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# Correlates of Commuting Patterns

## A Case Study of Bangkok, Thailand

Sureeporn Punpuing

Institute for Population and Social Research
Mahidol University

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## PREFACE

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**Sureeporn Punpuing**

# Contents

# List of Tables

# Correlates of Commuting Patterns: A Case Study of Bangkok, Thailand

Commuting, the movement between place of residence and workplace, does not entail a change in residence and therefore most demographers exclude it from the general class of mobility. They argue that the daily travel of working people only reflects forms of settlement in which individual's places of work are physically separated from the places where they sleep and socialize with families and neighbours (Kiseleva, 1976). However, there are important theoretical reasons why commuting needs to be considered as an important form of mobility. For example, several studies have demonstrated that commuting and other forms of mobility are related (Yapa et al., 1971; Fuchs and Demko, 1978; Congdon, 1983; Van der Veen and Evers, 1983; Vickerman, 1984; Evers, 1989).

Commuting can have an affect on individuals and societies. For example, it may have a negative impact on commuters' health and well-being, and their relationships to their families and communities may suffer through excessive travel cost and travel time. Commuting also has effects on policy decisions in areas such as the provision of housing, construction of traffic infrastructure, public facilities, and land use patterns (Schuler and Coulter, 1978; Gera and Kuhn, 1981; Madden, 1981).

Previous research has examined these issues in depth for developed societies only, as commuting has been seen as a reflection of the process of industrialization, especially the improvement of transportation and communication systems. However, research has shown that commuting is commonly employed as a mobility strategy in developing countries (Mantra, 1978; Singhanetra-Renard, 1981; Hugo, 1985: Guest, 1989). As yet, however, there has been no comprehensive attempt to investigate the conditions under which this strategy is most likely to be employed.

The objective of the study is to analyse the relationships between demographic, socio-economic, and social environment variables and commuting patterns. Commuting decisions are assume to involve a two-stage process. The first stage is the decision to work at home or outside the home as it has been suggested that a person may decide to work at home if he/she cannot afford to commute long distances (Reitsma and Vergoossen, 1988). The second stage of the decision-making process involves decisions about commuting distance and time.

This paper begins with an examination of theoretical issues related to commuting patterns, followed by a description of commuting in Bangkok. The third section assesses the data source and definitions used in the study. The choice of workplace location is analysed in the fourth section, while the following section focuses on identifying the correlates of commuting time and commuting distance. The paper concludes with an evaluation of how commuting is linked to demographic, socio-economic, and social environment factors in Bangkok.

## Correlates of Commuting

Commuting dominates in situations where the workplace changes but the place of residence is fixed, and where the workplace is fixed, but the place of residence changes for housing or environment reasons (Vickerman, 1984). Commuting plays a causal role in the process of adjustment between workplace and place of residence. It appears that changes in the place of residence often take place when commuting cannot be maintained due to problems of travel distance, travel time, transportation congestion, or the restriction of work hours (Reitsma and Vergoossen, 1988).

The use of commuting as a complement to migration can increase when individual residential preferences change. For example, in suburban areas high-income residents may exhibit a preference for housing based on environmental factors while for middle-income residents housing factors may dominate. These preferences result partly from the rise of social and physical environment problems

in big cities and from government policies for the improvement of suburban areas (Fuchs and Demko, 1978). Thus, individuals may decide to move from their old region of workplace and commute longer distances to work.

As development, particularly in transportation and communication, takes place, individuals are increasingly faced with a number of choices regarding residence and workplace location. The decision of whether to work at home or not, and the decision about the distance and time to be spent commuting may be related to demographic, socio-economic and social environment factors. Most of the literature on the correlates of commuting relates to urban environments in developed societies. Whether these relationships also hold in a developing country environment is an unanswered question.

## Demographic and Socio-Economic Factors

The decision to commute may be related to individual and family factors. Characteristics such as age, sex, occupation, education, and marital status may be linked to mobility choices. The hypotheses of the study are based on a cost-benefit framework which takes non-monetary costs and benefits into consideration. This is because the decision regarding the appropriate adjustment between workplace and place of residence depends not only on income but also on non-monetary factors such as preferences and satisfaction in the present and alternative location (DaVanzo, 1981).

The decision to move mainly depends upon the costs and benefits of the movement. For example, based on the cost-benefit framework, the young, compared to the old, are more likely to move because they can expect a higher level of lifetime income returns as they have a longer potential amount of time to spend in the labour force, and they are not tied as much to the family or community (Miller, 1971).

This argument can be extended to examine the correlates of commuting. It can be hypothesized that younger people are more likely to move close to their workplace because their lower costs of moving both in terms of lower psychic costs, as they have fewer ties to families or communities than older persons, and lower physical costs, as they are usually single. This will result in shorter commuting distances for younger people. Younger people have fewer costs of moving and therefore can adjust their place of residence to their place of work.

In the United States, males were more likely to undertake a longer worktrip than females (Gordon et al., 1989). This may result from the higher returns from mobility by males because of higher wage rates compared to those for females. Thus males are more likely than females to be willing to pay the extra costs imposed by longer commuting distances. Social and cultural norms may also affects the mobility of women (Mantra, 1978). Married women probably have greater household responsibilities; therefore, they cannot afford to spend as much time commuting as males or single women (Guest, 1976; Gera and Kuhn, 1981; Gordon and Molho, 1985).

Like young persons, the unmarried are often more likely to move than commute long distances because of lower levels of place-specific investments, both in terms of the direct costs of moving and psychic costs, compared to married persons (DaVanzo, 1981). A study of one-worker households in the United States showed that married workers had longer worktrips than the unmarried (Gordon et al., 1989). This suggests that unmarried workers were more likely than married workers to change their place of residence to be closer to their workplace, the result being reduced commuting distances.

Education is strongly and positively related to income and occupational status. More highly-educated people can also expect higher wages and a higher probability of obtaining employment (Todaro, 1976). Congdon (1983) found that in London white-collar workers were likely to move from their workplace areas and then commute long distances. It appears that the more educated and those persons

with high occupational status are more likely than others to use commuting as a complement to residential mobility and to commute longer distances.

For married couples, the wife's income and opportunity cost of her time seem to have a direct effect on family mobility decisions. This may be because working wives need to use part of their time for child care and housework (Guest, 1976). DaVanzo (1981) found that in the United States families with non-working wives moved longer distances than families with working wives. It can be hypothesized that individuals whose spouses are working would be more likely to commute longer distances than individuals whose spouses are not working. This may be due partly to the couples' different workplace locations and the work status of the spouse. The commuting patterns of married persons may be affected by the work status of spouses and the number of school-age children.

**The Social Environment**

Several researchers have argued that there are important inter-relationships among employment availability, commuting and migration (Congdon, 1983; Vickerman, 1984; Evers, 1989). For example, Vickerman (1984) argued that the decision to move was based on a trade-off between costs and benefits of employment factors and the workplace, housing factors and the place of residence. Since there is a strong relationship between workplace and place of residence, commuting can be expected to be one of the important adjustment factors used to obtain optimum costs and benefits of the movement.

Employment and housing availability have been identified as the two main factors affecting patterns of commuting (Congdon, 1983). Housing factors include the availability of housing as well as to satisfaction with housing. High rates of housing satisfaction may increase commuting distance and time when the workplace is not fixed. Deane (1990) found in the United States, at similar levels of residential duration, an individual's decision to move was more likely to depend upon neighbourhood satisfaction than upon housing satisfaction. Individuals with

strong ties to neighbours and the neighbourhood, or long residential duration would be more likely to commute longer distances than those with low neighbourhood ties and shorter residential duration because they would be less likely to be able to use mobility to adjust their places of residence to the location of their workplaces.

The relationship may be more complicated, however, due to relationships between residential duration and housing satisfaction. McHugh et al.(1990) found in the United States residential duration to be negatively related to neighbourhood satisfaction. This may be due to a gradual increase in housing dissatisfaction as neighbourhood composition changes (Huff and Clark, 1978). It seems likely that the greater the strength of community ties the less residential mobility and the greater the use of commuting as an adjustment factor where there are changes in workplace location (Harbison, 1981). The relationship may be even further complicated by the spatial evolution of cities. For example, where workplaces remain concentrated in certain locations while residential areas expand, those persons with the longest period of residence within communities will generally be those living in the oldest established areas, and therefore will be closest to areas of employment.

The structure and composition of a family may affect the strength of ties between the family and community (Harbison, 1981). The number of children in a family, particularly the number of school-age, seems to increase family ties to communities. Families with school-age children may be likely to commute further than those without school-age children because residential mobility could disrupt the schooling of the children. This demonstrates the need to consider indicators of social ties along with other variables in investigating the correlates of commuting.

Individuals' decisions about commuting patterns can also be related to family structure. Extended family networks, especially in developing societies, may encourage long commuting because of the strength of emotional ties to other members in the networks (Harbison, 1981). It can be expected that members of nuclear families, compared to those of extended families, would be more likely to

commute shorter distances because of the importance of parental roles; thus they cannot spend much time in commuting.

Home ownership may influence mobility decisions, with the probability of moving likely to increase where strong values are attached to home ownership. Gilbert and Varley (1990) found a strong value of home ownership among urban Mexicans, although some tenants, particularly those living in central locations, did not want to own homes in suburban areas. They suggested that this may have been due to the tenants' satisfaction with city life, in particular being located near their place of work. It can be hypothesized that commuting as a complement to residential mobility may increase in societies with a strong value of home ownership, which, in turn, may lead to long commuting distances.

It is important to stress that the argument relating commuting distance to community ties, either through residential satisfaction or social ties to the community, depends on a situation in which persons with few community ties attempt to minimize long commuting times by residing closer to their place of work. Other factors such as affordability of housing and changing place of work may operate to mitigate against these effects.

The literature suggests that commuting patterns are likely to be associated with demographic, socio-economic and social environment factors. The structure and composition of a family and its life-cycle, and attitudes and perceptions toward the community and housing are related to the strength of social ties to particular areas and these factors are also linked to the potential utility associated with different patterns of commuting.

## Commuting in Bangkok

In this study, commuting patterns are examined in relation to certain demographic and socio-economic characteristics and the social environment of a sample of residents of Bangkok, the capital city of Thailand. Bangkok, with a

population density of 3,584 per sq.km; differs from all other urban places in Thailand in its size and concentration of employment opportunities and services (Nakavachara, 1985). The rapid growth of Bangkok is a function of both natural increase and net migration. In addition, there has been significant 'spillover' of its population into the five surrounding provinces. In fact, these provinces had the fastest population growth rates in Thailand during the 1980s (Goldstein and Goldstein, 1986). At the same time, employment opportunities have remained concentrated in inner Bangkok (United Nations, 1987). Taken together, these factors are believed to have significantly raised the level of commuting in the area.

Commuting time has also worsened because of overcrowding, which has resulted in many urban ills such as traffic congestion, pollution, slums, and a shortage of transport and sanitary facilities (water supply, water disposal and drainage) (Becker, 1987). Bangkok residents must adapt themselves to these congested conditions. Middle-class residents have resorted to the twin strategies of residential mobility to the fringes of Bangkok in combination with lengthy commuting to their place of work. Others who have a choice have adopted high rise inner-city condominium living which reduces the distance between workplace and residence. Finally, those without resources are forced to live in many of Bangkok's slum areas, many of which are located far from potential workplaces (Chanont, 1990). Each of these locational decisions has implications for service provision, land use patterns, urban growth patterns, and environmental degradation. There are also potential effects on individuals, both in terms of health, and community and family life.

Although a policy of decentralization of Bangkok has been implemented, it has not been successful. The policy of developing new towns near Bangkok that include industrial estates, employment opportunities, housing, schools, shops and recreation grounds (Ministry of Interior, 1971) has failed due to employers reluctance to locate workplaces in the new towns. The residents of these new residential areas continue to commute to Bangkok.

This pattern arises partly because the process of development has been structured around a land market in which approximately 80 per cent of land in Bangkok is privately held (United Nations, 1987). The private land market has resulted in new housing being developed on the periphery, while there has been no available land near the centre for the construction of public housing to bring people closer to the location of their employment. This has also resulted in low levels of job dispersion because many employers cannot find locations as land is too costly, or lacks infrastructure such as roads, electricity, water, and drainage (Ministry of Interior, 1971). A further factor contributing to the situations is the government's lack of regulations for controlling private land owners whose contribution to public facilities is minimal or non-existent.

In turn, the private-sector led pattern of spatial development causes more serious traffic problems as it increases commuting distance and time. Private vehicles become necessary for commuting because of the lack of public transport. The traffic problem is worsened by the large number of slum dwellers who engage in such jobs as labourers, drivers and street vendors and who must commute to the city centre where many such jobs are located (Thai Development Support Committee, 1987).

While commuting is recognized in the media as a major feature and problem of life in Bangkok, no research has examined the conditions located in individual, family, and community structures that determine the commuting patterns of Bangkok residents. Such research is crucial to understand people's perceptions and the rationale for their commuting behaviour.

## Data Source and Definitions

This study is based on a survey conducted during January-March 1991. The survey covered 25 sub-districts from 17 of the districts comprising the Bangkok Metropolitan areas, based on a sample of 500 respondents aged between 15-59. The sampling techniques of probability proportional to size, systematic, and

random sampling were employed in selecting sub-districts, blocks in each sub-district, and households and respondents in each block respectively. To ensure that respondents who normally worked could be contacted, all interviewing was conducted on weekends. Interviewers were university graduates, trained and supervised by staff members of the Institute for Population and Social Research, Mahidol University.

The study population were people aged 15-59 who were in the labour force and not full-time students. A working respondent was defined as a person who worked with or without pay for at least one hour during the week previous to the interview date. Data were collected from a total of 110, 296, and 94 respondents who were working at home, working outside the home, and not working respectively.

## Variables

To study the correlates of commuting, two sets of analyses were undertaken. First, factors associated with people working at home or outside the home were examined. The dependent variable was dichotomous with the value of 1 if the person was working at home and 0 if he/she was not. The associated variables were individual characteristics, including age, sex, marital status, education, occupational status, and social environment factors. The social environment variables included indexes of community and housing satisfaction created from the measurement of attitudes toward aspects of community and residential life. The first covered aspect of community life, such as social contacts among participants, security, individual happiness and crowding. The second referred to aspects of residence such as privacy, security, size, structure, surrounding areas, and electricity and water supply systems (see Tables A1 and A2 in Appendix A).

Second, factors determining commuting patterns were analysed. The dependent variables, commuting distance and commuting time, were measured

from the total amount of distance and time of every daily journey to work. Commuting time was measured as half the time spent going to and from work, including any time that the respondents may have taken to go to other places while going to or returning from work. The independent variables were divided into demographic, socio-economic, and social environment variables.

During the survey, efforts were made to maximise the reliability and validity of measurements. Commuting time and distance were collected for randomly-specified working days during the previous week, and respondents were asked about time allocation of activities on that day in order to overcome problems of recall. Commuting distances were estimated by the respondents.

For the attitude questions, interviewers showed cards with a set of responses and let the respondents select the response. This method was used to avoid the potential bias of respondents selecting the first response.

**Table 1** Descriptive Statistics of Variables Employed in the Analysis of Commuting Patterns, Bangkok, 1991

| Variables | Mean | Standard Deviation |
|---|---|---|
| 1. Working at Home | 0.22 | 0.42 |
| 2. Commuting Time (minutes) | 50.4 | 36.20 |
| 3. Commuting Distance (kilometres) | 11.4 | 10.71 |
| 4. Age (years) | 34.5 | 9.79 |
| 5. Sex | | |
| Male | 0.47 | 0.50 |
| Female a) | 0.53 | 0.50 |
| 6. Marital Status | | |
| Never-Married | 0.29 | 0.46 |
| Ever-Married a) | 0.71 | 0.46 |
| 7. Education (years) | 9.8 | 4.85 |

**Table 1** (Continued)

| Variables | | Mean | Standard Deviation |
|---|---|---|---|
| 8. | Occupational Status Professional-Clerical | 0.29 | 0.46 |
| | Sales-Service | 0.39 | 0.49 |
| | Others a) | 0.32 | 0.47 |
| 9. | Spouse Work Status | | |
| | Yes | 0.49 | 0.50 |
| | No a) | 0.51 | 0.50 |
| 10. | School-Age Children | | |
| | Yes | 0.61 | 0.49 |
| | No a) | 0.39 | 0.49 |
| 11. | Home Ownership | | |
| | Yes | 0.63 | 0.48 |
| | No a) | 0.37 | 0.48 |
| 12. | Type of Family | | |
| | Nuclear | 0.47 | 0.50 |
| | Extended a) | 0.53 | 0.50 |
| 13. | Duration in Home (months) | 145.91 | 144.27 |
| 14. | Duration in Community (months) | 195.07 | 173.75 |
| 15. | Number of Relatives in Community | 2.1 | 3.45 |
| 16. | Number of Friends in Community | 2.2 | 3.39 |
| 17. | Rating of Housing Satisfaction | 30.02 | 4.04 |
| 18. | Rating of Community Satisfaction | 12.69 | 2.04 |

**Notes:** a) = Reference category in the analysis. Variables 1,5,6,8,9,10,11, and 12 are categorical variables. The figures shown for means are proportions. These variables are treated in the subsequent analysis as dummy variables.

Approximately 59 per cent of respondents worked outside the home. The average time taken for the journey to work for these workers was 50 minutes while the average distance was only 11 kilometres (see Table 1). Based on the results of this sample, the average resident of the Bangkok Metropolitan Area who worked outside the home spent nearly two hours commuting each day.

## Choice of Workplace Location

The workplace location--at home or away from home-- was examined on the assumption that commuting decisions involve a two-stage process. The first is the decision to work at home or outside the home. The second stage are decisions about commuting distance and time.

**Table 2** Percentage Distribution for Those Who Work at Home and Work Outside Home by Demographic, Socio-Economic, and Social Environment Factors; Bangkok, 1991.

| Characteristic | Work at Home | Work Outside Home | Number |
|---|---|---|---|
| 1. Age (years) | | | |
| 15-24 | 14.5 | 85.5 | 62 |
| 25-34 | 29.6 | 70.4 | 159 |
| 35-44 | 30.7 | 69.3 | 114 |
| 45-59 | 26.8 | 73.2 | 71 |
| 2. Sex* | | | |
| Male | 22.4 | 77.6 | 192 |
| Female | 31.3 | 68.7 | 214 |
| 3. Marital Status | | | |
| Never-Married | 22.9 | 77.1 | 118 |
| Ever-Married | 28.8 | 71.2 | 288 |
| 4. Education** | | | |
| Primary | 33.6 | 66.4 | 143 |
| Secondary | 33.3 | 66.7 | 114 |
| Tertiary | 16.1 | 83.9 | 149 |

**Table 2** (Continued)

| Characteristic | Work at Home | Work Outside Home | Number |
|---|---|---|---|
| 5. Occupational Status** | | | |
| Professional-Clerical | 0.0 | 100.0 | 119 |
| Sales-Service | 50.0 | 50.0 | 158 |
| Other | 23.4 | 76.6 | 128 |
| 6. Spouse Work Status | | | |
| Yes | 31.0 | 69.0 | 200 |
| No | 23.3 | 76.7 | 206 |
| 7. School-Age Children | | | |
| Yes | 30.1 | 69.9 | 246 |
| No | 22.5 | 77.5 | 160 |
| 8. Home Ownership | | | |
| Yes | 24.9 | 75.1 | 257 |
| No | 30.9 | 69.1 | 149 |
| 9. Type of Family | | | |
| Nuclear | 26.2 | 73.8 | 191 |
| Extended | 27.9 | 72.1 | 215 |

Notes: * = Significant at the 0.05 level
** = Significant at the 0.01 level
Significance levels were established through the use of Chi-Square statistic testing the difference between the distribution of those working at home and those working outside the home. A significant difference indicates that one or more distributions are different from each other at the 0.01 or 0.05 level
Table excludes respondents not working

Table 2 provides information on the bivariate relationships between workplace location and the socio-demographic characteristics of the respondents. Chi-square analysis indicates that sex, education, and occupation were significantly related to workplace location. Males were more likely than females to work outside the home. The reason that more women than men work at home may be due to the fact that women have more household responsibilities such as taking care of

children and family (Madden, 1981). Women may also prefer to work at home in order to eliminate time spent commuting.

Education and occupation were also related to differences in workplace location. Approximately one-third of respondents with primary and secondary education worked at home. The higher the level of education the higher the percentage of respondents working outside the home, with respondents with tertiary education displaying the highest percentage working outside the home. Highly educated people are more likely to be involved in the formal sector for which the workplace location is usually outside the home (Cropper and Gordon, 1991).

This proposition is supported by the high percentage of respondents with a professional/clerical career who were working outside the home. In fact all respondents in the professional and clerical category worked outside the home. Half of sales/service occupations worked at home, and nearly one-fourth in the 'other' occupational category worked at home. Note that respondents with sales/ service occupations included those who had their own business, such as a grocery shop or small company, which is often located in the owner's home.

It was expected that members of nuclear families would be more likely than members from extended families to work at home as they would be more likely to have to take care of children and do the housework. However, the analysis showed no difference in workplace location by type of family. This is probably because the members of nuclear families who worked outside the home could afford to pay for maids, nurseries or school bus services to help ease their domestic responsibilities.

While the data from Table 2 indicate that the decision of whether to work at home or not was partly associated with demographic, socio-economic and social environment factors, these variables were related to each other. Therefore, a multivariate technique, logistic regression was employed to examine the net effect

of each independent variable on the workplace decision. The workplace location was categorized as either working at home or not working at home.

Three models have been estimated. The selection of models was based on the assumption that the most parsimonious model consists of demographic factors (Kendig, 1984; Evers, 1989: Deane, 1990). The set of socio-economic factors was added into Model 2. Finally, social environment factors were taken into account in the third model.

**Table 3** Logistic Regression Estimates of Coefficients and Odds-Ratios of Working at Home by Demographic, Socio-Economic, and Social Environment Factors (N=403); Bangkok, 1991

| Variables | Model | | | Odds-Ratios Model 3 |
|---|---|---|---|---|
| | 1 | 2 | 3 | |
| 1. Age (years) | | | | |
| 15-24 | -0.813 | -1.112* | -1.310* | 0.270 |
| 25-49 | 0.007 | 0.071 | -0.057 | |
| 50-59 a) | - | - | - | |
| 2. Sex | | | | |
| Male | -0.486* | -0.702* | -0.724* | 0.485 |
| Female a) | - | - | - | |
| 3. Marital Status | | | | |
| Never-Married | -0.112 | 0.496 | 0.491 | |
| Ever-Married a) | - | - | - | - |
| 4. Education (years) | | -0.006 | -0.006 | |
| 5. Occupational Status | | | | |
| Professional-Clerical | | -13.449 | -13.386 | |
| Sales-Service | | 0.915** | 0.857** | 2.356 |
| Others a) | | - | - | |
| 6. Spouse Work Status | | | | |
| Yes | | 0.491 | 0.422 | |
| No a) | | - | - | |
| 7. School-Age Children | | | | |
| Yes | | | 0.065 | |
| No a) | | - | | |

**Table 3** (Continued)

| Variables | Model | | | Odds-Ratios Model 3 |
|---|---|---|---|---|
| | 1 | 2 | 3 | |
| 8. Home Ownership | | | | |
| Yes | | | -0.121 | |
| No a) | | | - | |
| 9. Type of Family | | | | |
| Nuclear | | | -0.230 | |
| Extended a) | | | - | |
| 10. Duration in Home (months) | | | -0.003* | 0.997 |
| 11. Duration in Community (months) | | | 0.001 | |
| 12. Number of Relatives | | | 0.052 | |
| 13. Number of Friends | | | 0.009 | |
| 14. Rating of Housing Satisfaction | | | 0.007 | |
| 15. Rating of Community Satisfaction | | | | |
| Poor | | | -0.068 | |
| Avarage | | | 0.366 | |
| Good a) | | | - | |
| Intercept | -0.646 | -0.860 | -0.814 | |
| Chi-Square | 11.08 | 130.98 | 139.66 | |
| Degrees of Freedom | 4 | 8 | 18 | |
| Change in Chi-Square | - | 119.9** | 8.68 | |

Notes: a) = Reference category in the analysis
* = Significant at the 0.05 level
** = Significant at the 0.01 level

Table 3 displays the coefficients and odds-ratios of the logistic regression. The coefficients indicate the propensity to work at home compared to working away from home. In Model 1, males were less likely to work at home than females. This may be due to the women having had more household responsibilities, and thus not wanting to waste time commuting.

The effect of introducing the socio-economic variables in Model 2 was to significantly increase the value of Chi-Square; that is, Model 2 provides a significantly better fit to the data compared to Model 1. The main reason for the better fit lies in the effect of occupation. Respondents in sales and service occupations were more likely to work at home compared to respondents with 'other' occupations, perhaps because many sales/service occupations can be conducted independently and therefore can be adequately performed at home. All professional/clerical respondents worked outside the home, resulting in a large coefficient but no variance; thus the result was not significant.

A significant association between age and work location emerges in Model 2. Respondents, aged 15-24, compared to those aged 50-59, were less likely to work at home. This relationship was much stronger after controlling for occupation. After removing this confounding effect, most likely a result of relatively high proportions of teenagers working in family enterprises located in the home, the significant effect emerges. Respondents aged 15-24 were more likely than those aged 50-59, to be found in sales/service and 'other' occupations. The reason these young persons were more likely to work outside the home may have been that the young expect to obtain a wider variety of employment, a higher probability of obtaining jobs, and high wage rates (Todaro, 1976) outside the home. Working at home tends to be limited to certain kinds of employment.

The social environment variables added in Model 3 do not significantly improve the model fit. Only the duration of time living at home had a significant effect on the workplace decision. Increasing time living in current home was associated with a decreasing propensity to work at home. A stronger social network with neighbours may have developed for those residing for long periods in the same house. The social network may also lead to the higher probabilities of obtaining employment outside home.

The odds-ratios of the final model, the last column of Table 3, provide an indication of the strength of the relations. They indicate that the young, aged 15-

24, were 73 per cent less likely than those aged 50-59 to work at home. Males, compared to females, were twice as likely to work outside the home, whereas, respondents in sales/service occupations were more than twice as likely as 'other' occupations to work at home. For every additional three years spent living in their current home, respondents were about 11 per cent less likely to work at home.

## Correlates of Commuting Time and Distance

Table 4 shows the bivariate relationship between commuting time and distance, and the independent variables. Analysis of variance indicates that differences in mean commuting time and commuting distance among educational, occupational, and home ownership categories were statistically significant. More highly educated respondents commuted a longer time and over longer distances than respondents with lower levels of education. As noted by Congdon (1983), more educated persons are more likely to use commuting as a complement to residential mobility; thus, they commute longer times and over longer distances than those with low education. This may be because higher levels of education are also linked to higher social class which, in turn, is often associated with residence in outer suburbs in order to avoid problems of congestion in the inner city (Landis, 1986).

Workers in professional/clerical occupations also have longer commuting distances than do persons in the sales/service and the 'other' occupational categories. Workers in professional/clerical occupations commuted an average of 1 hour and travelled 13.5 kilometres per trip. Persons involved in professional/ clerical occupations may have high incomes and can therefore afford higher commuting costs (Zax and Kain, 1991); they are also more likely to want to live in places where long commutes are necessary. For instance, levels of housing satisfaction vary according to levels of income (DaVanzo, 1981). Therefore, persons with high occupational status may prefer to live in a better environment in order to increase their quality of life.

It has been argued, however, that as high status workers obtain higher wages, the opportunity cost of their time spent commuting is high and that this should encourage a reduction in commuting time (Simpson, 1987). This argument may not hold in the case of Bangkok where serious problems of degradation of the environment, both social and physical, has occurred during the last decade. Areas which used to be residential have been encroached up on by factories and offices. This has forced many high status persons to move to the periphery of the city, a move reinforced by the availability of high quality housing estates on the outskirts of Bangkok. This flight to more environmentally pleasant surroundings is probably the major cause for the longer commuting time of professional and clerical workers compared to respondents in other occupations.

Respondents who owned their own house had a longer commuting distance and time than those who did not own their house. This is consistent with the finding that home owners were less likely than renters to change their place of residences (Deane, 1990); therefore, they are likely to accept long commuting times in situations where the workplace is fixed.

**Table 4** Commuting Time (Minutes) (N=281) and Distance (Kilometres), (N=280) by Demographic, Socio-Economic, and Social Environment Factors; Bangkok, 1991

| Characteristic | Time | Standard Deviation | Distance | Standard Deviation |
|---|---|---|---|---|
| 1. Age (years) | | | | |
| 15-24 | 44.3 | 35.0 | 11.6 | 12.7 |
| 25-34 | 51.7 | 33.3 | 11.4 | 10.2 |
| 35-44 | 46.7 | 38.0 | 9.9 | 9.1 |
| 45-59 | 59.7 | 39.9 | 13.4 | 11.7 |
| 2. Sex | | | | |
| Male | 50.0 | 35.7 | 11.8 | 11.8 |
| Female | 50.8 | 36.8 | 10.9 | 10.9 |

**Table 4** (Continued)

| Characteristic | Time | Standard Deviation | Distance | Standard Deviation |
|---|---|---|---|---|
| 3. Marital Status | | | | |
| Never-Married | 52.0 | 36.8 | 11.9 | 11.2 |
| Ever-Married | 49.7 | 36.0 | 11.2 | 10.5 |
| 4. Education | ** | | * | |
| Primary | 38.8 | 35.4 | 9.3 | 11.7 |
| Secondary | 47.3 | 36.7 | 10.6 | 10.4 |
| Tertiary | 60.2 | 34.0 | 13.2 | 9.9 |
| 5. Occupational Status | ** | | ** | |
| Professional/Clerical | 61.6 | 33.9 | 13.5 | 9.3 |
| Sales/Service | 37.5 | 32.9 | 7.2 | 7.4 |
| Other | 46.2 | 37.6 | 11.9 | 13.5 |
| 6. Spouse Work Status | | | | |
| Yes | 51.8 | 36.2 | 11.5 | 9.9 |
| No | 49.2 | 36.3 | 11.3 | 11.4 |
| 7. School-Age Children | | | | |
| Yes | 48.9 | 34.8 | 11.8 | 10.3 |
| No | 52.3 | 38.0 | 10.9 | 11.3 |
| 8. Home Ownership | ** | | ** | |
| Yes | 55.8 | 37.1 | 13.0 | 11.2 |
| No | 39.9 | 32.0 | 8.2 | 8.9 |
| 9. Type of Family | | | | |
| Nuclear | 48.9 | 36.2 | 11.2 | 11.1 |
| Extended | 51.7 | 36.3 | 11.5 | 10.4 |

Notes: * = Significant at the 0.05 level
** = Significant at the 0.01 level

Age, sex, marital status, spouse work status, type of family and the presence of school-age children were not related to commuting time. The absence of significance of variables which have been shown to be strongly related to commuting patterns in developed societies is important and needs further investigation.

Commuting time depends not only on distance but also on the mode of transportation and frequency of public transport. Bangkok residents have had to adapt themselves to traffic conditions by going to work very early and coming home from work very late in order to avoid rush hours. It is common for passengers, especially school-age children, to have their breakfast and sleep during the journey to work or school. Moreover, the distance between place of residence and workplace may not relate directly to commuting time because of traffic congestion.

According to the theoretical framework outlined earlier, commuting patterns are related to demographic, socio-economic and social environment factors. Regression analysis was used in order to estimate the net effect of each variable on commuting time and distance. The strategy employed was based on the same assumption as that used in the analysis of workplace decisions in the fourth section; that is, three models were examined.

**Table 5** Ordinary Least Square Estimates of Coefficients of Commuting Time by Sets of Demographic, Socio-Economic, and Social Environment Factors(N=256); Bangkok, 1991

| Variables | Model | | |
|---|---|---|---|
| | 1 | 2 | 3 |
| 1. Age (years) | 0.543** | 0.596** | 0.477* |
| 2. Sex | | | |
| Male | -1.916 | 2.409 | 3.395 |
| Female a) | - | - | - |

**Table 5** (Continued)

| Variables | Model | | |
|---|---|---|---|
| | 1 | 2 | 3 |
| 3. Marital Status | | | |
| Never-Married | 7.347 | 10.372 | 11.498 |
| Ever-Married a) | - | - | - |
| 4. Education (years) | | 1.106* | 0.757 |
| 5. Occupational Status | | | |
| Professional-Clerical | | 8.749 | 9.139 |
| Sales-Service | | -7.584 | -5.848 |
| Others a) | | - | - |
| 6. Spouse Work Status | | | |
| Yes | | 6.620 | 7.277 |
| No a) | | - | - |
| 7. School-Age Children | | | |
| Yes | | | -4.447 |
| No a) | | | - |
| 8. Home Ownership | | | |
| Yes | | | 9.727* |
| No a) | | | - |
| 9. Type of Family | | | |
| Nuclear | | | -1.592 |
| Extended a) | | | - |
| 10. Duration in Home (months) | | | -0.008 |
| 11. Duration in Community (months) | | | 0.004 |
| 12. Number of Relatives | | | 0.502 |
| 13. Number of Friends | | | -0.406 |
| 14. Rating of Housing Satisfaction | | | 0.648 |
| 15. Rating of Community Satisfaction | | | -0.577 |
| Intercept | 30.981 | 9.294 | 0.307 |
| $R^2$ | 0.018 | 0.109 | 0.136 |
| Change in $R^2$ | - | 0.091** | 0.027 |

Notes: a) = Reference category in the analysis
* = Significant at the 0.10 level
** = Significant at the 0.05 level

Table 5 presents the results of least squares regression models of commuting time. In Model 1, the age of respondent was positive and significantly related to variation in commuting time. Older respondents commuted a longer time than the young. Older persons may be more likely to move to the outskirts of Bangkok seeking a better environment (Evers, 1989), whereas the young may be willing to move close to their workplace to avoid long commutes because of their weaker ties to families and communities; they may also enjoy city life (Gilbert and Varley, 1990).

The explained variance in commuting time increased significantly from two per cent in Model 1 to 11 per cent after the set of socio-economic variables was entered into Model 2. In this model, education emerged as significantly related to commuting time: the higher the level of education the longer the time spent commuting. As noted, levels of education are related to social class. The residential preferences of higher class individuals, which may stress environmental factors (Atkinson et al., 1987), probably result in them living far from the congested central city areas, and thus far from their place of work, so they are likely to spend a long time commuting. Moreover, as level of education is positively related to income levels, highly educated persons are more likely to be able to afford the cost of commuting. In Bangkok, where public transport is highly subsidized, the costs of commuting long distances are measured more in terms of discomfort than money. Use of private cars is perhaps the only way in which commuting long distances can be undertaken in relative comfort in Bangkok, but the cost of owning a car is comparatively high.

In Model 3, the effect of education on commuting time disappears after controlling for the set of social environment variables. Basically this is a result of controlling for home ownership. In other words, some of the positive effect of education is due to the higher proportions of highly educated persons than less educated persons, owning their own homes. However, the set of social environment factors did not significantly increase the total explanation of variation in commuting time.

Respondents who owned their home commuted about 10 minutes longer on average than those who were not home owners. As Rossi (1955) argued, home owners have stronger social ties to neighbourhoods than renters; suggesting that owners may prefer to commute rather than change their place of residence. On the other hand, the strong value of home ownership in Bangkok (Tanphiphat, 1983) may encourage residents to try to purchase a home. Since the new residential areas are located in the outer zones of Bangkok, while their workplaces, which are usually located in the inner zone of Bangkok, are fixed home owners are more likely to commute longer distances. It is likely that both of these processes operate.

Table 5 indicates that about 14 per cent of the variability in commuting time could be explained by the independent variables. Among the independent variables, only age and home ownership were significantly related to commuting time. Hence, in Bangkok there is a large component of variability in commuting time that is unexplained by these variables that have proved important in determining commuting time in other societies.

**Table 6** Oridary Least Square Estimates of Coefficients of Commuting Distance by Sets of Demographic, Socio-Economic, and Social Environment Factors (N=255); Bangkok, 1991

| Variables | Model | | |
|---|---|---|---|
| | 1 | 2 | 3 |
| 1. Age (years) | 0.054 | 0.072 | 0.007 |
| 2. Sex | | | |
| Male | 0.178 | 0.763 | 1.357 |
| Female a) | - | - | - |
| 3. Marital Status | | | |
| Never-Married | 1.961 | 2.871 | 3.025 |
| Ever-Married a) | | - | - |
| 4. Education (years) | | 0.289* | 0.151 |

**Table 6** (Continued)

| Variables | Model | | |
|---|---|---|---|
| | 1 | 2 | 3 |
| 5. Occupational Status | | | |
| Professional-Clerical | | 0.255 | 0.637 |
| Sales-Service | | -3.732** | -3.492** |
| Others a) | | - | - |
| 6. Spouse Work Status | | | |
| Yes | | 1.980 | 1.709 |
| No a) | | - | - |
| 7. School-Age Children | | | |
| Yes | | | 0.911 |
| No a) | | | - |
| 8. Home Ownership | | | |
| Yes | | | 3.858** |
| No a) | | | - |
| 9. Type of Family | | | |
| Nuclear | | | -0.284 |
| Extended a) | | | - |
| 10. Duration in Home (months) | | | -0.010 |
| 11. Duration in Community (months) | | | 0.008 |
| 12. Number of Relatives | | | 0.101 |
| 13. Number of Friends | | | -0.127 |
| 14. Rating of Housing Satisfaction | | | 0.143 |
| 15. Rating of Community Satisfaction | | | -0.319 |
| Intercept | 8.622 | 4.222 | 4.427 |
| $R^2$ | 0.006 | 0.077 | 0.120 |
| Change in $R^2$ | - | 0.071** | 0.043 |

Notes: a) = Reference category in the analysis
* = Significant at the 0.10 level
** = Significant at the 0.05 level

In Table 6, the results of OLS regression on commuting distance are displayed. The results shown in the first column indicate that there was no significant relationship between the set of demographic variables and commuting distance. In Model 2, the socio-economic variables significantly add to the explained variance in commuting distance, which increased from less than one per cent in Model 1 to nearly eight per cent in Model 2.

An increase in education of one year was associated with an increase in commuting distance of about 0.3 kilometres, while persons in sales/service occupations commuted about four kilometres less than those with 'other' occupations. The low levels of commuting distance for sales/service respondents may be a consequence of the more flexible workplace location of persons involved in these occupations. For example, this group includes persons who sell fruit or food in the marketplace or on the street, who may have selected selling locations near their residences in order to reduce commuting distance. About 37 per cent of respondents in this group, compared to 16 per cent of respondents in 'other' occupations (data not shown here), did not work in offices or factories, suggesting that they were less likely to have a fixed place of work. Another possible reason for the difference is that the sales/service workers may have had to live close to their workplace because their jobs involved more irregular times than those who had jobs in the 'others' category. Thus, sales/service workers may have faced higher (psychic) costs in commuting.

In Model 3, the effect of education on commuting distance disappears. As noted previously, this is a result of the more educated being more likely to own their home. For example, nearly half of home owners had tertiary education (data not shown here). Those who owned their own houses commuted on average about four kilometres further than those who did not. This results from the availability of housing in the outer zone of Bangkok while the workplace is still concentrated in the inner and middle zone of Bangkok. The set of social environment factors did not significantly add to the explained variance in commuting distance. The independent variables employed explain 12 per cent of the variation in commuting

distance. The sales/service occupation and home ownership status were the only two variables, however, that significantly affected commuting distance.

## Conclusion

Based on the assumption that commuting decisions involve a two-step process--a decision to work either at home or not, and a decision on commuting distance and time--demographic, socio-economic, and social environment factors were examined in relation to commuting decisions. The analysis indicated that age, sex, occupation, and time spent living in current home were associated with workplace location. Commuting time was related to age and home ownership status, and commuting distance was related to sales/service occupation and home ownership status.

Unexpectedly, sex was not significantly related to commuting time and distance. Unlike in developed societies where sex is related to commuting patterns, there were no significant differences among men and women in commuting in Bangkok. This may result from the importance of economic factors in deciding whether women work. Once the decision has been made to work outside the home, either by men or women, the factors affecting commuting time apply equally to both sexes.

The findings suggest that the commuting patterns are largely determined by socio-economic factors rather than demographic and social environment factors. This is indicated by the significant change in total explained variance of commuting decisions of Model 2 from Model 1 in the multivariate analysis (results shown in Tables 3, 5 and 6). This may be due to economic constraints which reflect the high cost of living for Bangkok residents. They are forced to focus on maximizing income and cannot take into account family or social environment factors, which may be more important in developed societies. The dominant effect of economic factors in this analysis may reflect the trade-off between cost and benefits of employment factors, the workplace and housing factors (Vickerman, 1984), with

the greatest temphasis being placed on employment factors in determining commuting patterns. However, the values of home ownership shows a significant effect in explaining commuting time and distance. It appears that there are other important environment factors which are not measured in this study that attract people especially the highly educated or persons in high status occupations to move to the outskirts of the city.

Although models specified in this paper were based a cost-benefit framework, they provide a poor explanation of commuting decisions. This is partly because some of the independent variables such as housing and community satisfaction, family structure, and home ownership involve processes which are very difficult to test in a cross-sectional framework. In other words, utilities, both non-monetary and monetary, need to be examined in a longitudinal framework in which adjustments between place of work and residence can be related to the utility placed on various factors. This paper, however, illustrates how commuting decisions can begin to be understood in terms of demographic, socio-economic and social environment factors which can also provide a direct link with research concerning residential location.

The experience of developed societies shows significant relationships between demographic, socio-economic, and social environment factors and commuting decisions. The findings from the present study, however, suggest that these relationships are not directly transferable to a developing society. This may be due to differences in the process of development. In developed societies the stages of industrialization and urbanization were usually in sequence and this has led to the domination of commuting only at more advanced levels of development. In developing societies, the process of development is not likely to follow the same sequence as there is greater intervention through government policies, including urban decentralization (Skeldon, 1990). Bangkok is one example of a developing society where commuting has become dominant at earlier stages of development. The influence of government suburban housing policy has reduced, for most people, the influence of residential preferences in the commuting decision.

The government has to re-examine appropriate policy in planning the urban distribution of the population because of the rapid increase in industrialization and the large-scale rural-urban migration to larger cities (Fuchs and Demko, 1978). Land use patterns as they relate to housing and industrial locations should become a major policy concern, particularly as it seems likely that the development process in developing societies induces changes in both rural and urban areas which can increase the prevalence of commuting. The increase in levels and distance of commuting in the initial stages of development was partly due to improved transportation systems, land shortage and reduction of employment in agricultural sectors close to cities (Mantra, 1978; Singhanetra-Renard, 1981). More recently, commuting time and distance has increased because of the rapid spread of urban areas.

Finally, it would be appropriate to include physical environmental factors in the analysis of commuting patterns because of the obvious problems of pollution in Bangkok. Moreover, the examination of the effects of commuting on individual health, and family and community life is a very important topic for future research.

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# Appendix A

## Community Satisfaction Index

Five aspects of community satisfaction were designed to measure attitudes toward communities: social contacts among participants and with neighbours, social security, individual happiness and crowding. Questions were asked about the strength of (1) social contacts among participants in the community (2) social contact with neighbours (3) security (4) happiness (5) crowding. A high score indicated high satisfaction, except for the attitude towards crowding. The crowding item had a marked depressing effect on the reliability coefficient (alpha) of the index. Therefore, the community satisfaction index was created from the first four items. The alpha cofficient is 0.67.

**Table A1** Corrected Correlation and Alpha of Each Items

| Item | Corrected Item Total Correlation | Alpha If Item Deleted |
|---|---|---|
| 1 | 0.4939 | 0.5731 |
| 2 | 0.5587 | 0.5247 |
| 3 | 0.3750 | 0.6544 |
| 4 | 0.3940 | 0.6410 |

Alpha = 0.6697

1 = Attitude toward social contacts in community
2 = Attitude toward neighbours
3 = Attitude toward security
4 = Attitude toward happiness

## Housing Satisfaction Index

The housing satisfaction index comprised seven items concerning privacy, security, size and structure of the house, nature of the surrounding areas, electricity, and water supply system. The higher the score, the more positive the perceptions and the higher the level of housing satisfaction. The alpha coefficient of the index is 0.74.

**Table A2.** Corrected Correlation and Alpha of Each Item

| Item | Corrected Item Total Correlation | Alpha If Item Deleted |
|---|---|---|
| 1 | 0.5456 | 0.6831 |
| 2 | 0.4903 | 0.6997 |
| 3 | 0.5869 | 0.6702 |
| 4 | 0.5430 | 0.6825 |
| 5 | 0.3925 | 0.7216 |
| 6 | 0.2043 | 0.7567 |
| 7 | 0.4410 | 0.7137 |

Alpha = 0.7369

1 = House is appropriate for needs
2 = House is safe
3 = Size of house
4 = Structure of house
5 = Electrical system of house
6 = Water system of house
7 = Nature of the areas around house

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