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The ameliorated trade-off between commuting efficiency and jobs-housing balance in a green-belted city: Lessons from Seoul

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ABSTRACT

Co-locating jobs and housing is natural to cost-saving individuals but is potentially congestive at a local level. As for quasi-rational locators, whose rationality is limited in finding the best location especially in the short run, their houses and jobs tend to agglomerate, yielding congestion especially in growing localities. In the long run, when more information and time to adapt to such an externality become available, however, jobs-housing (J-H) balance may be improved after short-run imbalance. Graphically, the J-H balance to be expressible in the J-H ratio (X) and commuting efficiency (Y) tend to be linearly traded off at a regional level in the long run, but this trade-off can be U-shaped at a local level especially in the short run. This study discusses long-run stabilisation after short-run dynamic adaptation (periods) to such a U-shaped 'trade-off' in and outside the greenbelt of Seoul. Its spatial transitions between 2000, 2005, and 2010 were analysed regarding the quasi-rational commuters' local amelioration of the trade-off. It is shown that commuting time decreased and J-H balance overall improved in the long run. This trend is more apparent in the new towns built between 1989 and 1995 than the nine new towns built after the mid 2000s. Mean commuting time decreased sharply in such most job-rich or formerly housing-rich areas as ones with J-H ratios >2.08 or <1.18 . This suggests a quasi-rational-commuter-led transition to improved balance in the long run, despite the greenbelt's commuting-delaying effect. Considering this J-H range, this transition needs to be managed more scientifically, minimising the greenbelt's negative effect with any positive effect untainted.

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1. Introduction

In general, 'individual' commuting costs decrease as workplaces are in proximity to homes. To save commuting costs, hence, individual 'rational locators' [22] tend to co-locate jobs and housing. How 'rational' these locators will be socially as well depends on how 'stable' aggregate or average commuting times remain despite the inevitable agglomeration of co-locations in 'grown' cities as Levinson and Kumar [22] discussed.

In this article, Seoul is introduced as such a representative grown city where locators could not have commuted rationally to the full. It is adopted because commuters' rationality can be limited in calculating all the costs and benefits of both the long-standing greenbelt as its public good and government-led new town

development during the past twenty years up to the year of 2010 (or until more recently in some cases). The former public good is both spatially and temporally fixed but continually yields a 'spatial externality' [1], which induces mobile individuals to dynamically and socially adapt to it as given. The latter has been spatially developed over time as a 'public' externality and thus makes individuals more hard to predict other locators' choices as in markets.

Many other metropolises in the world also have their own long-standing spatial characteristics, respectively, and have been developed more or less 'publicly'. These can be such differently but appropriately operationalizable characteristics as Seoul's greenbelt and new town development as well, so meaningful implications are expected to be drawn from its analysis. When similar metropolitan cases are examined, with their own characteristics customarily operationalised according to the particularity of those cases, this analysis of Seoul would serve as a representative model by which commuting efficiency can be evaluated and managed in terms of jobs-housing (J-H) balance in the presence of a varied but similar 'public good'.

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If the rationality of locators is perfect, their location decisions will be hardly altered as it is possible to calculate such relevant costs and benefits of location as in markets. Stable commuting times may imply perfect commuting-cost calculation in both the short and long runs. Even if such perfect calculation were possible in real cases, however, aggregate commuting times could not have become stable especially because significant externalities, including government intervention, often arise. Further, relevant information is also often imperfect. Without public goods and with perfect information, individually-rational decisions might be equivalent to socially-rational decisions, but this equivalence is hard to observe. Moreover, in reality, human rationality itself is often bounded as Simon ([28]: 198) defined bounded rationality as “the capacity of the human mind for formulating and solving complex problems (is) very small compared with the size of the problems whose solution is required for objectively rational behavior in the real world” (parenthesis added by author).

In sum, the problem is the all-time presence of public goods. Further, all the costs and benefits of location cannot be perfectly signaled by market prices as to humans with ‘bounded rationality.’ Considering these, this article addresses how ‘quasi-rational’ commuters were in the long-standing presence of the greenbelt and new town development as two public goods in and outside Seoul. During the second half of the last century and until recently, Seoul Metropolitan Area (SMA) was one of the rapidly grown metropolises whose population exceeds 25 million. The aggregate commuting times could have remained stable in this grown green-belted city if commuters were (perfectly) rational. Meanwhile, this article regards commuters as ‘quasi-rational’ in the sense that they *cannot perfectly predict changes in aggregate commuting costs, which in turn affects individual costs* even in the mid run. Based on the length of time when adaptation has sufficiently been made, it presumes a 10-year ‘post-construction’ period or more as a long term while a 5-year ‘post-construction’ term or less as a short run.

2. Previous studies and present situations

2.1. Rational locators versus quasi-rational locators in metropolises

Based on the conventional assumption of rational locators, previous studies [2,12,21,32,34] proved the positive relationship between J-H co-location and commuting cost reduction in metropolises. Such a positive relationship was often observed as a general trend in those studies. It was especially because regional commuting costs were examined consistently as the aggregation of rational individuals’ costs in metropolises where commuters make urban dynamics more interactive among the intra-metropolis areas with differentiated private and public goods.

This presumed relationship is based on the interpretation of J-H balance as a resulting, stable state that is reachable by rational locators. This interpretation supports market-oriented approaches. If rational locators move across a large commutable plain under efficient transport conditions, optimised commuting and stable commuting times are very likely as for both individuals and areas.

Meanwhile, the commutable area is usually not a featureless and homogeneous plain especially in such larger regions as metropolises. Rather, it is often congested with ‘local’ jobs and housing in localisation or urbanisation economies or featured with mountains or greenbelts. Some local areas may show (statistically) significant heterogeneous variations over a shorter period either individually or aggregately, which needs to be studied in detail.

Having both short-term dynamics and long-term equilibrium in mind, this study assumes such a positive relationship between commuting cost reduction and J-H balance is not always stable and the externality of congestion as an unexpected aggregate

consequence of individually-rational choices is not perfectly foreseeable, as Peng [27], Wang [35], and Park and Kwon [26] demonstrated. The relationship is not considered always positive ‘at a local level’ because commuting time can increase due to local congestion in either job-rich or housing-rich areas. If urban spatial characteristics like greenbelts or growth boundaries are present, the local relationship will also become different especially in the short run. If all such changes as congestion or new institutions are not perfectly foreseeable, thus, both socio-economic planning and market choices are needed as a socio-economic ‘adaptation’ process as long as quasi-rational locators freely adapt themselves to changes either socially or individually. They are locators with ‘bounded rationality,’ in the sense that their rationality is limited in finding the best location especially in the short run.

Until commuting cost savings by co-locating jobs and houses are much greater than such diseconomies as local congestion costs, the overall positive and linear relationship between commuting cost reduction and the degree of J-H co-location is regionally and individually natural. In some local areas, however, increased congestion costs could turn into an incentive for commuters to (continue to) find an alternative location. From this stage, when the local relationship between commuting efficiency improvement (e.g., reduced commuting time) and J-H co-location begins to turn out negative, what we call ‘quasi-rational locators’ may re-adapt their commuting. Over these stages the regional aggregation of such individuals’ choices can lead to a ‘non-linear’ trade-off between commuting efficiency and J-H balance as individuals tend to adapt or re-adapt their commuting to the congestion in their local areas regardless of any overall linear trend at a regional level. This article analyses such ‘quasi-rational-commuter-led’ local amelioration of the trade-off between commuting efficiency and J-H balance as a regional-level dynamic process (as well as a resulting, stable result) of individual-level location decision to commute efficiently in a grown city with a greenbelt.

To appropriately address the commuting efficiency in the grown green-belted city, thus, this article defines commuting efficiency in ‘trade off’ with J-H balance, instead of other alternative approaches (e.g., calculating excess commuting to define efficient commuting.) In this approach, optimised commuting is understood to be constrained by the regional aggregation of cost-saving individuals’ ‘adaptive’ local commuting to the presence of the greenbelt. In the present article, regional commuting efficiency improvement is defined as ‘the average reduced time to commute between workplaces and homes as the J-H ratio changes.’ If the J-H ratio as an indicator of J-H balance has a ‘balanced’ value that facilitates (or at least corresponds to) a minimum level of commuting time, the ‘imbalanced’ J-H ratio can either increase up to or decrease to such a value as commuting time decreases. It is because either too many jobs or too many houses in an area are likely to increase commuting time so that the functional relationship between commuting time (Y) and J-H ratio (X) can have a ‘U’ shape in the X-Y axis. The more congested those local areas become, the more U-shaped the relationship will become. Ideally, in perfect competition, the relationship across a featureless plain, where rational locators spread uniformly, might be representable as a line above and along the X axis.

Seoul, the capital city of South Korea is the study area of this research. Its forty-year-old greenbelt has affected the relationship between commuting efficiency and J-H balance in SMA [2,20]. Considering the role of Seoul’s greenbelt, this article addresses the following question. What is the functional relationship between commuting efficiency and J-H balance in the green-belted city, concerning quasi-rational-locators’ shorter-term dynamic adaptation to local congestion, which is stabilised over a longer period? This question is about the rationale of the case city, Seoul’s

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