the film industry, represent regional development policy and an empirical evaluation of this policy can serve several purposes. First, it can provide local governments with information to help them better assess the benefits, in terms of economic impacts, that may be expected to accrue from the creation of a tax policy or change in an existing policy. Second, such an analysis can provide relevant information as to the importance of natural amenities in attracting industry and whether there exists some 'trade-off' between natural amenities and taxes. Finally, the analysis can be used to examine whether man-made capital can be substituted for natural amenities and vice-versa as well as the possible range of substitution.

Findings of this chapter using the quasi-experimental approach in order to analyze an impact of the tax incentive program in film industries on local economies can be summarized as follows. First, this chapter found meaningful methodological specifications that should be

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<sup>23</sup> For example, a movie 'Under the Tuscan Sun' shows a beautiful scene of Cassa di Risparmio di Firenze in Florence, Tuscany, Italy. Watching the heroine's staying in a little cottage in a county of Tuscany, audiences may indirectly experience tranquil life surrounded by pastoral landscapes of Tuscany, Italy.

considered in regional studies using a quasi-experimental approach. They include the appropriate consideration of control periods, spatial units of comparison, and validities of dummy variables representing extraneous shocks. Second, the impact of the tax program on local economies is negative in most industries. Particularly, small size establishments in policy participants reduced their shares compared to national level shares. Third, an influence of tax subsidy policy on local economies is limited to a central area and does not benefit neighboring areas.

To examine the role of tax policy as it relates to attracting the film industry, this chapter first provides a description of the tax incentive program for the film industry with emphasis being given to the programs in Louisiana and New Mexico. This is followed by a review of the relevant literature on a quasi-experimental analysis and the film industries in the context of regional development. Attention is then turned to the development of the methodology used to examine the role of tax policy as it relates to the relocation of the film industry. This section provides the justification for using the quasi-experimental approach. The regression equations considered for analysis are also developed in this section. Results are then presented in this section followed by the major conclusions of the study.

#### **4.2. Tax Incentive Program for the Film Industry**

According to Christopherson and Righthor (2009, p. 2), state policy makers throughout the nation have strived to attract film production to their respective states through tax-based subsidies that provide producers with “soft money” to finance production. Entertainment industries of film and television, a core of creative industries, can provide a low cost way to market the community and build its attraction to audiences as well as visitors. Because film crew activities are vividly recognized by the public, the film industry is an appealing sector for policy makers interested in improving their economies.

The film industry is a major private-sector employer which hires 2.5 million people. Most of them (2.2 million employees) are in businesses that are indirectly related to film industries, but also serve other industries in the economy<sup>24</sup> (Epstein, 2009). Based on the Bureau of Labor Statistics, Epstein (2009) reported that the average salary of employees in the core production-related industry (producing, marketing, manufacturing and distributing motion pictures and television shows) was just under \$75,000 in 2007. This was 75% higher than the average nationwide salary which helps show why film industries are appealing not only from a cultural perspective but also an economic perspective. However, the high financial risk of investment, especially in the production sector of the industry, can be mitigated through tax-friendly site selection for on-location filming activities (Schuker, 2009). Therefore, the following two sections briefly introduce tax incentive programs for film industry activity in Louisiana and New Mexico, two of the top filming regions in the U.S.

#### **4.2.1. Louisiana's Tax Incentive Program for the Film Industry**

According to Louisiana Production Capital (L.P.C.), Louisiana has offered three types of tax incentives since 2002: an investor tax credit, an employment tax credit, and a sales tax exemption. Depending on a total budget or the expenditures during a single year, the movie producer can expect a maximum of 25% of investment back in the form of tax credits. For the employment tax credit, Louisiana offers a 10% tax credit for Louisiana residents hired to work in movie production<sup>25</sup>. Lastly, if its expenditure exceeds \$250,000 in any consecutive 12-month period, a movie production company will be excluded from state sales and use tax (4%), (L.P.C., 2010).

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<sup>24</sup> Epstein (2009) takes the following businesses as examples of indirect industries: movie theaters, video rental operations, television broadcasters, cable companies, apparel and accessory retailers, car rental and sales dealers, caterers, dry cleaners, florists, hardware and lumber suppliers, transportation companies, themed restaurants and tourists attractions.

<sup>25</sup> After 2005, the maximum investor tax credit was increased to 40% and the employment tax credit was also increased up to 35% of the total aggregate payroll.



Louisiana also offers a tax credit on building of film infrastructure<sup>26</sup>. If the total Louisiana expenditure is greater than \$300,000 and less than or equal to \$8 million in one year, the producer shall be allowed a tax credit of 10% of the entire production budget, regardless of whether such funds are spent in Louisiana. If the total Louisiana expenditure is greater than \$8 million in one year, the producer shall be allowed a tax credit of 15% of the entire production budget regardless of where such funds are spent. Louisiana already has the Nims Center<sup>27</sup> in New Orleans and the Exposition Center in Shreveport (L.P.C., 2010).

The 10% employment tax credit (10% of the total aggregate payroll) is in connection with production when total production costs in Louisiana equal or exceed \$300,000 but are less than \$1 million. If the total production costs exceed \$1 million, Louisiana offers an additional 10% employment tax credit<sup>28</sup> (L.P.C., 2010). According to L.P.C. (2010), the tax credit including the employment tax credit is applied to Louisiana income tax and corporate franchise tax.

#### **4.2.2. New Mexico's Tax Incentive Program for the Film Industry**

According to Earnst & Young's report for the New Mexico State Film Office and State Investment Council (E&Y, 2009), New Mexico has also provided tax incentives to film productions since adoption of the film production tax credit in 2002 (E&Y, 2009). Initially, the tax credit rate was established at 15% of production expenses incurred during the production and post-production phases of each film produced in the state. The rate was increased twice bringing the rate to 25% in 2006<sup>29</sup>.

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<sup>26</sup> In addition to existing infrastructure such as basic road, airport, and hotel capacities, film infrastructure mostly comprises film studios, sound stages, a commissary and a storage warehouse for filming equipment and supplies. For example, East Feliciana Parish, Louisiana has sought ways to assist Armada Studios build a 160-acre, \$30 million complex near Baton Rouge to produce five movies annually (Trosclair, 2008)

<sup>27</sup> The Robert E. Nims Center is a studio for entertainment arts and multimedia technology which is operated in cooperation with the University of New Orleans, the Louisiana Governor's Office of Film & Television Development, New Orleans Office of Film & Video, and Jefferson Parish President's Office.

<sup>28</sup> However, this tax credit is not applied to any employee whose salary is more than \$1 million.

<sup>29</sup> While there is information about the current tax credit program of New Mexico, it is difficult to find tax credit information for 2002 except the initial year of New Mexico's credit program. Detailed information for the current

As of 2009, New Mexico offered a 25% tax rebate (a refund, not a credit) on all direct production expenditure (including New Mexico's labor). In addition, New Mexico offers a 0% loan for up to \$15 million per project for qualifying feature films or television projects and the loan amount can represent up to 100% of the budget. The qualified film must be wholly or partially (at least 85%) shot in the state. Additionally, a minimum of 60% of "below-the-line" (BTL) payroll and body count must be allocated to New Mexico residents. New Mexico offers a 50% reimbursement of wages for on-the-job training of New Mexico residents in advanced below-the-line crew positions.

New Mexico does not have a state sales tax on film industries. By the term "no state sales tax" for film industries, New Mexico issues to a movie production company an incentive: Nontaxable Transaction Certificates (NTTCs). As a type of grocery-store coupon, a certificate is presented at the point of sale and no gross receipt tax is charged.

### **4.3 Literature Review**

Since this chapter uses a quasi-experimental approach in order to analyze an influence of the tax incentive program in film industries on local economies, this literature review section first discusses the quasi-experimental approach and, then, the film industry on economic development.

#### **4.3.1. Literature on a Quasi-experimental Approach**

An attempt to use quasi-experimental analysis when evaluating regional policy dates back to Isserman and Merrifield (1982). They were suspicious that a hypothetical situation in which a policy would not be implemented was a central methodological problem in evaluating

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tax program in this section was found at the website of New Mexico Film Office (<http://www.nmfilm.com/filming/incentives/>).

regional policy. Since then, there has been progress made from a methodological perspective on diverse regional issues.

There are diverse quasi-experimental research topics on the impacts of regional facilities in an area: an analysis of economic structure's change caused by a large-scale energy facility's development (Isserman and Merrifield, 1987), an impact of highway construction on low income areas (Rephann and Isserman, 1994), a discussion of the empirical considerations in identifying effectiveness of enterprise zone planning (Boarnet, 2001), an assessment of employment growth in the counties of Georgia caused by the 1996 Summer Olympic Games (Hotchkiss, et al., 2003), an investigation on how the construction of a sports stadium affects residential housing values (Tu, 2005), an impact of meat-packing process industries on the rural economies of Midwestern and Southern areas (Artz, et al., 2007), and an attempt to investigate effectiveness of a construction of state-run prisons in rural economies (Glasmeier and Farrigan, 2007).

Reed and Rogers (2003) provided two methods to choose control groups which play a role as a counter-factual group to the treatment group in the quasi-experimental approach. The two methods include a case study and a twins study approach. The case study matches one treatment place to multiple control places and the outcome variable for the treatment place is compared to the mean or median of the outcome for the set of control places. On the other hand, the "twins" study assigns one control place to each of treatment place.

While case studies do not necessarily need a matching process prior to policy impact, the "twin" study requires each control observation to be matched to a single treatment place. This matching process is required due to the fact that observations in the paired sampling framework in "twins" studies are implicitly assumed to be independently and identically distributed. A basic premise in the pre-test in the quasi-experimental approach is the same as in experimental research: a group of places should be identified to create the comparison or the baseline from

which the change caused by the policy or project can be inferred. Although assignment to a treatment group occurs non-randomly, a control group must be selected in such a manner as to reconstruct that aspect of a true experiment. Once an acceptable control group has been identified, the difference between the control places and the treated places (or place) on an outcome measure is the inferred effect of the treatment (Isserman and Beaumont, 1989).

Case studies do not generally allow multiple analyses to yield a summary statistic of impact, and the results are usually qualitative in the sense that no formal hypothesis tests are conducted. Reed and Rogers (2003, p. 4) raised an issue of a quasi-experimental policy evaluation with a comment that “place-related impact analysis, in reality, relies on imperfect matching and that imperfect matching yields biased quasi-experimental evaluation estimators.”

It is required to present local similarities as a prerequisite of comparing and matching between treatment groups and control groups (Friedlander and Robins, 1996). Even though empirical results showed ineffectiveness, they used two statistical techniques in order to overcome shortcomings that conventional non-experimental evaluation strategies had in controlling for intrinsic differences in innate local characteristics; that is, statistical matching and a specification-test. In the statistical matching process, the observed characteristics of the treatment group are matched against those of each candidate. After this matching, the candidate generating the most similarity measured by an M-distance-metric is selected to be the control group.

A specification test used in their study was a test whether the econometric model captures the program’s effect by groups; that is, whether all the differences in outcome variables between temporal and sectoral groups except those affected by the program are adequately considered. In practice, a specification test analyzes whether the econometric model correctly predicts no difference in outcome between treatment groups and control groups before the treatment groups

are treated by the program. Their important findings are that comparison across states yield estimates of program effects quite far from true effects.

#### **4.3.2. Literature on a Film Industry in an Economic Development**

According to Christopherson (2008), the film and television industries are considered to be less harmful to the environment than manufacturing industries, create knowledge-based economy jobs, and benefit from a reformed “image” of a region. Making a shot for a film makes use of local attributes, for example, natural landscapes, without substantially transforming them. Knowledge-based economy jobs attract the ‘creative class’ (Florida, 2002) which is distinguished by its unique tastes to a place that is open to a wide spectrum of lifestyles (Beckstead, et al., 2008).

On the contrary to these positive effects, film industries are very risky in generating stable and predictable revenues. As a consequence, producers in entertainment industries undertake strategies to reduce downside risks in the production and distribution processes. Risk reduction strategies encompass the industry’s lobbying to change the regulation of competition and trade policies affecting media firms, producers’ pursuit of complex tax avoidance<sup>30</sup> and financing schemes, and media workers’ use of exclusive networks to insure employment continuity (Christopherson, 2008).

A tax incentive program to film industries was shown to be an attractive instrument for film crews in the previous chapter. In Chapter 3, I found that one more year of the prolonged tax incentive program would bring one more filming activities into an area. Results from the regression analysis using panel-dataset support recent rankings in preferred movie making locations. In a recently released magazine, *Movie Maker: the Art and Business of Making a*

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<sup>30</sup> For example, a producer of “Velocity”, an action thriller, changed on-location filming places continuously and rewrote scripts solely due to financial consideration. The final filming place was where he could obtain the most lucrative tax incentive and government subsidies (Schuker, 2009).

*Movie*, the top 10 Movie Cities in 2008 were Austin (TX), Albuquerque (NM), and Shreveport (LA), in descending order (Wood, 2008).

It is possible that this sudden increase of spending brings monetary benefits to the local community. For example, according to the Economics Research Associates (ERA 2006, p. 14), the total output multiplier of the film industry in Louisiana from 2002 through 2005 was 1.847922 (see Table 4.1). The total output multiplier represents how much each dollar of final demand for a particular sector (film industries in this case) generates in total economy-wide output (Isard, et al., 1998, p. 61). Therefore, for every \$100.00 of spending in the film industry, a total of \$184.80 will be generated in total output statewide.

**Table 4.1. Sample Industry Multipliers, Louisiana**

Industry	Multipliers
Facilities Support Services	1.853451
Scientific Research and Development Services	1.852233
Waste Management and Remediation Services	1.850115
Miscellaneous Wood Product Manufacturing	1.849452
Prefabricated Wood Building Manufacturing	1.848719
<b>Motion Picture and Video Industries</b>	<b>1.847922</b>
Meat Process from Carcasses	1.847706
Management Consulting Services	1.845871
Other Ambulatory Health Care Services	1.845515
Accounting and Booking Services	1.845487
Wood Windows and Door Manufacturing	1.843424

Source: Economic Research Associates (2006), 'Trends in Film, Music, & Digital Media', submitted to The State of Louisiana, Department of Economic Development

Prior to 2002, only \$32 million per year was spent in film and television production in Louisiana. Since 2002, however, \$1.5 billion has been spent in film production which equates to \$160 million per year. In addition to the tangible financial benefit, the local economy benefits from the increased film production activity. Retail services such as hotels, restaurants, food suppliers, accounting services, attorney services, and hardware stores are just a few businesses that benefit directly or indirectly from film making (Carrow-Jackson, 2007).

With the exception of Christopherson and Rightor's (2009) working paper, little research has been conducted which has examined the regional contribution of the film industry to regional economies. Christopherson and Rightor (2009) investigated how the subsidies-oriented approach has emerged from the service-oriented incentives that, until the late 1990s, were the norm. They examined the evidence concerning the fiscal impacts of film and television subsidy programs, and the methods used to calculate subsidy-produced job creation and tourism impacts.

Furthermore, they examined the use of production subsidies in New York State in descriptive detail and concluded that the effectiveness of tax-based subsidies was somewhat questionable. They came to a conclusion that the facilities-oriented subsidies to attract and retain television production did little to promote New York's distinctive advantages in shaping the future of the media economy and had the disadvantages associated with tax-based programs such as inequities in the allocation of the cost and benefit and inadequate consideration of opportunity costs.

Christopherson and Rightor (2009) imply that the location decision in film making is primarily determined by economic factors, and then secondarily affected by the distinctive scenes and features of a particular place. Movie producers are not involved in the location decision. Rather, major media conglomerates who are in charge of marketing and distribution of media products determine production locations. Therefore, this study does not investigate the location decision mechanism in movie production, but is focused on the impact of tax subsidy programs to film industries on regional economies. Further, this study does not use micro-level data on who benefits and who pays for the subsidy programs but rather a difference in difference policy analysis approach.

In conclusion, the film industry is considered a key industry being recruited by states to reshape regional economies and, as such, most state governments have enacted policies to attract

this media/cultural industry. As shown in chapter 3 as well as the literature review in this chapter, the cost of film-producing is the most crucial factor for film crews to select the site for film production. Moreover, the tax incentive policy targeted to a film industry is the most influential factor determining on-location filming activities and is significantly more important than either man-made or natural amenities of regions. Therefore, the following section tries to estimate the impact of a tax incentive program on local economies beyond film-related industries. Because this study compares two region's economic performances influenced by a regional policy, it uses a quasi-experimental approach which controls for non-random assignment of subjects to treatment (Kilkenny, 2009).

#### **4.4. Methodology**

As introduced in the introduction, a quasi-experimental approach uses a control group in order to find what would happen without policy, compared to a treatment group. Therefore, the first premise to be satisfied is to find an appropriate control group. This methodology section is composed of two parts; (1) a matching method to find an appropriate control group, and (2) the regression equation that generates difference-in-difference estimators in a difference-in-differences equation.

##### **4.4.1. Matching Method**

Being advantageous over other traditional policy evaluation methods such as shift share analysis and multiple regression analysis, a quasi-experimental analysis uses a specific group ('control group') which poses similar characteristics with the group of interest ('experiment group') (Bohm and Lind, 1993, p. 52). This specific group now plays a role as a good indicator of what would have happened in the 'without-policy' case. Furthermore, a quasi-experimental approach does not have to address *a priori* issue of functional form and variable choice. Since regional policy studies have shown considerable sensitivity to the structural dimensions of the



method and model used (Nicol, 1982), a quasi-experimental approach adopting a matching method is regarded as appropriate in regional research.

The most important consideration to be taken in the experimental research design is how to select control groups. Isserman and Merrifield (1982) made an emphasis on this research design, in essence, the treatment group (here, the states which have enacted tax-incentive programs) is compared to a control group. If the two groups are similar on tests before the treatment ('pre-test'), the criterion for a control group is met (Isserman and Merrifield, 1982).

Based on a discussion in a review on the quasi-experimental approach (Reed and Rogers, 2003), this study uses the twin matching technique in selecting the most similar control state to a treatment state. Even though various matching schemes are used for computational convenience or efficiency of the matching estimator, Reed and Roger (2003) mentioned drawbacks of the case study approach. According to Reed and Roger (2003), multiple analyses are generally not combined to produce a summary statistic of impact in the case study and the analyses are usually qualitative in the sense that no formal hypothesis tests are conducted. These shortcomings led to the choice of the twin matching technique.

The twin matching in the quasi-experimental approach in this chapter is composed of two steps. The first step uses the Mahalanobis distance measure defined as equation (4.1) by Reed and Rogers (2003), and the second step compares the rates of economic growth of each state. The twofold pre-test supports the importance of careful selection of the control regions.

As supported by past research, the more similar the experimental and the control groups and the more this similarity is confirmed by pre-test, the more effective the control becomes (Campbell and Stanley, 1966). Since the Mahalanobis distance measure is calculated by a man-

made infrastructure index and natural amenity indices of each state over one-time period<sup>31</sup>, the measure is assumed to indicate a state's static man-made and physical characteristics. On the other hand, the rate of economic growth – population growth, employment growth, and per capita income growth – between two years is assumed to reflect dynamic economic performance in an area. The second step in the pre-test compares the similarity of two regions by examining the evolution of their economies before the onset of the regional policy (Isserman and Merrifield, 1982).

As a first step in the pre-test, the Mahalanobis distance measure ( $M_{ij}$ ) is defined as:

$$(4.1) M_{ij} = (X_{Ti} - X_{Cj})' R^{-1} (X_{Ti} - X_{Cj}) \quad \forall i, j$$

where,  $X_{Ti}$  and  $X_{Cj}$  are the vectors of principal component scores associated with the  $i^{th}$  treatment ( $Ti$ ) state and  $j^{th}$  control group candidate state ( $Cj$ ), and  $R$  is the variance-covariance matrix associated with the variables in  $X$ . Since the Mahalanobis distance measure considers the variance-covariance matrix ( $R$ ) among the variables, the issue of scale and correlation inherent in the Euclidean distance measure is not problematic (Manly, 1986). States with small values for this measure are considered to have similar features with the treatment states, Louisiana or New Mexico.

The second step in the pre-test compares the rate of economic growth of between 1995 and 2000 for the treatment states (Louisiana and New Mexico) and control states. The reason for selecting this five-year period, 1995 and 2000, is the prior compatibility of dynamics of economic performance of the two states. If the control state is a good proxy for the hypothetical treatment of the state's growth for five years between 2000 and 2005, it should be a good proxy

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<sup>31</sup> Computation of the Mahalanobis distance measure uses five state-level indices ( $X$ ) created by using a principal component analysis from chapter 3: Man-made Infrastructure, Agland, Conservation, Water, and Temperature. It is appropriate here to have state-level indices, as the tax -related policy is enacted at the state level.

for the treatment state for the a short-time period before 2000 (Isserman and Rephann, 1995).

Following Isserman and Rephann (1995), the pre-test on economic growth rate consists of three stages. First, the growth rates in population, employment, and per capita income for all states are calculated. Second, the growth rates of control states are subtracted from those of treatment states. Third, the hypothesis is tested that the differences of those rates for all pairs of states (treatment states versus control states) is equal to zero at the 5 % significance level. Basically, there should be no statistically significant difference between the treatment state and an ideal control state. As a consequence, I select states which are not significantly different from the treatment state of which the differences of growth rates are located outside two tails of the 95% confidence interval. In the next section, I briefly describe which detailed information was used in selection of control state. Further, section 4.5.1 (Result of Matching) describes details composing explanatory vectors in the Mahalanobis distance measure including five indices reflecting local attributes.

#### **4.4.2. Difference-in-Differences Equation**

In the context of policy analysis using experiments, a pooled cross-section analysis with properly chosen dummy variables and interactions is used (Wooldridge, 2002). In using pooled cross-section, time period dummies are included to consider aggregate changes over time. In the simplest case, there are two time periods. For example, year zero represents the time before the tax incentive program was implemented, and year one represents the time after the tax incentive program was implemented. Both years have two groups, which are called a control group and treatment group. In the experimental literature, people (or firms, or cities, and so on) find

themselves in the treatment group if they are policy-affected. Due to the two fold divisions (a time-wise division in two groups), the model is labeled the difference-in-difference model<sup>32</sup>.

The reason why the control group (non-participants in the program) is included in the analysis is to remove unrelated effects of the policy change. These unrelated effects are implicitly captured as the mean change over time only for the treatment group, when we do not include the control group into the model. In addition to the unrelated effects, another problem that might be caused by omission of the control group is to ignore the first time period. By this ignorance of the initial period, we calculate only the difference in means for the treatment and control group in the second period, leading to not considering the time-horizon effect of the policy effect. Wooldridge (2002, p. 130) argues that “the problem with this pure cross-section approach is that there might be systematic, unmeasured differences in the treatment and control groups that have nothing to do with the treatment; attributing the difference in averages to a particular policy might be misleading.” Formalization of this discussion is presented in equation (4.2) through equation (4.5). These four equations provide a basic concept on which the equation used in the current analysis (equation 4.7) is modified.

$$(4.2) \quad y_{it} = \beta_0 + \beta_1 \cdot D_{it} + \varepsilon_{it}$$

where,  $y_{it}$  is the outcome of interest for unit  $i$  in period  $t$ ,  $t = 0, 1$ , for all  $i = 1, \dots, N$ . The term  $D_{it}$  is a treatment dummy variable. Hence, for the treatment group,  $D_{i0}$  equals to zero before the policy, and  $D_{i1}$  is equal to unity after the policy. Similarly, for control group,  $D_{i0}$  is equal to zero before the policy, and  $D_{i1}$  is also zero after the policy, because the control group did not

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<sup>32</sup> For example, a study analyzed an effect of minimum wages on establishment level employment outcomes. They chose 401 fast-food restaurants which followed the increase in the minimum wage for the treatment group and compared to a group other restaurants which, because they were already paying above minimum wage, did not increase wages when the minimum wage rate was increased. Comparison between initially high-wage stores (those paying more than the minimum level wages prior to effective date) and 401 restaurants which follow the wage change provided the alternative estimate of the impact of the new law (Card and Krueger, 1994).

receive the policy program. A goal in difference-in-difference regression analysis is to see if  $\beta_1$  is significantly different from zero, in which case one would conclude that the tax incentive program had an effect. The parameter  $\hat{\beta}_1$  can be estimated by ordinary least squares estimation method or by the difference-in-difference estimator.

To understand how the difference in difference estimator isolates policy effects, I begin by isolating the change in the dependent variables over the time period as shown in the following equation.

$$(4.3) \Delta y_i = y_{i1} - y_{i0}$$

Notice that  $\Delta y_i = \beta_1 \cdot \Delta D_i + u_i$ , where  $u_i$  is an error term. Also, notice that  $\Delta D_i = 0$  for the control group, and that  $\Delta D_i = 1$  for the treatment group. In addition to this manipulation, the average of the difference in variables of interest for both the control group and the treatment group, are obtained through the following equations.

$$(4.4) \Delta \bar{y}_C = \frac{1}{n_C} \sum_{i \in \text{control}} \Delta y_i$$

$$(4.5) \Delta \bar{y}_T = \frac{1}{n_T} \sum_{i \in \text{treatment}} \Delta y_i$$

In these equations,  $n_C$  represents the number of the control group and the subscript  $n_T$  represents the number of the treatment group. Therefore, the difference-in-difference estimator for  $\beta_1$  is  $\Delta \bar{y}_T - \Delta \bar{y}_C$ .

In order to obtain difference-in-difference estimates, the quasi-experimental approach needs two years of data (pre-policy and after-policy) for the two different states (treatment state and control state). Because the treatment group (Louisiana and New Mexico) enacted their film industry tax incentive programs in 2002, the two years of data I chose are 2000 and 2005.

Another reason for the selection of 2005 is that 2005 data reflects regional status prior to Hurricane Katrina and the Hurricane Rita that measurably impacted the regional economy of Louisiana and has been difficult to effectively control for in this type of modeling effort<sup>33</sup>.

Once the treatment groups (Louisiana and New Mexico) and their corresponding control groups<sup>34</sup> are selected, the difference-in-differences estimators are obtained at the county<sup>35</sup> level by using the higher-order interaction model developed by Meyer (1994). By doing this, diffusion effects of the tax incentive program into neighboring counties can be identified. The diffusion effect can be of a reverse direction. It may absorb establishments or employees into a central area from neighboring areas. Each reference county (or parish for the case of Louisiana) in which the movie was shot has neighboring counties/parishes. The neighboring counties were identified by using both Combined Statistical Areas defined by Office of Management and Budget (2003), the U.S. Census Bureau and the Google-map search engine. For example, if one movie has its location-site in Baton Rouge, Louisiana, seven parishes are identified as neighboring parishes to the reference parish (East Baton Rouge parish).

In this step, parishes of Louisiana are compared to those in its control state and counties of New Mexico are compared to those of its control state, respectively. In order to understand the change of regional economies' concentration among industries, we examine changes in the location quotient. The reason for selecting the location quotient over the variable (e.g., employment or establishments) itself is that the location quotient helps one understand one

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<sup>33</sup> One of variables whose change is of interest in this chapter is employment data and it denotes total mid-march employees. Such a massive extraneous shock to a region sweeps away regional establishments and this may yield a distorting result without elaborate controls in the analysis.

<sup>34</sup> E-mail and phone questions to state government offices in charge of film tax-incentive program were conducted in order to identify candidates for control groups. A few states that had begun the tax-related subsidy program before 2000 were deleted, because this chapter was focused on a change from 2000 and 2005. Even though Missouri has recent tax incentive program with a cap of \$4.5 million at 35 % tax credit rate which was revised in 2008, it initiated the program in 1999. Data for this study are for 2000 and 2005. Therefore, Missouri was deleted from candidates both for treatment group and for control group, even though its Mahalanobis distance measure was calculated.

<sup>35</sup> If an analysis is about Louisiana, a parish is equivalent to a county.

region's relative concentration or distribution of a particular industry to the national level (Isard, et al., 1998, p. 25).

This quotient, as a metric for making comparisons, presents information on: (1) what industry the region has and does not have, and (2) the extent to which each industry is under- or over-represented in the region compared to nation (Isard, et al., 1998). In addition to a location quotient on employment<sup>36</sup> ('lqemp'), I also considered a location quotient of establishments hiring different numbers of employees; 5 - 9 ('lqn5\_9'), and 500 - 999 ('lqn500\_999'). The reason why I include these employee size-wise establishments in the analysis is to find any difference in influences on establishments of small or large sizes. It is hypothesized that the influences on small size establishments would be more substantial than medium or large establishments, because eighty percent of the over 110,000 businesses related to film industries employ fewer than 10 people and film industries can support community-level small businesses and entrepreneurs (Epstein, 2009).

The location quotient is defined as equation (4.6) and three location quotients<sup>37</sup> are included as a dependent variable in equation (4.7) below.

(4.6)

$$LQ = \frac{E_h^i / E^i}{E_h / E}$$

where,

$E_h^i$  = employment (or number of establishments) in NAICS code  $h$  in a given county  $i$ ,

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<sup>36</sup> Employment data are total mid-march employees and are obtained from County Business Pattern (CBP) of each year (2000 and 2005). Some counties in CBP's employment dataset do not have exact number of employees but have ranges that denote employment size class for employees withheld to avoid disclosure (confidentiality). For these counties, mid-point estimates of the employees' ranges is computed and included into a calculation of the location quotient.

<sup>37</sup> They are location quotient of employment, location quotient of small-size establishments, and location quotient of large-size establishment.

$E_h$  = employment (or number of establishments) in NAICS code  $h$  in the nation,

$E^i$  = total employment (or number of establishments) in county  $i$ , and

$E$  = total employment (or number of establishments).

The difference-in-differences equation considering higher order interactions is described in equation (4.7) and the detail information of subscripts or variables is presented in Table 4.2.

$$(4.7) LQ_{it}^{jk} = \alpha_0 + \alpha_1 d_t + \alpha^1 d^j + \gamma^1 d^k + \alpha_1^1 d_t^j + \gamma_1^1 d_t^k + \alpha^{11} d^{jk} + \beta d_t^{jk} + \delta Z_{it}^j + \varepsilon_{it}^{jk}.$$

**Table 4.2. Description of Explanatory Variables of Difference-in-differences Equation**

Symbols		Description
Subscript (or superscript )	$i$	Counties
	$t$	Time period whether the variables are before tax-subsidies ( $t = 2000$ ) or after tax-subsidies ( $t = 2005$ )
	$j$	Group specification whether the counties are in Louisiana or New Mexico
	$k$	Sub-group specification whether the counties are neighboring to the county where on-location filming activities occurred.
First order interaction	$d_t$	1 if $y$ is of 2005, and 0 if $y$ is of 2000
	$d^j$	1 if $y$ is of either Louisiana or New Mexico, and 0 if $y$ is the selected control state
	$d^k$	1 if $y$ is of neighboring counties to the county where movie scenes were shot, and 0 otherwise
Second order interaction	$d_t^j$	1 if $y$ is of either Louisiana or New Mexico in 2005 (in other words, $d_t^j = d_t \times d^j$ ) and 0 otherwise
	$d^{jk}$	1 if $y$ is of neighboring counties where filming activities occurred in either Louisiana or New Mexico (in other words, $d^{jk} = d^j \times d^k$ ), and 0 otherwise
	$d_t^k$	1 if $y$ is of neighboring counties where filming activities occurred in 2005 (in other words, $d_t^k = d_t \times d^k$ ), and 0 otherwise
Third order interaction	$d_t^{jk}$	1 if $y$ is of neighboring counties where filming activities occurred in either Louisiana or New Mexico in 2005 (in other words, $d_t^{jk} = d_t \times d^j \times d^k$ ), and 0 otherwise
Continuous Variable	$Z_{it}^j$	Per capita income of county $i$ of state $j$ in time-period $t$



The reason why a continuous variable (per capita income) is included as an explanatory variable in the difference-in-differences equation is that one macro-economic variable adjusts for observable differences between the observations in the different groups and increases the model's goodness-of-fit (Meyer, 1994, p. 156). This macro-economic variable, per capita income, was chosen because of an assumption that income would capture regional economic growth patterns that should be observed. Income is an additional variable in the Carlino and Mills extended regional economic growth model which represents three-dimensional relationships: "people versus jobs versus income" (Deller et al., 2001). Therefore, results from the regression analysis can be understood as the following:

- $\alpha_1$  reflects whether outcome changes after the policy with target region unspecified;
- $\alpha^1$  reflects outcome difference purely occurred by region specification only;
- $\gamma^1$  reflects outcome difference purely due to that one county is adjacent to the counties where filming activities occurred;
- $\alpha_1^1$  reflects outcome changes of treatment states (Louisiana and New Mexico) after they began tax incentive program;
- $\gamma_1^1$  reflects outcomes changes of neighboring counties to the county where on-location filming activities occurred in 2005, no matter where the counties are in treatment states or control states;
- $\alpha^{11}$  reflects outcome change of neighboring counties to the place where on-location filming activities occurred in treatment states (Louisiana or New Mexico), no matter when it is 2000 or 2005, and

- $\beta$  reflects the outcome change of neighboring counties to the county where on-location filming activities occurred in treatment states (Louisiana or New Mexico) after the treatment states began the tax incentive program.

Based on interpretation of the parameters of the difference-in-difference estimator described above, our primary interest is focused on  $\alpha_1^1$  and  $\beta$ . Both estimators explain whether a tax incentive program on the film industry leads to an employment increase across industries. In particular,  $\alpha_1^1$  captures a change in the economic concentration level in treatment states after the policy changes. Similarly,  $\beta$  captures changes in local economies' concentration of counties, because the counties are located adjacent to the place where film scenes are shot. This estimator especially considers the time effect because it also interacts to the time period after tax incentive program is in effect.

## 4.5. Results

As the method section is composed of two parts (matching and difference-in-difference equation), this section is composed of two results. The first is an answer to the question of the choice of states to be selected as a control group for Louisiana and New Mexico, respectively. The other is a result obtained from a difference-in-differences regression equation.

### 4.5.1. Result of Matching

A state-level matching was conducted in two levels; a static level and a dynamic level. The static level was based on the Mahalanobis distance measure. The Mahalanobis distance measure used the 2002 estimate for an area's man-made infrastructure and the 1997 estimate for a state's natural amenities<sup>38</sup>. A dynamic level uses the rate of economic growth between 1995

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<sup>38</sup> The reason for selecting these years is different depending on the type of amenity. The year 2002 is selected for man-made infrastructure because 2002 CBP data is assumed to reflect an area's economic activities. In contrast, most sub-elements for natural amenities are obtained from NORSIS (The National Outdoor Recreation Supply

and 2000. This state-level matching provides candidates for control groups to Louisiana and New Mexico (treatment groups), respectively.

As discussed in method section, the Mahalanobis distance measure was calculated by using five indices covering an area's topographical conditions. The five indices represent man-made infrastructure, agricultural land, conservation land, water, and temperature<sup>39</sup>. Unlike the chapter 3, the man-made infrastructure encompasses the number of establishments of all sub-elements of commercial infrastructure, cultural goods and cultural assets, because of high collinearity among the three categories. The sub-elements for the man-made infrastructure index were obtained from County Business Patterns, US Census Bureau 2002. For natural amenities, sub-elements were obtained from various agencies and related programs such as USDA-NASS, NORSIS (The National Outdoor Recreation Supply Information System, U.S. Forest Service), and USDA-ERS<sup>40</sup>.

The detailed PCA scores of five indices<sup>41</sup> are presented in Appendix I. These scores were included as explanatory variables ( $X_n$ ) in equation (4.1) to create the Mahalanobis distance measures between two states (Louisiana and New Mexico) and the other states. Along with the selection of control states based on the Mahalanobis distance measure, three growth rates of all candidate control states were tested whether they were statistically equal to those of treatment states as discussed in Section 4.4.1. Table 4.3 shows a list of ten candidates (states) that generated the first ten smallest M-measures (Mahalanobis distance measure) of control groups' candidates.

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Information System) and these data are for 1997. Some sub-elements for Ag-land index are obtained from 2002 USDA-NASS. Therefore, the choice of year for natural amenities is mainly due to data availabilities.

<sup>39</sup> The sub-elements of the man-made infrastructure index and natural amenity indices are the same ones that were used in the chapter 3 and were presented in Table 3.1 through Table 3.7. Among these sub-elements, those in Table 3.1 through Table 3.3 are in aggregate included in creating a man-made infrastructure index.

<sup>40</sup> Data source: <http://www.ers.usda.gov/Data/NaturalAmenities/>

<sup>41</sup> The PCA scores in this chapter were computed by using Principal Component Analysis technique which was introduced in chapter 3.

**Table 4.3. Results of Matching: M-measure and Similarities in Economic Dynamics**

Ranks	State	M-measure to Louisiana	Pop	Empl	Pcinc	State	M-measure to New Mexico	Pop	Empl	Pcinc
1	WI	1.3585				NH	0.7820	√		
2	MN	1.9815	√	√		NV	1.0406			
3	CO	2.0938				KS	1.3182			
4	TN	3.5631	√	√	√	OK	1.3194	√	√	
5	SC	3.9028				MS	1.8592	√		
6	WA	3.9781				WY	2.1223			
7	MD	4.5185	√			NE	2.1622			√
8	IN	5.0944				RI	2.3219		√	
9	AR	5.1191	√			DE	2.5516			√
10	NC	5.7159				AZ	3.2599			√

The ten candidates were part of forty-seven candidate states for the control groups to Louisiana and New Mexico, respectively<sup>42</sup>. The ranking was first measured by the M-measure (Mahalanobis distance measure). In addition to the M-measure for each state, its similarity to its treatment state in terms of the rate of economic growth in population (Pop), employment (Empl), and per capita income (Pcinc) are provided in Table 4.3 as well.

The indicating mark (√) of three growth rates next to Mahalanobis distance measure shows that the specific state is not statistically different to the treatment state in terms of each of three growth rates. Considering two dimensions, the Mahalanobis distance measure and growth rates for selecting control states, it would be best to choose a state which generates both a small Mahalanobis distance measure and similar socio-economic characteristics.

For a control group to Louisiana, I selected Tennessee because it generated both a small Mahalanobis distance measure and its dynamic economic status resembles Louisiana in all three economic growth rates for the 1995 through 2000 time period. More than the similarities in both static and dynamic conditions, Tennessee began its state tax incentive program in 2007, which

<sup>42</sup> A full list of matching results is presented in Appendix II.

satisfies the first criterion that it should not have the tax policy prior to 2006. Minnesota shows smaller values of the distance measure (1.9815) than Tennessee. However, it is deleted from the final control group because Minnesota began its tax incentive prior to 2006.

For a control group for New Mexico, Oklahoma was selected over New Hampshire. In fact, neither of these two states had a tax based incentive program at the time when this research began in 2008. It was 2009 when Oklahoma initiated its tax incentive program, and New Hampshire still has not enacted such an incentive program as of the date of this writing. Based on the fact that the two candidates did not have the policy during the research period between 2000 and 2005, it is difficult to select only one control group out of these two candidates. However, I trade off the M-measure's difference between New Hampshire and Oklahoma for the pursuit of more similarity in dynamic economic growth. Therefore, I selected Oklahoma for the control group to New Mexico.

#### **4.5.2 Results of Difference-in-differences Regression**

The main dependent variables of interest are location quotients derived from employment and from establishments for most two digit NAICS codes<sup>43</sup> and the basic descriptive statistics over two years are provided in Table 4.4 and Table 4.5. Both data were obtained from County Business Patterns, US Census Bureau, years 2000 and 2005. Employment is the total mid-March employment at the county level and past literature emphasizes employment as the primary goal for most direct economic development policies (Bartik, 1991). Establishments are the number of establishments hiring different number of employees; 5-9, and 500-999.

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<sup>43</sup> Industries of interest in this research are as the following. Numbers in parentheses indicates two digit NAICS codes. Agriculture, Forestry, Fishing and Hunting (11), Mining (21), Utilities (22), Manufacturing (31), Wholesale Trade (42), Retail Trade (44), Transportation and Warehousing (48), Information (51), Finance and Insurance (52), Real Estate and Rental and Leasing (53), Professional, Scientific, and Technical Services (54), Management of Companies and Enterprises (55), Administrative and Support and Waste Management and Remediation Services (56), Educational Services (61), Health Care and Social Assistance (62), Arts, Entertainment, and Recreation (71), Accommodation and Food service (72), and Other Services except Public Administration (81).

**Table 4.4. Basic Descriptive Statistics of Location Quotients for Louisiana and Tennessee**

NAICS	LA (Total Observations : 128)			TN (Total Observations : 190)		
	lqemp	lqn5_9	lqn500_999	lqemp	lqn5_9	lqn500_999
11	10.446 (18.969)	7.559 (11.290)	0.000 (0.000)	1.726 (5.269)	3.136 (11.255)	0.000 (0.000)
21	5.778 (8.672)	3.220 (4.947)	2.693 (12.578)	0.374 (1.357)	2.306 (5.740)	0.000 (0.000)
22	1.695 (2.645)	3.338 (4.867)	1.327 (6.786)	0.042 (0.189)	3.431 (8.346)	0.000 (0.000)
31	0.996 (0.736)	0.465 (0.370)	0.952 (1.544)	2.384 (1.080)	1.310 (0.868)	1.497 (1.837)
42	0.853 (0.673)	0.627 (0.494)	0.160 (1.113)	0.537 (0.433)	0.648 (0.457)	0.128 (0.969)
44	1.263 (0.328)	0.857 (0.403)	1.195 (3.594)	1.345 (0.717)	1.851 (1.279)	0.325 (1.400)
48	1.331 (1.208)	1.342 (1.236)	0.466 (1.831)	0.776 (0.751)	1.293 (1.192)	0.313 (1.401)
51	0.356 (0.348)	0.715 (0.864)	0.061 (0.329)	0.350 (0.406)	1.192 (1.175)	0.083 (0.445)
52	0.759 (0.385)	0.777 (0.474)	0.103 (0.547)	0.597 (0.323)	0.987 (0.449)	0.192 (0.923)
53	0.733 (0.782)	0.555 (0.472)	0.617 (4.617)	0.542 (0.655)	0.688 (0.465)	0.326 (1.993)
54	0.505 (0.389)	0.530 (0.354)	0.277 (1.475)	0.320 (0.470)	0.522 (0.332)	0.205 (1.508)
55	0.106 (0.219)	0.414 (0.641)	0.000 (0.000)	(0.216 (0.525)	0.418 (0.828)	0.220 (0.856)
56	0.404 (0.410)	0.431 (0.360)	0.218 (0.633)	0.460 (0.520)	0.612 (0.498)	0.340 (1.119)
61	0.304 (0.528)	0.427 (0.768)	0.028 (0.231)	0.136 (0.340)	0.430 (0.829)	0.959 (4.419)
62	1.318 (0.688)	0.695 (0.396)	0.864 (1.855)	0.965 (0.408)	1.055 (0.340)	0.389 (1.199)
71	0.415 (0.835)	0.549 (0.723)	0.176 (0.996)	0.361 (0.577)	1.243 (1.596)	0.361 (4.883)
72	0.894 (0.561)	0.526 (0.353)	0.295 (1.316)	0.836 (0.464)	0.955 (0.564)	0.019 (0.175)
81	1.013 (0.322)	0.642 (0.321)	0.119 (0.887)	0.762 (0.324)	0.916 (0.353)	0.068 (0.543)

Note: Standard deviations are in parentheses.

**Table 4.5. Basic Descriptive Statistics of Location Quotients for New Mexico and Oklahoma**

NAICS	NM (Total Observations : 68)			OK (Total Observations : 156)		
	lqemp	lqn5_9	lqn500_999	lqemp	lqn5_9	lqn500_999
11	0.055 (0.229)	2.739 (8.189)	0.000 (0.000)	0.942 (4.209)	1.534 (4.503)	0.000 (0.000)
21	8.340 (26.930)	12.056 (46.853)	13.248 (37.207)	9.230 (18.229)	13.539 (26.555)	6.434 (30.942)
22	0.679 (1.157)	5.602 (11.190)	1.468 (5.780)	1.181 (2.894)	4.519 (7.258)	0.118 (0.577)
31	0.320 (0.375)	0.760 (0.541)	0.127 (0.408)	0.894 (0.783)	0.960 (0.721)	1.363 (1.704)
42	0.410 (0.333)	0.656 (0.474)	0.000 (0.000)	0.789 (0.629)	0.812 (0.598)	0.241 (1.378)
44	1.486 (0.541)	1.352 (0.524)	4.451 (6.963)	1.296 (0.299)	1.342 (0.363)	1.897 (3.692)
48	0.606 (0.633)	1.292 (1.257)	0.321 (1.257)	0.820 (0.927)	1.332 (1.455)	1.273 (4.268)
51	0.484 (0.487)	1.379 (1.734)	0.311 (1.235)	0.426 (0.411)	1.316 (1.144)	0.234 (0.998)
52	0.596 (0.442)	0.857 (0.732)	0.223 (0.830)	0.837 (0.441)	0.754 (0.532)	0.228 (0.786)
53	0.520 (0.587)	0.773 (0.528)	0.000 (0.000)	0.399 (0.531)	0.591 (0.528)	0.211 (0.846)
54	0.507 (0.554)	0.627 (0.471)	0.311 (1.531)	0.452 (0.301)	0.725 (0.348)	0.528 (2.541)
55	0.239 (0.437)	1.845 (4.567)	0.163 (0.635)	0.155 (0.451)	0.854 (1.749)	0.352 (1.337)
56	0.405 (0.768)	0.673 (0.630)	0.617 (2.096)	0.368 (0.708)	0.592 (0.521)	0.390 (1.219)
61	0.456 (0.871)	0.963 (1.769)	0.826 (3.238)	0.125 (0.271)	0.454 (0.742)	0.677 (2.787)
62	1.233 (0.697)	0.871 (0.600)	2.339 (2.409)	1.389 (0.555)	0.957 (0.436)	2.387 (2.598)
71	0.948 (1.707)	1.216 (1.649)	11.749 (25.166)	0.517 (0.900)	0.861 (1.061)	0.000 (0.000)
72	1.725 (0.852)	1.201 (0.743)	1.523 (6.105)	0.969 (0.457)	0.949 (0.545)	0.000 (0.000)
81	0.938 (0.404)	0.836 (0.341)	0.000 (0.000)	1.049 (0.388)	1.011 (0.356)	0.053 (0.377)

Note: Standard deviations are in parentheses.

The reason why these two categories of establishments are chosen in this chapter is to see whether different sized establishments are influenced by the film industry tax incentive program differently. The dataset for this difference-in-differences regression is found to have no severe problems with heteroskedasticity or multicollinearity for most industries. By using the Breusch-Pagan/Cook-Weisberg test, only four industries in the employment equation and two industries in the small-sized establishment equation are found to have issues of heteroskedasticity<sup>44</sup>. For these five industries, I corrected for heteroskedasticity by using a feasible generalized least squares (FGLS) estimator (Verbeek, 2004) and imposed a multiplicative form of heteroskedasticity<sup>45</sup>. For testing potential multicollinearity among explanatory variables, the computation of the uncentered variance inflation factors (‘estat vif’ in STATA) found no existence of multicollinearity<sup>46</sup>.

In order to detect omitted variables and to improve model specification, I performed RESET test (Regression Specification Error Test) suggested by Verbeek (2004). This test is conducted by testing significance of augmented variables in addition to the existing explanatory variables. For example, the original equation can be expressed as  $y_i = \alpha + \beta X + \varepsilon$ , where  $y_i$  is location quotient, and  $X$  is a vector of explanatory variables in the equation (4.7). Then, I consider the following artificial model in equation (4.8)<sup>47</sup>.

$$(4.8) \quad y_i = \alpha + \beta X + \gamma_1 \hat{y}_i^2 + \gamma_2 \hat{y}_i^3 + \varepsilon$$

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<sup>44</sup> In employment equations, these four industries included Retail Trade (44), Real Estate and Rental and Leasing (53), Administrative and Support and Waste Management and Remediation Services (56), and Other Services except Public Administration (81). In small sized establishment equation, two industries having issues of heteroskedasticity are Finance and Insurance (52) and Real Estate and Rental and Leasing (53).

<sup>45</sup> The form of multiplicative heteroskedasticity requires an assumption that error variance is dependent upon a number of exogenous variables (Verbeek, 2004, pp 89).

<sup>46</sup> Average value of ‘estat vif’ was 4.15 and the value less than ten means no-severe multicollinearity

<sup>47</sup> A general idea behind this is that the  $\hat{y}_i^2$  or  $\hat{y}_i^3$  is polynomial forms of a vector of  $X$ . Consider that polynomial forms can approximate many different types of functional forms. Even though squares or cubes of dummy variables are the dummies themselves, the polynomials with respect to continuous variable (per capita income) might induce different functional forms. Therefore, if the original functional form is not correct, the polynomial approximation may significantly improve the fit of the model (Verbeek, 2004).



Results of this test suggest that industry equations which generate significant estimates (e.g., Information (NAICS: 51) in employment equation of ‘NM and OK’) do not have any issue of model misspecification with 5 % significance level of F-test. However, the other industry equations producing insignificant estimates do not pass this test. Therefore, to improve model fitness, it is necessary to consider another equation form.

The regression results in Table 4.6 through Table 4.8 present coefficients and their p-values of the joint terms (dtj and dtjk) of interest: location quotient of employment, small-size establishments, and large-size establishments. According to equation (4.7), the first (dtj) is a second higher joint term of time-periods and states. This difference-in-differences estimate (dtj) indicates mean change between the treatment states (Louisiana or New Mexico) and the control states (Tennessee or Oklahoma) respectively, after treatment states began the tax incentive policy helping their respective film industries. Therefore, positive values greater than unity of the difference-in-differences estimates of the location quotient imply that specific industries’ share of an area employment increases compared to the nation’s share in the same industry.

The next (dtjk) is a third higher joint term that simultaneously encompasses time-periods, the state which adopts a policy, and neighboring counties of central counties where on-location filming activities occurred. Lists of central counties and their neighboring counties are provided in the Appendix III (for LA and TN) and Appendix IV (for NM and OK). The geographical illustrations of two pair of states (treatment state and control state) are also provided in the Appendix V (for LA and TN) and Appendix VI (for NM and OK). It was justified by an argument that the researcher may believe that there are extra secondary effects beside time and groups.

For example, it may be the case that the treatment group affects a certain sub-level group in the state and time period (Meyer, 1994).

**Table 4.6. Difference-in-differences Estimation Results on Employment Location Quotient**

Dependent Variable: lqemp	LA and TN			NM and OK		
NAICS	dtj	dtjk	R-square	dtj	dtjk	R-square
11	-1.954 (0.530)	0.586 (0.897)	0.250	3.121 (0.650)	-2.571 (0.741)	0.097
21	0.222 (0.895)	0.740 (0.759)	0.153	-3.221 (0.591)	1.560 (0.829)	0.033
22	-0.082 (0.946)	-0.631 (0.717)	0.079	-2.103 (0.370)	1.908 (0.506)	0.051
31	-0.372 (0.180)	0.304 (0.446)	0.440	0.098 (0.813)	-0.224 (0.658)	0.192
42	0.008 (0.967)	0.002 (0.993)	0.056	0.129 (0.742)	-0.194 (0.687)	0.085
44	-0.131 (0.200)	0.015 (0.913)	0.096	0.046 (0.814)	-0.149 (0.534)	0.194
48	-0.306 (0.310)	0.171 (0.693)	0.096	0.007 (0.990)	-0.138 (0.841)	0.076
51	0.068 (0.625)	-0.083 (0.678)	0.057	<b>-0.566</b> <b>(0.072)</b>	0.342 (0.375)	0.125
52	-0.150 (0.181)	0.018 (0.912)	0.071	-0.431 (0.209)	0.508 (0.224)	0.044
53	-0.202 (0.340)	0.077 (0.800)	0.040	0.457 (0.193)	-0.540 (0.202)	0.046
54	0.019 (0.883)	-0.044 (0.811)	0.164	0.069 (0.755)	-0.263 (0.332)	0.186
55	-0.172 (0.394)	0.184 (0.506)	0.163	-0.992 (0.463)	1.854 (0.219)	0.071
56	0.152 (0.306)	-0.024 (0.908)	0.247	-0.026 (0.945)	0.352 (0.435)	0.169
61	-0.009 (0.983)	0.071 (0.900)	0.013	-0.620 (0.429)	0.139 (0.880)	0.075
62	-0.019 (0.904)	0.016 (0.945)	0.154	0.158 (0.607)	0.028 (0.941)	0.103
71	0.103 (0.670)	-0.234 (0.497)	0.062	-0.502 (0.689)	-0.310 (0.838)	0.046
72	-0.090 (0.544)	-0.023 (0.915)	0.035	-0.353 (0.225)	0.270 (0.446)	0.402
81	-0.116 (0.235)	-0.060 (0.660)	0.194	-0.030 (0.923)	0.186 (0.621)	0.034

[Note] Bolds are statistically significant at 10 percent significance level and p-values are in parentheses.

**Table 4.7. Difference-in-differences Regression Estimation Results on Small Size Establishments' (hiring 5 - 9 employees) Location Quotient (with p-values in parentheses)**

Dependent Variable: lqn5_9	LA and TN			NM and OK		
NAICS	dtj	dtjk	R-squared	dtj	dtjk	R-squared
11	<b>-7.241</b> (0.033)	3.542 (0.468)	0.159	-1.303 (0.795)	2.464 (0.665)	0.029
21	<b>-5.014</b> (0.003)	0.595 (0.806)	0.081	-20.900 (0.268)	21.460 (0.358)	0.060
22	-2.705 (0.216)	-1.096 (0.727)	0.103	0.127 (0.978)	1.005 (0.860)	0.102
31	<b>-0.644</b> (0.004)	0.134 (0.675)	0.305	-0.136 (0.725)	0.140 (0.766)	0.041
42	<b>-0.439</b> (0.002)	-0.196 (0.306)	0.292	0.319 (0.294)	-0.192 (0.614)	0.043
44	0.398 (0.183)	-0.249 (0.562)	0.333	-0.142 (0.529)	0.110 (0.692)	0.078
48	<b>-1.178</b> (0.002)	0.284 (0.593)	0.102	0.703 (0.353)	-0.933 (0.324)	0.016
51	<b>-0.825</b> (0.012)	0.555 (0.238)	0.130	<b>1.412</b> (0.046)	<b>-1.832</b> (0.039)	0.076
52	<b>-0.764</b> (0.000)	-0.138 (0.455)	0.283	-0.197 (0.652)	-0.146 (0.715)	0.034
53	<b>-0.432</b> (0.001)	-0.048 (0.783)	0.400	0.396 (0.189)	-0.358 (0.329)	0.075
54	<b>-0.523</b> (0.000)	0.001 (0.991)	0.474	0.062 (0.767)	0.047 (0.856)	0.029
55	-0.361 (0.124)	0.238 (0.459)	0.193	-0.061 (0.981)	-1.787 (0.527)	0.051
56	<b>-0.292</b> (0.024)	-0.133 (0.446)	0.474	0.320 (0.328)	-0.613 (0.121)	0.039
61	-0.301 (0.225)	0.151 (0.672)	0.089	-0.610 (0.439)	1.213 (0.197)	0.089
62	<b>-0.540</b> (0.000)	0.033 (0.822)	0.396	0.047 (0.859)	0.141 (0.664)	0.087
71	<b>-0.835</b> (0.047)	0.247 (0.681)	0.087	-0.241 (0.756)	0.971 (0.299)	0.040
72	<b>-0.377</b> (0.012)	-0.293 (0.172)	0.252	<b>-0.746</b> (0.030)	0.543 (0.192)	0.096
81	<b>-0.540</b> (0.000)	0.082 (0.546)	0.359	0.163 (0.401)	-0.245 (0.305)	0.086

[Note] Bolds are statistically significant at 10 percent significance level and p-values are in parentheses.

**Table 4.8. Difference-in-differences Regression Estimation Results on Large Size Establishments' (hiring 500 -999 employees) Location Quotient (with p-values in parentheses)**

Dependent Variable: lqn500_999	LA and TN			NM and OK		
NAICS	dtj	dtjk	R-squared	dtj	dtjk	R-squared
21	NA	NA	NA	42.915 (0.144)	-47.828 (0.166)	0.148
22	-0.891 (0.516)	0.999 (0.613)	0.044	0.203 (0.957)	0.287 (0.947)	0.045
44	0.704 (0.369)	-1.176 (0.297)	0.100	1.941 (0.711)	-4.921 (0.413)	0.123
48	0.207 (0.676)	0.166 (0.816)	0.064	-0.912 (0.770)	3.898 (0.290)	0.069
51	-0.169 (0.154)	0.078 (0.648)	0.169	-0.020 (0.984)	-0.001 (0.999)	0.063
52	0.067 (0.785)	-0.312 (0.380)	0.068	-0.041 (0.955)	-0.233 (0.786)	0.066
54	0.301 (0.520)	-0.919 (0.172)	0.061	-0.296 (0.881)	-0.542 (0.816)	0.075
56	0.374 (0.202)	-0.303 (0.472)	0.097	<b>-3.092</b> (0.034)	0.160 (1.689)	0.105
61	-0.084 (0.939)	-0.318 (0.839)	0.040	0.000 (1.000)	0.198 (0.955)	0.040
62	-0.595 (0.209)	0.427 (0.531)	0.063	-1.517 (0.539)	2.270 (0.423)	0.106
72	0.045 (0.867)	0.159 (0.680)	0.059	0.000 (1.000)	0.911 (0.847)	0.052

[Note] Bolds are statistically significant at 10 percent significance level and p-values are in parentheses.

Therefore, a positive coefficient of this third higher joint term might be interpreted as a positive diffusion (or spatial spillover) effect to neighboring counties due to cultural activities.

On the contrary, a negative coefficient on this three dimension interaction term may imply that a relative concentration of employment (or establishments) occurs to only the counties where the cultural events happen.

First, results of difference-in-differences regression on employment location quotients in both treatment states (Table 4.6) show little statistical significance from the difference-in-differences estimation over the aggregated industries of interest. The insignificant results from

regression analysis might be due to several reasons. The first factor may be due to the aggregation of industry that is analyzed, two digit NAICS codes. The level of aggregation might be too broad to investigate an impact of policy targeted to one sub-industry of the Information industry (51). It should be noted the one industry that had significant was the Information Industry (51) for New Mexico; it is statistically significant at the 10 percent significance level. This weakly significant negative result appears contradictory to the hypothesis that the tax credit program would increase the concentration in this sector. One possible hypothesis is that the increase in film activity may result in having large outside business establishments bring in temporary employees from outside the region that supplant, or crowd out, local supply in the region. Hence, the tax credit program creates an unintended consequence of financing out-of-state businesses and the expense of in-state establishments. Another possibility for insignificant results may be due to the noise in employment data related to the disclosure issue. Since some industries in some counties in CBP provided numerical ranges instead of employment data points because of the disclosure issue, mid-point estimates of the ranges for employment were applied prior to the calculation of the location quotient. The third reason for obtaining insignificant results might be related to validity of dummy variables in explaining the exogenous shock caused solely by the tax incentive program in film industries.

Second, another contradictory result to the past research was found in the small establishment (5 - 9 employees) regression analysis. In the beginning of this chapter, a movie industry contributes to community economies because approximately eighty percent of establishments hire a small number (less than ten) of employees. However, Louisiana's results from Table 4.7 show that almost all industries lost their concentration level, which implies that the counties where the filming activities occur lose small sized establishment concentration irrespective of the tax incentive program. However, this negative result of five to nine employee

establishments might be congruent to an economic growth of the ten to nineteen employee establishments. That is, it may be easier for small businesses with only five to nine employees to expand in scale and hire more employees to meet film industry demand than simply creating new establishments. An analysis on the next category of ten to nineteen employee establishments would confirm this hypothesis.

Further, when we look at New Mexico's results, both joint terms (dtj and dtjk) are only significant in the small size establishment equation in Information (51). Since the second order interaction (dtj) shows a positive value but the third order interaction (dtjk) shows a negative value, we can infer that small size establishments in Information (51) are easily agglomerated from the neighboring counties to the center of movie making regions after the tax incentive program has been enacted. That is, there is a backwash effect where new firms establish and grow in the core county of the filming location while cannibalizing demand that traditionally went to establishments in neighboring regions.

#### **4.6. Conclusions**

This study is the first attempt to empirically analyze and measure the impact of a tax based strategy targeted to the film industry on regional economies. Based on the matching method of each state's endowment of man-made infrastructure and natural amenities, it was possible to sort out similar states to the state where the policy was enacted and focus of this study (Louisiana and New Mexico). Then, an impact of the film industry tax incentive program was analyzed with unobserved individual characteristics controlled by the difference-in-difference model.

Even though this chapter started based on the emphasis of past research on employment as the primary goal for most direct economic development policies (Bartik, 1991), I was unable

to identify many significant linkages between the tax incentive program for the film industry and employment gains in other diverse industries. There was a small positive impact on small firm establishment growth (number of Information industry (NAICS code 51) establishments with 5-9 employees); however, this came at the expense of a reduction in small firm establishment growth of contiguous counties. Further, the negative impact on the employment location quotient from the Information Industry in New Mexico may suggest that employment may not be growing for home grown establishments from the tax incentive program but from out-of-state establishments that may be only employing local residents for short-term jobs and the profits earned by these activities are leaving the state.

These results revealed several shortcomings that the difference-in-difference regression model in regional studies might contain based on the model specification. For example, a deliberate choice of using aggregated NAICS sectors most likely correctly showed that the film tax credit programs did not have a significant impact on employment for these large sectors. However, a smaller, and more detailed NAICS sector analysis may have shown more targeted employment and establishment growth. Second, the disclosure issue using County Business Patterns data likely constrained the employment location quotient equation from picking up some employment effects in sectors where employment was growing, but the number of establishments was still few such that the employment was not disclosed.

There are additional limitations of the research that should be mentioned. As mentioned in methodology section, a crucial issue in the quasi-experimental approach is how to select the best control group. The control group should be the one which did not participate in the treatment but should be similar to the treatment group as much as possible. This chapter used five physical and topographical variables as criteria in selecting the control group and its spatial unit was the state level. This chapter used only one control state per treatment state as a control

group. However, in further research, an attempt to use multiple control groups and to use average values of the control groups might increase confidence in the control group choice. Furthermore, once enough observations are obtained, a county-level comparison (county treatment and control groups) would generate more sensitive and more explicit impact analysis.

Additionally, a regional policy evaluation should consider the threats to external validity. In this quasi-experimental approach, a comparison of two states with a five-year-gap for the policy using dummy variables might not specify the net effect of film industry's tax incentive program appropriately. During the five-year period, it is reasonable to think that both treatment states and control states may have experienced more than one state policy. For example, according to Louisiana Department of Revenue (L.D.R.), Louisiana enacted the "Stelly Plan"<sup>48</sup> in January 2003 that eliminated sales tax on food and utilities and increased income tax to more wealthy households at the same time (L.D.R., 2003). The net effect of the Stelly Plan on retail trade has not been considered nor has it been tested in this quasi-experimental approach. However, this tax change might have possibly driven by some, if not most, of the results for state-level economies from both the employment and establishment location quotient results.

Lastly, it may be true that an impact of tax incentive program is not necessarily beneficial to all regions, even though it exists in one region. An influence of the tax program is more beneficial in central areas where all economic activities occur and even absorbs small economic units from neighboring areas. From this finding, film industries which are assumed to use natural landscapes for their production inputs, we might come to a conclusion that the level of natural amenities should be enhanced in harmony with man-made infrastructure of the region.

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<sup>48</sup> For more detail, see website of Louisiana Department of Revenue (<http://revenue.louisiana.gov/sections/publications/viewrelease.aspx?id=108>).



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## **CHAPTER 5**

### **CONCLUSION**

This dissertation addressed the question regarding whether natural amenities contribute to economic development of regions. The research process was broadly composed of two parts. The first was to organize findings of past research covering amenities through meta-analysis. The second was to analyze local government's economic incentive strategy to attract a media industry (the film industry) which transmits value of amenities to people through economic growth. In this concluding chapter, I provide summarizing remarks of the analyses and their policy implications, followed by limitations of this research and suggestions for future research.

#### **5.1. Summary**

Even though it is difficult to conceptualize an influential role of amenities due to their latent characteristics, growing economies in many regions (particularly rural regions) during and after the 1990s are explained by a contributing role of natural amenities to migration, employment growth, firm location, etc (Dissart and Deller, 2000, Gottlieb, 1995, Kim, et al., 2005). A statistical literature review using meta-analysis in Chapter 2 provided some meaningful findings on how research on amenities has previously been conducted.

Most research about amenities uses similar modeling approaches in linking economic growth and amenities. Especially, research including spatial autocorrelation terms takes advantage of those terms in enhancing other socio-economic variables besides amenity variables. Therefore, spatial autocorrelation correction terms indirectly benefit other variables in the same regression equation and improve overall model specification and performance. I found that incorporation of spatial autocorrelation correction terms reduced the significance of amenity variables from the Probit model in Chapter 2. This finding suggested that amenities in one's own

region may be capturing the economic benefits of another region when spatial lag terms are not included. For example, a mountain range in one's own region may not be physically located, but can be seen by a neighboring region. This spreading landscape adds a natural scenic view which attracts both the neighboring region's labor supply and employers to the neighboring region. To the extent that the region with the mountain range can supply an external labor force to employers in the neighboring region, that region can benefit from the neighboring region's economic growth. This interpretation explains why the significance on amenity variables declined in the presence of spatial models but also suggests future research. That is, the effects of one region's own amenity stock may influence its economic performance directly as well as through a "feedback loop" effect (e.g. inter-regional trade effects from input output modeling) through economic linkages of other regions that benefit from their amenity stock.

When two distinctive characteristics of amenities are considered according to their limitation or flexibility in supply, man-made/cultural amenities are more likely to be managed than natural amenities. Meta-analysis of amenities suggests that man-made amenities are more influential in economic growth when employment growth is of interest in particular. Man-made/cultural amenities such as galleries, museums, or theaters are known to bring talented workers in high technological industries into an area (Florida, 2002). In contrast, the tourism industry has been a historical rural economic development strategy showed insubstantial impacts on employment or income growth (Marcouiller, et al., 2004). Hence, it may be necessary for a tourism industry in a rural area to focus not only their natural amenities but also their capabilities in augmenting man-made/cultural amenities. Local governments would achieve more benefits if they devise a strategy to leverage natural amenities to enhance man-made/cultural amenities.

In fact, most states in the United States try to use their unique natural amenities in contemporary times whether or not their efforts are originally designed to focus on natural

amenities. Most U.S. states support a media industry in which values of amenities are transmitted to people. In this way, consumers of amenities enjoy values through an aspect of derived consumption (OECD, 1999). This dissertation discussed regional governments' tax incentive programs to the film industry. I analyzed how much the tax incentive program along with man-made amenities and natural amenities increases film production in an area. Then, once one state adopted the tax incentive program, economic benefits are accrued to those regions. This research from my assessment, was the first attempt to statistically analyze an impact of tax subsidies targeted to film industries on multiple industries in an regional economy, extending the political economic research (Christopherson and Righthor, 2009) and intra-industry research (Hefner, 2009) conducted on the topic.

## **5.2. Policy Implications**

Results of analysis on the impact of tax incentive programs and its induced effect on local economies, while mixed, do suggest that tax policy has a positive economic effect on attracting film industry production in an area. It is compatible with past research in that the location decision is predominantly a financial decision; the consideration where the best shots can be made depending on natural amenities for background scenes is secondary in the film shot location decision (Christopherson and Righthor, 2009).

If a media industry conveys values of amenities as a form of the derived consumption (OECD, 1999), the media industry can be a good candidate for an amenity-led development strategy. I attempted to analyze whether the derived consumption of amenities is a useful way to valorize amenities by testing whether it can bring economic benefits beyond the legitimacy of preservation or promotion of amenities in economic development.

As a result, increasing filming activities does not necessarily drive gains in the employment level or number of establishments into an area in general. My results suggest that

the tax policies of two states considered to be growing regions and competitive alternatives to the historical concentration of the filming industry in California, Louisiana and New Mexico, do not appear to receive significant economic benefits from a macroeconomic perspective. Some evidence from New Mexico suggests that targeted industries are growing; however, they do not appear to be spilling over in a statistically significant way to other industries hypothesized to benefit from the filming industry in a given area. Given that the tax incentives are considered rather lucrative for a given industry compared to tax incentives given to other industries, future research should conduct cost-benefit analyses where the benefits are carefully calculated against controls through a with/without tax policy scenarios.

In addition to an effort to research employing cost-benefit analyses in existing policy programs in cultural industries, it should not be ignored that an economic instrument in a cultural industry can be more influencing on local economies if the size of economies is relatively small. Given that New Mexico's economies are less diverse and less dynamic than Louisiana's economies, an impact of the tax incentive program focused on film industries were more realized in New Mexico. Therefore, policy makers at the sub-state level who want to accomplish their aims to reshape local economies might want to have economic incentive programs to attract cultural industries into their areas.

### **5.3. Limitations and Suggestions to Future Research**

This dissertation mainly discussed relationships among amenities, economic development, and local governments' effort to valorize amenities in revitalizing local economies. Based on one of the ways to realize value through amenities, a film industry's contribution to local economies was analyzed by using a quasi-experimental approach. One of the most important decision variables in the approach is the selection of the best matching group to the reference group. This study used the twin study approach which compared the single best matching group with the

group of interest. If a quasi-experimental approach analysis is based on imperfect matching (Reed and Rogers, 2003), it may be worth augmenting more groups to be compared and obtain estimates of interest as average changes of variables.

In addition to sensitivities depending on specific compared groups, a smaller spatial unit may be considered. This research was limited to the state level for the spatial unit because the tax subsidy policy is imposed at state level. However, one region within a state might have experienced more changes from the state's tax incentive program than others. Hence, the potential positive impact of a smaller region may be hidden in such state-centered analyses. The accuracy of policy impact could be increased if the study unit is narrowed to the sub-state level.

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### APPENDIX I. PCA INDEX SCORES OF EACH STATE

State	Man-made Infrastructure	Ag-Land	Conservation	Water	Temperature
AL	-1.0022	0.2166	-0.3187	-0.0520	-0.0264
AZ	-1.1725	-0.6504	0.5243	-0.1968	1.9346
AR	-1.9586	0.1399	-0.1930	0.7029	0.0904
CA	15.0063	1.9807	-0.2193	0.9959	0.6598
CO	-0.0932	-0.0338	0.7007	-0.2005	0.9219
CT	-1.3000	-0.7984	-0.6490	-0.9849	-0.0732
DE	-2.9268	-0.8147	-0.6697	-0.9530	-0.0631
FL	7.1520	0.6201	-0.0815	0.7421	0.8188
GA	1.4211	0.6345	-0.1266	0.7214	0.2409
ID	-2.5227	-0.4612	-0.0236	0.1455	-0.3259
IL	3.6843	0.2603	-0.1521	-0.0660	-0.2516
IN	-0.1386	-0.1561	-0.3821	-0.4142	-0.4410
IA	-1.0048	0.2960	0.1719	-0.5137	-0.1884
KS	-1.6989	0.3028	0.2477	-0.3315	0.5486
KY	-1.2818	0.3185	-0.4463	0.0772	-0.3277
LA	-0.7057	-0.3853	1.1680	0.2131	-0.0282
ME	-2.3962	-0.6232	-0.4091	-0.1494	-0.4076
MD	-0.3390	-0.6950	-0.5704	-0.6919	-0.1457
MA	0.5399	-0.7730	-0.6248	-0.8686	-0.3655
MI	1.8836	-0.1881	-0.0560	0.6137	-0.8704
MN	0.1007	0.3526	0.4901	0.7189	-0.4578
MS	-1.8212	0.2837	-0.0456	-0.0069	0.0948
MO	0.0662	1.1614	0.1818	0.9007	0.1324
MT	-2.3498	0.6283	0.4887	0.0927	-0.2512
NE	-2.3133	0.0758	0.4745	-0.5170	0.2357
NV	-2.2472	-0.7701	-0.5199	-0.9473	1.1362
NH	-2.5375	-0.7603	-0.6258	-0.5269	-0.5730
NJ	1.5714	-0.7758	-0.5977	-0.7995	-0.0641
NM	-2.0544	0.1162	-0.3318	-0.4740	1.3272
NY	8.5166	-0.1596	0.1513	0.5773	-0.6878
NC	1.1019	0.0482	-0.2809	0.9849	0.1819
ND	-2.9241	0.0367	2.4940	-0.4431	-0.3303
OH	2.3421	-0.0308	-0.3374	-0.3301	-0.6182
OK	-1.2429	0.4592	-0.2996	-0.2794	0.6964
OR	-1.0031	0.0894	-0.4392	0.3869	-0.5966
PA	3.0111	-0.2066	-0.4198	-0.1568	-0.5101
RI	-2.7867	-0.8342	-0.6659	-1.0682	0.0027
SC	-0.8878	-0.2264	-0.3872	0.0217	0.3601
SD	-2.6267	-0.0214	2.6801	-0.4904	0.0089
TN	-0.3159	0.0570	-0.2874	0.9443	-0.2501
TX	8.0977	2.7934	1.4332	1.2019	0.8827
UT	-2.0492	-0.6247	-0.2400	0.2396	0.3749
VT	-2.9052	-0.6732	-0.6596	-0.7583	-0.7109
VA	-1.0324	0.0704	-0.5000	0.2075	-0.1110
WA	0.4182	-0.0102	-0.0925	0.8848	-1.0063
WV	-2.5014	-0.3657	-0.5618	0.2383	-0.7740
WI	-0.0669	0.3788	1.3278	0.5730	-0.5725
WY	-2.7065	-0.2821	-0.3199	0.0363	0.3794

**APPENDIX II. RESULTS OF MATCHING: CANDIDATES OF CONTROL GROUP TO  
LOUISIANA AND NEW MEXICO (RESPECTIVELY)**

Ranking	M-measure to Louisiana		Pop	Empl	Pcinc	M-measure to NM		Pop	Empl	Pcinc
1	WI	1.3585				NH	0.7820	√		
2	MN	1.9815	√	√		NV	1.0406			
3	CO	2.0938				KS	1.3182			
4	TN	3.5631	√	√	√	OK	1.3194	√	√	
5	SC	3.9028				MS	1.8592	√		
6	WA	3.9781				WY	2.1223			
7	MD	4.5185	√			NE	2.1622			√
8	IN	5.0944				RI	2.3219		√	
9	AR	5.1191	√			DE	2.5516			√
10	NC	5.7159				AZ	3.2599			√
11	CT	5.7634				AL	3.4962			
12	MO	5.8059		√		KY	3.6191			
13	VA	5.9143	√			UT	3.6611			√
14	OR	5.9845		√		ME	3.6707		√	√
15	AL	6.2151				VA	3.8645	√		
16	UT	6.3453			√	ID	4.1653			√
17	IA	6.5232			√	SC	4.2664			
18	GA	6.7762				MT	4.3124		√	
19	KS	7.8074				VT	4.6233		√	√
20	MA	7.8983		√		IA	5.2054			√
21	NH	8.2250	√			CT	5.2657			
22	ID	8.6436			√	WV	5.3478			
23	ME	8.6557		√	√	OR	5.6967		√	
24	KY	8.6685				MO	6.9913		√	
25	SD	8.7404				AR	8.1196	√		
26	MS	8.9301	√			TN	9.1288	√	√	√
27	OK	9.2964	√	√		CO	10.2495			
28	NE	9.2970			√	IN	10.4266			
29	AZ	9.3908			√	MD	10.4820	√		
30	NV	9.4742				MN	12.0871	√	√	
31	MI	10.7160		√		LA	12.3738			
32	ND	11.0797				ND	12.6813			
33	WV	12.2086				SD	12.8608			

# APPENDIX II. CONTINUED

Ranks	M-measure to Louisiana		Pop	Empl	Pcinc	M-measure to NM		Pop	Empl	Pcinc
34	RI	12.3430		√		WI	14.6813			
35	NM	12.3738	√	√		WA	17.1954			
36	WY	12.4405				GA	18.2509			
37	DE	13.2451			√	NC	19.5026			
38	MT	13.5194		√		MA	19.7897		√	
39	NJ	13.6718		√		NJ	31.7491		√	
40	VT	14.4424		√	√	MI	33.8717		√	
41	OH	17.3975				OH	38.1975			
42	PA	23.6419			√	PA	49.6950			√
43	IL	29.6292				IL	57.4588			
44	FL	87.7103				FL	134			
45	TX	95.6287			√	TX	141			√
46	NY	136		√	√	NY	202		√	√
47	CA	349	√			CA	435	√		

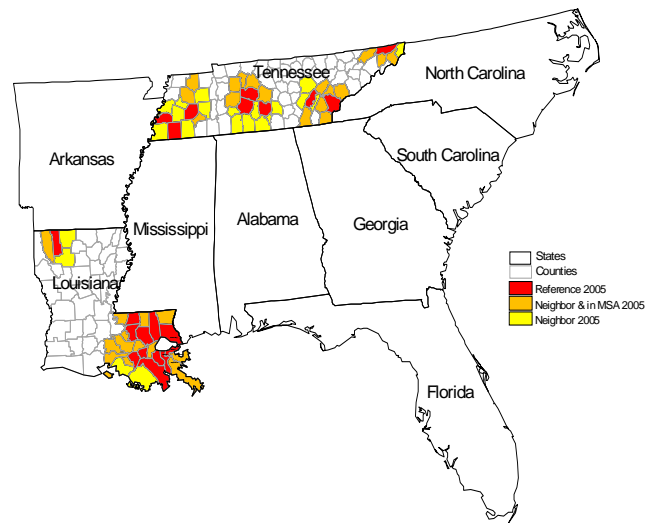
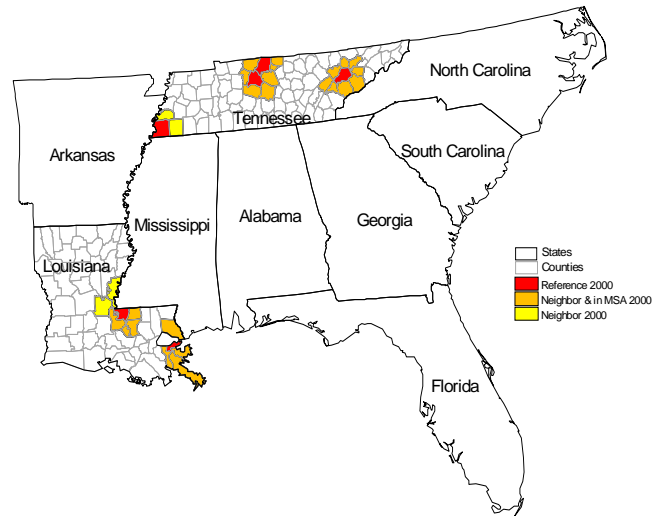
**APPENDIX III. LIST OF CENTRAL COUNTIES OF MOVIE PRODUCTION AND  
THEIR NEIGHBORING COUNTIES IN LOUISIANA AND TENNESSEE**

State	Year	Reference County	Neighboring Counties
LA	2000	Orleans parish	Jefferson, Plaquemines, St. Bernard, St. Tammany
		West Feliciana parish	Avoyelles, Concordia, East Baton Rouge, East Feliciana, Pointe Coupee, West Baton Rouge
	2005	Assumption parish	Ascension, Iberia, Iberville, Lafourche, St. James, St. Martin, St. Mary, Terrebonne
		Lafourche parish	Assumption, Jefferson, St. Charles, St. James, St. John the Baptist, Terrebonne
		St. Tammany Parish	Orleans, Washington, Tangipahoa
		Webster Parish	Bienville, Bossier, Claiborne
		East Baton Rouge Parish	Ascension, East Feliciana, Iberville, Livingston, St. Helena, West Baton Rouge, West Feliciana
		East Feliciana Parish	West Feliciana, East Baton Rouge, St. Helena, West Baton Rouge, West Feliciana
		Jefferson Parish	Lafourche, Orleans, Plaquemines, St. Charles
		Livingston Parish	Ascension, East Baton Rouge, St. Helena, St. John the Baptist
		Orleans Parish	Jefferson, Plaquemines, St. Bernard, St. Tammany
		St. Charles Parish	Jefferson, Lafourche, St. John the Baptist
		St. James Parish	Ascension, Assumption, Lafourche, St. John the Baptist
		Tangipahoa Parish	Livingston, St. Helena, St. John the Baptist, St. Tammany, Washington
		St. Tammany Parish	Orleans, Tangipahoa, Washington
TN	2000	Sumner County	Wilson, Davidson, Macon, Robertson, Trousdale
		Shelby County	Fayette, Tipton
		Knox County	Anderson, Blount, Grainger, Jefferson, Loudon, Roane, Sevier, Union
		Davidson County	Cheatham, Robertson, Rutherford, Sumner, Williamson, Wilson
	2005	Maury County	Giles, Hickman, Lawrence, Lewis, Marshall, Williamson
		Williamson County	Cheatham, Davidson, Dickson, Hickman, Marshall, Maury, Rutherford
		Rhea County	Bledsoe, Cumberland, Hamilton, Meigs, Roane
		Bedford County	Coffee, Lincoln, Marshall, Moore, Rutherford
		Fayette County	Shelby, Hardeman, Haywood, Tipton
		Madison County	Carroll, Chester, Crockett, Gibson, Hardeman, Haywood, Henderson
		Sullivan County	Carter, Hawkins, Johnson, Washington
		Monroe County	Blount, McMinn, Polk, Loudon
		Tipton County	Shelby, Fayette, Haywood, Lauderdale

**APPENDIX IV. LIST OF CENTRAL COUNTIES OF MOVIE PRODUCTION AND  
THEIR NEIGHBORING COUNTIES IN NEW MEXICO AND OKLAHOMA**

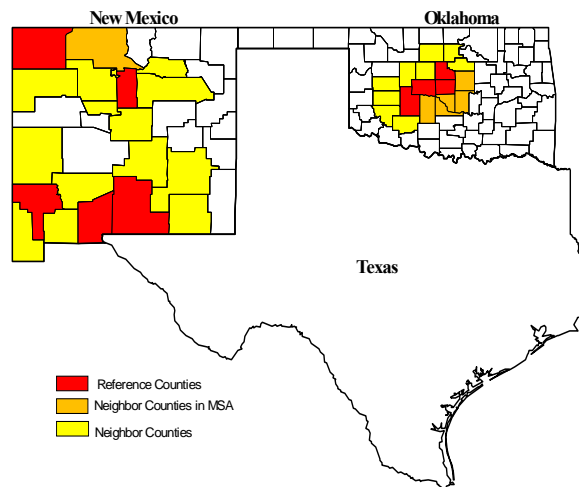
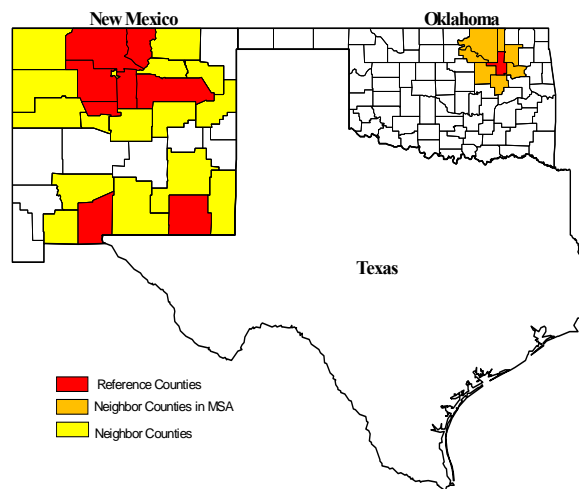
State	Year	Reference County	Neighboring Counties
NM	2000	Rio Arriba County	Santa Fe, Taos, Los Alamos, Mora, San Juan, Sandoval
		Santa Fe County	Bernalillo, Los Alamos, Mora, Rio Arriba, San Miguel, Sandoval, Torrance
		San Miguel County	Guadalupe, Harding, Mora, Quay, Santa Fe, Torrance
		Taos County	Colfax, Mora, Rio Arriba
		Eddy County	Chaves, Lea, Otero
		Dona Ana County	Sierra, Luna, Otero
		Bernalillo County	Cibola, Sandoval, Santa Fe, Torrance, Valencia
		Sandoval County	Bernalillo, Cibola, Los Alamos, McKinley, Rio Arriba, San Juan, Santa Fe
	2005	San Juan County	Sandoval, Rio Arriba, McKinley
		Otero County	Chaves, Sierra, Dona Ana, Eddy, Lincoln
		Grant County	Carton, Sierra, Hidalgo, Luna
		Santa Fe County	Bernalillo, Los Alamos, Mora, Rio Arriba, San Miguel, Sandoval, Torrance
OK	2000	Tulsa County	Creek, Okmulgee, Osage, Pawnee, Rogers, Wagoner, Washington
	2005	Caddo County	Blaine, Canadian, Comanche, Custer, Grady, Kiowa, Washita
		Canadian County	Blaine, Caddo, Cleveland, Grady, Kingfisher, Logan, McClain, Oklahoma
		Logan County	Canadian, Garfield, Kingfisher, Lincoln, Noble, Oklahoma, Payne
		Oklahoma County	Canadian, Cleveland, Kingfisher, Lincoln, Logan, Pottawatomie

**APPENDIX V. GEOGRAPHICAL ILLUSTRATION OF COUNTIES OF MOVIE PRODUCTION IN LOUISIANA AND TENNESSEE, 2000 (UPPER) AND 2005 (BELOW)**



Note: Red counties are central counties. Both yellow and orange counties are neighboring counties. Orange indicates MSA (Metropolitan Statistical Area) and yellow indicates non-MSA.

**APPENDIX VI. GEOGRAPHICAL ILLUSTRATION OF COUNTIES OF MOVIE PRODUCTION IN NEW MEXICO AND OKLAHOMA, 2000 (UPPER) AND 2005 (BELOW)**



Note: Red counties are central counties. Both yellow and orange counties are neighboring counties. Orange indicates MSA (Metropolitan Statistical Area) and yellow indicates non-MSA.



## VITA

Junpyo Hong was born in January, 1974, in Seoul, South Korea. After finishing his undergraduate education majoring in agricultural economics at Seoul National University in 2000, he continued his study in agricultural economics at the same university.

While he was pursuing his master's degree at the Department of Agricultural Economic in Seoul National University, he was involved in research projects mostly in fields of either production economics or environmental economics. Those projects were sponsored by Rural Development Administration (Korea), Ministry of Environment (Korea), or Korea Energy Economics Institute (Korea). Junpyo completed his master's program by authoring his master's thesis entitled "The Analysis on the Effects of Korean Agricultural R&D Expenditure". He was advised by the late Dr. Bong-Soon Kang and mostly by Dr. Oh-Sang Kwon.

After the completion of his master's degree, he had worked at Korea Rural Economic Institute (Seoul, Korea). During his temporary work, he accomplished a research project in a field of agricultural marketing which was cooperated by LG CNS Co. Ltd.; Establishment of EPC (Electronic Product Catalogue) Structure in NACF (National Agricultural Cooperative Federation) Retail-Marketing Information System.

He came to Louisiana State University in 2005 to pursue his doctorate in agricultural economics. He worked with Dr. James Matthew Fannin in a field of rural development. His research interest is to identify local areas' competitiveness in terms of quality-of-life. He is appointed to work at Korea Rural Economic Institute (Seoul, Korea) as a senior research associate after the completion of his doctoral degree.