Modelling Vietnamese Households: A Simple Economic Model of a Village

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Abstract

Following the reforms of *doi moi*, household farms in Vietnam are being affected by policies which are implementing land, financial and trade reforms. The nature of agriculture in Vietnam is such that household farms operate within and are constrained by the activities of their location within a village. Modelling household farms to analyse the effects of changing policies needs to account for the spatial links between farms in relation to labour, inputs and produce, and the constraints that operate on production decisions in the context of a village. In this paper we develop a conceptual household model of Vietnamese farms at the village level, to develop a simple economic model of a village.

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Introduction

Land and its use have been central policy issues in Vietnam for a very long period of time. As explained by Kerkvliet, (2000, pp. 1-2) by 1956 nearly all land in the north of Vietnam had been distributed more or less evenly. In the South the opposite was the case where the land had been returned to previous owners. Following unification in 1975 the Communist Party government outlawed tenancy in the South and redistributed land so that less than six per cent of peasants were without land. In the North, and later in the South, the government insisted on the pooling of land, labour and other resources and the sharing of output. However, by the 1970s there was resistance to this approach so that by 1988 the family household became the basic organisational unit for agricultural production.

According to current law in Vietnam all land belongs to the people of Vietnam as a whole. Thus, there is no ownership of agricultural land but the rights to use the land are allocated to households. Associated with the land use right is the possibility of lending the right to others, mortgaging, exchanging and bequeathing the land use. The life of the land use right is limited in terms of time, 20 years for cropping land and 50 years for perennial crops and there are area limits per household. Redistribution of land is also carried out so as to maintain a degree of equality in the distribution.

Thus, much of Vietnam has a land distribution and use structure which results from a highly regulated and controlled allocation of land. This raises the question as to what will happen to the structure of agriculture if various of the controls on land use are relaxed. In addition, the relationship between changes in land-use policy and the exchange of labour and the products of farm activity are also of interest as well as what are the effects of changing the level of efficiency of land use.

Structure and Organisation of Agricultural Households within the Village Context

To understand some of the issues involved in modelling a village some of the characteristics of Vietnamese villages are considered in this section.

Land allocation to households within a village

Within Vietnam, villages are a common organisational structure. The basic structure of a village is households located centrally/together within or adjacent to an area of land that is farmed by members of the village who have the land use rights (LURs) to the land. A village may be made up of several hamlets. Following *doi moi* and the recognition of the household as the basic unit of

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production (see Kerkvliet, 2000) land-use rights have been allocated to households. This has been done differently in different villages, but generally land has been allocated based on family size and the equitable allocation of parcels of different land quality, especially in the north.

This allocation policy has resulted in fragmentation of land. Typically each household in the Red River delta will have land use rights for 3-10 small plots scattered in different locations (Chung, 1994). In mountainous areas, where land quality is more variable, plot numbers per households can be higher and the distance between plots greater. Throughout Vietnam there are now around 75 million parcels or plots of land, on average 8 to 10 per household (Vy, 2000). The government is encouraging the consolidation of plots at a village level and there is some indication that this is occurring (Marsh and MacAulay, 2001).

There are limits on the size of holdings of between 2 to 3 hectares per household for annually cropped land depending on the district, and land use right titles specify that the land is to be used for either annual or perennial crops (or housing). Five rights are associated with the land-use right: the ability to transfer, lease, exchange, mortgage or inherit land use. There is anecdotal evidence that this is occurring informally (Kerkvleit, 2000), and limited data to support that idea that low-income farmers are transferring land use rights to high and medium-income farmers (Marsh and MacAulay, 2001). Kirsch (1997) suggests that in any village there will be a proportion of people with land (they have title to land use rights) and landless labourers.

Modelling at village level is conceptually one way to capture land transfers within a village that may be resulting in either land consolidation (consolidation of plots into larger plots) or land accumulation (increasing overall farm size), and a resultant increase in landless labour.

Management of the village

Communes are the smallest administrative unit of government, and may consist of a hamlet, a village or several villages, depending on the size. Each level of administration (province, district, commune) has a party committee headed by a secretary, and (on the 'state' side) a popularly elected people's council, which selects a people's committee to take charge of day-to-day administration. These party and state administrative bodies operate in parallel, but with considerable overlap of personnel and responsibilities (East Asia Analytical Unit, 1997). People's committees exist at all levels of administration. In practice, the People's Committee in a village serves as an administrative as well as political body (Kirsch, 1997). Each individual is a commune member, and the People's Committee is the elected body of household representatives over 16 years of age (Kirsch, 1997).

Other mass organisations (for example, Women's Union, Youth Union, Farmers' Association) have similar hierarchical structures at province, district and village level. These organizations can be active in extension activities, off-farm enterprises such as handicraft, and facilitating credit for households through micro-finance schemes and bank loans. Additionally, some districts have agricultural cooperatives, which are organisations of producers (usually concerned with the supply of services, but in some cases also with the organisation of production and the sale of outputs) from one or more villages. Not all households in a village need be members of the cooperative. The structures and interrelationships between villages, communes and cooperatives can be quite

complex. For example, the Nam Son cooperative comprises 1050 households cultivating 281 hectares (Vu Ban District, Nam Ha Province – Red River Delta), and involves farmers from half of Tam Hane commune's four villages (Kirsch, 1997).

Farmers pay agricultural land-use taxes at the commune level and a share is delivered sequentially to the commune, district, province and national levels of government. A land-use tax is charged on the basis of cultivated area according to location and cultivation conditions (six categories for annual crop land and five categories for perennial crop land). In addition, dues are paid to the People's Committee (and to cooperatives if they exist in the village) for special services such as irrigation, electricity, extension services, etc).

In many cases there appears to be production organization within a village, either from necessity (for example, irrigation of wet rice land–paddy) or from tradition. Production can be organised by the cooperative to the extent that it may plan the timetables for the cultivation of plots optimising irrigation and cultivation (Kirsch, 1997). In some districts control over production in still exerted by the State, particularly with regard to rice production (The World Bank in Vietnam, 1998). Production targets are set at a local level in response to government directives and individual households may have to grow crops as directed. Some 4 million hectares of land in Vietnam is still 'required' to grow rice (Vietnam News, 2000).

In relation to the development of economic models of a village there is an issue about control of decision-making. How much control over production do individual households have within a village relative to that dictated by the People's Committee, or by cooperatives? This may be linked to (but not the only cause of) a lack of flexibility in using land for different crops (for example, rice versus vegetables).

Joint activities in a village

The sharing of labour and resources between households is an integral part of village life. Kirsch (1997, p. 2) remarks that:

> 'Vietnam has always had the tradition of mutual self-help at village level. Many joint activities still occur in villages and are often coordinated by the agricultural cooperatives or informal self-help groups.'

He then comments (Kirsch 1997, p. 10):

> 'In most agricultural cooperatives, even in the well-functioning ones, the farmers/members organise themselves within informal self-help groups for different purposes (technology transfer, coordination of irrigation, soil preparation groups, credit groups linked with the banks via mass organisations, handicraft, etc.). A special case is the soil preparation groups organising the joint use of machinery. … The soil preparation group tries to bring together all farmers living in a certain part of the village to arrange for big parcels of land to be ploughed regardless of individual boundaries, thus optimising the use of tractors.'

Thus, another important issue for modelling at a village level is sharing of labour and other resources, either in-kind or paid.

The Economic Conceptualisation of a Village

In a village context transactions costs would appear to be a significant element in determining the transactions and exchanges that take place between the households in a village. For a collectivised agriculture the basic structure is a sharing of the resources and the product of the use of those resources. When households become the basic functional units and have command over resources then trade and exchange of the resources and products will be a significant component of the economic structure of a village. Of course, there will be exchange of output and inputs beyond the boundaries of the village but in terms of simplification it is useful to think of a village as a self-sufficient entity. This will be the case used in this paper. In many respects a collection of villages become a regional economy.

Consider the issue of labour within the context of a village. Sadoulet, de Janvry and Benjamin (1996, p. 1) point out that farm households with different asset positions often relate to labour markets which are typically characterised by large transactions costs that '… make effective wages received when selling labor and effective wages paid when hiring labor diverge …'. Thus, some households sell labour, others hire labour and some are self-sufficient in labour. This situation is analogous to the relationship between trading nations which may import, export of have no trade between them. Labour also has characteristics of not generally being storable

Another major aspect of a household within the context of a village is that it is subject to a budget constraint. This budget constraint is specific to the household yet it is possible for exchanges to take place between households in relation to working capital. Such exchange will also be subject to transactions costs.

In relation to land, another major resource for households within a village, land-use rights or land ownership allow for the transfer of land and land-use between households. These transfers will also be subject to transactions costs.

For the production from the agricultural household, the marketable surplus may be traded with other village households or outside the village. Whether or not a household imports or exports production will depend on many factors but the flows will also be subject to transactions costs. The size of the transactions costs and the excess demand or supply (as reflected by the individual household) will determine the nature of the trade.

Although, there are clearly many factors which make up the relationship between households in a village it is proposed in this paper that the central economic relationships are those of exchange and the associated transactions costs involved in exchanging factors of production and the products of that production.

The Basic Household Model

Early work on the model of an agricultural household appeared in Chayanov (1996) and Sen (1996). Nakajima (1986) and Singh, Squire and Strauss (1986) provide extensive treatments of different versions of the household model and Ellis (1993) provides a more up-to-date review of some of these household models.

To provide the necessary background for the village model the Barnum and Squire (1979) version, as summarised in Ellis (1993), is given below. It is assumed that there is a labour market, in which households can hire labour and be employed, the land available to the household is fixed and the household produces z-goods (goods produced in the household from other goods, including leisure, and using household time). A significant choice faced by the household is between consumption of produced output and its sale to earn cash income. Generation of cash income allows the purchase of other goods. Risk is not included.

In Figure 1 the basic household model is represented where the total time available to the household is indicated as 100 units. This time is divided between the farm work by family members, L_f, hired labour (hired in), L_w, and the home time producing z-goods (including leisure), that is L_z. The vertical axes are measured in total value terms and the horizontal in physical units of labour or time. The opportunity cost of labour or time is given by the wage rate w as reflected in the slope of line ww'. The points of tangency of ww' with the highest possible utility indifference curve and the production function give the optimal levels of use of the various types of time or labour and reflect the fact that the household will use labour so that the opportunity cost of labour is equated to the marginal value product of production. In Figure 1 it is indicated that the household hires labour, Lw, for the production of farm output, uses Lf of family labour and Lz for the production of z-goods. Note that it is possible for the household to be in one of three positions of hiring in labour, hiring out labour and using only family labour (neither hiring in or out).

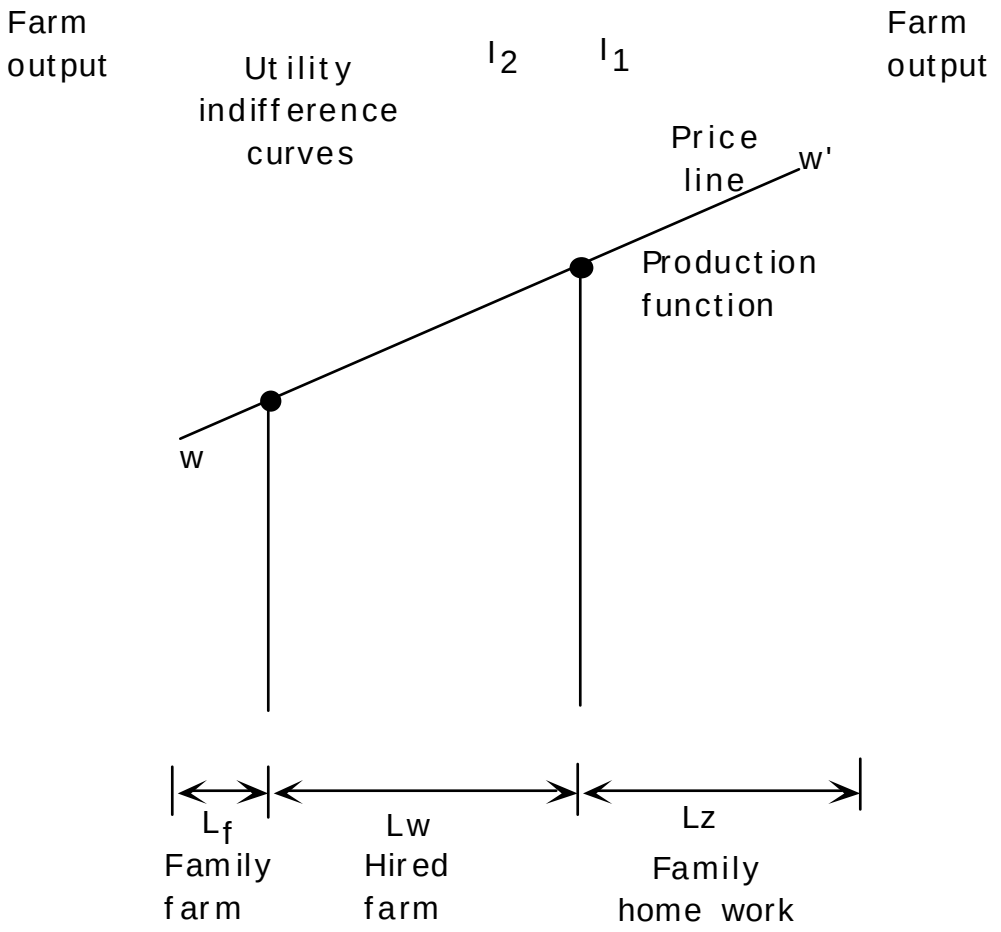

Figure 1 A Representation of the Barnum and Squire Farm Household Model

In algebraic form the basic model of Barnum and Squire (1979) (as presented in Ellis 1993 and modified) is given below (also see MacAulay and Hertzler 2000).

Let U be a well-behaved utility function:

(1) $U = U(L_Z, Q, M)$,

where, Lz is time for the production of z-goods and leisure, Q is home consumption of output, and M is purchased goods. Farm output is generated from the use of farm resources through the production function:

(2) $Y = Y(A, L_F + L_H, X)$

where Y is the household's production, A is land used for farm production, L_F is family labour and $L_{H\,i}$is hired labour and X is the set of variable inputs. The time constraint of the household is as follows:

(3) $L = L_Z + L_F - L_W + L_h$

where L_Z is time allocated to z-goods including leisure, L_F is time allocated to farming, and L_W is hired-out labour allocated to wage based employment and L_H is hired-in labour used for farm production Finally, the household is subject to an income constraint:

(4) $p (Y - Q) + w L_W - w L_H - p_x X = m M$

where the production sold is Y-Q, p is the output price, w is the labour wage rate, p_x is the price of variable inputs X and m is the average price of purchased goods of quantity M.

The important equilibrium conditions for the solution to the model relate to production and consumption. These can be found in a number of places but are given in Barnum and Squire (1979) for a slightly different form of the model. For production the marginal value product of labour equals the wage rate and the marginal value product of the other variable inputs equal their price. For consumption the marginal rates of substitution between each pair of goods in the utility function must equal the price ratios between them.

The important results from such a model relate to the trade offs between the use of time on farm for production and non-farm activities for earning cash income, choices on hiring in and hiring out labour and choices on home consumption versus marketed surplus as illustrated in Figure 1. The effects of changes in relative prices can also be observed.

The purpose in this paper is to further develop this model in such a way that trade or exchange between households, which is subject to transactions costs, can be represented and thus the basic economic aspects of a village modelled.

A Basic Village Model with Labour Transfer

The exchange or sharing of labour between households is one of the important resources that are exchanged in many villages in Vietnam. So as to keep the model to a manageable size only the transfer of labour is considered in this section. In principle, extension to other resources such as land and capital should be straightforward.

At the simplest level, consider that two households form the basis for a generalisation to a village of many households. Let the households be identified as h1 and h2. Then, it is possible to ask how would labour be transferred between two different households? Suppose that h1 has a requirement for hired labour and that household h2 has a matching requirement for off-farm work. Then, also suppose that both households are willing to pay or be paid the necessary wage to bring forth the required amounts of labour. If the labour were to be exchanged without cash exchange then the exchange is also assumed to take place at the relevant opportunity costs. The implication of there being no monetary exchange would be that there would be no effect of the exchange for the budget constraint so that the labour costs and returns would be omitted from the budget relationship.

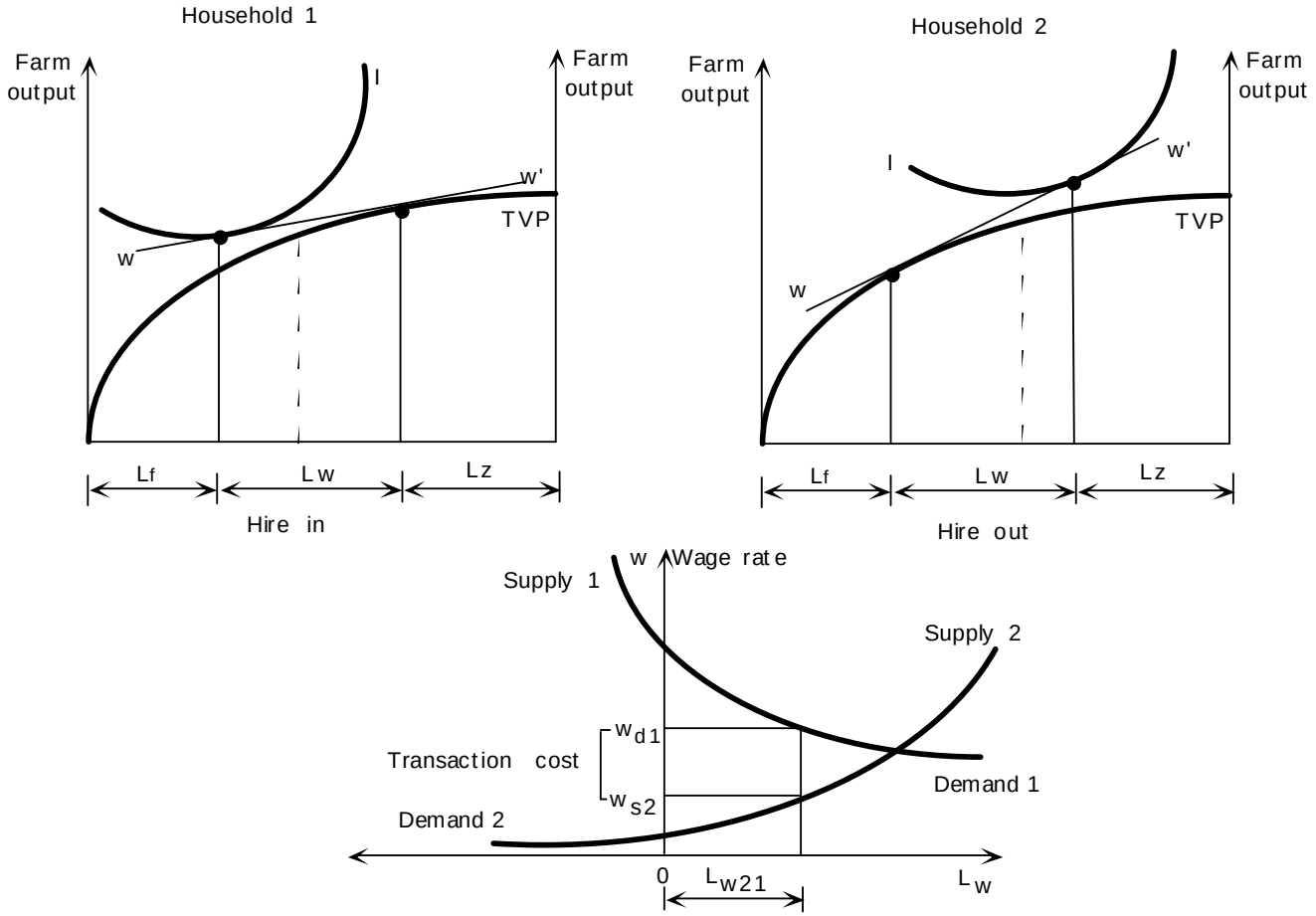

Figure 2 Labour exchange between households

In Figure 2, two representative households are portrayed. In order to obtain the implied labour supply and demand functions (lower panel in Figure 2) for each household it is necessary to vary the slope of the lines ww'. With a flatter line the lower the wage rate. As the wage varies it is possible to trace out for each household the mapping of points which shows the wage rate and the amount of labour hired in or hired out. These relationships are plotted in the lower panel. In this lower panel, the difference between the two wage rates for each household is represented as equal to the transactions costs in trading labour between the two households. By continuing to balance the exchange of labour it is possible to reach an equilibrium with the amount hired in for household 1 with the amount that is hired out by household 2 and the wage rates (or the relevant opportunity costs of labour) differ by the amount of the transaction cost. With such an arrangement it is possible for there to be no exchange of labour over a range of wage rates and for the flow of labour to be reversed.

Next, it is possible to represent a two-household model algebraically. This is given below. The basic structure is that of the Barnum and Squire formulation given above with utility functions (equations (5) and (6)). It is assumed that each household maximises utility over consumption and that in this sense individuals in the household are not distinguished. Also, the concept of z-goods is used in which it is not the purchased goods from which satisfaction is derived but these are combined with household labour or time to produce the z-goods from which final satisfaction is obtained. In addition, the use of time for the production of z-goods is combined with leisure time. Leisure can be considered to be a z-good which requires time to produce. Thus, the variable Lz in the utility functions represent the time used to produce z-goods, including leisure. Within the modelling framework it is assumed that the utility from each household can be treated additively in the objective function for the model.

Farm production is generated through the use of Cobb-Douglas production functions (equations (7) and (8)). Family labour and hired labour are distinguished and as indicated in the production functions may have different productivities.

The focus of the model is on the transfer of labour. The exchange of farm produced output and capital might also be included in applied modelling but in this paper labour is used for purposes of illustration. The time/labour available in each household is defined in equations (11) and (12) and is the sum of Lz, the time supplied for the production of z-goods and the time supplied for farm activity, Lii, and for hiring labour out, Lij. The demand for labour, Ldi, is defined in equations (9) and (10) and is the labour used in farm production, Lii, plus labour hired in, Lji.

The household budget relationships reflect the cash flow of the household (equations (13) and (14)). The marketable surplus (Yi-Qi) is sold at the market price p (assumed to be the same for each household) plus earnings from labour hired out, the cost of labour hired in, the costs of variable or purchased farm inputs, Xi, and the cost of purchased consumption goods, Mi.

Finally, what are termed the wage arbitrage conditions reflect the fact that in the exchange of labour between the households there will be either an explicit or implicit price at which that exchange takes place. The wage rates are separated by transactions costs into demand rates, wdi, and supply rates, wsi. For a particular household there will be no difference between the demand

and supply rates (this assumption could be relaxed if a wage subsidy or tax were present). However, for labour exchanged or traded between households there will be transaction costs involved. These costs may be as simple as the time or cost for travel. In some cases, such labour may not be exchanged for wages but in-kind. In this case the cost and/or income items in the budget constraint would be removed and the exchange would be reflected at the opportunity cost values for labour.

Maximise the sum of the utility functions

Ui = level of utility
Qi = farm production consumed
Lzi = time to produce z-goods including leisure
ki = minimum consumption levels
a_{ij} are parameters

(5) $U1==(Q1-k1)^{a11}\ Lz1^{a12}\ M^{a13}$
(6) $U2==(Q2-k2)^{a21}\ Lz2^{a22}\ M^{a23}$

Subject to

Production functions
Y1 = farm production
Ai= farm area (taken as fixed)
Ldi =demand for household labour on farm
Xi = variable inputs used in production
Lij=labour hired in

(7) $Y1==A1*Ld1^{b11}\ X1^{b12}\ L21^{b13}$
(8) $Y2==A2*Ld2^{b21}\ X2^{b22}\ L12^{b23}$

Farm labour demand
Ldi = demand for labour
Lij = labour transferred from household hi to hj
(9) Ld1 == L11 + L21
(10) Ld2 == L12 + L22

Farm labour supply
Li = total available family time
(11) L1 == Lz1 + L11 + L12
(12) L2 == Lz2 + L21 + L22

Household budget constraint
p = market price for production
wsi = wage for labour hired out or supplied

wdi = wage for labour hired in and used in farm production
pxi = variable input cost
(13) p *(Y1-Q1) + ws1*L12 - wd1*L21 - px1*X1 – m1*M1== 0
(14) p *(Y2-Q2) + ws2*L21 - wd2*L12 - px2*X2 + m2*M2== 0

Wage arbitrage conditions
twij= the transaction cost in the use of labour between households
(15) wd1 - ws1 == 0
(16) wd1 - ws2 == tw21
(17) wd2 - ws1 == tw12
(18) wd2 - ws2 == 0

Within the arbitrage conditions and other parts of the model there are many opportunities for the specification of policy changes in relation to labour. For example, what are the effects of reducing the labour transactions cost such as reducing the walking time between land plots. The effects of wage rate subsidies could be easily examined along with changes in the productivity of different types of labour. By separating male and female labour some of the implications of changing perceptions about the traditional patterns of male and female farm work can be examined.

This model has been prepared as the foundation for a more extensive mathematical programming formulation of a village. Such a model may only include a limited number of households but include the geographical structure of the land holdings in villages in Vietnam and allow for exchange in land, the products produced and also labour. The effects of externalities of one household on another may also be included so that the farm activities of one household may impact on the production function of another household.

It should be noted that the model development is not designed to have a model of a village which includes every household in a representative village. This task would be simply too large. The approach is to collect data on households and use this in the modelling of a small number of households of different types and with different resource endowments. Then it will become possible to examine some of the consequences of policy changes on the way in which households interact with each other.

Dynamic Model Simulations with Risk

Linked with the above work is the development of a model of a household which is dynamic and includes the effects of risk on decision making (MacAulay and Hertzler 2000). The possibility exists of using the above approach for a dynamic model of a village type system. In that work households are assumed to behave as if they maximise their expected utility subject to a budget constraint for the change in wealth. Starting in time zero, initial wealth increases over time with changes in the wealth. Parameters of the consumption and production functions and standard deviations for stochastic risk are fixed within each decision cycle.

Two approaches might be taken to the implementation of such a model into a village like system. The first is to fully integrate the exchange relationships as demonstrated above. The second is to estimate the derived supply and demand equations for a range of different representative households and use these functions in a spatial trading model for land, labour and products. Work is continuing in this area.

Further Work

The integration of households into village like structures seems like a promising approach to the more detailed analysis of policy in developing countries such as Vietnam. In addition, the approach provides a rich training ground in research and economic analysis. The practical side of such modelling work still requires considerable development but with very large capacity mathematical programming systems progress is unlikely to be severely inhibited by computing power. One of the major challenges is the collection of suitable data sets on the nature of villages and the households that make them up.

Further developments in the modelling of agricultural households, particularly under risk, may be in four areas.

First, households are not usually comprised of a single decision-maker, particularly if there is segregation of labour between men and women. Men will have their objectives and women will have theirs. Yet both are usually linked by a common budget constraint. This is an interesting form of dynamic game which has been analysed in problems without risk and could be modified to include risk.

Second, villages have some decisions made by a central authority and some made by individuals. They are linked by the need for individuals to support the village authority which will provide infrastructure, cooperative enterprises and other ways to reduce transactions costs. In other words, a village has both public and private sectors and could be modelled as a game with a mixture in individual and collective decision-making.

Third, many of the resources of the village are not priced in a market-place and probably never will be. Natural and environmental resources, even in developed countries, do not have market prices until they are extracted and sold. Investment in education and knowledge is also unpriced. These unpriced assets could be included along with priced assets to get a more complete accounting of household and village wealth.

Fourth, developed countries have a social safety net which allows entrepreneurs to take risks and risk a failure. Agricultural households in many developing countries have no such safety net and can't risk a failure. This may be a disincentive to development. Studying this issue will require solutions to the agricultural households' decision problem under risk with and without a safety net in place.

It is also clear, that future modelling work with the economics of a village can be used to explore the effects of land exchange (including leases and transfers) on land consolidation and land

accumulation within a village. The village can be thought of as a stock of land plots, some of which are more likely to enter the land market than others, depending on a range of policies (including those for land, inputs and outputs, taxes and credit), the circumstances of individual households, and their location. Land consolidation and accumulation will, in turn, affect land use choice, technology choice and both land and labour productivity (and vice versa) in what is clearly a complex set of interrelationships.

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