The nonlinear effect of convenience stores on residential property prices: A case study of Taipei, Taiwan

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ABSTRACT

This paper examines the nonlinear effect of convenience stores on residential property prices. In the light of Andrews's (1964) argument, this study seeks to advance Rosen's (1974) hedonic housing analysis by hypothesizing that residents' attitudes towards the accessibility of facilities (i.e. convenience stores), which is attributed to the compactness of supply of the services they are interested in accessing while on the move, may further have impact on local property prices.

The application of Koenker and Bassett's (1978) quantile regression on the property data of Taipei found that 'availability' of convenience store is positively related to low-quantile property prices, while 'density' demonstrates a nonlinear effect — positively related to low-quantile property prices but negatively related to high-quantile property prices. The residents in the neighbourhoods with lower-priced property may prefer accessibility to convenience stores where they can complete multiple tasks in one go, while those in the neighbourhoods with higher-priced property may be more mobile to access convenience stores in other suburbs en route from one place to another.

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Introduction

"An estimated 100 million Americans visit a convenience store on any given day; … Over 80 percent of all Americans, because of their busy schedules, prefer convenience stores to supermarkets"

Altizio & York, 2007: 2

The convenience store, from the perspective of hedonic housing theory, would be simply treated as a local facility, the effect of which would be measured in terms of the shortest distance (from a property to its nearest store) in ordinary least squares regression. Its positive relationship with property is generally assumed since the convenience store, an American invention for the explosion in suburban living after World War II, generally serves as a substitute for shopping centres and supermarkets, such as 7—11/Circle K in United States, Mini-Mart/Couche-Tard in Canada, Carrefour City in France, Best-One/One Stop in United Kingdom, and many other brands across countries. The introduction of B-to-C (business to consumer) e-commerce service through in-store multimedia kiosks in Japan and other countries transformed conventional convenience stores (i.e. gas-station shops) to modern convenience stores that offer not only food/snacks/drinks but also daily services, including basic printing/faxing, purchase of tickets (e.g. trains/buses, concerts or sport events), payment of bills (e.g. parking, insurance, or utilities), delivery services (combined with online orders)[1] and many others.

The prosperity of convenience stores in Western and Asian countries leads to abundant academic research in several domains, including: (1) information economy: the e-commerce collaboration between convenience stores and online retailers is widely discussed (Aoyama, 2001; Hsu & Huang, 2006), (2) allocation theory: where a new convenience store would be optimally allocated is examined (Sakashita, 2000; Wood & Browne, 2007); (3) criminology: why convenience stores may fall for opportunistic bait for robbery in United States is analyzed (Amandus, Hunter, James, & Hendricks, 1995; Petrosino & Brensilber, 2003), (4) dietary behaviour: the association between unhealthy dietary behaviours and geographic proximity to convenience stores is examined (Murakami, Sasaki, Takahashi, & Uenishi, 2009; Skidmore et al.,

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[1] The cooperation of convenience stores (providing the delivery service) with online shopping retailers (handling the ordering and payment processes) allows a consumer to purchase items online and choose the convenience store where he then picks up the items.

Table 1
Convenience stores in United States, Japan and Taiwan.

Country	United States	Japan	Taiwan
Land size (km^2)	9,826,675	377,915	35,980
Population	313,847,465	127,368,088	23,110,923
Number of convenience stores (nationwide)	149,220	46,905	9831
Convenience store per 100 km^2	2	12	27

2010). Despite its importance to local neighbourhoods, the convenience store is rarely taken as a key determinant to property prices in housing studies.

Here, an attempt is made to examine the nonlinear effect of convenience stores on different scales of property prices in the case of Taipei Metropolis through the application of Koenker and Bassett's (1978) quantile regression. Moreover, in the light of Andrews's (1964) argument, the *density* of convenience stores is further examined to advance the hedonic analysis of location on property prices by taking account of the possibility that what may shape residents' attitudes towards the accessibility of facilities is not only how convenient it is for them to get to the nearest supply point for any individual service (which, as Andrews emphasized, is not necessarily best measures by its distance from where they live, given that they move around anyway as they go about their lives) but on the compactness of supply of the bundle of services they are interested in accessing.

At first sight (see Table 1), in 2012, the United States' leading record of 149,220 convenience stores along with Japan's 46,905 stores may make it seem parochial to focus on Taiwan's 9,831 stores locating across a relatively small land area (35,980 km^2). However, when it comes to geographic density, there are on average two convenience stores (per 100 km^2) in U.S., 12 in Japan but up to 27 in Taiwan — possibly the highest density across the globe. Taiwan's convenience stores in 2012 generate NTD$ 224.9 billion sales volume through 2.8 billion transactions from its widely-ranged services.

This paper is structured as follows. The theoretical framework is presented in the next section, followed by a section of data. The empirical model, hypotheses and the results of the nonlinear effect of convenience stores on property prices will be illustrated in the fourth section. The final section will conclude this paper.

Theoretical framework

Rosen's (1974) hedonic model views a property as a bundle of valuable characteristics, and thus the implicit price of *a* characteristic can be derived from the market price of the property. These characteristics can be generally categorized into several types (c.f. Sirmans, Macpherson, & Zietz, 2005): (1) housing attributes: such as age of house, floor size, building materials, number of bathrooms/bedrooms, parking space and others (Clapp & Giaccotto, 1998; Forrest, 1991; Leishman, 2001); (2) environmental living quality: such as neighbourhood greenery (Luttik, 2000), noise (Theebe, 2004) or crime rate (Lynch & Rasmussen, 2001); and/or (3) local facilities, which can be generally classed into (a) amenities (which generate positive externalities): such as education institution (Black, 1999), parks (Li & Brown, 1980) or churches (Carroll, Clauretie, & Jensen, 1996), and (b) dis-amenities (which generate negative externalities): such as incinerators (Kiel & McClain, 1995), sewage treatment plants (Groothuis & Miller, 1994), cell phone towers (Bond & Xue, 2007), or landfills (Nelson, Genereux, & Genereux, 1992). It should be noted that, the convenience store, as one of the popular local facilities in our daily lives, is rarely discussed in literature.

In general, the empirical studies mentioned above mainly apply ordinary least square methods in analyzing the effects of these facilities on property prices (Sirmans et al., 2005). Moreover, the influence of each facility on property prices is determined by its spatial location, primarily measured in terms of the shortest straight-line distance (or trip duration) from a house to the nearest facility through GIS (geographic information system) technique. Therefore, in a conventional setting, convenience stores would be taken as a type of local facilities, the effect of which on property prices would be measured in terms of straight-line distance, and the application of ordinary least square regression would provide a single and marginal indicator of its location proximity to its potential consumers.

However, to take this approach seems to ignore the potentially significant arguments raised half a century ago by P.W.S. Andrews in his revival of Marshall's (1890) work. Andrews criticized Chamberlin's (1933) theory of location-oriented monopolistic profits. Andrews (1949, 1964) argued that location is not necessarily a differentiating factor since we consumers, who are mobile rather than paraplegic or confined to homes, "… tend to satisfy our continual needs for cigarettes [or other goods] from *any shop that we happen to pass*" (Andrews, 1951: 253–254; italics added). In other words, it would be futile for retailers to try to charge premium prices on the basis of their proximity to where consumers live, since consumers would shop elsewhere en route to workplaces or to any other locations "so long as these fit in with their way of life" (Earl & Wakeley, 2010: 173).

Given consumers' mobility and the dense supplies of convenience stores with multi-facet services, it is assumed in this study that the more convenience stores there are in neighbourhoods, the more likely consumers can get multiple tasks (e.g. buy magazines, buy train tickets, or pay phone bills) done in one trip when they happen to be 'passing' one en route between their homes and other places (e.g. railway stations, offices, or schools) without making a special journey for services. Having many convenience stores in neighbourhood does not only make it easier to do 'shopping on the run' on any journey but also increase the probability of a convenience store being close to where one lives. Hence, in this study, the effect of convenience stores on property prices will be measured in terms of the clustering of stores rather than the distance to the closest store from houses. That is, given a fixed boundary, the *availability* (i.e. whether a house has 'a' convenience store) and the *density* of convenience stores (i.e. whether a house has 'two or more') should have different effects on property prices.

Another step to reveal the effect of convenience stores is to recognize that their absence might make a suburb less attractive as a convenient place to live in but not everyone wants to live *really* close to such a store if in some respects it 'lowers the tone of the neighbourhood' via its impact on the streetscape, traffic noise or congestion as shoppers and delivery vehicles come and go. Whether we should view convenience stores as amenities or disamenities might thus depend on the type of suburbs in which they are located. Such nonlinear relationship tends to be overlooked in the widely-applied ordinary least square (OLS) regression, which indicates a *single* and *linear* estimate of regressor (i.e. house characteristics or facilities) on the *mean* value of the regressand (i.e. property prices). That is, the OLS setting may not be able to explain why residents in some counties with relatively lower property prices filed a petition of the installation of *a* convenience store for its convenient services[2] while residents in some counties with relatively higher property prices filed a

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[2] Residents in several less-developed neighbourhoods felt ashamed of not having any convenience store — a basic 'necessity' in lives in their view (http://udn.com/NEWS/NATIONAL/NAT2/5959886.SHTML#IXZZ21W8k5MHa; accessed 15 August 2012).