Reading reflections

USP 570

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Week 3

Main point

- Transportation system and spatial form

Muller (2017) reviews the evolution of the U.S. urban form and describe the four eras of intrametropolitan growth inludes walking-horsecar era, electric streetcar era, recreational auto era, and freeway era. We can see the transportation technology is a determining constraint to other factors for urban form. The four-stage urban transportation development have their dominated spatial structure, which cannot be represented by some socio-economic factors. In the last section of his paper wrote in 1995, Muller stated the two problem of congestion and spatial mismatch caused by suburbanization and auto dependency. He also summarized some socioeconomic dynamics such as postindustrial economy, globalization, and the expansion of the services sector. He didn't talk about how new transportation techonology may launch the next era of metroplitian expansion. Now we can see some emerging techonological breakthrough is happening. Intelligent Transportation Systems (ITS) are replaceing precious travel decision mechanism. Many scholars start to predict the new urban forms affeceted by autononous vehicles. However, admitting techonolgy as a initial force cannont tel us how will it forge a decidedly different future. As Levinson and Krizek (2018) emphasise transportation is a neccessary but not a sufficient factor for any development.

- The choice of house and job

Levinson and Krizek (2018 ch.3) introduce several theories and models explaining how transport influences residential location preferences. From an economic perspective, the transport cost is the core element in Thünen's model of agricultural land and Alonso's Bid-rent theory. Meanwhile, Schelling's Segregation Model and Tiebout's model of 'vote with feet' disclose the significant function of self-selection as a social element.

Levinson and Krizek (2018 ch.4) point out "the theory of behavior based on gravity models assume that geograohy plays a prominent role in predicting who interacts with whom and how frequently." This theory can explain the macro structure. Some evidences such as 'excess driving' and 'weak ties' show that transportation network is only a part of travel decisions. Social networks with a 'hub-and-spoke structure' play a prominent role in finding a job.

The mechanism of social networks is difficult to define and messure by such as 'weak or strong link', 'close relation or not'. We have to depend on modeling to connnect the phenomenon and the roots. It is important to highlight the complex and indirect role of grography from Levinson and Krizek (2018)'s argument.

Discussion

In describing the process of housing choice, some subjectively assessed attributes are hardly measured. Hedonic regression analysis is a method using modeling techniques for measuring non-market benefits uses the change in prices of complementary goods to infer a willing to pay (WTP) for a healthier environment or less risky environment. The main hypothesis is that the accessibility of transit or bike facility has some positive effects on housing sale prices. Here we compare the methodology and findings from three articles using hedonic models (Chen, Rufolo, and Dueker 1998; Welch, Gehrke, and Wang 2016; Liu and Shi 2017).

- The models

All the three studies used ordinary least-squares (OLS) modeling, which based on maximum likelihood principle. Chen, Rufolo, and Dueker (1998)'s model[1] is a typical multiple regression. Both Liu and Shi (2017)[2] and Welch, Gehrke, and Wang (2016)[3] try to control spatial dependence and prevent overestimation of coefficient estimates. Welch, Gehrke, and Wang (2016) employ a a spatiotemporal autocorrelation model to overcome the potentially confounding modeling errors. To avoid sample bias, Welch, Gehrke, and Wang (2016)'s spatial panel data model adopt a bootstrapping regression estimates with a nonparametric approach, which

[1] Chen, Rufolo, and Dueker (1998)'s model:

$$P = a + bX + rZ + e$$

where P the sales price or log transformation, a constant term, X a vector of control variables, Z a vector of spatial-related variables, e the random error term, and a, b, r parameters to be estimated.

[2] Liu and Shi (2017)'s model

$$P_i = \beta_0 + \beta_1 T_i + \beta_2 H_i + \beta_3 R_i + \beta_4 B_i + \varepsilon_i$$

P_i Property sale price; T_i TransacSon characterisScs, such as year and season of the sale; H_i Internal property characterisScs , such as age, size and property tax liability; R_i External neighborhood characterisScs, such as school quality, crime rate, and walk score; B_i Bike facility characterisScs, such as distance to nearest advanced bicycle facility, and advanced bike facility density within a half-mile radius.

$$\begin{cases} Y = \rho WY + X\beta + \varepsilon & \text{Spatial lag model} \\ Y = X\beta + \lambda W\varepsilon + \nu & \text{Spatial error model} \end{cases}$$

where ρWY spatially lagged dependent variable that represents the omitted variable in the regression model, ρ spatial lag parameter, W spatial weighting matrix that represents the interaction between different locations, and X vector of all variables included in the OLS model. λ spatial error parameter, $W\varepsilon$ spatial error, interpreted as the mean error from neighboring locations, and ν independent model error.

[3] Welch, Gehrke, and Wang (2016)'s spatial panel data model

$$\begin{cases} y = \lambda(I_T \cdot W_N)y + X\beta + u & \\ u = (\iota_T \cdot I_N)\mu + \varepsilon & \text{sum of the temporal autocorrelation} \\ \varepsilon = \rho(I_T \cdot W_N)\varepsilon + \upsilon & \text{spatial autocorrelation} \end{cases}$$

where, y is an $NT \times 1$ vector of observations on the dependent variable, X is a $NT \times k$ matrix of observations on the non-stochastic exogenous variables, I_T is an identity matrix of dimension T, W_N is an $N \times N$ spatial weights matrix with diagonal elements set to zero, λ represents the corresponding spatial parameter.

constructed a 'pseudo spatial panel dataset' from a single observation for every grid cell, each year of the study period.

Chen, Rufolo, and Dueker (1998) examine the simple effects of LRT. The other two research conside the corelated effects of improved bike and rail transit facility access. Chen, Rufolo, and Dueker (1998) evaluate the combined effect of accessibility and nuisance respond the distance from station or line. However, for LRT, the positive effect of accessibility is only related with the station, not the line. Welch, Gehrke, and Wang (2016) use street network distance instead of the straight-line measurements or a series of areal buffer approximations.

'Long term' means observe the cumulated effects by cross-sectional data analysis. Welch, Gehrke, and Wang (2016) think panel dataset can examine the long-term influence better. Since the opening of the Yellow Line in 2004, Green Line in 2009, and Central Loop Line in 2012, is DID method comparing the pre- and post-treatment effects from transit investments better?

Chen, Rufolo, and Dueker (1998) only studied a corridor of the light rail system (MAX) in Portland, Oregon. The other two studies include all the City of Portland. With this advantage, Liu and Shi (2017) can examine the extensiveness of the bike network and Welch, Gehrke, and Wang (2016) create a 300-meter grid cell system cast over the city.

Levinson and Krizek (2018) divide the home attributes to three catagories: structural (including internal and external) attributes, location attributes, and neighborhood characteristics. All three studies basically follow this division. Moreover, Liu and Shi (2017) distinguish the two property types of SFHs and MFHs, add the advanced bicycle facility characteristics. Her study measures bothease of access (distance) and extensiveness of bike network (density). Welch, Gehrke, and Wang (2016) examine the bike facilities types,including local and regional, on-street and off-street. There is also a risk of overfitting, which making an overly complex model to explain idiosyncrasies in the data under study.

Some relevant hedonic price studies show some consistent findings. Al-Mosaind et al. (1993), Lewis-Workman and Brod (1997), Chen et al. (1998), Dueker and Bianco (1999), Welch, Gehrke, and Wang (2016) found the positive effects by Light rail transit. Lindsey et al. (2004) Krizek (2006) Asabere and Huffman (2009) Parent and vom Hofe (2013) found Multi-use paths have positive effects. Krizek (2006) and Welch, Gehrke, and Wang (2016) found the effects of bike lanes are not significant or negative. Liu and Shi (2017) further found extensiveness of the bike network is a positive and statistically significant contributor to property prices after controlling for proximity to bike facilites and other internal and external variables. As more studies on different urban regions, a meta analysis may be neccessary.

Notes

References

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