SUSTAINABLE AGRICULTURAL DEVELOPMENT: THE ROLE OF INTERNATIONAL COOPERATION

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The Theory of Resource Allocation by Farm Households: The Role
of Off-farm Employment, Household Production and Transaction Costs

INTRODUCTION

'The process of economic development is in part a shift from household production to market production', as Locay (1990) has explained. This 'partial shift', in fact, has three different, although very often mutually interrelated, dimensions. First, numerous economic activities originally carried out within households have been transferred to emerging firms, resulting in an institutional division of labour between households supplying resources such as labour and capital, and firms demanding resources. Supply and demand of resources are coordinated by factor markets, which therefore have a role to play in affecting the economic activities of households and firms. Basically, the division of labour is affected by technological innovations which are reflected in lower costs of production due to economies of scale, requiring inputs of labour exceeding the amounts which could be supplied by a single household.

Second, in contrast to firms employing more workers than can be provided by a single family, there may be other 'firms', even in advanced economies, whose optimal labour input does not exceed, or even falls short of, the labour capacity of single households. This can occur when economies of scale of size in production of specific goods and services are rather restricted, and/or when household labour capacity has been enlarged by labour-saving technological innovations. Instead of large-scale production resulting in an institutional division of labour between households and separate firms, in cases of small-scale production the household and the 'firm' remain as an integrated organizational unit, conveniently designated as a 'family firm', or 'family managed firm'. In agriculture the concept is that of a family farm.[1] In fact, official statistics reveal that the family farm – typically worked jointly by a married couple and their children, or, in many countries by members of an extended family who live together in a single household – is the dominant form of agricultural organization in the United States and in most non-socialist developed and developing countries (Pollak, 1985). Family firms or farms are, therefore, not subject to an institutional division of labour, but only to a functional division of labour with respect to the production of various goods and services.

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Third, all households whether they are only supplying resources to relevant markets, or supplying goods and services to commodity markets, combine family labour with goods and services bought either on markets or produced by the family firm or farm in order to obtain goods and services which the household ultimately desires (household production). Since Becker's (1965) 'new home economics' household production is seen as the economic foundation of households behaviour. Household production plays an important role even in developed countries (Eisner, 1988) and is almost by definition a concomitant of family farming.

Family farming, therefore, implies that farm households have to be seen as the decisive institution organizing farm and household production. This implies, furthermore, that farm family resources are allocated to farm as well as household production. In fact, however, use within the family will compete with employment outside the farm and farm household and thus part-time farming comes to the fore. By extending Becker's non-farm household model to farm households, it can easily be demonstrated that equilibrium in the allocation of household members' time is achieved if the marginal labour product in each of all three competing forms of employment is equal and equal to the marginal utility of leisure time.

In this paper I will present only the fundamentals of the economic theory of farm households, because it is already available (Schmitt, 1989b, 1990a and 1990b). The empirical relevance of that theory, rather than a theory of 'farms as firms', will be demonstrated by analysing the problem of optimal farm size. The implications of principal–agent relations, which appear in all form of economic organization, are considered next. Finally, the role and implications of household production by farm households will be discussed, with some further, final conclusions.

THE THEORY OF FARM HOUSEHOLDS

As already explained, farm households differ from non-farm households only in so far as they allocate resources to farm production in addition to household production and, very often, to off-farm employment. Most non-farm households allocate resources only to household and off-household production of non-farm goods and services. Whether, and to what extent, farm family labour as the major resource is allocated to farm and/or off-farm production alongside household production is determined by the respective marginal value of labour product, which has to be equal if family income is to be maximized.

In Figure 1, that optimal allocation of farm household members' time T is demonstrated, neglecting transaction costs at the start. In the upper part of Figure 1, Y^A reflects the farm's income possibility curve,[2] E, and Y^{A+H} reflects the farm plus household production and (imputed) income possibility curve, whereas Y^{A+H+0} reflects the farm household's aggregated income possibility curve, including off-farm income (the linear segment of that curve). Whereas both the farm and the household's production income curve are subject to the law of diminishing returns, the non-farm income possibility curve is not. This reflects the fact that off-farm wages are not affected by the size of a single
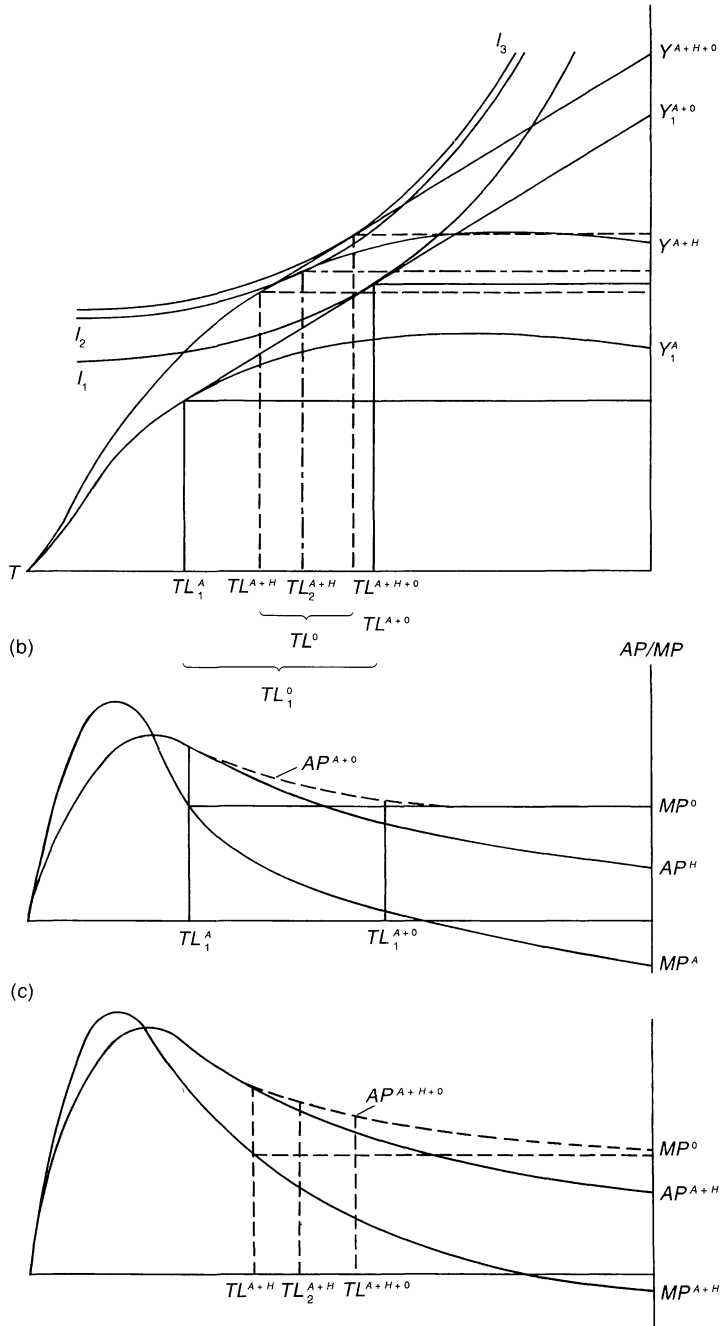
FIGURE 1   *The fundamentals*

household's labour supply (that is, there is perfect competition in labour markets). Assuming perfect markets, the off-farm wage rate represents the opportunity costs of family labour allocated to farm and household production.

Optimal allocation of the farm family's time is achieved if marginal value labour product (*MP*) is equal in all three activities; that is, MP^{A+H} is equal to the off-farm wage rate (MP^0), as the lower part of Figure 1 reveals. In this equilibrium, optimal labour input to farm and household production is TL^{A+H} and to off-farm employment TL^0, so that total labour time is TL^{A+H+0} and leisure time $T–TL^{A+H+0}$ (Figure 1c). As Figure 1 reveals, at the optimal allocation of time, the highest indifference curve I^3 is achieved, and any time allocation different from this equilibrium will be sub-optimal.[3]

As Figure 1 also demonstrates, optimal farm labour input and, hence, the optimal farm size in terms of labour input, are determined by, first, the economies of farm size (reflected in Y^A) and, second, by the opportunity costs of farm labour (MP^0). The higher (lower) opportunity costs are, the smaller (larger) is the optimal farm size *ceteris paribus*. Furthermore, provided that, within the range of household labour capacity, marginal farm labour product achieved is below opportunity cost, off-farm employment is optimal and, hence, part-time farming has to be seen as an efficient resource allocation by farm families. This is contrary to the conventional wisdom, according to which part-time farming is seen as inefficient and not competitive relative to full-time farms.

With respect to Y^A, the second factor affecting optimal farm size in addition to the opportunity costs of farm labour is determined, of course, by the relevant production technique currently prevailing. This incorporates physical production conditions such as the quality of farm inputs and prevailing economic conditions such as sectoral terms of trade. Other things being equal, more efficient production techniques, as well as more favourable physical and economic conditions, favour larger farms. These could employ hired as well as family labour and would, therefore, be organized as family-managed farms. However, it has also to be remembered that household production is important with respect to optimal farm sizes, because household and farm production have to be seen as competitive with respect to the allocation of farm household's time. Figure 1 may also be interpreted in this respect by assuming that household production is more efficient than farm production. This can be demonstrated by simply interpreting Y^A as the imputed income possibility curve of household rather than farm production. In this case, optimal farm labour input (farm size) would be $TL^{A+H} – TL^A_1$ and, thus, it would be smaller than TL^A_1 (the original optimal farm size).

Before discussing the problem of optimal farm sizes, as such, with respect to the form of organization in agriculture, the empirical relevance of off-farm wages to the opportunity cost of farm labour has to be discussed. Of course, markets for (farm) labour are subject to various forms of imperfections and, furthermore, the suitability of farm labour for off-farm activities is restricted by discrepancies in qualifications due to age, sex, education, training and experience (Huffman and Lange, 1989; Gunter and McNamara, 1990). All of these factors may be unfavourable to farm household labour. In this context,
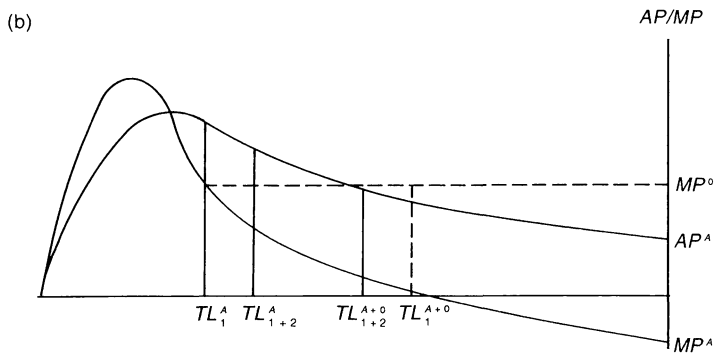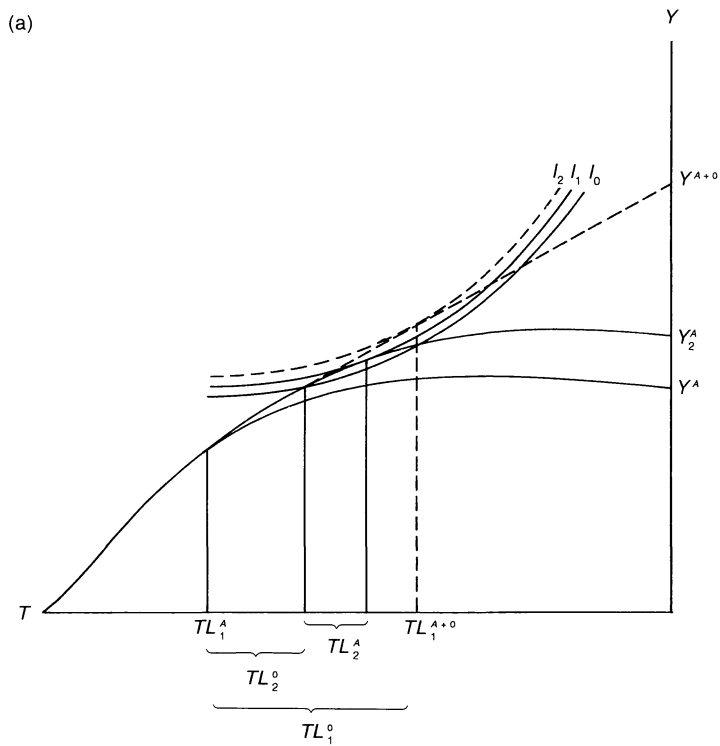
FIGURE 2 *Working time restrictions*

however, a specific, but rather common, imperfection of (formal) markets for labour has to be stressed, namely restrictions concerning minimum and maximum (daily, weekly and lifelong) working time as fixed by relevant regulations.

In Figure 2 the implications of such working time restrictions for optimal time allocation of (part-time) farm households are demonstrated. Without such restrictions, optimal farm labour input would be TL_1^A and off-farm labour input TL_1^0, so that total labour time would be TL_1^{A+0} (neglecting household production) and, thus, indifference curve I^2 would be achieved. By contrast, if maximum off-farm labour time is restricted, say to TL_2^0, optimal labour time offered by the farm household to off-farm employment TL_1^0 exceeds that maximum labour time. Without any adjustment to the relevant regulations, the farm household could only achieve I^0. However, owing to the fact that opportunity costs of labour time exceeding $TL_1^A + TL_2^0$ are below the market wage rate MP^0, it is efficient to enhance farm labour input to TL_{1+2}^A so that marginal farm labour product is below MP^0 but still contributes positively to the household's income. Thus the relevant income possibility curve is Y_1^{A+0} (instead of Y^{A+0} under perfect market conditions) and indifference curve I^1, above I^0, can be achieved. Therefore the optimal farm size is larger than under perfect labour market conditions (Figure 1).

THE PROBLEM OF OPTIMAL
FARM SIZES: FAMILY VERSUS HIRED LABOUR FARMS

Whether farms are organized by farm families or other forms of organization, such as hired labour farms or producer cooperatives, depends *inter alia* on economies of size in farm production, as already stated. In fact, agricultural economists rely almost exclusively on economies of scale, size and scope as determinants of the lowest level of average cost of production and, hence, maximum profits become the decisive criterion of optimal farm size. Furthermore, technological innovations in agriculture are favouring large-scale production, so that smaller than optimal family farms are expected to be replaced by large hired labour farms. This was the view expressed by Karl Marx in 1848.

In analysing the relationship between average production costs and farm sizes, the Office of Technology Assessment (1986, p.113) came to 'two major conclusions: first, most economies of size are apparently captured by moderate-size farms. Second, while the lowest average cost of production may be attainable on a moderate-size farm, average costs tend to remain relatively constant over a wide range of farm sizes. Thus farmers have a strong incentive to expand the sizes of their farms in order to increase total profits.' However, US statistics reveal that the share of moderate-size farms, which are almost exclusively family farms, is rather small and has not increased very much over several decades.[4] The share of those farms which are above moderate size is even smaller, so that the majority of farms are organized by farm families and consist of smaller than moderate-size farms, often seen as less efficient. A large share of these farms are, however, part-time farms.

Therefore three closely interconnected questions have to be raised: first, why are most farms smaller than optimal sized farms? Second, why are these farms organized as family farms? Third, are these smaller than optimal sized family farms really inefficient? Seven explanations are listed, as follows, although only three of them will be discussed more fully later on.

(1) Cost-reducing economies of scale, size and scope in agriculture favouring large hired labour farms are rather restricted as compared with many (but not all) forms of production of non-farm goods and services. Such an assessment is supported by OTA, at least implicitly.

(2) Most technological innovations in agriculture are biased towards increases in labour productivity. Statistics reveal that labour productivity in agriculture has increased two to four times as much as in the non-farm economy. Increases in labour productivity imply corresponding expansion of labour capacities of farm families, thus enabling them to capture economies of size of enlarged farms.

(3) Opportunity costs of family labour are to a large extent below market wage rates of hired labour in industry, and also in agriculture. Low opportunity costs are due not only to specific adverse characteristics of family labour, but are also due to labour time restrictions. The latter may result in part-time farming being an efficient use of labour which is not fully employed outside agriculture. This has already been demonstrated (Figure 2).

(4) Farm households react to changing economic conditions within agriculture by adjusting not only the size and structure of farms but also the size and structure of families. So the migration of farm labour to off-farm employment takes two forms: it may involve remaining in the family's farm household, or leaving that household and founding a new one.

(5) The (farm) family as a small 'team' (Radner, 1987) implies advantages in lower transaction costs relative to other forms of organization, such as hired labour farms and producer cooperatives. That proposition will be discussed more fully later.

(6) The more efficient solution of the 'principal–agent problem' within and by farm families, resulting in lower transaction costs, also enables families to allocate family labour efficiently and in the most flexible way, to farm, off-farm and household production, according to prevailing and rapidly changing economic conditions. This has also been demonstrated theoretically (Figure 1).

(7) Household production provided by farm households is subject to similar production costs (low opportunity costs of family labour) and transaction cost advantages as farm production itself. Therefore household production increases the welfare (real income) of farm families (Fast and Munro, 1991).

THE PRINCIPAL–AGENT PROBLEM IN AGRICULTURE

Whereas the first four propositions mentioned above need no further comment, the role and significance of transaction costs linked to the principal–agent problem, and to that of household production, has to be commented upon.

Since the famous article of Coase (1937) on 'The Nature of the Firm', institutional economists have been well aware of the fact that factor allocation is not automatically achieved by the 'invisible hand' of markets as conventional economics assumes. It involves organizations acting within markets or, more precisely, executives managing the organizations. However, because of imperfections of markets, especially imperfect information resulting in uncertainties and risks, managers' decisions on factor allocation are burdened by organizational or transaction costs. According to Matthews (1986), 'the fundamental idea of transaction costs is that they consist of the costs of arranging a contract *ex-ante*, and monitoring and enforcing it *ex-post*, as opposed to production costs, which are the costs of executing a contract'. Institutional economics also teaches that transaction costs differ between various forms of organization. Thus in a competitive world that organizational form will succeed which has the lowest transaction costs, provided that transaction cost advantages are not neutralized by higher costs of production (Williamson, 1975, 1985). Basically, transaction costs are costs to the organizations which are founded in order to reduce uncertainties and risks of market transactions by better information.

A major problem of allocating resources efficiently, by and within organizations, relates to the coordination of the activities of their employees. The problem is examined within the 'principal–agent' literature which is 'concerned with how one individual, the principal (say an employer), can design a compensation system (a contract) which motivates another individual (his agent, say the employee), to act in the principal's interests' (Stiglitz, 1987). The problem arises because the principal's interests are different from those of his agents. Whereas the principal may be concerned with maximizing profits, the agents pursue utility-maximizing objectives. However, any compensation system which is to work efficiently has to be operated, and that requires agents' actions being monitored and supervised. It is an activity burdened with transaction costs.

The fact that the majority of farms in developing and developed countries are organized by farm families has to be explained mainly by lower transaction costs compensating, or even over-compensating, lower production costs of larger non-family units. Thus Pollak (1985) comes to the conclusion that 'the family farm can be regarded as an organizational solution to the difficulty of monitoring and supervising workers, who, for technological reasons, cannot be gathered in a single location'. Although transaction costs are difficult to measure, as Pollak and others maintain, there is some empirical evidence supporting the conclusion. For instance, Riebe (1961) in analysing the advantages and disadvantages of family and hired labour farms in West Germany, has suggested that 'hired labour farming requires large supervising and administrative activities. According to our analysis, in family farms only 10 working hours per hectare are needed for management contrary to 20 to 25

hours per hectare by hired labour farms. Such differences of labour input are of special importance because administrative personnel are paid relatively high wages. Furthermore, the differences in administrative labour input has to be multiplied by the total area of farms ...'. It has to be added that labour costs of monitoring and supervising hired labour are increasing rather quickly owing to the fact that organizational innovations increasing productivity of administration are relatively scarce. Higher transaction costs of hired compared with family labour implies that hired labour has to be seen, therefore, as an imperfect substitute (Pollak, 1985).

Before the factors affecting those transaction cost differentials are discussed, their implications with respect to optimal farm sizes are demonstrated in Figure 3. This is almost identical to Figure 1(a) except that (opportunity) costs of transactions TC are taken into account. Assuming that these transaction
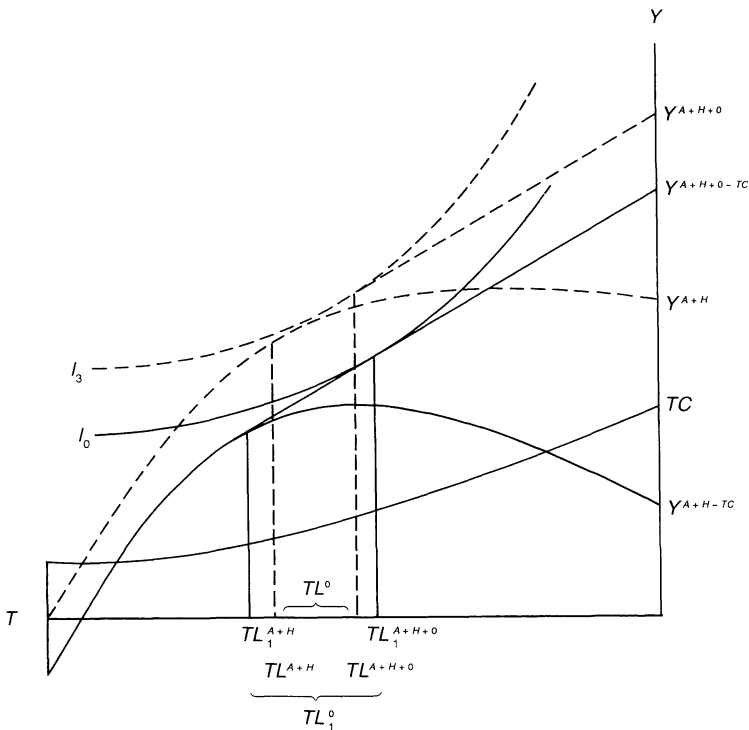

FIGURE 3   *Transactions costs and optimal farm size*

costs have a fixed cost element (Niehans, 1987), average costs are declining (or are constant) as long as family labour is expanded, but are rising if, in addition to family labour, hired labour input is used and further enlarged. As Figure 3 reveals, the relevant farm income possibility curve is Y^{A+H-TC} and the relevant total income possibility curve $Y^{A+H+0-TC}$. Therefore, optimal farm labour input is TL_1^{A+H} (instead of TL^{A+H}) so that the optimal farm size is smaller as compared with Figure 1. Although optimal off-farm labour time (TL_1^0) is larger than without considering TC and, therefore, total labour time supplied by the farm family (TL_1^{A+H+0}) is larger, only indifference curve I^0, instead of I^1, can be achieved.

Why are costs bound to an efficient solution of the principle–agent problem just described higher for hired as compared to family labour, as Figure 3 implies? Pollak (1985) gives the following answer:

> When agricultural tasks can be monitored easily in terms of inputs or outputs, family farms are often overshadowed by other forms of agricultural organization. For some crops and tasks, hired labour can be concentrated into work gangs and supervised directly, so plantation agriculture is possible. For other crops and tasks (e.g. harvesting) output can be measured directly and workers paid on a piece-rate basis ... Nevertheless, since most farm tasks are not susceptible to either of these forms of supervision or monitoring, the family farm is the dominant form of agricultural organization.

Owing to the fact that a farm family as a small team provides better information concerning the actions, comparative advantages and behaviour of family members, as well as the local conditions of the farm, transaction costs are low as compared to large hired labour farms. Pollak's conclusion that the family farm can be regarded as an efficient solution to the principal–agent problem had already received support from Aereboe's (1928) much neglected comparison of the working conditions in agriculture and industry, as well as by his (1923) comparison of family and hired labour farms.

However, there is still an open question concerning the compensation system applied in farm families as a necessary prerequisite of the efficient solution of the principal–agent problem which also faces them. Whereas, in hired labour farms, workers have to be paid whatever their individual performance, family members are most often paid much less. Therefore questions arise about the nature of incentives stimulating the family member's interest in the farm's economic success. That question can only be answered by referring to the role of home production by farm households. Of course, altruism and solidarity may be important in this respect. However, those factors may not be sufficient to explain the monitoring advantages of family farming.

THE ROLE OF HOUSEHOLDS AND THE ECONOMIES OF (FARM) HOUSEHOLD PRODUCTION

According to an American definition a household can include all persons who occupy a housing unit, including related family members and all unrelated

persons, who share the housing unit. For behavioural analysis use is made of the economics of household production (Becker, 1965). The specific economies of household production are due to low opportunity costs of family labour and low transaction costs (Pollak, 1985). These are similar to the economies of farm production by farm families, but are also due to some economies of scale. According to Nelson (1988), the latter are achieved because 'some goods are public within households ... increasing returns in household production of goods and services [and] advantages of bulk discount in purchasing' inputs to that production.

Eisner (1988) has systematically grouped various home production activities, such as 'housework', 'obtaining goods and services', 'care of the family and others including child care', 'helping and teaching children', and 'medical care provided to children and others in the household'. Such an enumeration implies that household production has two important characteristics. First, household production involves a large amount of provision of social security to children, plus provision for family members who may have lost their gainful employment because of age, illness, accident, unemployment, separation or divorce. Of course, private and collective insurance schemes as well as obligatory training and education systems have eroded the role of families as an 'insurance company' (Becker, 1981). However, that role has not yet vanished, even in economically advanced countries, especially with respect to farm households.

Second, household production implies income redistribution between gainfully active and inactive members. That redistribution is affected by the fact that inputs supplied by markets for use in household production have to be financed by income achieved by active members, and also by the fact that the output of home production is distributed both to inactive and active members according to their specific needs. In fact, income redistribution, as effected on the input side of household production, is reflected in the point, mentioned earlier, that pecuniary remuneration of family members engaged in household and farm production is smaller than opportunity costs (market wages). In addition, family members engaged in off-farm employment, and remunerated by market wages, are expected to transfer parts of that income to the household as a compensation for household goods and services consumed.

With respect to income redistribution within (farm) families it might be assumed that incentives stimulating members' efforts and activities would be extremely weak. However, in the longer run, active family members will become inactive because of age, while children currently inactive will become active. Furthermore, the activity of present active members is subject to uncertainties and risks due to unexpected unemployment, illness or accident. The provision of social security by households reduces those uncertainties and risks. Therefore, in the shorter run, there are incentives provided to household provision of social security to guard against unemployment, illness and accident. In the longer run, social security provided by households is valuable in old age, and that again strengthens the efficiency of the incentive systems which operate in farm households. Thus the compensation system provides an efficient solution of the principal–agent problem facing family farm households. They are able to exploit the monitoring and supervising advantages which that form of organization offers to the small team.

SOME MORE GENERAL CONCLUSIONS

Five more general conclusions can be added:

(1) The economics of agriculture can only be explained and analysed adequately by applying the theory of farm households instead of the theory of farms as firms. This will apply as long as agriculture is mainly organized by family farms.

(2) Resources in agriculture and elsewhere are not allocated by the 'invisible hand' of markets but by the visible hand of organizations such as firms, farms, households and government agencies.

(3) Institutional economics offers a broader base for the explanation of the organization of agriculture and its economic operation than does traditional (neo-classical) economic theory. Nevertheless, institutional economics cannot, and should not, replace neo-classical economic theory. The latter must be used and applied as an analytical tool within institutional economics.

(4) Institutional economics can therefore help in explaining why agriculture is mainly organized by farm families and why that organization is an efficient one.

(5) The organization of agriculture by family farms implies that household production, transaction costs and, very often, off-farm employment, do play an economically important role which affects resource allocation and enumeration in a way quite different from that which traditional agricultural economics presumes.

NOTES

[1]There is no strict definition of family firms (farms) with respect to the number of family and non-family members who are gainfully employed. However, in general, family farms may be defined as such if the number of non-family workers does not permanently exceed the number of active family members. Pollak (1985) distinguishes family firms from 'family-managed firms' and from 'firms that are merely family owned in which a single family member participates in management'. According to that definition, most farms in many western countries are predominantly family farms, and to a much smaller extent family-managed farms.

[2]The farm income possibility curve reflects farm families' net farm income, as defined by USDA, which includes earnings of unpaid family members. It differs because capital gains are excluded.

[3]Figures 1(b) and (c) also reveal that, by neglecting the family's allocation of labour time to household production (and off-farm employment), the average (AP) and marginal 'farm' labour product (MP) (and hence family 'income') are under-estimated. Labour productivity in agriculture is most often estimated by relating labour statistically attached to agriculture to that sector's value added (Kuznets, 1971), which is therefore misleading. See Schmitt (1989b).

[4]According to OTA (1986), in 1969 and 1982, 3.1 per cent and 8.1 per cent, respectively, of all farms in the USA were defined as moderate-size farms. In 1987, more than 80 per cent of that category were defined as family farms.

REFERENCES

Aereboe, F., 1923, *Allgemeine landwirtschaftliche Bertriebslehre*, Parey, Berlin.

Aereboe, F., 1928, *Agrarpolitik*, Parey, Berlin.

Arayma, Y., 1989, 'Outmigration from Agriculture and Time Allocation within Farm Households' in *Agriculture and Government in an Interdependent World*, Dartmouth, Aldershot, pp. 63–77.

Becker, G., 1965, 'A Theory of the Allocation of Time', *Economic Journal*, 75, pp. 493–517.

Becker, G., 1981, *A Treatise on the Family*, Cambridge University Press, Cambridge.

Coase, R., 1937, 'The Nature of the Firm', *Economica*, 4, pp. 386–405.

Eggertson, T., 1990, *Economic Behaviour and Institutions*, Cambridge Surveys of Economic Literature, Cambridge.

Eisner, R., 1988, 'Extended Accounts for National Income and Product', *Journal of Economic Literature*, 26, pp. 1611–83.

Fast, I. and Munro, B., 1991, 'Value of Household and Farm Work: Evidence from Alberta Farm Family Data', *Canadian Journal of Agricultural Economics*, 39, pp. 137–50.

Gunter, L. and NcNamara, K.T., 1990, 'The Impact of Local Market Conditions on the Off-farm Earnings of Farm Operators', *Southern Journal of Agricultural Economics*, 22, pp. 155–65.

Huffman, W. and Lange, M., 1989, 'Off-Farm Work Decisions of Husbands and Wives: Joint Decision Making', *Review of Economics and Statistics*, 71, pp. 471–80.

Kuznets, S., 1971, *Economic Growth of Nations. Total Output and Production Structure*, Harvard University Press, Cambridge, MA.

Locay, L., 1990, 'Economic Development and the Division of Production between Households and Markets', *Journal of Political Economy*, 98, pp. 965–82.

Matthews, R., 1986, 'The Economics of Institutions and the Sources of Growth', *Economic Journal*, 96, pp. 903–10.

Nelson, J., 1988, 'Household Economies of Scale in Consumption: Theory and Evidence', *Econometrica*, 56, pp. 1301–14.

Niehans, J., 1987, 'Transaction costs', *The New Palgrave. A Dictionary of Economics*, vol. 4, Macmillan, London, pp. 676–9.

Office of Technology Assessment (OTA), 1986, *Technology, Public Policy, and the Changing Structure of American Agriculture*, Washington, DC.

Pollak, R., 1985, 'A Transaction Cost Approach to Families and Households', *Journal of Economic Literature*, 23, pp. 581–608.

Radner, R., 1987, 'Teams', *The New Palgrave. A Dictionary of Economics*, vol. 4, Macmillan, London, pp. 613–16.

Riebe, K., 1961, 'Arbeit und Betriebsgröße', *Das landwirtschaftliche Betriebsgrößenproblem im Westen und Osten*, Sonderheft 13 der Agrarwirtschaft, Hannover, pp. 83–91.

Schmitt, G., 1988, 'Wie optimal ist eigentlich die "optimale" Betriebsgröße in der Landwirtschaft?', *Agrarwirtschaft*, 37, pp. 234–45.

Schmitt, G., 1989a, 'Warum ist Landwirtschaft eigentlich überwiegend bäuerliche Familienwirtschaft?', *Berichte über Landwirtschaft*, 67, pp. 161–218.

Schmitt, G., 1989b, 'Simon Kuznet's Sectoral Shares in Labor Force: A Different Explanation of His (I + S)/A Ratio', *American Economic Review*, 79, pp. 1262–76.

Schmitt, G., 1989c, 'Farms, Farm Households and Productivity of Resource Use in Agriculture', *European Review of Agricultural Economics*, 16, pp. 257–84.

Schmitt, G., 1990a, 'Is Structural Change Really a Source of Economic Growth? The Case of Agriculture', *Journal of Institutional and Theoretical Economics*, 146, pp. 470–9.

Schmitt, G., 1990b, 'Die ökonomische Logik der Einheit von Haushalt und Betrieb in der Landwirtschaft', *Agrarwirtschaft*, 39, pp. 209–20.

Stiglitz, J., 1987, 'Principal and Agent (II)'.*The New Palgrave. A Dictionary of Economics*, vol. 3, Macmillan, London, pp. 966–72.

Williamson, O., 1975, *Markets and Hierarchies: Analysis and Antitrust Implications*, Free Press, New York.

Williamson, O., 1985, *The Economic Institutions of Capitalism*, Free Press, New York and London.

DISCUSSION OPENING – MARY C. AHEARN*

In his paper Günther Schmitt seeks to establish two major points: first, that the appropriate model for understanding the behaviour of farms is the household production model pioneered by Becker (1965) and extended by many, for example, Pollak and Wachter (1975); second, that hired labour is an imperfect substitute for family labour in agriculture, owing largely to the high level of transaction costs associated with non-family labour, and that these costs are an important force in maintaining family farming and moderating the forces of economies of size on agricultural structure.

The importance of the 'new household economics' for addressing many issues affecting farm behaviour cannot be refuted. The relevant optimizing unit overall is a farm household, not a farm firm. I agree with the author's view that traditionally the firm is taken as the unit of analysis. Historical data series are often a mirror of the ruling concepts of the times. In the USA, although the number of days worked off the farm by the operator were collected by the Census of Agriculture from 1929, estimates of off-farm income were not collected until 1959, and even then only for the farm spouse. In the same vein, until 1988, the USDA has assumed that all of the sector's farm income accrued to the farm operator household – in other words it has assumed that all farms were sole proprietor, single household operations. In general, data on farm firms have taken a back seat to data on farm households.

In the new approach the production, consumption and labour supply decisions of the farm household are addressed simultaneously. Households are assumed to maximize utility subject to constraints of time, income, farm production technology and local labour market opportunities. Utility is a function of leisure and consumption goods. Some of the consumption goods may be produced in the household with inputs from either the market or the farm business.

The dominance of off-farm sources of income in the farm operator household's total income is well established and that dominance will obviously affect resource allocation decisions. In the USA in 1988, some 85 per cent of the cash income of farm operator households came from off-farm sources, two-thirds were more dependent on off-farm income than farm income, and about 90 per cent of farm operator households received some income from off-farm sources (Ahearn, 1990). Depending on how one wishes to define part-time farming, anywhere from one-third to two-thirds of US farms are part-time farms (Ahearn and Lee, forthcoming).

In fairness to the contributions of many agricultural economists, off-farm income and the trade-offs in labour allocation within the farm household have been studied for some time (for example, Lee, 1965). At the recent 1991 American Agricultural Economics Association Meetings, at least seven presentations directly focused on the topic of off-farm income. Many of the farm applications of the household production model have been with respect to developing countries where consumption and production decisions are fully intertwined (Singh, Squire and Strauss, 1986). With reference to the USA,

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Wallace Huffman has applied the model of the new household economics extensively to the labour allocation issue of farm households (Huffman, 1980).

Having stated my basic agreement with one of Schmitt's major points, namely that a more comprehensive model of the farm decision process is appropriate, I would also add that there are times when this model is less appropriate. In empirical applications, the new household model has extensive data requirements and, because of its comprehensiveness, is mathematically complicated. As with many conceptual models, these characteristics impose very real constraints on its applicability. In response to those constraints, economists very often assume separability within a system. In the case of farm firm decisions, that may be a valid assumption for many types of research questions, especially those decisions viewed in the short run. So I do not share Schmitt's apparent view that the most appropriate model for all allocation issues is a household-based model, rather than a firm-based model. Furthermore, a disadvantage of the new household model for some purposes is that it relies on the existence of a functioning rural labour market. In many agricultural areas of the USA, and I assume other places in the world, there is no rural labour market outside agriculture.

Schmitt's second major point is that significant transaction costs exist in hiring non-family labour on the farm. These added costs are the primary reason why family labour is superior, and farm size is seen as constrained by its availability. For example, Schmitt states: 'The fact that the majority of farms in developing and developed countries are organized by farm families has to be explained by lower transaction costs compensating, or even over-compensating, lower production costs of larger non-family units.' In developing his argument, Schmitt draws on the transaction cost literature of the 'new institutional economics' which focuses on the *ex ante* costs of obtaining information about contract selection and the *ex post* costs of the transaction, such as monitoring the contract. He also draws our attention to the relevance of the principal–agent literature and contrasts the motives of family labour versus hired non-family labour with respect to the performance of the farm business.

There are two criticisms. First, I believe he over-states the importance of transaction costs when he argues that the reason that farming is largely a family business is the transaction costs of hiring non-family labour. Many factors shape the agricultural structure, which Schmitt acknowledged earlier and then seems to overlook. The traditional factors viewed as affecting structure, such as technological development and market conditions, cannot be dismissed. This is not to say that transaction costs are unimportant, and may become even more important if the market for hired agricultural workers becomes thinner as a result of regulations and immigration reform. However, ignoring all other factors but transaction costs can lead to faulty results. For example, government policies must have enormous impacts on agricultural structure world-wide, given the massive subsidies and taxes imposed on the sector (World Bank, 1986). As an example of the danger, I refer to a recent analysis of Tunisian agriculture where transaction costs have recently been found to be an important explanation for a move towards sharecropping and away from cash renting by absentee landlords (Matoussi and Nugent, 1989). I have no knowledge from which to question that specification for Tunisian

agriculture and thought the research was interesting and well done, but a specification of a model to explain share renting of major crops in the USA would be meaningless without inclusion of government programmes. Take rice, for example, which is one of the most highly subsidized commodities in US agriculture. About 63 per cent of all rice land in production is share rented, 16 per cent is owned and the rest is cash rented. The major reasons for the high proportion of share rented land can be ascribed to the nature of the programme: (1) share rent landlords are eligible for payments, but not cash rent landlords, and (2) there is a payment limit to individuals, thereby discouraging concentration of ownership in the hands of a few individuals. Transaction costs probably play a minor role in this common tenure arrangement for rice production.

My second criticism of Schmitt's treatment of the role of transaction costs in explaining farm structure is a general one. His explanation for the role of farm households in minimizing transaction costs is tautological: he maintains that the efficient form of farm organization will predominate and, since the family farm predominates, it is the most efficient. This type of a functionalist assumption is a common criticism of the new institutional economics (Datta and Nugent, 1989). Schmitt would have been on much firmer ground had he proposed the importance of transaction costs as a hypothesis to explain the predominance of family farms, and then proposed a means for empirical testing.

The types of transaction costs associated with hiring non-family labour in the past have often been grouped with general management expenses. For example, such expenses serve as the explanation for a theoretical cost curve having a U shape, with costs rising for the largest firm sizes. However, I strongly agree with the author that labour is a unique input and the transaction costs associated with labour merit individual study.

Much can be said about the issue of agricultural labour. We know relatively little about it. In the USA, there is even a controversy about how many annual labour hours we have in agriculture, as well as how to value paid and unpaid family hours (Huffman, Sumner, forthcoming). In addition, valuation of unpaid labour is often critical in the conclusions one can draw about economies of size in agriculture (Vlastuin, Lawrence and Quiggin, 1982). Hired non-family labour is not a perfect substitute for family labour, but it is a partial substitute. It is useful to think of labour as a composite input. Its component parts have implications for the firm and, in the case of family labour, directly for the household. With respect to the firm, labour can offer a physical and a management component. What family labour generally offers relative to hired non-family labour is a large management component. One advantage to family labour is that often the management function (of assimilating relevant production and marketing information) occurs simultaneously with the physical labour. Timmer has stated that one of agriculture's unique features is that labour and management cannot be separated without a loss of efficiency (Timmer, 1988). This is a rather strong statement which probably does not hold for all types of agriculture, for example for commodity production requiring large amounts of hand harvesting or irrigating. However, the message in his statement is consistent with the issue of simultaneity of physical labour

and management that occurs with family, and to a much lesser degree non-family, workers. Schmitt footnotes USDA's practice of valuing unpaid labour at the hired farm wage rate as 'a more or less irrelevant assumption'. The practice is certainly controversial, but one justification for the practice is that the physical labour component of the contribution of the unpaid worker is what is being valued in this treatment. USDA then includes return to management in the residual.

Two important quality differences are that family labour may generally be more flexible in terms of scheduling of work and since less 'shirking' occurs, requires less supervision. The importance of flexibility in agriculture cannot be over-stated. Crop farmers, especially, must wait patiently for the right mix of conditions, most of which are not under their control, to perform many of their field operations. For an operation dependent on hired labour, bottlenecks can occur.

From a household perspective, there are additional distinctions between family and hired non-family workers. First, there is the issue of the intergenerational transfer of wealth, which Schmitt mentions, and other considerations of preservation of the family heritage. Finally, there are benefits which accrue from providing employment and a rural life style to family members. Because utilities are interdependent in a family, both the individual enabling others to have employment and a rural life style and those in the family seeking those arrangements are benefited.

In closing, I would like to commend the author for integrating some very useful literature in the examination of the issues of farm resource allocation.

REFERENCES

Ahearn, Mary, 1990, 'The Role of the Farm Household in the Agricultural Economy', *Agricultural Income and Finance Situation and Outlook*, AFO-37, May.

Ahearn, Mary and Lee, John E. Jr., forthcoming, 'Multiple Job Holding Among Farm Operator Households in the U.S.: Historical Perspective and Future Prospect', in J. Findeis, M. Hallberg and D. Lass (eds), *Multiple Job Holding Among Farm Families in North America*, Iowa State University Press, Ames.

Becker, G., 1965, 'A Theory of the Allocation of Time', *Economic Journal*, 75, September.

Datta, S. and Nugent J., 1989, Ch. 2 in M. Nabli and J.B. Nugent (eds), *The New Institutional Economics and Development: Theory and Application to Tunisia*, North Holland, Amsterdam.

Huffman, Wallace, 1980, 'Farm and Off-Farm Work Decisions: The Role of Human Capital', *The Review of Economics and Statistics*, 62, (1).

Huffman, Wallace, forthcoming, 'A Perspective on Estimating Costs of Human Capital Services and More', Ch. 18 in M. Ahearn and U. Vasavada (eds) *Costs and Returns for Agricultural Commodities: Advances in Concepts and Measurement*, Westview Press, Boulder, Co.

Lee, John E., Jr., 1965, 'Allocating Farm Resources Between Farm and Nonfarm Uses', *Journal of Farm Economics*, 47, (1).

Matoussi, M.S. and Nugent, J.B., 1989, ch. 4 in M. Nabli and J.B.Nugent (eds) *New Institutional Economics*.

Pollak, R. A. and Wachter, M.L. 1975, 'The Relevance of the Household Production Function and Its Implications for the Allocation of Time', *Journal of Political Economy*, 83, (2).

Singh, I., Squire L and Strauss J. (eds), 1986, *Agricultural Household Models: Extensions, Applications, and Policy*, Johns Hopkins University Press, Baltimore, Md.

Sumner, D., forthcoming, 'Human Capital Issues in Measuring Costs of Production', ch. 17, in M. Ahearn and U. Vasavada, (eds), *Costs and Returns*.

Timmer, C. Peter, 1988, 'The Agricultural Transformation', in H.B. Chenery and T.N. Srinivasan (eds) *Handbook of Development Economics*, vol. 1 of *Handbooks in Economics*, 9, North Holland, Amsterdam.

Vlastuin, C, Lawrence D. and Quiggin J., 1982, 'Size Economies in Australian Agriculture', *Review of Marketing and Agricultural Economics*, 50, (1).

World Bank, 1986, *World Development Report 1986*, Oxford University Press, New York.