

TRANSPORTATION AND LAND PRICES IN THE TOKYO METROPOLITAN AREA*

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ABSTRACT The paper investigates the relationship between high land prices and long commuting times in the Tokyo metropolitan area. It starts with a review of transportation and land use in Tokyo in historical perspective. In a second part information about the concurrent development of transport infrastructure, land use distribution and land prices is compiled. Based on this evidence, it is asked how the mechanisms of land-use/transport interaction are affected by large-scale land speculation. The final part discusses alternative policies for influencing the trends and mechanisms revealed in the analysis.

1. INTRODUCTION

For a visitor from abroad, the growth of Tokyo is overwhelming. From almost total destruction in the war, it has in an unprecedented burst of urbanization entered the stage as a world city. Never before has a city of this size been built in so short a time, has basic urban infrastructure been provided for so vast an urban area, has a sophisticated transportation system been developed for so many people. In no other city is change so rapid, the transformation of the cityscape so fast as in Tokyo. Yet besides all its progressiveness and dynamics, Tokyo has preserved the small-scale variety of its neighborhoods and the tranquility of the pockets of green around its shrines and temples. Tokyo is safe, clean, efficient and convenient.

For a *city planner* from abroad, Tokyo is therefore an object of admiration, but also of scrutiny. Is Tokyo a model for urban life of tomorrow? Love makes blind, but true affection sharpens the eye. So it cannot remain unnoticed that the rise of Tokyo has not always been a smooth one.

Tokyo is unsurpassed among the large cities of the world by its extraordinary land prices. Stimulated by rapid growth in the last decades, land prices in the Tokyo metropolitan area have increased many times faster than the consumer price index and much faster than in the rest of Japan. At the same time, despite its highly efficient public transportation system, Tokyo has also the longest commuting times of comparable world cities in industrial countries, with work trips of one and a half hour one-way being not uncommon.

These two phenomena are not unrelated. The long commuting times are the result of an unprecedented decentralization of population during the last decades stretching the city's boundaries to 50 km from central Tokyo. On first sight, this rapid decentralization is the unavoidable consequence of the growth of the Tokyo metropolitan area, which with a population of 30 million now comprises nearly a quarter of the population of Japan.

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A closer second look however reveals that decentralization has been much greater than necessary and it has been to a large part a displacement process by which middle-class households were forced to move farther and farther away from their, still centralized, work places. The reasons can be clearly traced to exaggerated land prices in combination with a system of land ownership rewarding speculative land hoarding.

The process of increasing spatial division of labor in the metropolitan region would not have been possible without Tokyo's highly efficient transportation system. Under the above circumstances, however, the transportation planners face a serious dilemma. In a land market distorted by speculation transportation improvements may not result in enhanced accessibility and greater benefit for everybody, but in effect may serve only to stimulate further land price increases that drive out people even farther and thus actually worsen their situation.

The present paper plans to demonstrate this dilemma in more detail and to discuss its policy implications. It starts with a review of transportation and land use in Tokyo in historical perspective. In a second part information about the concurrent development of transport infrastructure, land use distribution and land prices is compiled. Based on this evidence, it is asked how the mechanisms of land-use/transport interaction are affected by large-scale land speculation. The final part discusses alternative policies for influencing the trends and mechanisms revealed in the analysis.

2. TRANSPORTATION AND LAND USE IN TOKYO IN HISTORICAL PERSPECTIVE

In the 17th and 18th century, Edo, the predecessor of Tokyo, may have been the largest city in the world. With its one million people it was larger than London and much larger than Paris. Its size had political reasons. It rested in the regulation that all feudal lords or daimyo of Japan had to hold residence with their family and retainers in the Shogun's capital; the city prospered on the money they spent.

Edo consisted of two parts: the hilly areas to the north, west and south of the Shogun's palace ('*Yamanote*') and the marshland areas to the northeast and east ('*Shitamachi*'). The daimyo lived on the Yamanote hills, while the merchants and craftsmen serving them lived in the Low City. The whole urban area measured not more than five kilometers in diameter, so conditions in the Low City must have been extremely crowded (Seidensticker 1983).

Edo was a city (almost) without wheels. Being a castle town, its roads were intentionally kept narrow and winding (different from Kyoto). The castle was protected by layers of moats with few gates, the Low City had a system of canals with arched bridges. Like in Venice, the most appropriate transportation modes were water transport, walking, carrying and being carried (by palanquin). There were hand-drawn carts (Matsuba et al. 1989).

Meiji Tokyo

With the Meiji Restoration in 1868 the daimyo disappeared and the city's population was reduced to 600,000. It took twelve years to get the new Tokyo back to one million. The Meiji period (1868-1912) first brought the rickshaw and the horse-drawn carriage, later the trolley (1883) and finally the electric tramway (1903), but the narrow streets inherited from Edo were badly fit for vehicles. This did not change much until the Great Kanto earthquake of 1923, after which at least in the most damaged eastern part of the city new wider roads were built.

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The railways arrived in Tokyo in 1872 when the first train went to Yokohama. In 1890, the Chuo line going west from Tokyo was finished, and in 1891 the northern line started from Ueno. But these lines were for long-distance travel; intra-city rapid rail travel started with the opening of the ring or Yamanote line in 1910.

The emergence of modern Tokyo

At the end of Meiji, Tokyo had a population of 2.2 million. At this time private railway companies like Keio and Seibu began the combination of railway and real estate business characteristic for Tokyo. To attract passengers for their (originally electric trolley) lines fanning out from the Yamanote ring to the west, these companies developed agricultural land on both sides of their lines as residential suburbs for the growing number of white-collar office workers of the burgeoning capital. Within the Yamanote ring, electric tramways dominated, until the first subway, the Ginza line, opened in 1929 (Cassim and Negoro 1985a).

The terminals of the private railways along the Yamanote line developed to fast growing shopping and entertainment centers, Shinjuku and Shibuya being the most prominent ones. Again the private railways led the way by establishing department stores on top of their terminal stations and so offered their passengers/tenants a total service for all needs of life.

The spilling out of the urban area beyond the Yamanote loop marked the first phase of the separation of work places and residences, while at the same time Western-style apartments were built in large numbers in the inner wards of the city (Cassim and Negoro 1985b).

During the 1920s and 1930s the city grew by immigration and expansion of its boundaries to a maximum pre-war population of 6.8 million. During World War II half the houses in Tokyo were destroyed by air raids and its population had decreased to 2.8 million (Hanayama 1986).

The exploding metropolis

After the war, ambitious plans to fundamentally reorganize Tokyo had to be scaled down, mainly because of lack of funds to pay the necessary compensations in the planned large-scale land readjustment schemes, so only six percent of all planned land readjustments were carried out (Hanayama 1986). At the same time the return of people evacuated during the war, repatriates from the colonies, and growing rural immigration created an enormous need for housing which could not be met even by large public housing programs, so low-standard wooden rental flats sprung up all over the city without much planning control. By 1955, Tokyo had a population of 7 million and thus exceeded its pre-war maximum.

During the years of rapid economic growth in the 1960s, the Tokyo metropolitan area grew by 600,000 persons annually, from 18 million to 24 million, half by natural increase, half by migration. The huge housing demand could only be met by moving farther and farther out into the suburbs. In these years the first large high-rise housing developments were built for the middle-class by the *Japan Housing Corporation*. At the same time the private railway companies continued to develop low-rise housing areas at the outer ends of their commuter lines.

Infrastructure improvement concentrated on public transportation in order to relieve the growing overcrowding of rush-hour trains. From early after the war Tokyo has continuously extended its subway system to its present 10 lines with 212 km of track. One ingenious specialty of the Tokyo subway is

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how it is linked with the commuter railways outside the Yamanote loop either at, or one station before, their terminals. In some cases the commuter and subway trains stop at the same platform for easy transfer. In some cases the commuter train even continues into the subway network carrying its passengers without transfer into central Tokyo. Today public transportation (including bus) accounts for 70 percent of the 50 million daily passenger trips in the Tokyo metropolitan area. Current plans provide for the construction of three more subway and several more commuter rail lines.

Road construction lagged behind. Still in 1960, most residential roads in Tokyo were unpaved. Only few major thoroughfares had been widened after the war. Mass motorization hit Japan not before the 1960s.

In preparation for the 1964 Olympics, Tokyo superimposed an extensive expressway system over its irregular street network. As no land had been set aside in a long-range land-use plan, the expressway had to be constructed using the air space over existing roads or, in central Tokyo, former castle moats. Today the expressway, despite its high toll fees, is heavily congested. As for lack of space widening of its inner sections is hardly possible, current improvements concentrate on the completion of the regional network. Eventually the expressway network will be a system consisting of radial expressways leading into central Tokyo connected by several rings.

Today the Tokyo metropolitan area has a population of 30 million, of which 11 million live in Tokyo itself. Its commuters come from an area extending over four prefectures within 50 km from central Tokyo.

3. TRANSPORTATION AND LAND PRICES IN TOKYO

There has always been a very close association between transport infrastructure and land prices in the Tokyo metropolitan area. Unlike in other countries, most notably the USA, however, the most important determining factor of land price is not the location in the highway network, but the location in the rail network expressed as travel time to central Tokyo, and on a more microscopic level, the distance to the next rail station. Therefore land price maps typically show the areas of higher land prices extending finger-like along the radial railway lines with small peaks around rail stations. This pattern has remained stable over time despite the enormous changes in price levels (see Figure 1).

This evidence is supported by statistical analyses. In regressions based on land price data collected by the National Land Agency, travel time to central Tokyo and distance to the nearest station stand out as the most significant factor determining land price (Nakamura et al. 1983).

Of course the analysis explains only the distribution, but not the *level* of land prices. A comparison of the two maps in Figure 1 shows an average increase by a factor of 15 between 1969 and 1987. In fact land prices in the six largest metropolitan areas in Japan increased by a factor of 130 between 1955 and 1988, compared with a consumer price index increase through inflation by a factor of five.

Today a square meter of land in Tokyo costs ¥1 million (\$7,200) on average, which according to a study of the Japanese Association of Real Estate Appraisal is 99 times as much as in Los Angeles or 30 times more than in London or Frankfurt. It has been estimated that the total real estate of Tokyo, at \$7.7 trillion, is worth more than twice as much as all the land in the USA, at \$3.7 trillion. At prime locations in the Ginza or Marunouchi areas, a square meter costs as much as ¥30 million (\$215,000).

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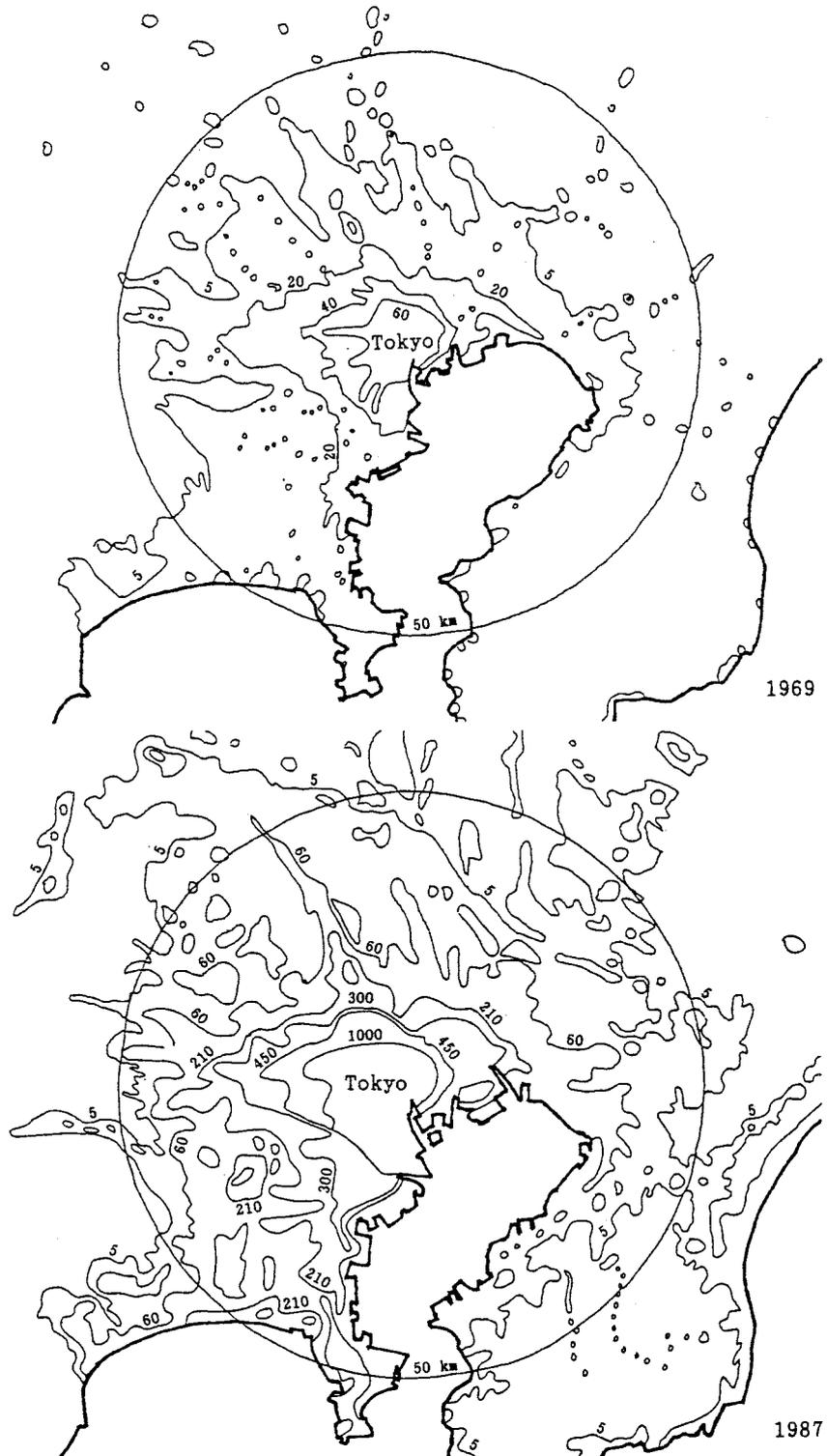


Figure 1. Land prices in the Tokyo metropolitan area in 1969 and 1987, in ¥1,000 (Source: Tokyu Land Corporation).

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with nearly two hours travel time. That improvements in housing conditions are generally connected with longer commuting times, was shown in a survey conducted by the Better Living Information Center in 1977 (Hanayama 1986, 88-91): 1,228 households who had recently bought houses in suburban housing areas near Tokyo, if compared with their previous home, had increased their lot size by 8.2 m² (from 132.4 to 140.6) and their floor space by 11.1 m² (from 67.6 to 78.7), but their commuting time by 19 minutes (from 48 to 67) on average.

In Tokyo, the household would have to spend more than 10 times its annual income for a similar home. Many families living in Tokyo have given up the dream of owning a house and turn into vigorous buying of consumer goods, according to the 1988 White Paper on National Life by the Economic Planning Agency. The recent 'gourmet boom' in basement floors of department stores has also been related to the purchasing power of frustrated would-be home owners.

The majority, however, values home-ownership high. In a survey conducted for the government in 1988, when asked which they preferred, a single house requiring long commuting time or an apartment with short commuting time, 54 percent said they preferred the single house. This choice behavior is at the base of the typical life style of the male Tokyo white-collar worker, who leaves home early, works long hours, and comes home late after work-related social activities separated from his family.

Decentralization of population

This choice behavior is also one factor behind the extreme degree of decentralization of population in the Tokyo metropolitan area. That population is indeed extremely decentralized, is shown in Table 1 which is due to R. Kakumoto (Ohta 1989). Three cities of (in 1980) similar size were compared: Tokyo, New York and Paris. Each city was subdivided into a core and an inner ring zone trying to make the subdivision as similar as possible. Then population, employment and in-commuters for each area were noted. It is immediately observable that the core of Tokyo had much more work places and much less population than the cores of the two other cities. Consequently, nine out of ten employees working in the core were commuters. In New York, however, only 71, and in Paris only 53 percent of all core employees lived outside of the core. Moreover (not shown in the table), more than half of the commuters to the core of Tokyo were long-distance commuters, i.e. lived outside the inner ring. The same proportion was 32 percent for New York and 38 percent for Paris.

If one looks at the area outside the inner ring, one is surprised by the scattered pattern of development. Even between 15 and 30 km from central Tokyo one can frequently find clusters of houses surrounded by small fields still in agricultural use, and the proportion of non-developed land becomes larger as one gets farther out (Hebbert 1985). Even in some of the 23 wards of Tokyo a substantial share of the total area is still used for agriculture (Hanayama 1986). Yet despite this seemingly easily developable land, which is frequently in close proximity to rail stations, residential development occurs at the same time in areas much more distant from Tokyo. Because of this continuing urban sprawl, decentralization of population in the Tokyo metropolitan area is not only greater than in comparable cities, but also greater than necessary.

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Table 1. Comparison of Tokyo, New York and Paris.

City		Core ^a	Inner Ring	Total
Tokyo (1980)	Area (km ²)	59	533	592
	Population ^b	638	7,669	8,352
	Employment ^b	2,406	3,828	6,234
	Commuters ^b	2,111	1,144	3,255
New York (1980)	Area (km ²)	57	725	782
	Population ^b	1,428	5,644	7,072
	Employment ^b	1,949	1,351	3,300
	Commuters ^b	1,379	291	1,670
Paris (1975)	Area (km ²)	105	656	761
	Population ^b	2,300	3,977	6,277
	Employment ^b	1,918	1,640	3,558
	Commuters ^b	1,016	500	1,516

a Tokyo: Chiyoda, Chuo, Minato, Shinjuku; New York: Manhattan; Paris: City of Paris.
b in 1,000

Source: R. Kakumoto (Ohta 1989).

The reasons for this are also related to the continuous increases in land prices. Agricultural land ownership in Japan is fragmented - a heritage from the land reform after World War II - and protected, as long as the land is actually used for agriculture. Moreover, it is taxed as low-value agricultural land instead of by its much higher market value as residential land. Even in areas not zones as residential, frequent changes of zoning in the past have nourished the expectation that eventually the land will become residential. All this makes it profitable for small landlords to sell as little land as possible and to hoard the rest in the expectation that suburban land prices will continue to rise. It follows that not lack of land is at the core of high land prices, but *unavailability* of existing land.

It has also been argued that the low-density urban-rural mixture now characterizing Tokyo's suburbs may be environmentally and socially more acceptable than many forms of crowded city housing or mono-functional suburban subdivisions (Hebbert 1985). These ideas deserve serious consideration, in particular as the urban-rural continuum they envisage might be a model of development for other cities in Asia. However this model would require not only providing these areas with adequate infrastructure, but more importantly a consistent and effective policy of decentralization of employment.

Employment in Tokyo, however, in contrast to population, is highly concentrated in the core, not in terms of regional share, but in absolute terms, and this concentration is increasing due to the still growing importance of Tokyo as a financial center. Why foreign and domestic companies insist on a location in a few square kilometers of central Tokyo in a time of computer networks and telecommunications, remains "a riddle wrapped in a mystery inside an enigma" (Lester Thurow), but is aptly summarized in the advertisement for the Kioicho Building (Figure 2) where the little map shows what the text calls a "strategic location and prestigious environment":

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National Diet, Liberal Democratic Party, House of Councilors, and the Hotel New Otani and the expensive restaurants in Akasaka where the receptions and luncheons take place which are so important for business. As long as they are important, the concentration of office space in central Tokyo is not likely to be reduced.

The problem is that each new office building is likely to displace more of the small houses that still exist even in central Tokyo, and that their residents, willingly or not, have to become commuters. If trends continue, the urban area will expand further even beyond the 50-km radius around central Tokyo. What this means in terms of travel indicates Figure 3 adapted from Nakamura et al. (1983). The map shows rail travel times from Tokyo Station. It can be seen that the 50-km radius roughly coincides with the 90-minute isochrone. Note that the map only shows train travel times; for door-to-door times, access times at either end of the trip have to be added.



Figure 3. Rail travel times (minutes) from Tokyo Station.

4. TRANSPORTATION IN A DISTORTED LAND MARKET

It has been shown so far that the rapid decentralization of population leading to the long commuting times in the Tokyo metropolitan area is not the unavoidable consequence of the growth of Tokyo, but has been much greater than necessary and has been to a large part a displacement process by which middle-class households were forced to move farther and farther away from their, still centralized, work places. The reasons could be traced to exaggerated land prices in combination with a system of land ownership rewarding speculative hoarding of land. In this section the role of transportation in a land market distorted by speculation will be discussed.

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A 'normal' land market

It is not at all a natural thing that urban land should be privately owned. In the Middle Ages, in many towns in Europe all urban land was public and only given to individuals on the basis of a 99-year land-lease. Even today the city of Stockholm in capitalist Sweden owns 80 percent of its territory. From the point of view of city planning, private land ownership and the land market serve only one purpose, to secure the most efficient allocation of land uses in space.

From a theoretical point of view, land prices are capitalized land rent where land rent is the revenue that can be achieved on a piece of land by agriculture or other economic activity minus other factors such as labor, capital, transportation costs and a normal profit (Scott 1980). Because the transportation costs vary with location, land rents vary by an amount called differential rent. If demand for land is higher than land supply, scarcity rents appear in order to adjust either demand or supply.

Land is a normal good, i.e. more is better than less. In a price/quantity diagram, the demand curve slopes downward, i.e. demand decreases if prices go up. The supply curve slopes upward, i.e. if prices go down, so does supply. Market clearance occurs at the quantity and price of the intersection between the demand and supply curves.

In such a 'normal' land market, land prices and rents are always connected to the revenue that can be achieved on the land (or by the household living on it). Because firms have to pay for other factors besides land, and because households have to divide their budget between land, travel, clothing, food, and other expenses, the land or housing costs cannot exceed a certain share of the revenue of firms or households. For instance, in most industrialized countries, a proportion of 25 percent of their income is considered the maximum middle-class households can afford to spend on housing. If lease or rent exceed that share, the firm or household has to move to a less expensive location. They will be replaced by more profitable firms or richer households. If no such firms or households are found, the land price or rent have to go down.

In a growing economy, land prices in general will increase in line with increasing productivity and incomes, subject to inflation. In addition, in agglomerations, demand for land is likely to exceed supply, so scarcity rents will occur; however even there the fundamental relation between land rent and land revenue remains intact: if no firms can make a profit or no household can afford to live at a location, rents have to go down.

A distorted system

These simple mechanisms change if there is land speculation. Land speculators are firms or individuals who acquire or hold real estate not for construction or use purposes, but for making a profit by selling it. Two conditions must prevail for large-scale land speculation to occur: the availability of money and the expectation of rising land prices.

Both conditions have been ideally met in the Tokyo metropolitan region. Japan is a land with low interest rates, but an enormous amount of surplus money looking around for investment opportunities. Carried along by an atmosphere of confidence in the Japanese economy, many firms have turned to investing in land as a profitable alternative to investing abroad or buying Japanese stocks, which due to their exaggerated price have only minimal dividend earnings.

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Already since the 1960s, but in particular since the publication of Prime Minister Kakuei Tanaka's *Plan for the Reconstruction of the Japanese Islands* in 1972, many large companies started to buy land in the Tokyo metropolitan area and other parts of Japan (Douglass 1988), with the effect that prices started to increase much more rapidly than before. It was at this time that the link between land revenue and land rent that is essential for the working of the 'normal' land market, became disrupted.

Once land prices reach a certain level, the return on land investment can no longer be generated from rent or lease income but only from speculative gains. With only a little algebra, this can be demonstrated for a shop. If the rent the shop is paying is say, 10 percent of its turnover, then for each percent of rent increase the retail prices of the shop would need to be increased by .1 percent, if other costs and profit are to remain the same, i.e. a doubling of rent would require a ten percent price increase. Clearly not many shops can afford to increase their prices much without losing customers. Households are even more sensitive to changes in housing rent. In general already a doubling of rent would force most of them to move out.

The speculative land owner therefore will most likely not insist on receiving an adequate return of his investment from rents or leases. He can do so easily as long as he has confidence in his prospects of earning a much larger profit from a later resale of the property. If he has a long-term perspective, he will even hold to this strategy if land prices for some period fail to rise vigorously. This is one explanation why even in areas of central Tokyo with astronomical land prices there are still small shops with moderate prices and even middle-class residences. Another is that some tenants do not depend on earning the rent in the rented space. Such tenants for instance are chain stores which can afford to subsidize one shop at a prestige location through the revenues of other shops, or offices of large corporations seeking a prestige address but earning their money elsewhere.

Once land prices have been separated from land revenue, there is no limit for further rises. In fact, land has become an object of purely speculative 'money games' like certain high-risk types of stock or, more recently, paintings by famous artists. One characteristic feature of these markets is that they are focused on growth rates, i.e. always prefer a higher price over a lower one if the higher price has the potential to rise even higher. In other words, the demand curve in these markets has a *positive* slope - always under the provision that there is enough volatile money and that the confidence in the land market remains strong. It is clear that under these circumstances a capital gains tax on land transactions is not only ineffective as a tool to curb land prices, but most likely will even stimulate further price increases.

Another disturbing abnormality can be observed on the supply side. As the major part of all *new* residential land in the Tokyo metropolitan area can only come from the small farming land owners in the suburbs, their behavior is particularly important. It has been shown (Hanayama 1986) that these land owners do not display the profit-maximizing behavior underlying the interaction of supply and demand in the 'normal' land market. Instead they practice what Hanayama calls *target profit* behavior. Being traditionally attached to their land, they sell land only when they need a certain amount for say, the education or marriage of children, the construction of a house, or paying inheritance tax. As they need only a fixed amount, they sell only as much land as necessary, i.e. they sell *less* if land prices

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rise. In other words, at least for this important segment of the land market, the supply curve slopes *downward*.

In a land market in which for important market segments the demand curve slopes upward and the supply curve downward, enormous pressure will be applied to still untapped supply, in particular to the small owner-occupiers still existing in the inner wards of Tokyo who are in fact known to be continuously urged by representatives of banks and real estate companies to sell. It is easy to predict that many of them will sooner or later yield to this pressure, which means that the small-scale variety of Tokyo's inner-city neighborhoods is seriously endangered.

Transportation and land prices

There is a two-way interaction between transportation and land use in urban areas (Webster et al. 1988):

- Spatial division of labor, i.e. location of working, living, shopping and other human activities in different parts of the region, requires spatial interactions in the form of passenger or goods traffic flows. The traffic flows determine the pattern of trips - work trips, shopping trips, delivery trips etc. - over the various modes of the transport network and give rise to congestion on elements of the network where demand exceeds capacity. Transportation planning is called upon to improve the network in order to provide the best possible service.
- The travel opportunities offered by the transportation network for a certain location can be measured as accessibility, for instance as a function of travel times, distances or costs. Accessibility is an important factor co-determining the attractiveness of a location for development by housing investors or industrial or commercial firms, and thus, as it was shown in Section 3, also plays an important role in the formation of land prices.

High land prices affect the so-called *land-use/transport feedback cycle* in various ways:

The most visible effect of high land prices on transportation is that they make the provision of land for transportation infrastructure extremely difficult. Projects to widen trunk roads are stalled for years by individual land owners who know that each year they resist will substantially increase their compensation. But even where such resistance is absent the costs are so high that only a small number of the seriously needed improvements can be implemented. In other cases transportation planners have to virtually go underground in order to avoid high land acquisition costs, but then high costs for tunnels and ramps again limit the number of projects that can be completed.

But besides these obvious and direct impacts there are other more indirect ones.

The first of these are the high monetary and social costs of transportation in an urban region in which due to high land prices and scattered land ownership population is extremely decentralized. These costs are partly carried by the public in form of construction costs and subsidies for transportation infrastructure, partly by the employers in form of commuting allowances, and partly by the commuters in form of long commuting times. If the causal analysis relating decentralization and hence long commuting times to high land prices is correct, this result contains a large degree of unfairness because high land prices benefit only a small number of land sellers whereas the large number of land users pay through heavy financial bur-

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den and long commuting times. Transportation planning can relieve this situation at least in part by providing commuters with faster and more convenient transportation.

The second of the indirect impacts of high land prices is the dialectic counterpart of the first because by doing just that, i.e. by improving the transportation infrastructure, under the conditions of a land market distorted by speculation, transportation planners unintentionally contribute to its extension. Take the example of a new suburban rail line. By providing fast and convenient access to an outlying area, which formerly was too distant from the central city to be a location for commuters, the new line opens up a new area for rapid increases of land prices. With an upward sloping demand curve, the added supply will not help to bring land prices down, instead, through the land price increase along the line, it will force many households to move farther out. Chances are that the benefits of the new line will largely go to the developers and land owners, while the households of the area at large, through higher land prices and longer commuting times, will be in a worse situation than before. A similar phenomenon in the Munich metropolitan area was described by Kreibich (1978).

5. POLICY ALTERNATIVES

This dilemma of the transportation planners is not easily resolved. To suggest that they abandon the improvement of the transportation infrastructure is not a serious alternative. Instead it is necessary to search for policy alternatives which can help to create conditions under which the positive impacts of transportation projects are retained and their negative impacts are less likely to occur.

The socioeconomic framework under which such policies will have to be applied is predictable. The Metropolitan Government expects the population of Tokyo to grow to 12.3 million in the year 2005, 3.7 percent more than in 1985. However, provided that no major disturbances will affect the development of the Japanese economy, its daytime population will reach 14.8 million, 5.6 percent more than in 1985. That means that the 'commuter gap' between the daytime and nighttime populations will increase from 2.18 million in 1985 to 2.52 million in 2005. Of the inbound people, 1.46 million will be coming to the four central wards of Tokyo (see Table 1), 23 percent more than in 1980. It is also predictable that the 500,000 new residents will need housing, but also that the 11.8 million already living in Tokyo will want to improve their housing conditions as the Japanese society gets more affluent. With 26 m² floor space per capita, housing provision in Japan is still less than half of that in the United States and 60 percent of that in West Germany. The additional housing demand thus generated will challenge both the construction industry and urban planners alike.

There have been numerous proposals how to cope with the problem of high land prices. They can be roughly classified in six groups.

(1) Policies to create new land

These policies aim at increasing the supply of land by creating new land underground, on the water, or in the air.

The most substantial land gains are expected from land reclamations from Tokyo Bay. Presently in the northern part of the Bay housing for 60,000 people and work places for 110,000 people are planned on several artificial islands. More than one hundred other schemes have been proposed.

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Apart from their yet unresolved ecological problems, these projects have one thing in common: Because of their high construction costs, their financing schemes work only under the prospect that the land they create can be sold or leased after completion at market prices. Therefore these projects cannot be expected to bring land prices down, even though, through their general decentralization effect, they may take some pressure from central Tokyo. Only there a small effect on land prices can be expected. The effect on commuting time depends on the number of residences that will eventually exist in the new developments.

(2) Policies to mobilize untapped land supply

These policies aim at fighting urban sprawl by making it less attractive for land owners to hold vacant land.

The greatest impact is expected from abolishing the tax privilege of farming land owners in suburban areas, thus establishing a land holding tax (Hanayama 1986). Today agricultural property in suburban areas on the average is taxed one thousand times less than residential property in the same area. If this tax would be made equal to the tax on residential land, most farmers would be forced to sell or develop most of their land. Depending on the amount of supply such released, land prices should effectively go down. In the medium term this would allow more development in areas closer to central Tokyo and hence on average shorter commuting times.

The effects of an increase in the tax on capital gains from land sales on the willingness to sell of land owners is judged as difficult to predict because of complex interactions with the interest rates for bank credits. It has already mentioned that in the case of speculative land transactions the effect of the capital gains tax on limiting price increases is likely to be minimal.

Other proposals include an increase in the city planning tax or compulsory inclusion in land readjustment schemes (Hanayama 1986). Increasing the city planning tax would have a similar effect as the property tax except that it would also increase the tax load of residential lots. Land readjustment actually reduces the amount of residential land, the new lots however have a higher use-value and may carry more dwellings, which could decrease commuting times. Land prices are likely to go up.

(3) Policies to influence the supply of housing

One way to protect households from the financial burdens of high land prices and rents is to subsidize housing construction.

In the Tokyo metropolitan area there have been extensive housing projects both by the Japan Housing Corporation (see Section 3) and by local government. Being in general high-rise developments, these projects have helped to fight urban sprawl. However, as land for them had to be bought at market prices, they have not contributed to a reduction of land prices. Because of high land prices, in particular housing projects of the Japan Housing Corporation have tended to be at distant locations and have thus effectively contributed to the increase in commuting times.

(4) Policies to influence the demand for housing

In a market economy, policies to influence demand are weak. In particular the demand behavior of business firms and real estate developers can hardly be influenced by a planning authority. However, there is some possibility of influencing the demand behavior of private households.

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Besides subsidizing housing projects, housing subsidies can be given to households in form of housing loans or allowances.

Housing loans from public loan corporations have lower interest rates than private bank loans, but not everybody is eligible to receive a public loan, and in general the public loan does not cover the full cost of the house, so additional private loans must be taken. With rising land prices, not only the number of households being in debt has grown considerably, but also the share of their income required for monthly installments and the duration of repayment have increased (Shitara and Sugimoto 1985). While housing loans make it possible for many households to move into a house or apartment they would otherwise not be able to afford, housing loans create demand at market price and hence stimulate land price development.

Many large corporations, in particular foreign firms, give housing allowances to their employees to make it possible for them to live in Tokyo. Housing allowances frequently exceed the salary. Clearly they create demand in the high-price sector stimulating rent increases. In fact a special market of luxury apartments and houses has developed in the southwestern suburbs of Tokyo to cater to the growing number of such households.

Practically all firms subsidize the commuting expenses of their employees by commuting allowances. While it is only fair that at least the financial burden of long commuting is taken from commuters, it has the undesirable effect that when choosing a residence they consider only travel time. If they had to pay for commuting from the same budget as for housing, many households would probably choose a closer location. The government supports this system of wrong incentives by taxexempting expenditures for commuting allowances by employers up to a limit. Recently this limit was raised to ¥50,000 per month, good for 100 km of commuting.

To abolish the tax exemption of commuting allowances would be a first but unpopular move to discourage long commuting. Another certainly even more unpopular policy would be to raise public transit fares. While this would be highly effective in reducing average commuting distances, it would do so at the expense of those who are the least to blame for the long commuting.

(5) Policies to reduce commuting time

From an engineering point of view, the most direct way to reduce long commuting times, is to provide faster transportation. On existing commuter rail lines, this can be achieved through higher train speeds, shorter stops at stations and more frequent trains. Express trains can pass by groups of stations to serve only more distant sections of a line. Subway stations can be optimized in order to facilitate passenger access and transfer.

In fact all of these measures have been extensively applied to produce the impressive efficiency of the public transportation system in Tokyo. Although improvement is still going on and several projects are still in the planning stage, dramatic reductions in the door-to-door journey times are not likely. New public transport technologies such as light rail transit or busway systems may offer less expensive alternatives especially for suburban areas, but will not fundamentally change average travel speeds.

The greatest impacts of transportation improvements will therefore occur where entirely new lines make land at the periphery of the metropolitan area accessible for commuting. It has been already shown, however, that this kind of infrastructure, through their impact on residential location, will result in longer travel distances and hence longer commuting times.

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(6) Policies to reclaim transportation costs

These policies originally were discussed to open up new channels of financing transportation infrastructure in the face of rising construction costs and land prices, following the principle of *value captures* (Hayashi 1989).

However, some of these measures serve also to distribute the benefits and burdens of transportation improvements in a more equitable way between land owners and land users. If, for instance land owners along a new commuter rail line are charged a higher property tax in proportion to the increase in price of their property due to the new line, a fairer distribution of benefits would result. Apart from the difficulties of objectively imputing the benefits to individual lots, the problem is, of course, that nothing can hinder the landowners to pass these extra costs on to their tenants or buyers, in which case the value capture measure would contribute to justifying further land price increases. A positive effect would result in the case of speculative land hoarding as it would make it more expensive to withhold vacant land from the market.

Comparison of policies

Summarizing the policies reviewed so far, it is possible to give an overview of their most likely impacts in Table 2.

Table 2. Impacts of land-use and transportation policies.

Policy	Likely impact on		
	Land supply	Land prices	Commuting time
(1) Land reclamation	++	-	-
(2) Land holding tax	+++	--	---
Capital gains tax		-	
City planning tax	++	-	-
Land readjustment	+	+	-
(3) Public housing			+
(4) Housing loans		+	
Housing allowances		++	
Commuting allowances			++
Fare increases			--
(5) Faster trains		+	-
New lines	++	+	++
(6) Value captures	+	+	

Legend: +/+/+++ small/medium/large increase -/--/--- small/medium/large decrease.

It is apparent that there are a number of policies which can be expected to effectively mobilize suburban land presently withheld from the market, but only few policies in which the additional supply would also lead to reductions in land prices. Of these, raising agricultural land taxation to the level of residential land, thus creating a land holding tax, would probably be the most successful.

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All sorts of financial assistance to households, be it in form of loans or allowances, improve their housing situation, but at the same time create demand at market conditions and thus reinforce high land prices and long commuting. To increase the fares of public transport would reduce commuting times, but at unacceptable social costs. Faster trains would also decrease commuting time, but would induce land price increases likely to outweigh that benefit.

Transportation investments will make commuting faster and more convenient, but will in general also contribute to further land price increases, even where they make new land supply at the periphery of the urban area accessible. In that case they make even commuting times longer.

In short, except the land holding tax, there is no single policy that would achieve the two objectives of lower land prices and shorter commuting times without negative side effects. The land holding tax, however, seems to be the most difficult to implement, because although in the past many experts have suggested such a tax, there has not been a government to carry it through the legislative procedure.

6. CONCLUSIONS

The analysis of transportation and land prices in the Tokyo metropolitan area has shown that the long commuting times are the result of an extraordinary decentralization of population in the urban area and that this decentralization is a consequence of high land prices and fragmented land ownership. The exaggerated land prices, however, are not the result of land scarcity, but of large-scale speculation and withholding of land due to imbalances in the property tax system.

It was also shown that transportation investments, under the conditions of a land market distorted by speculation, not only serve to improve the ease and convenience of mobility in the urban area, but may themselves contribute to increasing land prices and even commuting times and so in part destroy the benefits they are designed to provide.

The review of policies addressing the two objectives of reducing land prices and commuting times showed that a change in the property tax making withholding of agricultural land in suburban areas more expensive would be most effective in increasing the supply of residential land and hence reducing land prices.

A new land policy

The National Land Agency of Japan is presently preparing a new *Basic Land Law*. Its basic principles are:

- (1) Land ownership is accompanied by responsibility of land use.
- (2) In the use of land public good comes first.
- (3) Land use must be planned.
- (4) Profit from land development must be returned to the community.
- (5) Burden should be borne equitably.

These are excellent principles, but it remains to be seen whether it will be possible to enact a law in which these principles come to life. At the present level of land prices that may not be easy. In the history of land booms, there has not been one case in which land prices exaggerated by speculation have returned to a normal level without a major disturbance such as inflation, economic crisis, or war. It will be a great challenge for an advanced country like Japan to demonstrate that it is possible.

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