Hedonic Prices, Economic Growth, and Spatial Dependence

by

Krister Sandberg
Acknowledgements

It is now time to show how grateful I am to those that in one way or another have helped me get to this point were I am today. First of all I would like to give a big hand to my supervisor Lars Westin, who has been there for many years - a man with firm support, thousand ideas, and a great sense of humor. Come to think of it, I have to thank his wife Kristin too. Why? Well, when finalizing my MSc paper I was invited to their home for some final adjustments. She then confronted me with a simple and, I suppose, harmless question - so are you applying for graduate school? Not knowing exactly what it was at the time, or what to answer, I panicked and said yes! Thanks.

Jörgen Johansson, my co-author, deserves some recognition too. It was he that pushed me into the research direction in conjunction with the first paper. He was also a great help during the first year of the graduate studies. Robert Sörensson deserves some recognition for sharing a room with me for the last couple of years (actually some more). It has been mostly fun. Patrik Asplund used to quote Creedence Clearwater Revival “Someday Never Comes”. For once you were wrong! Other colleagues that made life easy during this time were Thomas Westerberg, Mattias Ankarhem, Ulf Jonsson, Anna Norin, and Niklas Nordman. I would also like to thank the rest of the people at CERUM and at the Department of Economics, past and present. I have not forgotten my non-work related friends either, thank you all.

During my visits, first to IIASA in Vienna and later to UC Berkeley I had the fortune to get to know some nice people. Maarit, Rud, Monica, James, Ann Kristin, Catherine, Johannes, Keishiro, Jonas, Thomas, and all other unmentioned but not forgotten really know how to combine work with alternative activities. Life would truly be boring without you all. Thanks also to the staff at both places.

To conclude, I would also like to take this opportunity to thank my parents Kjell and Eva, siblings Kristina and Kristian, and grandparents Erik, Nanny, Nils, and Astrid. I could not have done it without you.

Dixi et salvavi animam meam

Umeå in April 2004
Krister Sandberg
Abstract

This thesis consists of three papers on econometric modeling of spatial dependence. The awareness of interactions between actors is fundamental for understanding property markets as well as the growth of regions. In both cases, neighbors and neighboring markets may stimulate or hamper growth of values. From a modeling point of view, these interdependencies calls for spatial econometric models. In the thesis we introduce such methods in the analysis of regional property markets as well as in a comparative regional growth analysis.

[1] In the first paper, we estimate hedonic prices in the market for co-operative flats in the city of Umeå, Sweden, during 1998 and 1999. Structural, neighborhood, and accessibility characteristics are used as attributes in the hedonic price function. Important attributes were the rent, floor space, age, and population density. Two attractive nodes, although with different characteristics, were found. Thus there are signs supporting the view that Umeå has developed into a multi-nodal structure for property values. SAR-GM estimation was used due to signs of spatial error dependence.

[2] In the second paper, hedonic prices for single-family homes in two Swedish counties are estimated for two years. Parameter estimates are compared and changes in space and time analyzed. Spatial lag dependence is found to influence the results. Hence, four independent variables are lagged with a spatial weights matrix. Additional spatial error dependence is treated by SAR-GM estimation. Structural, neighborhood, and accessibility characteristics are used as attributes. The regional price pattern and its changes over time, is illustrated and identified with GIS maps. Proximity to the two county capitals, as well as the other municipality centers, influence property prices positively. This is also noticeable over time, where values have risen for homes located near major population centers and those which have water provided by the municipality. Values are in addition largely a function of the quality of each home.

[3] The third paper examines the provincial pattern of growth in China during the period 1985–2000, testing the hypothesis that provinces with similar growth rates are more spatially clustered than would be expected by chance. The provincial economic growth is explained by the distribution of industrial enterprises, foreign direct investment, infrastructure, and governmental preferential policies. The neoclassical hypothesis of convergence is also tested. Indications of unconditional convergence does occur during the periods 1985–2000 and 1985–1990. In addition, conditional convergence is found during the sub-period 1990–1995. Evidence of spatial dependence between adjacent provinces has also been established, and in the econometric part, solved by a spatial lag, or alternatively a spatial error term, in the growth equation.

Keywords: Hedonic prices, Spatial econometrics, Co-operative flats, Spatial dependence, SAR-GM, Single-family homes, Heterogeneity, China, Convergence, Provincial economic growth.

Classification[JEL]: D46, D61, R11, R12, R20, R21, O18
The thesis consists of a summary and the following papers.


1 Introduction

Actors in most markets depend on collaboration with, competition from, and the decisions made by other actors. In the housing market, it is obvious that appearance and quality of individual homes is important for value creation and price determination. Market prices of homes in the neighborhood, prices that indicate accessibility and status of the area may, in addition, have an impact on individual property prices. Property prices are also closely connected with the overall economic development in the region of location.

On the regional level, wealth and income growth depends on the dynamics within each region, e.g. how the market for homes operates. Additionally, regional growth may be dependent on the development in other regions. As in the property market, this dependence is a function of the type and strength of the interaction between markets in the different regions. Hence, in both the property market, and at the regional level, one may assume that proximity to other markets contributes to the explanation of values and growth.

When economic behavior is modeled, spatial dependence of this type calls for spatial econometric methods. In this thesis, the economic behavior of spatially located actors are analyzed with data from two regional property markets in Sweden and from data on regional economic growth in China.

The first two papers in the thesis deals with hedonic prices for two important categories of housing in the Swedish real estate market. The first paper examines the market for co-operative flats in the city
Background and Summary

of Umeå. In the second paper, hedonic prices for single-family homes in the two Swedish counties of Västerbotten and Västernorrland are estimated for the years 1994 and 1999. Space-time changes are illustrated and analyzed. The third paper is concerned with provincial (regional) economic growth in China during the fifteen-year period between 1985 and 2000.

The rest of this summary is devoted to an overview of the issues and previous literature of relevance for the three papers. Section 2 provides an introduction to spatial econometrics followed by a section on hedonic prices related to the treatment of co-operative flats and single-family homes. Regional economic growth theory and the regional situation in China is treated in Section 4. Summaries of the included papers are given in the concluding section.

2 Spatial Data and Spatial Econometrics

What is so special about spatial data analysis? In the property market especially, but also more generally in discussions on urban and regional growth, one saying often heard is “Location, Location, and Location is everything”. Add to this Toblers first law of geography – everything depends on everything else, but closer things more so – and we begin to grasp what spatial analysis is all about. A central aspect of most economic markets is spatial interaction, externalities, spill-overs, copy-catting, etc. An implication is that in the same way as economic units are examined in time series for time dependence, they may be examined for dependence in geographical space. However, this comparison does not only contain similarities. A major difference between spatial and time dependencies is how the dependence operates. In a spatial context the dependence may, and usually does, operate in both directions. This makes it much harder to deal with. Initially, dependence due to measurable relations such as distance, barriers, and congestions are easily controlled for. However, there may still be signs of dependence due to omitted variables or tacit relations. One common simplification is first to assume equally strong dependence in both directions. A spatial weights matrix is thereafter constructed to proxy for these multiple dependencies between observations that are to be included in the estimation. There are various ways to construct this matrix, but the most common, so far, is a binary approach based on unit contiguity or a matrix based
Thoughts on the character of these spatial relationships in a statistical sense dates back at least 60 years. The Swedish statistician Bertil Matérn (1947) acknowledged the existence of spatial variation, or as he called it, typological variation to approximate overall forest growth. That is, trees at different locations are associated with different growth rates, or more generally, he thought that there might be an inherent systematic dependence between observations that could not be explained by traditional variables.

Exploratory data analysis is a good start in order to test for spatial dependence (spatial autocorrelation). In this way we may confirm or reject the hypothesis that objects of similar values are more clustered than by pure chance. At our disposal are a couple of global tests for spatial autocorrelation, such as Moran’s I and Geary’s C (Moran 1948; Geary 1954; Cliff and Ord 1973, 1981). The notion of global tests refers to the fact that they consider the overall data pattern and only return a single value which either confirm or rejects the hypothesis. No specific information is given about the prevailing pattern. When this is of interest, local tests are used instead, such as those suggested by Getis and Ord (1992), Ord and Getis (1995, 2001), and Anselin (1995).

The next step is usually to further examine and solve for spatial dependence in a regression analysis. Two kinds of spatial dependence are commonly assumed to potentially contaminate the analysis. The first arises when, for instance, prices of adjacent observations move together due to common or correlated unobservable variables, i.e. lack of stochastic independence between observations. This dependence leads to inefficient estimates if left unsolved. The problem is discussed at length in Cliff and Ord (1972, 1973). A partition of the error term into two parts, together with a spatial weights matrix, solves this spatial dependence problem. The model is known as the Spatial Error Model.

The second and more serious problem of spatial dependence is present when spatial correlation in the dependent variable between observations exists. An example of this is how the growth rate in one region is influenced by the growth rates in nearby regions and vice versa. Such dependence leads to both biased and inefficient estimates. For a further discussion of this problem see Anselin (1988). This problem may be solved for in various ways. The most common
Background and Summary

is to include the dependent variable of the other observations on the right hand side of the equation lagged by a spatial weights matrix. This model is known as the Spatial Lag Model.

An alternative to the Spatial Lag Model is the Spatial Cross-Regressive Model suggested by Florax and Folmer (1992), where instead spatially lagged independent variables of the adjacent observations are included in order to avoid otherwise induced heteroscedasticity when the dependence is of a more local variety. As usual, additional problems during estimation, such as heterogeneity and heteroscedasticity may occur. These problems are solved by standard econometric methods.

The classical estimation routine towards a proper model specification under the potential influence of spatial dependence is, for instance, given in Florax et al. (2003). The initial model is estimated by means of OLS. The residuals are then used to test the hypothesis of no spatial dependence caused by an omitted spatial lag or by spatially autoregressive errors by use of two Lagrange Multiplier tests (the LM-lag test and the LM-error test), e.g., Anselin (1988) and Burridge (1980). When the hypothesis cannot be rejected (no spatial dependence is at hand) meaning that the results from the OLS may be used. However, in the event that the hypothesis is, by both tests rejected, a new model should be estimated. The proper model is indicated by the most significant LM test. In case that only the LM-lag test is significant, the next step would be to estimate a Spatial Lag Model, or, consequently, a Spatial Error Model if the opposite is indicated.

3 The Swedish Housing Market and its Hedonic Prices

3.1 Bid rent and Hedonic Prices

A comprehensive exposition of modern urban economic theory is provided by e.g. Fujita (1989). Fujita observes that land is a commodity like any other, apart from that it is completely immobile. A parcel of land may differ in size but most importantly it is associated with a unique location in geographical space. These two characteristics of land imply strong non-convexities in consumers’ preferences, and concave household indifference curves for distance and parcel
size. In urban economic theory, this is avoided by the following two assumptions.

Each household is assumed to choose one and only one location. Thus, the household consumption space may be defined separately as consumption of land at that location and consumption of a composite good.

The households of each type are assumed to be so large that they may be represented in terms of a density function throughout the monocentric city. Not only does this assumption solve the problem above, it also implies that the bid rent function approach is applicable for the determination of household equilibrium location.

The bid rent $\gamma(d, u)$ is defined as the maximum rent per unit of land that the household is able to pay for residing at distance $d$ from the central business district (CBD) in a monocentric city given a fixed utility level $u$. In other words, the bid rent transforms consumption space indifference curves into corresponding indifference curves in urban space (bid rent curves) with the dimensions of location and land rent.

The bid rent function approach, first introduced by von Thünen (1826) in his agricultural land use model, plays a significant role in the first two papers of the thesis. The application for urban land use was later developed by Alonso (1964) and Solow (1973).

In order to connect the theory of land use with a theory of attribute valuation of individual homes, we use the theory of hedonic prices. Thus, heterogeneous goods may be seen as bundles of valued attributes that match the household utility function as discussed by e.g., Haas (1922), Lancaster (1966), and Rosen (1974). In other words, it is assumed that the buyer implicitly reveals his or her preferences for attributes through the price paid. Thus, given the assumption that the highest bidder purchases each home, the market prices yield the outer envelope of each attribute valuation by all households in the market. This optimal choice is characterized by equality between the slope of the bid rent and the hedonic price, with respect to each attribute.

### 3.2 Supply and Demand for Housing

The interaction between supply and demand for housing in the regional property market obviously is important for the determination
of the hedonic prices related to the overall attraction of a property. But transaction prices also provide detailed information on the attractiveness of local areas, individually designed homes and their standards. If the supply of property in all those aspects don’t match the utility driven demand for housing by consumers or the profit driven demand for nonresidential space by firms, the value of the regional property and the attractiveness of the city-region is put under pressure by competition from other cities. In DiPasquale and Wheaton (1996) the dynamics of supply and demand for property is to some extent modeled at an aggregated level. However, since the actual match making takes place at the level of individual properties and since this is the level where many of the hedonic prices still are determined, it may be appropriate to briefly sketch the process here.

The seller is assumed to release a home on the market when a potential buyer is thought to exist. If not, the seller must improve the object before advertising it, or withdraw from the market and wait for a future increase in demand. The buyer, given his preferences related to the characteristics that fulfill his utility, searches for an attractive home restricted by his budget constraint. When an object is found to be within both the choice set and the budget constraint, negotiations may begin. One may observe here that the choice set as such may be more or less dynamic as the buyer modifies his set in the process of object evaluation.

Thus, hedonic prices are market determined through buyer/seller negotiations. In these negotiations the seller tries to maximize the price of the object subject to a time constraint given, e.g. by the time when his new residence is available or changes in tax legislations. The buyer naturally tries to reduce the price given his experience on possible bids from competing buyers. If an agreement is not met, the buyer must either modify his choice set, wait for another object, or completely withdraw from the process. Although interesting, the dynamics of the negotiations or auctions between buyers and sellers and thus which objects in the property market that actually are transacted is not considered in the following.

Given that we currently only have transaction data at hand, changes in aggregate regional supply of objects with given attributes are neither possible to control for in a dynamic analysis. Nor is it possible to fine-tune our models with respect to all neighborhood attributes since we lack information about the stock of nontransacted
objects and their attributes.

The major housing categories in Sweden are co-operative flats, single-family homes, and flats with right of tenancy. Since market prices may only be observed for co-operative flats and single-family homes, this thesis is focused on these markets. Brief descriptions are given below.

3.3 The Role of Co-operative Flats in the Swedish Housing Market

Contrary to the international housing market, co-operative flats are fairly common in Sweden. According to Statistics Sweden (2003a; 2003b) about 15% of the Swedish population resides in co-operative flats, and about 70,000 flats were transacted in the year 1999. Of those, 2,000 flats, or 2.8%, were sold in the county of Västerbotten and about half of those were sold in the municipality of Umeå. The average price for a flat was 170,500 SEK in Umeå, 110,000 in the county of Västerbotten, and 284,500 in Sweden, (Statistics Sweden, 2001).

In the first paper in this thesis our sample consists of 194 flats, or 18% of those sold in the municipality of Umeå. Since our sample is limited geographically to flats sold in the actual city of Umeå, the sample percentage is somewhat higher. The average price in our sample is 145,000 SEK. This low average transaction price may come as a surprise, but may be explained by data selection. Our sample consists of observations from many areas in order to get as complete a geographic picture as possible of the market for co-operative flats in Umeå. Most observations are located at some distance from the city center, while most transacted flats in the high price segment are actually found in the immediate vicinity of the city center.

Since most co-operative flats are located in a similar type of multifamily housing as flats with right of tenancy, it is at this point appropriate to distinguish between these two categories in the Swedish housing market. The most obvious difference is the kind of ownership they represent. The co-operative flat is coupled with a membership and a share in a housing co-operative; the legal owner of the building. This provides the owner of the flat an indirect ownership of the building, while a right of tenancy does not represent any ownership at all. This share in the housing co-operative has
an economic value and may, together with the flat, be sold on the market.

The owners of co-operative flats also have more rights and responsibilities than renters. They have, for instance, wider possibilities to change the quality of the flat or alter its appearance. Ownership also makes it possible to influence the maintenance of the building, and thus the rent per month. The real estate tax is paid by the co-operative, thus indirect by the members. For tax purposes a co-operative flat is considered to be an asset, so members must additionally pay wealth tax for it. On the other hand, he or she may also make tax deduction for the interest on housing mortgages. In a flat rented by tenure, all these responsibilities and benefits belong to the housing company owners.

Different strategies may be chosen to finance the co-operative when it is started. Dependent of the chosen strategy, risk and capital costs are distributed differently between the co-operative and the individual owners. One alternative is for the co-operative to assume a large portion of the loans and sell the flats to its future members with a high rent per month charge. Another alternative is to let the members themselves raise the money and thereby directly finance the co-operative loans. These flats are then sold with a relatively high price while the rent per month is kept at a lower level.

3.4 Single-Family Homes as the Major Housing Category

The second paper deals with sales of Single-family homes. This is the most important category of housing in Sweden. About 57% of the Swedish population resides in single family homes, (Statistics Sweden, 2003a). In the year 1994 the total stock of single-family homes in Sweden were 1,937,000. Five years later the stock was 1,957,000, a modest increase of 1%. The three city regions, Stockholm, Göteborg, and Malmö, contributed half of that increase, (Statistics Sweden, 2004). The average price rose by 29% in Västerbotten, 9% in Västernorrland, and 49% in Sweden between the years 1990 and 2002. During the study period in the second paper, 1994–1999, the increase was 15% in Västerbotten, a mere 5% in Västernorrland, and 27% in Sweden, (Statistics Sweden (2003b). However, in the market for homes, the regional price indicators are very crude since the price of individual homes may vary in a broad interval around the average,
4 Regional Economic Growth in China

Knowledge about which factors that determines national and regional GDP growth is important in order to determine how regions grow, how the regional economy works, and to understand how regions interact with each other. One hypothesis often tested in studies of regional economic growth is the convergence hypothesis. That is, the lower the initial level of per capita income a region has, the higher should its growth be. This is predicted by the neoclassical growth theory, e.g., Ramsey (1928), Kuznets (1955), Solow (1956), Swan (1956), Cass (1965), and Koopmans (1965). The prediction of convergence is derived from the assumption of diminishing returns to capital. When the capital/labor ratio within a region is below its long run value, that region tends to have a higher rate of return than other regions. Hence, if all regions were essentially the same, with the exception of their initial capital/labor ratios, the convergence would be unconditional so that poorer regions would eventually “catch up” with the wealthier regions. However, if the regions are different in various aspects the convergence would instead be conditional and the regions would strive towards their own steady state growth.

The hypothesis of convergence has, however, been criticized in many studies of nations in favor of the endogenous growth theory; where the growth is instead driven by the accumulation of human and physical capital. Standard references are Romer (1986) and Lucas (1988).

The convergence and growth discussion provides us with a general background to the analysis of the Chinese development in paper three of the thesis. In many aspects, China is far from a homogeneous country, a fact that only makes it more interesting to study. The Chinese history and a rough characteristic of its provinces may serve as an introduction to the third paper.

China was forced to cede Hong Kong to British rule and to open up their ports to foreign control after the Opium war loss in the 1840’s. China kept on waging war against its enemies but lost more and more of its independence to foreign countries. In 1911, revolution broke out and the Qing dynasty collapsed. Different warlords ruled the country until 1927 when China was united followed by
a brief period of relative peace. Manchuria was seized by Japan in 1931, followed by the war in 1937 that eventually transformed into the well-known civil war, which ended in 1949 with communist victory.

The Japanese had during their occupation invested in heavy industry mainly for export to Japan so by the end of the war, the majority of China’s industrial capacity was in Manchuria. Apart from that, China was mainly a country inhabited by peasants. With Manchuria as a base, and with help from the Soviet Union, China started its industrial transformation. The new leaders established a strong government (but contrary to the Soviet model acknowledged that regions differ in various ways, and thus allowed different regional initiatives) and progressed towards a socialistic industrial complex. Planners, however, neglected labor-intensive sectors suitable for the large population, and instead poured resources into capital-intensive factories to produce metals, machinery, and chemicals. During this period most of the GDP growth may be attributed to capital input. The “big pushes” that additionally drew resources from the labor-intensive industry to the capital intensive seems only to have made things worse.

In 1978 China began to reform their command economy and have since then gradually created the framework of a socialistic market economy. The major forces behind this change was partly the fear of not being able to support its growing population (memories of the great famine in the early 1960’s were still vivid), and partly the threat from their neighbors’ new economic success. Positive effects were visible on economic growth almost immediately. Loop-holes and other possibilities made it possible for individuals with initiative to take advantage of the new situation and make handsome profits. When inflation and corruption grew, people began to protest, which culminated in the massacre at Tiananmen Square in 1989. This led to a slow down of the reform process. International commentators, as well as the Chinese community, had strong doubts whether the reforms would continue or not. Deng Xiaoping gave a clear sign in 1992 during his “Southern Tour” to the most successful provinces and made sure that the reform process would continue. Not only did the reforms continue, they also changed direction. This time more effort was inserted to level the playing field for the market actors. Other reforms included fiscal reforms and a reconstruction of the
Background and Summary

state owned enterprise sector. A recent and important step was the World Trade Organization (WTO) membership in December 2001.

Figure 1: The Chinese Provinces.

The three metropolises, Beijing, Shanghai, and Tianjin, are highly industrialized and also the provinces with the highest Gross Regional Product (GRP) per capita. The coastal provinces in the southeast, previously a poor and isolated region with a rugged coastline and an inhospitable climate, have since the reforms started experienced a rapid growth in GRP per capita and are now among the richest provinces in the country. These provinces have a special status due to the preferential policies levied on them by the government and are generally considered to be the engines of growth in the Chinese economy.

In the northeast, we find the old industrialized center, Manchuria. This area had, during the pre-reform era, the highest GRP per capita level. Even though they have not experienced such a rapid growth as the coastal provinces in the southeast, the GRP per capita is still
among the highest in China.

The central provinces, between the rivers Yellow and Yangtze, have a high population density and are well suited for agriculture. The southwestern provinces are also, from a climatic perspective, suited for agriculture but have limited access due to the mountains. These provinces have, in general, had a low annual GRP per capita growth since the start of the reforms.

In the northwestern part of China we find quite isolated provinces like Tibet, Xinjiang, and Qinghai, characterized by high elevation and a low transport infrastructure capacity.

In the third paper of the thesis, the above mentioned aspects are considered when the Chinese provincial growth and its pattern are explored and explained. As is the case in the first two papers, problems of spatial dependence play a major role.
5 Summaries of the Papers

[1] In the paper “Spatial Autoregressive Generalized Moment Estimation of Hedonic Prices for Co-operative Flats” the important characteristics and their magnitude for the price determination of Co-operative flats in the city of Umeå during the years 1998 and 1999 are estimated. Due to spatial dependence, the model in the final estimation is adjusted by a spatially lagged error term.

The results show that central business district and university accessibility influences the prices in a positive direction. Other variables that are important for the price are age, rent per month, and square meter area of the flats. Included are also the examination of neighborhood importance through the population density, the share of single-family homes, and the rate of turnover in the co-operatives.

[2] The second paper “On Space-Time Changes of Hedonic Prices for Single-Family Homes” studies the prices and important characteristics in the real estate market for single family homes in the counties of Västerbotten and Västernorrland for two years, 1994 and 1999. Included are all sales of single-family homes for both years. Apart from the usual object specific characteristics such as age and floor size, a major effort was made to deal with the spatial aspects of this market. This is not only taken care of by a gravity approach to capture the importance of accessibility and size of population nodes simultaneously, but also by the introduction of a spatial weighs matrix for four of the characteristics based on distance between the observations. To investigate and control for heterogeneity, these variables were also divided into four groups based on municipality location. Group 1 and 2 consists of homes in the municipalities of Umeå and Sundsvall. The third group consists of homes in the other coastal municipalities, and group 4 consists of homes in the inland municipalities. The final model includes all these aspects mentioned above with the addition of a spatial error component. The paper concludes with an analysis of the temporal adjustment between the two years. It is found that prices have increased most for homes with high accessibility to population, water provided by the municipality, and high housing quality. The predicted prices and their spatial distribution are also illustrated in GIS maps.

economic growth in China during the period 1985–2000 are investigated. Part one consists of a search for global spatial autocorrelation as well as local spatial association (hot/cold spots) in an exploratory data analysis. Clusters of provinces with high growth, especially in the coastal region in the southeast, and provinces with low growth in the center and western parts of China were found.

This is in the second part followed by a regression analysis. The hypothesis of unconditional convergence could not be rejected for the periods 1985–2000 and 1985–1990, while positive spatial dependence was found between the provinces for the periods 1990–1995 and 1985–2000.

In the conditional convergence regressions, preferential policy, enterprise structure, transport capacity, and foreign direct investments, were all important variables used in order to explain provincial economic growth. Spatial dependence, however, was not that significant. Thus, the provinces are in fact relatively independent of each other. One possible explanation for this could be that the aggregation at province level is too high, with a sample of only 30 observations so that differences in growth and spillover-effects actually takes place within each province, hinted at by e.g. Yao and Liu (1998) and Oi (1999). A similar investigation at the more detailed county level might have left us with different results. On the other hand, major problems of non-existing data restricted us in this case. Even if data would be available there would be questions about data quality.
References


Background and Summary


