

Extension of urban rail transit network and residential property values: a difference-in-differences approach

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Urban rail transit has been widely considered an efficient and environmentally friendly mode of transport to address urban transport challenges. In the past decades, there is growing investment in urban rail transit systems in cities worldwide to meet the increasing demand for travel. According to urban economics theory, households make trade-offs between commuting cost and housing consumptions in selecting their residential locations, hence the accessibility benefit brought by urban rail transit could be capitalized into residential property values. On the empirical side, although a large body of studies have investigated the impact of transit station proximity on residential property values, most research rely on classical hedonic price analysis with cross-sectional data, thus unable to discern the causal effect of urban rail transit investment on residential property values.

In this study, we revisit the relationship between urban rail transit and residential property values using the extension of Mass Rapid Transit (MRT) network in Singapore as an empirical setting. MRT is a heavy rail transit system, which forms the backbone of the public transport system in Singapore. To meet the increasing travel demand resulting from the steady economic growth and population growth, the Singapore Government has been continuously extending its MRT network in the past decades. Most notably, the Northeast Line (NEL) and the first two phases of the Circle Line (CCL) were opened in June 2003 and April 2010, respectively. The NEL runs through populated public housing estates, while the CCL runs through high-income private

housing estates. Both lines have led to significant growth in the public transit ridership in Singapore.

This study seeks to examine the impact of new MRT stations on the nearby public and non-landed private residences using a difference-in-differences (DID) estimator within the hedonic price modelling framework. We compare the transaction prices “before and after” the inauguration of new MRT lines through a “treatment” group versus a “control” groups, while controlling for property characteristics, neighbourhood amenities, and neighbourhood and transaction quarter fixed effects. We use the network distances from transacted properties to the nearest stations to characterize proximity to MRT stations. Local polynomial regression is employed to identify the impact zone of new MRT stations. The fitted curves of unit housing price by network distance to MRT station suggest that public housing units within 800m walking distance to new NEL stations and non-land private housing units within 1000m walking distance to new CCL stations experienced significant unit price appreciation after the inauguration of new MRT lines compared with properties further away from the new stations. Therefore, we define the treatment groups in our DID models as public housing units within 800m to NEL stations and non-landed private housing units within 1000m to CCL stations, while classify public housing units between 800m-1600m to NEL stations and private housing units between 1000m-2000m to CCL stations as the control groups.

The estimation results of the two DID models suggest that the opening of the NEL has increased the value of public housing units within 800 meters of new NEL stations by approximately 13%, and the CCL has increased the value of private housing units within 1000 meters of new CCL stations by approximately 3%, compared with prices of housing units in corresponding control groups. The difference in the price premiums of MRT between public and private housing units could be attributed to the different levels of dependence on MRT for travel of households living in public and private housing units. We also use alternative impact zone definitions to recalibrate the two DID models as robustness checks. The DID models with 850m (for public housing) and 1300m (for private housing) as the threshold distances to differentiate the treatment and control groups show much lower or insignificant impacts of MRT on

residential property values, thus providing some supports for our impact zone definitions.

This study provides more reliable estimates of the causal effect of urban rail transit investment on residential property values compared with conventional cross sectional hedonic price analysis. The research findings could contribute to more informed policy design for value capture programs.