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Some Factors Explaining Variations in Rents of Downtown Apartments for 49 Cities of the World

Paul K. Asabere and Carl McGowan [First received August 1986; in final form, February 1987]

Summary. There exists a substantial variation in apartment rents between cities of the world. Several factors must contribute to inter-city variations in rents. This paper presents an empirical identification and measurement of some of the relevant factors explaining the variations in rents between a sample of forty-nine cities. The results of our empirical analysis show that the variables which explain inter-city variations in rents are: population size, costs of public and private intra-urban transport, tax assessments, and social insurance contributions.

1. Introduction

A recent survey by the Union Bank of Switzerland (1985) showed a substantial variation in apartment rents between cities of the world. For example, according to the survey the rent of a standard, furnished, four-room apartment, located near or within the city center ranged from \$300 a month in Dublin to \$3,670 a month in Abu Dhabi. The average for all the 49 cities covered in the survey was \$1,100. The most reasonably priced four-room apartments by regions are found in Europe, where rents extended from \$300 in Dublin, \$360 in Lisbon to somewhat over \$850 in London, Geneva and Brussels. The average rent for all 19 European cities is \$615. In South America, the average is \$1,150. Steep rents have to be paid for a four-room apartment in the Far Eastern cities of Singapore, Hong Kong, and Tokyo, where rents reach skyward from \$1,730 to \$3,260. Chicago and New York surpass all of the other North American cities with an average monthly rent of \$3,300. In Montreal, the rent is \$620 and in Houston and Los Angeles, \$1,060. Rents again are high in the Arab cities of Manamah, Jeddah, and Abu Dhabi, where prices range from \$1,580 to \$3,670.

Factors that explain the inter-city variations in rents include city structure, landscape, environment, demography, economy, crime, and national and regional political and historical forces. Empirical literature on the subject is, however, lacking mainly due to the problems of assembling international data.

The Union Bank of Switzerland's data thus offer a unique opportunity for the empirical identification and measurement of some of the relevant factors explaining the variation in apartment rents between the cities of the world. Our paper is divided into four sections. Section 2 of this paper discusses the framework for our empirical analysis. Section 3 discusses the data and the estimation results. Section 4 presents the summary and policy implications of our empirical analysis.

2. The Framework for Empirical Analysis

It is hypothesized that the rent of a standard city-center apartment in a given city would be influenced by: the size of the city; costs of intra-urban transportation; levels of taxes and social services; the macro-economy of the city; and several other

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exogenous variables. As a background for our empirical analysis, the variables included in our study are discussed below.

Area Population: Urban economic theory tells us that land rent is influenced by variables such as proximity to points of economic activity, transportation costs and neighborhood amenities or disamenities while holding city size constant. Thus, it is important that a size variable be included in an empirical model explaining variations in rents across cities. In an attempt to capture some partial effects of city size, we have included area population in our empirical model.

It is expected that cities facing large population pressures like New York, Hong Kong, London, Tokyo, and Bombay would be faced with higher demand for housing services, and therefore, higher rents with all other influential factors held constant. The opposite would be true for cities of low population densities like Lisbon, Amsterdam, Zurich, and Stockholm.

Intra-city Transportation: A major function of an urban area is to facilitate the exchange of goods and services, a function that entails the movement of people. Thus, the size, structure, and efficiency of an urban area are influenced by the transportation system which moves goods and people. On the supply side of urban transportation, streets and highways are owned by governments. Public transit facilities such as buses, street cars, and subways, are also either owned or regulated by governments in most countries. On the demand side, private automobiles, minibuses, taxis and trucks are privately owned in most countries. Their owners pay to use the streets with user fees, such as vehicle registration fees, licensing fees, taxes on tires and motor-vehicle fuel. Public transit riders pay fares. To the extent that all these modes of transportation are available, urban residents can choose between private automobile and public transit, depending on automobile prices, and the combination of fares or fees charged and services available.

The purpose of a good public transit system, for example, is to make intra-city travel economical. With public transportation improvements, people employed in the Central Business District (CBD) would find it advantageous to live farther out, on the average, to reap the benefits of cheaper land and housing prices. Urban economic theory suggests that a decrease in intra-urban transport costs would

flatten the population density function of CBD workers. Several studies recognize the importance of travel savings on residential site choice including Alonso (1964a, b), Domencich and McFadden (1975), Harris *et al.* (1982), Hensher (1977), Mills (1967), Quandt (1970), Vickrey (1963) and Wingo (1961).

The typical apartment dweller has a choice of selecting either the city center apartment or one further from the city center and closer to the travel margin, which is the point beyond which the demand for the standard apartment motivated by travel savings has no further effect on apartment rents. Thus, in general, we expect low intra-city transportation costs to be associated with low residential property values (or rents) in the central city; and probably with relatively high suburban residential property values. Specifically, it is hypothesized that the higher the cost of intra-city transportation, the higher will be the level of rentals at the city center with all other influential factors held constant.

Our data, described in Section 3, contain five transportation-cost variables that can be used to detect the potential effect of travel savings on rents of downtown apartments. These variables are: (1) cost of public transportation; (2) taxi fares; (3) automobile purchase prices; (4) automobile taxes; and (5) automobile maintenance or check-up costs.

Taxes and Social Services: The data, described in Section 3, for our empirical analysis contain information on tax assessments and social insurance contributions as a percentage of gross earnings for all 49 cities in the sample. The highest percentages are paid in the cities in countries with socialist governments, such as Copenhagen, Helsinki and Istanbul, where taxes and social insurance contributions claim between 37 per cent and 47 per cent of gross incomes. In Jakarta and Abu Dhabi, on the other hand, employees pay no taxes and make no social insurance contributions, as these costs are borne in full by employers. We expect apartment rents to be relatively low in cities with steeper taxes and social insurance contributions. This may be due to a lower level of effective demand, excessive governmental controls on rents, or even rent subsidies.

Macro-economy: The level of rents in a city would be affected by the state of the local economy of the city or country. Variables used to proxy the local

economy were an index of general price levels (excluding rents), a purchasing power index, and the prices of major household appliances.

Following standard hedonic literature, the empirical model can be written as follows:

$$(1) \text{ Rent } \$ = f(\text{Popn, Subway Fare, Taxi Fare, Auto Price, Auto Tax, Checkup, Taxes and Soc., Macro Variables})$$

Where:

Rent \$ = monthly actual rent paid for the standard apartment in US dollars;

Popn = population of the city;

Subway Fare = price of a single ticket of public transportation (i.e., bus, street car or subway) good for one ride of about 10 kilometers (six miles) or at least 10 stops;

Taxi Fare = the price of five-kilometer ride (three Fare miles) during daytime within city limits, including tips;

Auto Price = the purchase price (including sales tax) of a popular medium-sized car; price refers to most popular, four-door, standard-sized automobiles with a 1.5 to 2.0 liter engine capacity;

Auto Tax = road tax (license fee) per year or annual registration fee;

Checkup = the average labor cost (not including price of spare parts and oil change) for a 15,000 kilometer (approx. 9,000 miles) checkup on an automobile;

Taxes and Soc. = tax assessments and social insurance contributions as a percentage of gross earnings;

Macro Variables = a number of macro-economic variables including index of general price levels (excluding rents), purchasing power index, and prices of major household appliances.

Based on the Union Bank data described in Section 3, regression estimates were made using Ordinary Least Squares. We tried several alternative functional forms for Equation (1), including linear, semi-log, and double-logged. The results are shown in Tables 3 and 4.

3. The Data and the Empirical Results

The principal data source for this study is the 1985 edition of 'Prices and Earnings Around the Globe', published by the Economic Research Department of Union Bank of Switzerland. The comparisons are based on a survey which was commissioned in the first half of 1985. In order to obtain as balanced a picture as possible, surveys were conducted by two unrelated organizations in most of the cities. The questionnaire covered 126 price positions and various matters regarding salaries and working hours in 12 occupations. The population contains roughly 20,000 items of information concerning prices, earnings and rents. Data on city population are gleaned from the 'Book of World City Rankings' (Marlin, Ness and Collins, 1986).

Table 1 presents a list of the 49 cities which Union Bank sampled. Table 2 contains summary statistics of the variables used for our study.

The Union Bank Survey covered two basic types of apartments: furnished, four-room apartments;¹ and unfurnished, three-room apartments.² The survey report further stratified the data into three sub-categories in each case — expensive, medium, and cheap. As shown in Table 2, the mean rent for the furnished expensive category is \$1,916. The mean rent for the furnished medium-priced unit is \$1,105 and \$770 for the furnished, cheap unit. The corresponding figures for unfurnished expensive, medium, and cheap are \$896, \$622 and \$436, respectively. It must be noted that we are dealing with more or less standardized commodities within each sub-category. Distance to city center is also not a factor in our analysis since all apartments are located in and around the city center. Summary characteristics of the other variables are also presented in Table 2.

¹The furnished four-room apartments covered by the survey are units built after 1960. They offer the comfort that Europeans in middle management positions are accustomed to and are situated in neighborhoods in and around the C.B.D. The apartments have a living room, three bedrooms, a kitchen, a bathroom, and a garage. Rents quoted in the survey exclude additional charges for heat, hot water, and other utilities.

²This refers to unfurnished three-room apartments, with kitchen and bathroom including additional charges but without garage. All apartments were built after 1960. They provide local living comfort and are in and around the C.B.D.

Table 1

The 49 Cities Sampled

City	Country	City	Country
Abu Dhabi	Abu Dhabi	London	England
Amsterdam	Holland	Los Angeles	United States
Athens	Greece	Luxembourg	Luxembourg
Bangkok	Thailand	Madrid	Spain
Bogota	Columbia	Manamah	Bahrain
Bombay	India	Manila	Philippines
Brussels	Belgium	Mexico City	Mexico
Buenos Aires	Argentina	Milan	Italy
Cairo	Egypt	Montreal	Canada
Caracas	Venezuela	New York	United States
Chicago	United States	Oslo	Norway
Copenhagen	Denmark	Panama	Panama
Dublin	Ireland	Paris	France
Dusseldorf	Germany	Rio de Janeiro	Brazil
Geneva	Switzerland	Sao Paulo	Brazil
Helsinki	Finland	Seoul	South Korea
Hong Kong	Hong Kong	Singapore	Singapore
Houston	United States	Stockholm	Sweden
Istanbul	Turkey	Sydney	Australia
Jakarta	Indonesia	Tel Aviv	Israel
Jeddah	Saudi Arabia	Tokyo	Japan
Johannesburg	South Africa	Toronto	Canada
Kuala Lumpur	Malaysia	Vienna	Austria
Lagos	Nigeria	Zurich	Switzerland
Lisbon	Portugal		

It must be noted that producing international data of the kind used by this study entails certain problems. The Union Bank of Switzerland attempted to take into account varying regional consumer habits, but by and large the basket of goods and services on which their 'price-and-earnings' data are based reflects European buying patterns. The weighting is identical for all cities. Nevertheless, deviations from the average spending pattern occur owing to price differences among the individual cities. Moreover, certain items in the basket are not always comparable due to quality variations. Of course, no two pieces of real estate are identical in all respects. It must also be stressed that limited leeway was granted to local pollsters in their choice of products when the survey was being conducted (Union Bank of Switzerland, 1985).

As Tables 3 and 4 show the results of our empirical analysis are extremely interesting given the comparability problems that may exist for global data of this kind. The adjusted R^2 s range from a high of 0.78 to a low of 0.43 depending on which category of apartment is analyzed. These results are satisfactory given the cross-sectional nature of the data and again given the international comparability problems.

As shown by Tables 3 and 4, the variables for population, tax assessments and social insurance contributions (Taxes and Soc.), cost of public transportation (Subway Fare), automobile price (Auto Price), automobile taxes (Auto Tax), and check-up cost, all are significant at the conventional levels (0.05). The signs of all variables are as expected. It must, however, be mentioned that trial runs of the model were made which included: taxi fare, general price level excluding rents, household appliance, wages of construction workers, and purchasing power. These variables did not produce significant results and were dropped from the final regressions.

Based on Equation 2 in Table 3 a 1 per cent increase in area population appears to lead to a 0.46 per cent increase in downtown rents for the unfurnished, medium range type of apartment. A dollar increase in tax or social insurance bill appears to translate to a 3.3 per cent rent subsidy or discount. It is possible that at least part of what we are capturing here is the effect of rent controls. Recall that the highest percentages of taxes and social insurance costs are found in cities of countries with socialist governments which probably impose

Table 2
Summary Statistics

Variable	Mean	Standard Deviation
Rent (furnished)		
expensive	\$1916	\$1814
medium	\$1105	\$816
cheap	\$770	\$566
Rent (unfurnished)		
expensive	\$897	\$727
medium	\$622	\$488
cheap	\$436	\$319
Population (Log.)	14.82	0.78
Cost of Public Transportation	\$0.48	\$0.45
Taxi Fare	\$3.23	\$1.69
Automobile Price	\$10.430	\$10.238
Automobile Tax	\$123	\$120
Automobile Maintenance (check-up)	\$47.65	\$31.10
Prices of Services	\$101.63	\$25.15
Taxes and Social Services	21.128%	10.487%
General Price Level Excluding Rents	106.69	31.84
Household Appliances	105.81	29.45
Wages of Construction Workers	62.21	54.01
Purchasing Power	70.07	19.56

Table 3
Regression Results for Unfurnished Apartments

	(1) Expensive	(2) Medium	(3) Cheap
Log Popn.	0.3608 (2.716)	0.4597 (6.581)	0.4299 (5.213)
Subway Fare	0.0126 (4.701)	0.0115 (8.204)	0.0103 (6.195)
Auto Price	0.000005 (0.615) NS	0.000004 (0.833) NS	0.000005 (0.101) NS
Auto Taxes	0.0015 (2.035)	0.0012 (3.203)	0.0011 (2.458)
Taxes and Soc.	-0.0444 (-3.848)	-0.0333 (-5.496)	-0.0266 (-3.712)
Check-Up	0.0065 (2.219)	0.0037 (2.392)	0.0035 (1.934)
Constant	1.664 (0.810) NS	-0.2260 (-0.209) NS	-0.1623 (-0.127) NS
Adjusted R ²	0.539	0.781	0.669
F	8.162	24.710	14.472

t - ratios are shown in parentheses below regression coefficients
NS = not significant at the 5% level.

Table 4
Regression Results for Furnished Apartments

	(4) Expensive	(5) Medium	(6) Cheap
Log Popn.	0.4764 (4.159)	0.3887 (3.096)	0.3632 (3.026)
Subway Fare	0.0108 (4.684)	0.0072 (2.857)	0.0090 (3.703)
Auto Price	0.00005 (1.848)	0.00006 (2.162)	0.00005 (1.801)
Auto Taxes	0.0016 (2.610)	0.0015 (2.126)	0.0011 (1.630)
Taxes and Soc.	-0.0305 (-3.052)	-0.0215 (-1.973)	-0.0259 (-2.487)
Check-Up	0.0024 (0.957) NS	0.0039 (1.402) NS	0.0051 (1.923)
Constant	-0.7667 (-0.432) NS	0.145 (0.075) NS	0.2076 (0.112) NS
Adjusted R ²	0.547	0.472	0.427
F	9.042	5.074	5.972

t - ratios are shown in parentheses below regression coefficients
NS = not significant at conventional levels.

very restrictive regulations on apartment rents. A 1 per cent increase in the ticket price of public transportation (Subway Fare) appears to lead to as much as 1.2 per cent increase in rents of the city center apartments. Based on Equation 5, a dollar premium in private automobile prices leads to a 0.006 per cent increase in downtown rentals. A dollar extra in automobile taxes appears to lead to a 0.15 per cent increase in rents. The results of these three transportation variables indicate that intra-urban transportation expenses are capitalized into rental prices.

4. Conclusions and Policy Implications

The study has established that rents for standard downtown apartments are significantly influenced by the population size, costs of both public and private intra-city transportation, and taxes and social insurance rates.

The confirmation that city-center rents are influenced by area population has several public and private policy implications. Population reflects the historical development of the physical, political, social, environmental and economic background of

a city. Cities, for example, may grow rapidly due to the presence of new economic opportunities or due to some socio-economic developments that would affect the population density pattern, rents, and housing values. In recent years new cities like Calgary, Phoenix, and Perth, where jobs have been expanding, have seen population growth and escalating rents. On the other hand, older cities with declining economic bases like Liverpool, Birmingham, Baltimore, Houston, Dallas, Detroit, and St. Louis, have been losing population along with rents and property values.

Urban and regional planners in most countries attempt to control urban population size through density controls such as zoning ordinances, subdivision annexations, and rural development programs to reverse rural-urban migration. All these have repercussions on rents and property values, and, thus, on real estate investment decision-making.

The finding that city-center rents are influenced by costs of intra-city public and private transportation has policy implications. Intra-city transportation systems are usually supported by public subsidy. Every city or metropolitan area requires some minimal level of government support of its transportation system. Most urban mass transit systems require huge capital expenditures and usually operate at a financial loss based on fares alone. In densely populated urban centers, an integrated public transportation system reduces motor vehicle dependency, traffic congestion, air pollution, and energy consumption. In US cities, mass transit subsidies have declined under the Reagan Administration's New Federalism, which aims to decentralize responsibility for such services to the state and local level. As Federal subsidies have been sharply cut back in the 1980s, maintenance and development of new mass transit systems have been postponed or cancelled, while the cost of maintenance of some facilities has increased. The reduction of government subsidies of transit and roads in the US, the UK, and other Western European cities, has contributed to higher fares (Marlin *et al.*, 1986). This study concludes that the higher fares would be capitalized into steeper rents for housing within the city. This finding is relevant to public policy as well as for private real estate investment decision-making. Lastly, access to low-cost public transportation is important in the Third World where people cannot

afford higher rents. The most common response has been rent controls which may have adverse effects on the supply side of the market, at least in the long-run. This study has, among other things, clearly demonstrated that a more systematic way to soften rents is not via rent regulation but through proper land use and transportation policy planning.

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