Testing the Effect of Family Characteristics on Locational Choice for Residence: Evidence from a Panel Study

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This paper examines the importance of family characteristics in choosing location for residence, especially school districts. In testing this fact, I employ two data set the PSID and the Census of Government, Finance Statistics. The main finding is that families with a lower total child-care time available choose school districts with a higher expenditure to compensate for their time. If we recognize that parental child-care time is important in occurring intergenerational wealth transfer through the cognitive development of the child, this kind of parental compensatory behavior can play an important role in neutralizing variations of the future income of children. (*JEL* classifications: C23, I21, R20)

I. Motivation

Economists have increasingly tried to show the effects of family characteristics on such diverse economic issues as children's performance, family size, intergenerational transfers of wealth and human capital accumulation. However, even though there have been

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many studies about mobility analysis in the last three decades, unfortunately none has tried to tie family characteristics to mobility analysis. Just as demand or kinds of demand are varied according to the demander's characteristics in a modern demand theory of private goods, irrespective of how the motive of mobility is specified, locational choice for residence through mobility will differ according to individual characteristics or preferences. Therefore it is natural that individual characteristics should be central in the mobility analysis.

Most previous studies of mobility analysis including that based on the Tiebout mechanism have focused on the behavior of movers with regard to characteristics of the motive of mobility assumed in each study. For example, with regard to the change in housing demand as a motive of mobility, research showed the average response of movers on dwelling characteristics. To be concrete, the following statement is a clear example of this research: "single detached dwellings are preferred to apartments among movers considered". In a word, even though family characteristics are an important determinant in choosing a location for residence, all previous studies have ignored this aspect. This paper addresses this issue.

This paper has two purposes. First, in the mobility analysis based on the Tiebout mechanism, I show how the characteristics of location chosen by each family expressed in terms of local public services are varied according to the difference in family characteristics. Second, while the original work of Tiebout focused on the role of different local governments in eliciting information about individual preferences for public goods, in choosing location for residence individuals might act in such a way as to undo each local government's decisions. For example, since families with a working mother usually have less child-care time than families with a non-working mother, they might appear to act in a compensatory manner by choosing a community providing a higher school expenditure than do families with a non-working mother. Testing this hypothesis is especially important. Because most studies about student's performance concluded the school inputs are not an important factor in determining a student's performance, to the extent that this hypothesis is accepted, the effect of school input on a student's performance is entirely underestimated in the existing studies. In sum, the second purpose is to test whether families act in a compensatory manner or not, especially in choosing school districts.

Data set merged from the Panel Study of Income Dynamics and

the Census of Government, Finance Statistics are used for the empirical analysis of this paper.

This paper is composed as follows: Section II gives an overview of model and an explanation of the data. Section III gives an explanation of variables to be used in empirical studies. Section IV provides empirical results. Section V concludes.

II. Overview of Model and Data

Family characteristics might be very important facts in analyzing household mobility and local public services provided by each local government are known to be one of the important motives involved in the decision whether to move or to stay. Therefore, combining these two things might give us a new set of facts, contrasted with results obtained from a traditional mobility analysis. To be more specific, first, since moving families are more likely to be closer to their equilibrium quantities of local public services, focusing attention on the locational choices of movers can possibly help isolate the true effects of local public goods on household decision making. To the extent that families with different characteristics have different choices of local public services, this analysis will give us richer information that any other traditional mobility analysis. Second, we can examine how the difference in parents' total child-care time available, especially the mother's child-care time, affect locational choice. That is, it is a well-known fact that a working mother at the given mother education level spends less time in child-care than a non-working mother.[1] As a result, families with a working mother might choose a location which provides a higher school expenditure to compensate the shortage in their child-care time relative to families with a non-working mother. It is important in two respects. First, because many economists, beginning with the pioneering work of Coleman, have confirmed that school inputs are not an important factor in determining a student's performance,

[1]According to C. R Hill and F. P. Stafford (1985), a college-educated woman who works more than 20 hours per week in the market puts in only about 25% less time per child in the care of children under age 5 than all women with a college education. In the case of those high school-educated women who work for more than 20 hours per week, the reduction in child care time is much larger than for college-educated women

to the extent that this hypothesis is accepted, the conclusions in the existing studies might be wrong. Second, to the degree that school quality can substitute for parents child-care time in the development of the cognitive abilities of a child, which is believed to have a close relation to the future income of the child, mobility can be an important factor in neutralizing the future income of a child.

In undertaking this combined mobility analysis, the followings are implicitly assumed: (1) the main motive of mobility is a local public service; (2) each local government is identified by one's public expenditure; (3)distribution of local public expenditures provided by each local government is perfectly known; (4) quality of local public services is well represented in terms of expenditure. Under these assumptions, people choose the community which maximizes their preference. In my analysis, since it is assumed that each local government is characterized according to a local public expenditure provided by that local government, the community chosen by a mover can be expressed in terms of local public expenditures of the community.

For the simplicity of analysis, it is assumed that the utility function depends only on private good C and per capita local public expenditure, LPE. The shape of the utility function of each family is determined by family characteristics, for example, head's education level, sex of head, having-child or not, etc. The nth family's utility function can be expressed as follows:

$$U(C_n,\ LPE:\ x_n), \tag{1}$$

where x_n=the nth family's characteristics. Then each family will choose a community to maximize it's preference among alternatives subject to wealth constraint. Based on the result of this optimization, if the nth family chooses community, the followings are obtained:

$$C_{in}^{*} = G(x_n,\ \text{wealth}) \tag{2}$$

$$LPE_{in}^{*} = F(x_n,\ \text{wealth}). \tag{3}$$

Since wealth can be considered as one factor of family characteristics(for example, it can be expressed as family permanent income), location choice actually depends only on family characteristics including wealth. In formula:

$$LPE_{in}^{*} = \Phi(X_n), \tag{4}$$

where X_n=the nth family's characteristics including wealth. Also if the nth family chooses location i by the result of maximization, the following holds at equilibrium:

$$V(C_{in}^*, LPE_{in}^* : X_n) > V(C_{jn}, LPE_{jn} : X_n) \text{ for any alternative } j. \quad (5)$$

where $V(X_n)$=the indirect utility function of the nth family. As alluded to several times above, the purpose of this section is to examine the relation between local public expenditure and family characteristics. Expenditure for local public services can be divided largely into two parts, expenditure for local public schools and other expenditures[2] A substantial portion of these expenditures is financed by local property tax. Thus variation of expenditure for local public services among communities can be regarded as a variation of local property tax rates.

The estimation of locational choice at this study follows the following[3] based on equation (4):

$$LPE_{in}^* = X'_n \alpha + \varepsilon_{in}. \quad (6)$$

To estimate (6), we need the data set to contain information about family characteristics and local public expenditure of the local government of the place to which the family moves, respectively. Unfortunately, there is no such data set containing both types of informations. While the Panel Study of Income Dynamics(hereafter PSID) data have previously been used for studying individual mobility because of its rich data base on the individual or family, they have not contained relevant information about individual school districts and jurisdictions. However this weakness of the PSID data set can be complemented by Cenus Government, Finance Statistics(hereafter CGFS). The CGFS data set, conducted by the Bureau of the Census by every five years, contains all kinds of finance data about

[2]Police protection, parks and recreation, sewerage and fire protection, etc, are the typical examples for this kind of expenditure.

[3]The estimation method in our model is not a discrete choice approach as used in the traditional locational choice model because expenditure for local public services is a continuous variable. Of course, by dividing communities into several parts according to expenditure levels, for example communities with a high expenditure for local public service and communities with a low expenditure, this model can be converted into a discrete choice mode. However, in doing so, there are two problems: (1)the standard of how to divide is too arbitrary, (2) in the process to convert a continuous variable to a discrete variable, some bias might occur.

all types of government.[4] By merging the PSID data with CGFS data, we can get the complete data set required to estimate our model. In order to merge these data sets, I used the PSID-Geocode Match File[5] which contains address files of the respondents of the PSID data set, including zip cods.[6]

III. Empirical Implementation

It is a well-known fact that school expenditure has occupied the biggest part and has been the most important element among several types of public expenditure.

Furthermore, nowadays, the evidence that large variations in public school expenditures per student across communities exists and several economists have concluded that spending per student can vary by as much as a factor of tow even across nearby communities.[7] If it is taken into account that school expenditure is substantially financed by local property tax,[8] it can be said that

[4]Here "all types of government" implies the federal government. 29,427 special district governments, 3,042 country governments, 19,217 municipal governments, 16,985 township government and 14,721 independent school district governments.

[5]The original purpose of this file was to include the identification code necessary in order to link data from the PSID to the Census Extract dataset drawn from the 1970 and 1980 Census for various levels of geographic aggregation, which is similar to the neighborhood mentioned earlier. This linkage allows addition to the PSID individual-or family-level data of information regarding the characteristics of the geographical area in which families lived. However even the Census Extract dataset do not contain expenditure data for each local government. Additionally, since the PSID-Geocode file contains private information on the respondents, this file can not be used without the permission of the Survey Research Center in Michigan.

[6]However, only part of the data could be merged in this way. Since zip codes from the address files of the PSID-Geocode Match File are those where the respondents live and zip codes from the address files of the CFGS data set are those where each government is located, making a full data set in this way was impossible. For the data sets not mergeable in this way, I could find the zip code of the local government to which the non-merged family moves by using the National Center Education Statistics Common Core of Data Disc(hereafter NCES CCD Disc)and the Geographic Identification Scheme.

[7]See Fernandez and Rogerson (1992).

[8]45-7% of total expenditure was financed by local government in the past

school expenditure reflects the various preferences of movers for local public services better than any other type of local public services. Therefore, without the loss of generality, school expenditure per pupil (hereafter psex) is used as a proxy variable of local public services.

As variables representing family characteristics, several things are considered. First, several variables representing family socio-economic status are considered. Since a contemporaneous measure of income, that is, current income, is problematic in reflecting a family's financial status exactly, permanent family income, which is calculated by averaging family income over four years is used. In addition to permanent family income, head's educational level is considered as another variable describing family socio-economic status.

Second, variables concerning children are taken into account. In choosing a location, the behavior of a family with children, especially school-aged children, will be different form that of a family without children.

Third, in addition to these variables related to generic characteristics are also considered. Since many markets, especially the housing market, are segregated by race, it is a very important in analyzing a locational choice model. In addition, sex of head is taken into account as another variable representing generic variables.

In this paper, local school expenditure is implicitly regarded as a measure of the quality of local schools. However if all school districts in the sample don't face the same input prices, this measure would not be entirely appropriate. In other words, if there are big differences in education costs among school districts, nominal school expenditure can no longer be a good measure of the quality of local schools[9]. Therefore, this nominal variable must be adjusted by the general price level of each school district. But it is impossible to get such a data. As an alternative, we have some variables which are closely related to the general price level of each community. As mentioned before, a substantial proportion of the

decade.

[9]For example, since the general price level is different between rural and urban areas, the salary of teachers which is the biggest part of school expenditures must be compensated in urban areas. Thus, even though teachers in each area are of the same quality, the expenditure of school districts located in urban areas especially metropolitan areas, might be higher than that of school districts in rural areas.

variation of price level among locations can be explained by the difference in residing location. For these variables, the following are used: variables representing whether the respondent moves to a metropolitan area[10] or not, or whether he/she moves to the north-east, north central, south or west[11] It is hoped that use of these variables will largely reduce the bias which can take place when simply using a nominal variable.

In addition to the variables mentioned above, variables related to mother's working behavior are also considered for the second part of the empirical analysis. The real reason to consider a mother's working behavior is to see how the difference in parents' total time for child-care available affects the locational choice. In terms of this, two major systematic differences across families in total time available are considered: the number of adults in a family and the work behavior of the mother. Analysis of this not only provides information about the equity problem as related to intergenerational wealth transfer,[12] but also provides information about the potential long run effects of the increased divorce rates and dramatic changes in female labor force participation rates of the past two decades.[13]

Contrasted with the first part of the empirical analysis, the second part is limited to the family with just children. Therefore, the meaning of variables representing family socio-economic status used in th second part must be somewhat different from the meaning of that in the first part. In other words, as suggested by Hanushek(1992), these two things, head's education level and income, can be regarded as the variables which reflect the quality of parental time.

IV. Empirical Results

The estimation is divided into two parts: the case of the total of

[10]I follow the concept of metropolitan defined by the Census of Bureau. That is, a metropolitan area is defined as a location which has a population greater than 50,000

[11]In Bergstrom, Rubinfeld and Shapiro(1982), the average teacher's salary in the county where the respondent lives was used as a proxy variable.

[12]It is argued by many economist the parental time devoted to the child might affect the future income or life-time income of the child through the cognitive development of the child. For the evidence of this fact, see Hill and Stafford (1977).

[13]For details, see Hanushek (1992).

families which move (hereafter I will call this case the baseline case) and the case of families with children among these families (hereafter the mother's working behaviour case). In order to make an accurate data set, if a family moves within the same community, the family is deleted from the sample. Since the mobility analysis of this paper is based on the "Tiebout Hypothesis", in defining the concept of location, it must be defined as the place providing local public services, for example, a city or school district. Thus, in the case of movers within the same city, as they face the same level of school expenditure before and after movement, their mobility can not be told to follow the "Tiebout Hypothesis".

Furthermore if movers within the same community are included in the data set, non-movers from the PSID data set should be included at the data set, since they also face the same school expenditure even after movement like non-movers. If these cases are not deleted, the data set might lose its consistency. As a result, in the case of 1979, the total number of observations available is 547 from a total of 1720 movers and, in the case of 1982, 299 observations from 1655 movers.[14]

A. Baseline Case

In the baseline model case, the basic structure to be estimated is as follows based on equation (6):

$$PSEX_{ij} = \alpha_1 + \alpha_2 VFSE_j + \alpha_3 VCH_j + \alpha_4 VGE_j + \alpha_5 VGR_j + \varepsilon_{ij}, \qquad (7)$$

where $PSEX_{ij}$: per capita school expenditure of location i chosen by family j

VFSE : variables related to family socio-economic status

VCH : variables related to children

VGE : variables related to generic characteristics

VGR : variables related to location

Table 1 provides variable definition, and Table 2 displays the estimation results for 1979, 1982 respectively. The dependent variable

[14]The one reason for the big difference in the final data set available for both years is that in the case of 1982, since school enrollment data for city –or county–dependent school districts with an enrollment of less than 5,000 is not available, per capita school expenditure can not be calculated in this case. Thus these cases are deleted from the data set. However, the number is not large enough to explain the difference.

and only income variable among the independent variables are taken by log, so the parameter has the usual elasticity interpretation. The first and third models (from column (1) to column (3)) use the number of children as the dummy variable related to children, while the second and fourth (column (2) and column (4)) use the dummy variable dichotomized by having children or not.

Lots of variables are used as dummy variables. Since the intercept term in this kind of model usually captures the omitted dummy variable in the regression, the intercept term in my model reflects the behavior of a family which is non-white, without children, and moves to a non-metropolitan location in the northeast of the United States and the coefficient of included dummy variables reflects the marginal effect between two variables.

The family head's education level(*HE*) and permanent family income(*PFI*) are considered as the variables related to family socio-economic status (hereafter FSE). When these two variables are simultaneously used, the coefficient of income represents a pure income effect, holding education level constant. When both variables are used together, the head's education is significant and positive but the income variable is not significant. This result means that the higher educated, they have a tendency to choose the location providing high school expenditure, holding other things constant. As variables concerned with generic characteristics, the head's sex and race are considered. In the case of race, the coefficients are negative and significant in every case for both years.

This result appears to be somewhat strange. However, this is identical to the result of Bergstrom, Rubinfeld and Shapiro(1982), which just estimates demand function for school expenditure.[15] Furthermore, the difference between whites and non-whites increased by almost two times, from 0.047 in 1979 to 0.073 in 1982. Converted this into dollars, the difference was $96 at 1979 and $147 at 1982. This implies that when non-white movers move, they have a stronger desire to move to a location providing a high quality local public service than do whites who have similar family factors except race. It might be said that as their standard for

[15]The truncation of the sample is suggested as one of the reasons. That is, since their study is confined to homeowners, if black homeowners differ more radically from black renters in their demand for education than is the case for whites, then this parameter can be biased due to truncation. However, the sample used in this paper includes non-white renters.

TABLE 1

VARIABLE DEFINITION

	Dependent Variable
LPSEX	log of school expenditure per student
SEX	school expenditure per student
	Independent Variable
VFSE	
LPFI	log of permanent family income (4 year average of family income)
PFI	permanent family income
HE	head's education level
ME	mother's education level
VCH	
LLD	= 1 if family has a child or children older than 3 years old; = 0 otherwise
LTN1	= 1 if family has a one child than 3 years old; = 0 otherwise
LTN2	= 1 if family has two children older than 3 years old; = 0 otherwise
LTN3	= 1 if family has three children or more older than 3 years old; = 0 otherwise
VGE	
HOS	= 1 if sex of head is female; = 0 otherwise
R	= 1 if head is white; = 0 otherwise
VGR	
LSMSA	= 1 if family moves to a location with population greater than 50,000; = 0 otherwise
GR1	= 1 if family moves to the Northeast; = 0 otherwise
GR2	= 1 if family moves to the North Central; = 0 otherwise
GM3	= 1 if family moves to the South; = 0 otherwise
GR4	= 1 if family moves to the West, = 0 otherwise
VPCHT	(variables related to parents' child-care time, especially the mother's)
WWH	mother's average working hours per week
LWWH	= 1 if mother work; = 0 otherwise
LLWWH	= 1 if mother's working hour $\geq$ 30; = 0 otherwise
NOA	= 1 if both parents exist; = 0 otherwise
HS	house size measured by the number of rooms excluding bathrooms
COMW	commuting hours of wife per week

deciding residential place, non-whites have a stronger preference for local public services than whites have, while whites might have a stronger preference for circumstances of neighborhood,[16] which is considered as a narrower concept geographically.

Sex of head is positive and in almost every case significant. This implies that females are more sensitive to local public services in choosing a location as a residence, compared to males.

As mentioned above, variables related to location are used to reflect general price levels. These variables are significant in both years in all cases except *GR*4. As expected, the coefficient of *LSMSA* in significantly positive and coefficients of *GR* are significantly negative. This is consistent with the fact that metropolitan areas have a higher price level than non-metropolitan areas and the northeast region a higher price level than any other region in the United States.

In general, a family with children wants to move to a school district with a high expenditure. However, while a family with children needs a bigger house than does a family without children, as house prices are more expensive in a school district with a high expenditure than in a school district with a lower expenditure,[17] this desire might be restrained. Thus, if the variable which reflects this fact is omitted, it allows coefficients of the child-variable to reflect not only the pure effect of the child-variable on choosing a school district but also a side effect of the omitted variable. Therefore, the coefficient of the child-variable must be overestimated without controlling the omitted variable. House size which is measured as the number of rooms excluding bathrooms is considered for this purpose. As expected, coefficients of house size have a negative sign. This implies that among movers a family that moves to a big house has a tendency to choose a location with a lower school expenditure than a family which moves to a small house. However, coefficients of variables related to children have a negative sign. This is unexpected result.

[16]The representative example is the ratio of black-white.

[17]As suggested by Oates(1969), if we consider a system in which localities have a varying property tax rate and offer differing levels of output of public services, the house price in a school district with a high expenditure will be higher than the price in a school district with a lower expenditure since the effect of benefits from a high expenditure on house price dominates the effect of a high property tax rate on house price (known as "capitalization effect").

TABLE 2

BASELINE CASE

	1979		1982	
	1	2	3	4
INT	7.28 (49.70)	7.27 (49.59)	7.62 (56.68)	7.59 (56.78)
HE	0.007 (1.76)	0.008 (1.96)	0.014 (2.42)	0.014 (2.54)
LPFI	0.025 (1.43)	0.025 (1.41)	0.0182 (1.42)	0.02 (1.57)
LLD		-0.0017 (-0.08)		-0.0036 (-1.22)
LTN1	0.034 (1.19)		-0.052 (-1.46)	
LTN2	-0.037 (-1.07)		0.039 (0.762)	
LTN3	-0.036 (-0.87)		-0.093 (-1.47)	
HOS	0.063 (2.61)	0.061 (2.55)	0.045 (1.60)	0.046 (1.62)
R	-0.047 (-1.94)	-0.048 (-1.97)	-0.072 (-2.62)	-0.076 (-2.77)
LSMSA	0.086 (4.13)	0.086 (4.15)	0.073 (2.67)	0.068 (2.53)
GR2	-0.217 (-6.73)	-0.214 (-6.62)	-0.073 (-1.73)	-0.065 (-1.54)
GR3	-0.346 (-10.67)	-0.345 (-10.61)	-0.217 (-5.41)	-0.216 (-5.37)
GR4	-0.172 (-5.19)	-0.169 (-5.09)	-0.046 (-1.12)	-0.043 (-1.05)
HS	-0.0058 (-0.96)	-0.0061 (-0.99)	-0.0007 (-0.101)	-0.0002 (-0.98)
Df	524	526	266	268
R^2	26.27	25.69	24.96	23.96

Note: The number of blank is *t*-statistics.

This result might be due to a problem caused by controlling house size that is, the interdependency of permanent family income and house size. In order to avoid the interdependency, the sample was stratified by income level. Table 3 and Table 4 provide results of regression by income level. The crucial result of these tables is that, irrespective of how income level is divided, the coefficients of the variable related to children (here *LLD*) in the lower level of each standard income, usually the lower income family, have a negative sign in both years, while all coefficients in the upper level have a positive sign in 1979 and in the case of 1982, only in the income group greater than 27,000 do they have a positive sign. This result is robust in the case in which an income greater than 27,000 is used as a standard basis. This indicates that usually, a family which belongs to a higher income group among movers is inclined to choose a location providing a higher school expenditure when it has children than when it doesn't have children, while a family belonging to a lower income group among movers is inclined to select a school district with a lower expenditure as residence when it has children. To the extent thant a high income family has the ability to purchase a house according to the number of family, this evidence strongly supports my guess that house size might be a serious obstacle to undo the desire. Another implication to be derived from this evidence is that children from successful families are more likely to be successful not only by virtue of their superior endowments but also by virtue of moving to a school district providing a high expenditure. Other results of Tables 3 and 4 are very similar to the results of Table 2.

B. Mother's Working Behavior Case

It was shown that having-children or not is a very important fact in deciding locational choice for residence. Thus, in this case, in order to see behavior related to locational choice of the family with children in detail, the sample is limited to families with children extracted from the sample used in the baseline case. As a result, the number of observations are reduced to 177 and 77 for each year, respectively. Variables related to parents' total child-care time available are added, instead of variables related to children. The basic estimation model to be used in this section is also based on equation (6) like baseline case. The main body of the equation is as

TABLE 3

BASELINE CASE FOR 1979: BY FAMILY INCOME

	PFI>18000	≤18000	*PFI*>20000	≤20000	*PFI*>25000	≤25000
INT	7.50 (93.3)	7.61 (184.5)	7.50 (85.13)	7.60 (1.875)	7.43 (60.57)	7.61 (201.9)
LLD	0.085 (1.97)	-0.041 (-1.75)	0.072 (1.54)	-0.028 (-1.20)	0.057 (0.82)	-0.019 (-0.88)
R	-0.0019 (-0.030)	-0.050 (-2.01)	-0.016 (0.07)	-0.042 (-1.70)	0.016 (0.16)	-0.050 (-2.12)
LSMSA	0.150 (3.32)	0.081 (3.55)	0.148 (3.09)	0.085 (3.77)	0.206 (2.89)	0.085 (4.05)
GR2	-0.227 (-3.67)	-0.206 (5.51)	-0.216 (3.36)	-0.210 (-5.69)	-0.168 (-1.85)	-0.223 (-6.58)
GR3	-0.270 (-4.16)	-0.371 (-9.96)	-0.260 (-3.78)	-0.371 (-9.96)	-0.068 (-0.66)	-0.380 (-11.3)
GR4	-0.173 (-2.69)	-0.711 (-4.47)	-0.177 (-2.58)	-0.089 (-0.85)	-0.179 (-5.22)	
Df	130	402	109	423	52	480
R^2	20.12	26.73	19.23	25.83	17.17	26.44

TABLE 4

BASELINE CASE FOR 1982: BY FAMILY INCOME

	PFI>18000	≤18000	*PFI*>25000	≤25000	*PFI*>27000	≤27000
INT	8.01 (101.7)	7.96 (160.2)	7.99 (68.37)	7.97 (178.7)	8.03 (62.46)	7.97 (183.8)
LLD	-0.055 (-1.11)	-0.042 (-1.11)	-0.043 (-0.64)	-0.038 (-0.17)	0.07 (0.89)	-0.062 (-2.07)
R	-0.045 (-0.81)	-0.079 (-2.48)	-0.037 (-0.47)	-0.069 (-2.39)	0.003 (0.038)	-0.075 (-26.7)
LSMS A	0.077 (1.60)	0.086 (2.70)	0.053 (0.78)	0.097 (3.33)	-0.033 (-0.43)	0.103 (3.68)
GR2	-0.067 (-0.82)	-0.079 (-1.62)	-0.076 (0.67)	-0.08 (-1.75)	-0.119 (-0.93)	-0.084 (-1.90)
GR3	-0.234 (-3.07)	-0.224 (-4.84)	-0.204 (-1.84)	-0.239 (-5.57)	-0.295 (-2.44)	-0.237 (-5.65)
GR4	-0.085 (-1.08)	-0.038 (-0.78)	-0.062 (-0.56)	-0.053 (-1.18)	-0.082 (-0.67)	-0.061 (-1.40)
Df	99	166	58	207	44	221
R^2	15.66	26.34	12.45	24.68	17.76	25.15

follows:

$$PSEX_y = \alpha_1 + \alpha_2 VFSE_j + \alpha_3 VPCHT_j + \alpha_4 VGE_j + \alpha_5 VGR_j + \varepsilon_y. \quad (8)$$

The crucial point of this section is to see how the difference in parents' total child-care time available affects the choice of a school district. Variables representing the mother's working behavior are used as proxy variables of child-care time. Additionally the mother's commuting hour (hereafter *COMW*) is also considered. If *COMW* is negatively correlated with school expenditure in the sample and this variable is omitted, variables related to the mother's working behavior, especially *LLWWH*, can not be good proxy variables for the mother's child-care time. Since, if these two variables are negatively correlated in the sample, the reason for families with a working mother to choose school districts with a high expenditure might not be for child (less total child-care time available, compared to families with a non-working mother) but for her job. Therefore *COMW* must be controlled in order to get the pure effect of the difference in child-care time available on choosing a school district.

Table 5 provide results. In the case of dependent variable (school expenditure) two forms are considered, that is without taking the log or taking the log. Regardless of how the dependent variable is specified, two measures of family socio-economic status, the wife's education and permanent family income, have a positive sign for both years like the baseline model, but the wife's education level is not significant for both years. Permanent family income is significant only for 1979, but when expressed in terms of dollar units, the size is very small.

As variables for the parents' total child-care time available, the number of adults (hereafter *NOA*) and the mother's working behavior are considered. The coefficient of *NOA* is negative for both years. That is, the family with a single parent has a tendency to choose a school district with a higher expenditure than does the family with two parents. These estimates imply that when it has children, the family with a single parent moves to a school district with a higher expenditure to compensate for less total child-care time available than does the family with two parents. However these estimates are not significant. Variables for the mother's working behavior are not consistent for both years. For 1979 year, the coefficient of *LLWWH* is only significant and positive. The quasi-elasticity with respect to *LLWWH* (the family in which the

TABLE 5

THE CASE OF MOTHER'S WORKING BEHAVIOR

	1979		1982	
	LPSEX	*PSEX*	*LPSEX*	*PSEX*
INT	6.79	1754.7	7.69	3131.5
	(18.92)	(8.83)	(17.24)	(8.31)
WE	0.0004	0.81	0.005	14.9
	(0.05)	(0.61)	(0.35)	(0.46)
LPF1	0.081		0.043	
	(2.23)		(0.99)	
PFI		0.01		0.007
		(2.69)		(1.20)
NOA	-0.015	-23.52	-0.210	-587.6
	(0.17)	(-0.16)	(-1.10)	(-1.23)
WWH	-0.0034	-5.93	-0.002	-5.94
	(-1.08)	(-1.07)	(-0.50)	(-0.62)
LWWH	-0.008	17.61	0.095	270.22
	(-0.14)	(0.18)	(0.99)	(1.11)
LLWWH	0.155	285.0	-0.039	-25.50
	(1.63)	(1.71)	(-0.38)	(-0.10)
HOS	0.089	159.1	0.021	55.13
	(1.39)	(1.53)	(0.32)	(0.35)
R	-0.072	-123.1	-0.124	-302.4
	(1.64)	(-1.61)	(-2.18)	(-2.05)
LSMSA	0.1000	156.5	0.104	216.6
	(2.23)	(1.98)	(1.90)	(1.55)
GR2	-0.233	-398.8	-0.045	-71.98
	(-3.38)	(-3.30)	(-0.42)	(-0.26)
GR3	-0.357	-548.7	-0.254	-622.0
	(-5.27)	(-4.64)	(-2.48)	(-2.39)
GR4	-0.107	152.7	-0.113	-271.8
	(-1.52)	(-1.23)	(-1.05)	(-1.00)
COMH	-0.0002	-0.55	-0.00005	-0.18
	(-0.80)	(1.32)	(-0.12)	(-0.20)
Df	163	163	67	63
R^2	31.49	28.60	34.98	31.34

mother works more than 30 hours per week vs otherwise) is 0.1545. This effect is clearer when the dependent variable is used without taking the log. In the case of families with the mother's working hours more than 30 hours, the average school expenditure of locations chosen by them is higher by $285 than the average school expenditure of locations chosen by other families. In the case of 1982, the coefficient of *LWWH* (working mother vs non-working mother) is only positive. This means that the family with working mother has a tendency to move to a location with a higher school expenditure than does the family with a non-working mother. The coefficient of *LWWH* is absolutely insignificant, but is the most significant among variables considered for the mother's working behavior.

The interesting feature of these estimates is that among all variables considered for the mother's working behavior, the most significant variable has a positive sign for both years. Since income is already controlled, this evidence supports the hypotheses that families with less total child-care time available seem to act in a compensatory manner. Another important implication to be obtained from this result relates to the effectiveness of school expenditure on individual student performance. It has been assumed that student performance usually is determined by both family input and school input. Since the pioneering work of Coleman, many economists have confirmed that school input is not very important in determining student performance. However if families with less total child-care time available choose school districts with a higher expenditure to compensate for the lack of child-care time as our result, the existing results about the effectiveness of school input become unsuitable. That is, the estimates of school input in the existing empirical studies are underestimated due to the family's compensatory behavior. There might be a crowding-out effect (or substitutability) between school inputs and family inputs.

Race is also significantly negative for both years as in the baseline case. However the magnitude is increased enormously relative to the baseline case. This implies that when non-whites have children, they have a much stronger tendency to choose a community providing a higher school expenditure than what they had in the baseline case, compared to whites.

Other variables are similar to the baseline model in 1979, but in the case of 1982, compared to the baseline model, coefficients are

similar in sign, but in almost all cases, not significant.[18]

V. Summary and Conclusions

Family characteristics were found to be very important in choosing location for residence, especially school districts. Education and income had a positive effect on choosing school districts. Geographic variables used as proxy variables for price levels were also found to be crucial. Regarding variables related to children, the effect of these variables on locational choice was somewhat blurred. However, it was obvious that among high income movers, families with children were inclined to choose a location, as residence, with a higher school expenditure than did families without children and that for the mover with children belonging to the lower income group, house size was an important fact in detering their desire to want to move to a school district with a high expenditure. Another surprising result was concerning race. In every case, it was found that non-whites choose community providing a high school expenditure, compared to whites. I can not give a clear explanation for that, but it might be concluded from this evidence that in choosing a place of residence, whites give more attention to circumstances of neighborhood rather than local public services provided by city or county governments, which is a broader concept than neighborhood in terms of geographical concept.

The effect of parents' total child-care time available on choosing a school district was somewhat ambiguous. However, if we consider that the degree of confidence of coefficients in 1982 is low due to the small sample, it can be concluded from the empirical analysis that parents appear to act in a compensatory manner. If we recognize that parental child-care time is an important element in occurring intergenerational wealth transfer through the cognitive development of the child, to the extent that school inputs develope the cognitive ability of the child, this kind of parental compensatory behavior can play an important role in neutralizing variations of the future income of children. In sum, from the evidence related to children in the baseline case and the mother's working behavior

[18]This insignificance might be due to a smaller number of observations. Especially, the number of the sample in which the mother works more than 20 hours per week is only 17.

case, it can be inferred that to the extent that the quality of school education affects the human capital accumulation of children through a location choice.

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