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Can value capture work in a car dependent city? Willingness to pay for transit access in Perth, Western Australia

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ABSTRACT

This paper investigates the impact of transit on urban land markets in the highly car dependent corridors of Perth with a focus on where new fast rail transit services have recently been built. It determines people's willingness to pay for transit access within different pedestrian catchments for each of the corridors based on hedonic price modelling using land value data on over 460,000 households. The case study uses cross sectional and panel data hedonic price modelling methodology for the calculation of willingness to pay for transit. It finds that land market increases of up to 40% can be achieved, and is particularly relevant to car dependent cities looking to capture the financial and economic value created to build transit extensions or entirely new systems, thus making a strong case for value capture funding of transit projects into car dependent suburbs and the potential for density increases near stations.

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1. Introduction

The need to build new transit infrastructure is back on the agenda in many cities (Newman et al., 2013) though several questions remain about how new urban transit can work in car dependent areas and the potential for using land value capture to help fund it (McIntosh et al., 2011). This paper seeks to answer these questions by first introducing the concepts of land markets and willingness to pay (Rosen, 1974) and in particular the willingness to pay for transit accessibility. Following this, an assessment methodology will be proposed to show how willingness to pay for different land attributes is reflected in residential land markets and how it can be calculated using hedonic price modelling to determine the value placed on transit accessibility. This methodology will then be applied in a case study of Perth, Western Australia, a city built around the car, which like many cities worldwide is now grappling with the issues of car dependence by investing in extensions to its urban transit network.

1.1. Land markets, consumer behaviour and willingness to pay theory

Economically, land is the most basic resource and a heterogeneous good that differs in terms of its characteristics and location. Although land markets are imperfect (due to the unstandardized commodities they trade) they perform four important functions (Hannonen, 2009):

- they bring buyers and sellers together to facilitate transactions,
- they set prices for land parcels,

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- they allocate land by setting land prices that clear at the quantity of land demanded, and
- they play an important role in ensuring that land is efficiently used.

An important factor in land markets is that land is spatially immobile, which implies that location is an intrinsic attribute of the land parcel and should form the basis of its economic analysis. Importantly, land market prices reflect the interaction between the buyers and sellers in the land market as costs (such as travel) are traded-off against land rents (and population densities) in a bid rent curve (Alonso, 1964; Muth, 1969). Fig. 1 illustrates the Bid-Rent Curve with respect to the investment in transit, and how it relates to the change in travel time for urban accessibility to employment.

Lancaster's (1966) theory on consumer behaviour theory suggests that goods (in this case land) are not direct objects of utility but it is their properties or characteristics from which utility is derived, and it is these properties that drive consumption. Following this theory, land parcels can have multiple relationships between them, making consumption decisions generally a set of joint decisions across multiple attributes.

Consumer preference/welfare theory was further developed quantitatively by Rosen (1974) through hedonic price modelling (HPM) and the calculation of willingness to pay. Hedonic price modelling posits that in the case of land, it is typically sold as a package of inherent attributes (topography, physical conditions, patterns of land ownership, availability of infrastructure and government regulations), and HPM enables the determination of the willingness to pay for each attribute. Therefore the price of one land parcel relative to another will differ with the additional units of the different attributes inherent in one parcel relative to another (Chin and Chau, 2003; Tiebout, 1956). Models of household location choice provide a theoretical foundation for measuring the willingness to pay for public goods (Kuminoff et al., 2010). The willingness to pay for the access to transit can be developed through a unified framework that relates land value capitalization to the underlying concept of market equilibrium on which welfare measurement is based (Kuminoff et al., 2010), where the relative price of a land parcel is the summation of all its marginal or implicit prices that can be estimated through HPM regression analysis.

1.2. Hedonic price modelling

The term "hedonics" is derived from the Greek word *hedonikos*, which simply means pleasure, and in an economic context refers to the utility or satisfaction one derives through the consumption of goods and services (Chin and Chau, 2003). HPM has been employed extensively in land and property research and whilst there are some issues with regard to data and measurement accuracy, the technique is valid for empirical studies of the housing market (Chin and Chau, 2003).

There are five key assumptions in economic analysis, and they are particularly important for HPM analysis:

1. Land market homogeneity
2. Perfect competition in the market
3. Buyers and sellers have freedom to enter and exit the market
4. Buyers and sellers have perfect information concerning the product and price
5. Market equilibrium with no interrelationships between price and attributes

HPM generally involves the application of Least Squares regression analysis, where the relationship between the dependent variable and explanatory variables is expected to be linear. The parametric equation for the observed land price (P) is shown in Eq. (1).

Equation 1 Parametric Land Price Equation

$$P_i = f(X_j; \beta_j) + \varepsilon_i \tag{1}$$

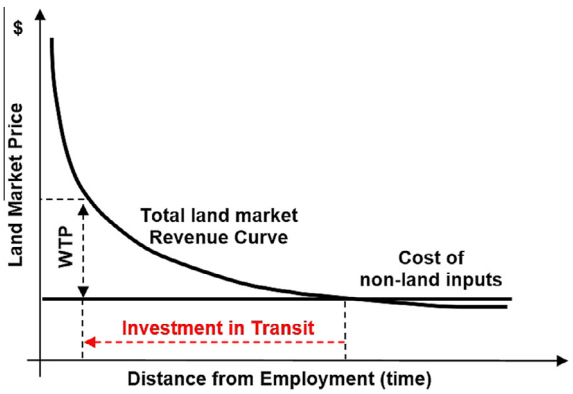

Fig. 1. Land bid rent curve (land bid rent = Total Revenue – Cost of non-land inputs) (Adapted from O'Sullivan, 2012).

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