A Theoretical Framework for Analyzing Residence Shifts of Farm Families

B. Delworth Gardner

Brigham Young University

Follow this and additional works at: https://scholarsarchive.byu.edu/facpub

Part of the Agricultural and Resource Economics Commons

BYU ScholarsArchive Citation
https://scholarsarchive.byu.edu/facpub/3743

This Peer-Reviewed Article is brought to you for free and open access by BYU ScholarsArchive. It has been accepted for inclusion in Faculty Publications by an authorized administrator of BYU ScholarsArchive. For more information, please contact scholarsarchive@byu.edu, ellen_amatangelo@byu.edu.
A THEORETICAL FRAMEWORK FOR ANALYZING RESIDENCE SHIFTS
OF FARM FAMILIES*

Larry K. Bond and B. Delworth Gardner**

The ever-changing composition of the American rural population is an established fact and has been the subject of much research.1 Urban families are moving to the "country" to escape the noise and congestion of the city, while the migration of people from the farm to urban centers continues. The net result is a decrease in rural population relative to that classified as urban, although in absolute terms the rural population is increasing also. In 1969, less than 30 per cent of all Americans were classed as rural residents, compared to 60 per cent in 1900 and 95 per cent in 1790.

Of notable interest also is another more recent trend which may have far-reaching implications. Many families that depend on farming for all or part of their livelihood are establishing residence off the farm. What are their reasons for moving into "town", and will the trend continue? Answers to these questions must be obtained before adequate social and economic planning can be done in both urban and rural areas.

A first step toward finding these answers is a theoretical conceptualization of the phenomenon of shifting rural residence and an identification of the factors influencing it.

This paper presents a theoretical model which hopefully will identify the significant causal variables influencing residence location. A brief discussion of national residence trends will precede the derivation of the model.
I. National Trends in Farm Operator Residence

Census data were used to tabulate numbers of farm operators living on and off the farm for various census years since 1940 (Table 1). The estimated number of on-farm residents in 1964 is about one-half of the number estimated for 1940 (Table 1, row 4). The decrease over the entire period is monotonic with the largest absolute decrease between 1954 and 1959 census years. Of course, most of this large decline over the 25-year period resulted from farmers leaving agriculture altogether. Some of the decrease, however, is attributable to the fact that farm operators moved their residences off the farm but remained in agriculture.

In absolute numbers, the estimates indicate that there has been relatively little change over the period in operators living off the farm (Table 1, row 5). The figure in 1940 was approximately 329,000 and was up to 341,000 in 1945, probably reflecting the fact that many farm operators moved off the farm to take part-time jobs to assist the war effort. The year 1950 shows a substantial decline, but this is probably attributable to a unique characteristic of the 1950 census. The 1950 enumeration took place in April, whereas in other years it was done in November-December. Those farmers that maintain a residence in town and one on the farm, especially those in the South, were already in their fields by April. A detailed study of the census data suggests that many of these farm operators who reported on-farm residency in April likely would have reported off-farm residency had the census been taken in November-December as usual, since by this time they would have moved back to their urban homes.

These data should not be misinterpreted. Even though the total number of operators living off the farm in 1964 was about the same as in 1940,
the composition of this group probably changed a good deal. Farm operators
probably left agricultural employment from this group between census years
at about the same rate as those living on farms. If so, those leaving ag-
riculture from off-farm residences must have been almost completely offset
by operators entering the off-farm residence group from the on-farm residence
group.

How many operators are shifting residence off the farm between census
years? Unfortunately, we cannot identify those who move from information
contained in the census. We can, however, roughly estimate the number who
move to off-farm residences (Table 1, row 7). These estimates were obtained
in the following way.

It is assumed that operators living off the farm leave agriculture at
the same rate as those having on-farm residences. The total number of farm
operators declined by 3.9 percent between 1940 and 1945. Accordingly, applying
this rate to the off-farm residers, we might have expected 316,000 in 1945
had there been no residence shifts. Instead, actually 341,000 lived off the
farm. This implies that about 25,000 shifted residence from the farm to
town.

The negative figure (-38,000) in 1950 implies a shift from off-farm
to on-farm residence. This figure, however, probably reflects the enumeration
problem with the 1950 census, alluded to above, rather than a real residence
movement off the farm.

With the exception of 1950, the trend over time is for greater numbers
of operators to shift residence off the farm. Moreover, a careful study of
the data strongly suggests that those operators who are moving off the farm
are not in the process of abandoning agriculture altogether. They are just
| 1. Number reporting living on farms (thousands) | 5,506 | 5,460 | 4,982 | 4,392 | 3,231 | 2,770 |
| 2. Number reporting living off farm (thousands) | 314 | 337 | 268 | 290 | 266 | 291 |
| 3. Number not reporting residence (thousands) | 277 | 62 | 132 | 100 | 207 | 93 |
| 4. Estimated number living on farms (thousands) \(^1\) | 5,768 | 5,519 | 5,107 | 4,486 | 3,422 | 2,854 |
| 5. Estimated number living off farms (thousands) \(^1\) | 329 | 341 | 275 | 296 | 282 | 300 |
| 6. Estimated percent living off farms \(^1\) | 5.4 | 5.8 | 5.1 | 6.2 | 7.6 | 9.5 |
| 7. Estimated numbers shifting residence off the farm (thousands) \(^{iii}\) | 25 | -38 | 52 | 53 | 60 |

Source: U.S. Census of Agriculture \([10]\)

\(^1\) Those not reporting residence were distributed among on-farm residence and off-farm residence by the same percentage in these groups as those who did report residence.

\(^{ii}\) \( \text{Row 2} = \text{Row 1} + \text{Row 2} \)

\(^{iii}\) The following is an explanation of how these figures were estimated. It was assumed that operators living off the farm left agriculture at the same rate as those living on the farm. The rate of decline between 1940 and 1945 for example was 3.9 percent. Had there been no shifting of operator residence from the farm to off the farm, therefore, it might be expected that there would have been \(329 - (329 \times 0.039) = 316,000\) operators living off the farm in 1945. In fact, 341,000 lived off the farm. Under the assumptions above then, 25,000 must have moved from residences on the farm to residences off the farm.
as viable as a group in agriculture as the on-farm residents as indicated by the fact that their farm incomes, on the average, are greater and they have expanded farm size over time just as rapidly as the on-farm group.

The time trends of operator residence can be easily seen in the percentages of farm families living off the farm (Table 1, row 6). The 5.4 to 9.5 per cent increase from 1940 to 1964 is a significant increase. It takes on greater meaning when one realizes that this is a national average and some states have a much higher percentage of off-farm residency. Utah, which ranked highest in the per cent of farm operators living off the farm in 1964, had 26.3 per cent off-farm residence compared to 17.2 per cent in 1954. This is an increase of 9.1 percentage points in just ten years. Texas, which ranked fourth in 1964, showed 21.4 per cent compared to 12.6 per cent in 1954. When viewed on a county basis, several Utah counties reported over 50 per cent of the farm operators living off the farm in 1964 while several counties in Texas exceeded 60 per cent for the same year. The 1969 census, already taken, but not compiled and analyzed, will be studied with interest to ascertain if the county, state, and national trends have continued since 1964.

II. Costs and Decision-Making

The decision to maintain residence on the farm or to move into town embodies more than mere "decision-making" based on costs. It involves subjective evaluation of future gains and losses in utility from various alternatives. Traditionally, in a scientific sense, economists have been concerned with measurable costs in predicting the behavior of rational, utility-maximizing, decision-makers. In this sense, decision-makers do not choose. As James M. Buchanan [5] puts it, "...they behave predictably in response to objectively-measurable changes in their environment." Or
to put it another way, the predictive theorists have been dealing with a
theory of behavior rather than a theory of choice. Thus, costs have been
reckoned in a "utility dimension" in a theory of choice. Cost is purely
subjective in a theory of choice and exists only in the mind of the individual
making the choice. It represents the individual's evaluation of future
utility streams that result from choosing one alternative rather than another.
This is the intellectual framework utilized in this study. The goal of this
paper is to specify a set of causal variables explaining residence location
that derive from a theoretical choice model. ³

III. A Model For Analyzing Residence Location

A basic assumption is that farm households are simultaneously both
producers and consumers. Thus, regardless of whether they live on or off the
farm, they make both production and consumption decisions. Hence, both the
theory of the firm and the theory of the household are relevant and must be
incorporated into the model. Assuming rational behavior, scarce resources
will be allocated among competing consumptive and productive activities in
such a way as to maximize utility. One such variable that deserves special
attention is time, since time is considered a basic resource in both con-
sumptive and productive activities of the model. ⁴

In traditional production theory, time, as a factor of production, enters
the production function indirectly in terms of an opportunity cost. An hour
of labor time, if utilized in one enterprise, cannot be used in another.
The theory of the household, however, has historically overlooked time as
an opportunity cost of consumption. ⁵ Time is utilized in activities necessary
to sustain life (eating and sleeping) and other activities, such as working,
going to a movie, reading, etc. Thus, for any given time period, an individual can increase consumption time of a particular activity only at the expense of one or more other activities. Hence, there is a direct opportunity cost attached to time as a basic resource of consumption.

Farming is relatively free of institutional constraints on the number of hours a farm operator can work. Hence, the operator is "free" to allocate his time among the various productive and consumptive activities facing him. It should be emphasized, however, that it is the farm household and not just the farm operator that is the utility-maximizing entity of this model. Thus, the farm household employs time, labor, capital (including income and savings), and management resources in three basic production activities if consumption can be considered as production of utility:

1) Consumption items that directly enter the consumption function and thus produce utility are produced by combining time and quantities of commodities (goods and services, both tangible or intangible, whether market allocated or provided by nature). Let the quantity of the \( i^{th} \) such consumption item be denoted \( Z_i \) (\( i = 1, \ldots, m \)), where

\[
Z_i = \sum_{k=1}^{q} z_{ik}
\]

and \( z_{ik} \) represents the consumption item \( i \) for each of the \( k \) members of the household. The logic of breaking the \( Z_i \) down into individual family member components stems from the variation in tastes and preferences (and needs) among members of the family. Each member consumes a different 'bundle' of goods although some items may be consumed in equal amounts by several or all members of the household.

2) Time and other resources are combined in order to produce farm products. Let the quantity of the \( j^{th} \) product be denoted \( Y_j \) (\( j = 1, \ldots, n \)).

3) Time and other resources are combined to produce income by working off the farm. Let \( W \) denote household income from off-farm employment where
\[
W = \sum_{k=1}^{q} w_k \quad (k = 1, \ldots, q)
\]

and \( w_k \) (\( k = 1, \ldots, q \)) represents the income of the \( k \)th member of the household.\(^7\) (\( k = 1, \ldots, q \))

**Assumptions**

Certain simplifying assumptions are made in order to focus on the critical explanatory variables of the model. The farm family is assumed to choose those options available to it which will maximize utility. One such option is whether or not to move residence from the farm.

Let perfect competition in both factor and commodity markets be assumed. Moreover, a short-run production function is assumed in which the supply of land and capital (both fixed and operating) is constant. Time spent in work and consumption is variable and is subject to diminishing marginal returns (utility) in both types of activities. It is assumed, moreover, that work and consumption can be strictly separated so that production functions are independent and no 'utility' is derived from work on the farm apart from the income received. That is, it is the income from work and not the work itself which yields utility.

**Production Functions**

The production function for consumption items which directly enter the utility function can be expressed as follows:

\[
(1) \quad z_{ik} = f_{ik}(x_{ik}, e_{ik}, T_{ik}^C) \quad (i = 1, \ldots, m) \quad (k = 1, \ldots, q)
\]

where \( x_{ik} \) is a matrix of market goods, \( e_{ik} \) is a matrix of collective goods or non-market "free" goods, hereafter referred to as environmental goods,\(^8\) and \( T_{ik}^C \) is a matrix of time inputs used in producing the utility of the \( i \)th consumption item.\(^10\) The time element, \( T_{ik}^C \), applies to both market
and environmental goods. Each member of the household combines market and/or environmental goods with time to produce other basic commodities that directly enter the utility function. Expressing $T^C_{ik}$ as a matrix of time inputs allows the differentiation of time according to the time of day or time of week as well as according to each individual member of the family. The reason for this is that some activities are engaged in during the day and others at night, and some on weekends and others during the week. Moreover, not all activities may be engaged in by every member of the household. In short, the opportunity cost of time differs according to time of day and time of week and among the different members of the family. For simplicity, it is assumed that the $x_{ik}$, $e_{ik}$, and $T^C_{ik}$ can be aggregated over the individuals to yield family parameters in these same variables. Thus, the summation of $z_i$ over $k$ in (1) yields the aggregate production function for the household

\[(1a) \quad z_i = f_i(x_i, e_i, T^C_i),\]

which is the relevant production function of the model for basic consumption items.

The production function for farm products is

\[(2) \quad y_j = g_j(L_j, C_j, T^P_j) \quad (j = 1, \ldots, n)\]

where $L_j$ is a vector of land inputs, $C_j$ is a vector of capital inputs, and $T^P_j$ is a vector of time inputs (includes labor and management) used in the production of the various $j$'s. (The bars above $L$ and $C$ denote the supply of these inputs is fixed, which seemed appropriate for the problem at hand.) The vector $T^P_j$ is the sum of the time inputs of each member of the family in the production of the various $j$'s.

The possibility of joint products should now be evident, since the activities of consumption and production can, in some cases, be carried on
simultaneously. A consumption activity, such as watching a sunset, can be engaged in at the same time one is plowing a field. Thus, time becomes a factor in the joint production of a basic consumption item (which enters the utility function directly) and a farm commodity. If joint products are considered important, they could easily be handled in the model by summation of the utilities of the joint products. [7, E. J. Mishan].

The production function for off-farm work is

\[ w_k = w_k(w_k, T_W^k) \quad (k = 1, \ldots, q) \]

where \( w_k \) is a vector of net wage rates for off-farm work, \( T_W^k \) is a vector representing total expenditure of time in off-farm employment by each member of the household. Vectors instead of scalars are used since in some cases more than one member of the household engages in off-farm work. Moreover, wage rates are likely to differ among individuals of the same family.

Since the production function for off-farm work has been viewed separately for each member of the household, the aggregate function can be obtained by summing (3) over \( k \) which yields

\[ W = W(\overline{w}, T^W) \]

where \( \overline{w} \) is a weighted average wage rate for the family, where the weights are the hours spent by each family member working off the farm.

Maximization of Utility

The production functions for the three basic production activities of the farm household are (1a), (2), and (3a). Following the assumption that farm households are utility maximizers, the utility function to be maximized is:

\[ U = U(Z_1, \ldots, Z_m) = U(f_1, \ldots, f_m) = U(x_1, \ldots, x_m; \ e_1, \ldots, e_m; \ T_1^c, \ldots, T_m^c) \]
subject to a resource constraint

\[ h(Z_1, \ldots, Z_m) = Z \]

where \( h \) is an expenditure function of \( Z \) and \( Z \) is the bound on consumption resources.

Recalling production function (1a), consumption items are expressed a functions of market goods, environmental goods, and time. Hence, \( Z \) can be broken down into three component constraints. In some circumstances the environmental constraint can be accepted as a given if the individual family is powerless to alter the supply. In this case

\[ E = \overline{E} \]

Often those environmental goods peculiar to 'country living' are 'free' to those who live in the country. Some of these also can be consumed by urban dwellers at the expense of taking a trip to the country. If time and income constraints are relevant for environmental goods, they should be incorporated in the constraints as shown below. Likewise, some public goods which are a characteristic part of urban life are not as cheaply consumed by rural residents. For example, the public library, city parks, museums, etc., are open to anyone, but those who live out of town must incur expense, both in time and travel, to consume these items.

The market goods constraint can be written as

\[
\sum_{i=1}^{m} P_i^x x_i = ( \sum_{j=1}^{n} Y_j^y P_j^y - \sum_{j=1}^{n} Y_j^c C_j ) + T \overline{W} + \sum_{i=1}^{m} P_i^e e_i
\]

where \( P_i^x \) is a vector of unit prices of \( x_i \), \( P_j^y \) are the market prices of the \( Y_j \), \( C_j \) are the unit costs of producing the \( Y_j \), \( P_i^e \) is a vector of unit prices (expenses) associated with consuming environmental goods, and \( e_i \) are the environmental goods which have a consumption expense associated with them. In other words, the market goods constraint is equal to net farm income plus
net off-farm income of the farm family less what is spent in consuming environmental goods. In this framework, market goods and environmental goods should be considered together and equation (7) can be rearranged into a total goods constraint of the form

\[
(7a) \quad \sum_{i=1}^{m} (P_{i}x_{i} + P_{i}e_{i}) = \left( \sum_{j=1}^{n} Y_{j}P_{j}^{y} - \sum_{j=1}^{n} Y_{j}C_{j} \right) + T_{w}^{w}
\]

The time constraint can be written as

\[
(8) \quad T = \sum_{i=1}^{m} T_{i}^{c} + \sum_{j=1}^{n} T_{j}^{p} + T_{w}^{w}
\]

where T is the total time available for consumption, farm work and off-farm work. Since sleep and other activities necessary to sustain life are considered as consumption items, T equals maximum total man-hours available to the household per relevant time period.

The production functions for basic consumption items (1a) can be written in equivalent form as

\[
T_{i}^{c} = t_{i}^{c}Z_{i}
\]

\[
x_{i} = a_{i}Z_{i}
\]

\[
e_{i} = b_{i}Z_{i}
\]

where \( t_{i}^{c} \) is a vector of time inputs per unit of \( Z_{i} \), \( a_{i} \) is a vector of inputs of market goods, and \( b_{i} \) is a vector of inputs of environmental goods per unit of \( Z_{i} \). That is, \( t_{i}^{c} \) is a functional parameter relating \( T_{i}^{c} \) to \( Z_{i} \) and \( a_{i} \) and \( b_{i} \) are functional parameters relating \( x_{i} \) and \( e_{i} \) respectively to \( Z_{i} \).

While it appears that the problem at hand is to maximize the utility function (4) subject to the multiple constraints (6), (7), and (8) and to
the production relations (9), it is easily shown that the problem can be reduced to the maximization of (4) subject to a single constraint. Since the environmental goods are either present or not present, the physical constraint (6) is unimportant for these goods. When present, the time constraint (8) and an income constraint may be important.

Let the time constraint (8) be rewritten in equivalent form as

\[ T^w = T - \sum_{i=1}^{m} T^c_i - \sum_{j=1}^{n} T^p_j \]

recalling from equation (1a) that \( T^c_i \) includes time spent consuming environmental goods as well as market goods. Substituting the equivalent of \( T^w \) from (10) into the goods constraint (7a) yields

\[ \sum_{i=1}^{m} (p^x_i x_i + p^e_i e_i) = \left( \sum_{j=1}^{n} y^p_j y^p_j - \sum_{j=1}^{n} y^c_j y^c_j \right) + (T - \sum_{i=1}^{m} T^c_i - \sum_{j=1}^{n} T^p_j) \]

where the \( e_i \) represents only those environmental goods which have a travel expense associated with their consumption and the \( p^e_i \) represents the travel expense of the \( i^{th} \) good. Those environmental goods which have no costs whatsoever associated with their consumption can be omitted since the only relevant constraint is time and \( T^c_i \) in (11) includes time spent consuming environmental as well as market goods. When equation (11) is rearranged and values from (9) are substituted into it, the result is a single constraint of the form

\[ \sum_{i=1}^{m} (p^x_i a_i + p^e_i + t^c_i) Z_i + \sum_{j=1}^{n} T^p_j = \left( \sum_{j=1}^{n} y^p_j y^p_j - \sum_{j=1}^{n} y^c_j y^c_j \right) + T^w \]

Equation (12) can be interpreted as follows: The sum of the price of goods and the consumption time per unit of \( Z_i \) plus the opportunity cost of time spent in on-farm work is equal to net income from farm production plus
money income that would be received if all available time were expended in off-farm work. That is, the amount of resources (both time and goods) available for production and consumption activities on the left are constrained by the amount of resources on the right.

To simplify handling of the constraint, let

\[(13) \quad \phi_i = P_i^x a_i + P_i b_i + c_i \]

so that the total resource constraint (12) can be expressed as

\[(14) \quad \sum_{i=1}^{m} \phi_i Z_i + \sum_{j=1}^{n} T_{i,j} = \left( \sum_{j=1}^{n} Y_j P_j Y - \sum_{j=1}^{n} Y_j C_j \right) + T_{i,j}\]

Letting \( Z = (Z_1, \ldots, Z_m) \) and \( \phi = (\phi_1, \ldots, \phi_m) \), the Lagrangean associated with this maximization problem becomes

\[(15) \quad L(Z, \lambda) = U(Z) + \lambda \left[ (\phi Z + \sum_{j=1}^{n} T_{i,j}^p) - \sum_{j=1}^{n} Y_j P_j Y - \sum_{j=1}^{n} Y_j C_j - T_{i,j} \right].\]

In order to yield a maximum, a necessary first order condition is that

\[(16) \quad \frac{\delta L}{\delta Z} = \frac{\delta U}{\delta Z} + \lambda \left[ \frac{\delta \phi}{\delta Z} - Z + \phi \right] = 0\]

where \( \lambda \) is the marginal utility of money income.

**Annual Utility and Choice of Residence**

It will be recalled from the discussion of the time constraint that (8) represents total time available to the household for the various consumption and production activities. It seems desirable to incorporate a temporal dimension to the analysis. This is accomplished by assuming that total utility \( U \) is an annual quantity. Furthermore, it is ex ante (anticipated) rather than ex poste (actually experienced). In other words, farm household decisions are made on the basis of expected utility, \( E(U) \). It follows that it will vary from year to year since there is no a priori reason to assume
it will be constant. The household can visualize a flow of (U's) over some relevant time horizon (s years) which must be discounted back to the present for decision making purposes. The result is a "present value" of the flow of annual utilities, $E(U)$, defined as:

$$E(U) = \sum_{t=1}^{s} \frac{U_t}{(1+r)^t}$$

where $r$ is the rate of discount.

The household decision-maker can estimate an $E(U)$ for residence on the farm and another for residence off the farm. Thus, residence location will be determined on the basis of the highest $E(U)$.

IV. Factors Affecting Farm Residence

Thus far, attention has been focused in a general way on the framework within which residence of farm households can be analyzed. The model suggests broad categories of variables that might be expected to affect residence. The characteristics of these variables must be more clearly specified, however, as a basis for hypothesis formulation and empirical testing. Focus is given to those factors that can be controlled by the household rather than those which are exogenously imposed from without. This is by choice rather than because of any limitation of the model, since any imposed shifts of exogenous variables (such as prices) could be analyzed within the framework of the model.

Several more specific variables are implied by the model as being relevant and analytically useful. They are: 1) Household preferences, and the supplies of consumption and environmental goods, 2) Age and condition of farm housing, 3) Production conditions at the farm, 4) Farm location and travel conditions, 5) Off-farm employment opportunities, and 6) Special
'cultural' characteristics. A brief discussion of each follows.

**Household Preferences and The Supply of Consumption Goods**

Recall that the production function for basic consumption items (1a) is expressed as

\[ z_i = f_i (x_i, e_i, t_i^C). \]

The \( z_i \), including the "goods" and "time" components, and the specification of the production of utility \( f_i \) will be determined largely by tastes and preferences, the income and time constraints on consumption, the availability or lack of various kinds of goods and services, and the prices and time costs of acquiring and consuming these commodities in various residence locations.

Tastes and preferences of the farm household will be influenced markedly by such demographic characteristics as the size of the family, and the age and educational attainments of the members of the family. Families with school-age children will "demand" schooling services, and the costs of schooling (both monetary and time costs) may be quite different if the family lives in town rather than on the farm.

Some commodities, of high household priority, may not be available at one residence location, or if available, may be very costly. For example, one family may set a high priority on living in the country where children can have definite responsibilities (farm chores). Or perhaps, the mere fact that the farm has been in the family for several generations may result in a high priority being placed on farm residence. Swimming lessons or music lessons may be available only in town and would therefore be more costly to farm residents since they require more time inputs as well as travel expense. The range and quality of goods and services offered, both in the private market and through government programs, often differ drastically
between rural and urban areas. It is a question of the size of the community as well as market structure.

With changes in life style, influenced by a lengthening list of consumption items over time, the increased per capita income, the increased emphasis on education, and the seeming trend to more group-oriented activities, such as an almost endless list of things like clubs and PTA, time resources are becoming ever more scarce and market goods are constituting an ever larger proportion of the consumption bundle. This suggests the hypothesis that farm households are moving to urban centers because the complete bundle of goods and services demanded can be acquired more cheaply by living off the farm.

Age and Condition of Farm Housing

Logically, housing could be discussed under the previous subheading; however, since it is such a major consumption expenditure which is integrated to residence choice, it warrants special attention. The expected marginal costs of providing "adequate" housing is largely a function of the age and condition of the house. Many agricultural areas were settled over 100 years ago and housing is often old and in poor condition. Where this is the case, the costs of abandoning the house in favor of one in town is much less than if the house is modern. On the other hand, in those states where taxes on farm housing are less than for a house of equal value in the city, the opportunity cost of living in town is increased. It is expected, therefore, that the age, condition, and relative maintenance costs of farm housing would be highly correlated with shifts in residence.

Production Conditions on the Farm

The production function for farm output in model equation (2) and the specific nature of the $g_j$ will very likely influence the opportunity costs
of residence alternatives. The $g_j$ will be determined by crop and livestock enterprise selection, technology utilized, land, capital and labor resources available, and marketing arrangements for both inputs and outputs.

Some enterprises utilize labor and management fairly constantly throughout the year while others are strictly seasonal. For example, livestock enterprises would tend to require a more even allocation of labor throughout the year than crop enterprises. On the other hand, many livestock feeding enterprises are becoming highly mechanized, which reduces labor requirements considerably, but routine health checks of livestock are still a necessary part of good management. Dairy and egg enterprises require substantial daily labor inputs on a scheduled basis. Irrigation agriculture, which has traditionally required steady doses of labor inputs, has recently been using more mechanized irrigation systems which would permit more hours away from the farm than previously. Since mechanization generally tends to be a substitute for labor, perhaps a fruitful hypothesis would be that farm residence would be higher on that class of farms having a "low" capital-labor ratio.

The size of the farm business may also influence residence location. Some of the larger farms may have hired help living on the farmstead the year around. Where this is the case, the operator may be largely freed from daily routine on the farm, and the opportunity cost of living in town may be less than otherwise would be the case. Moreover, large scale production would be expected to be associated with large net farm incomes. If off-farm consumption is a strongly superior good with high income elasticity, the income effect would favor off-farm residence, ceteris paribus. That is, where incomes are large and many off-farm consumption alternatives are available, the opportunity costs of living on the farm would be correspondingly high, thus inducing off-farm residence.
Farm Location and Conditions of Travel

A recent study suggests that communities having populations greater than 25,000 tend to "reach out" to the hinterlands that surround them [3, B.J.L. Berry and E. Neils]. They provide a wide range of public services and highly developed markets for farm products, farm inputs, and off-farm employment opportunities for family members. Thus, as nearby cities approach this size and become even larger, families may be able to live on the farm and still enjoy some of the benefits of the city. On the other hand, it appears that the smaller cities and towns are not able to provide these services to the rural areas. The consumption parameters, $f_i$, therefore will be importantly linked to the location of the farm relative to town. Hence, ceteris paribus, it may be that counties which have only small towns will have a "low" proportion of farm households living on the farm.

Remoteness and travel conditions are also important. Given the size of city and the services it supplies, the time and travel costs of living on the farm are positively related to the remoteness of the farm and conditions that increase the difficulty of travel, such as crooked roads and bad weather conditions. One would expect, a priori, a greater percentage of off-farm residence as the distance from farm to town increases and as travel conditions become worse, especially if the type of farm does not require year-round presence of the operator. It may be less costly if the operator commutes to the farm from a home in town than having the family commute to town for various reasons from a home on the farm. Thus, the $g_j$ farm production parameters are also affected by farm location and travel conditions.

Off-Farm Employment Opportunities

There is an upward trend in the percentage of farmers in the U.S. who are engaged in part-time employment off the farm. The model developed in
this paper suggests this trend could be expected to have an impact on residence location. Total resources available to the family (Z in (5)) may increase as non-farm income increases, although there may be a decrease in farm income as more time is devoted to off-farm work. Travel time and expense consequent to off-farm employment increase the "costs" of living on the farm. Thus the \( w_k \) (equation 3) are greatly influenced by part-time work opportunities. A reasonable hypothesis would be that, other things being equal, the greater the extent of off-farm employment, the greater the tendency to live off the farm.

**Cultural Characteristics**

Rural settlement patterns in many areas of the U.S. have been influenced by certain institutional and social patterns. People with a common cultural or religious background often settled in the same area, with their cultural and social habits largely responsible for their settlement patterns within a given area. One example is the Mormon settlements in Utah where families established homes in town but worked farms either adjacent to the residence or outside of town. Town living was much more convenient than living on the farm since their social, cultural, and educational activities, as well as religious rites, were closely tied to the community church. On the other hand, alleged discriminatory treatment of minority groups, such as Indians, Negroes, and Mexican-Americans, in towns and cities could be expected to increase the "costs" of living in town. Thus, the parameters in all three production functions of the model would be influenced by these cultural factors.

Measuring the precise effects of all these factors will not be an easy task, but cross-sectional comparisons of residence patterns in localities having basic differences in the causal factors will probably be rewarding.
V. A Concluding Comment

Studies are now underway at Utah State University that will test empirically the importance of factors alleged to be important in this paper. Cross-sectional variations among states in off-farm residence is being analyzed, as is inter-county variation in several selected states. Finally, some intensive local studies are being carried out in Utah to determine differences in social and economic characteristics of farm families living on and off the farm.

By understanding the trends taking place in farm household residence, and reasons for them, we can better plan for the future and increase the probability that scarce land, capital, and human resources are optimally allocated in the interest of all Americans.
FOOTNOTES

* The research on which this study was based was begun under a grant from Resources for the Future, Washington, D.C., and is continuing at Utah State University, financed by a grant from the National Science Foundation. The authors gratefully acknowledge the suggestions of colleagues James B. McDonald and Herbert H. Fullerton, without inferring that they concur with all the results and conclusions.

** Larry K. Bond is Research Assistant and a Ph.D. candidate in Economics and D. Delworth Gardner is Professor of Economics at Utah State University.

1 Some of the more recent studies are the following: Advisory Commission on Intergovernmental Relations [8], C.L. Beale [1], D.J. Bogue and C.L. Beale [4], and statements by Dale Hathaway and Senator Fred R. Harris, Senate Subcommittee on Government Research [9].

2 Source: United States Census of Agriculture [10].

3 The empirical study, testing the causal significance of the variables derived, has been nearly completed. This work, however, has been committed to another publication, the name of which is withheld pending final arrangements. The authors would welcome further inquiries about this work.

4 This approach was taken by Gary S. Becker [2], in his article dealing with the allocation of time.

5 For a very recent exception, read Staffan B. Linder [6].

6 There may be institutional restrictions on the number of hours he or other members of his family can work in off-farm employment.
7The justification for breaking household income down in this manner is that in some families more than one member may work and wage rates will not likely be equal for all members of the family. Moreover, income is not only a function of the wage rate but also a function of time worked, and the productivity of time may also vary among members of the household. Later discussions of time inputs and the opportunity cost of time will make this justification more apparent.

8In the case of consumer durables, the x refers to the flow of services yielded by the goods.

9Environmental goods refer to both the collective goods provided by nature, which are usually considered as being available in the 'country', and public goods and services provided by public expenditures at the various levels of government and which may be quite different if one lives in town rather than on the farm.

10The superscript c refers to time used in consumption to differentiate time used in this way from time utilized in production on the farm (T^p_j) and work off the farm (T^w_k).

11Expenses consequent to off-farm work may include such expenses as baby sitting and travel expense.
REFERENCES


