Multiple job holding and leisure time

CLAUS-HENNIG HANF
ROLF A. E. MÜLLER
University of Kiel

Summary

Many farmers in Western Europe improve their income situations by multiple job holding. Under the economic conditions of the Federal Republic of Germany multiple job holding is typical on many small farms. The analysis of a simple two-persons model shows that, under these conditions, improvement of family income is connected with a reduction of the leisure time of both the farmer and his wife. The leisure time of the wife is, however, reduced to a greater extent than that of the farmer himself.

One of the main aspects of recent structural change in Germany's agriculture has been the reduction in the number of full-time farmers while the number of part-time farmers has slightly increased. In the decade from 1960 to 1970 the number of full-time farmers on farms of two or more hectares decreased by 266,000. On the other hand the number of part-time farmers on farms of two or more hectares increased by 17,000. (Stat. Jahrbuch, 1973, p. 42). The different trends in the numbers of these two types of farmers can be explained to a certain extent by a special form of stepwise departure from agriculture.

At the beginning of this process of departure the farmer will only take up occasional off-farm jobs (= Zuerwerb). After increasing the number of hours worked off the farm he will, at some point, take up full off-farm employment in addition to his work on the farm (= Nebenerwerb), and then finally he will give up farming completely (Heidhues, 1972, p. 46; Köhne, 1972, p. 98). The object of this departure from agriculture is to improve, or at least to maintain, the family income situation (see Köhne, 1972, p. 103 ff).

However, increasing the family income by taking up non-farm employment will affect total labour input. Lee (1965) has shown that in all cases multiple job holding will increase the family's total labour input as well as the family income. However, Lee does not investigate the distribution of the additional labour input to be provided by the farmer and the farmer's wife.¹

¹ In its most general form the effect of an increase in productivity on the allocation of time is investigated by Linder (4, 1970, p. 147f).

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This note is confined to the question of the extent to which the farmer's wife will have
to provide the additional labour input as the farmer increasingly allocates his own labour
input to non-farm employment.

To answer this question it is necessary to expand Lee's model from a one-person
model to a two-persons model. Lee's model is based on the following assumptions:
— diminishing marginal returns of farm labour input;
— diminishing marginal value of leisure time;
— utility of income is proportional to the amount of income.
Figure 1 is based on these assumptions.

Figure 1. Distribution of total time. Case 1: No off-farm employment undertaken

Assuming farmers maximize their utilities they will allocate their total time $OP$ between
labour time $OQ_1$ and leisure time $Q_1P$ such that $g(t) = l(t)$ where:

$g(t) = \text{marginal utility of labour time}$
$g(t) = \text{marginal utility of labour time}$

If there exists the opportunity for off-farm employment at a constant wage rate $(w)$,
Figure 1 can be modified as shown in Figure 2.

Hence, total time $OP$ consists of:
— farm labour time $OQ_1$,
— off-farm labour-time $Q_1Q_2$,
— leisure time $Q_2P$,
such that $w = g(t) = l(t)$.

Comparing Figure 1 and Figure 2 it is clear that multiple job holding leads to:
— a reduction of farm labour input;
— an increase of total labour input;
— a reduction of leisure time.
Considering the actual conditions on many German farms, we introduce the following additional assumptions:

- the farmer works both on and off his farm;
- the wife works both on the farm and in her household.

Hence, Lee's modified model can be specified:

- The income function of farm labour is homogenous of first degree and can be sufficiently approximated by a Cobb-Douglas function:

\[ IF = \gamma_1 x_1^{\alpha_1} z_1^{\beta_1} \]

where

- \( IF \) = income from farm labour
- \( x_1 \) = working hours of the farmer on the farm
- \( z_1 \) = working hours of the wife on the farm
- The farmer works off the farm at a constant wage rate.

(2) \( IW = w \cdot x_2 \)

where

- \( IW \) = income from non-farm employment
- \( w \) = wage rate
- \( x_2 \) = working hours at non-farm employment
- The farmer's wife works in the household to reduce the family's expenditure.

(3) \( IH = \gamma_2 \cdot z_2^{\beta_2} \)

where \( 0 < \beta_2 < 1 \)

- \( IH \) = income (= saving on expenditure) from household labour
- \( z_2 \) = working hours of the wife in the household.
- The marginal utility of the farmer's leisure time and that of his wife are equal and diminishing.
\( LF = \gamma_3 \cdot x_3^{\alpha_3} \) where \( 0 < \alpha_3 < 1 \)

\( LW = \gamma_3 \cdot z_3^{\alpha_3} \)

where

\( LF \) = utility of the farmer's leisure time
\( LW \) = utility of the wife's leisure time
\( x_3 \) = leisure hours of the farmer
\( z_3 \) = leisure hours of the wife

The farmer and his wife are indifferent to the alternative sources of income. Thus, the utility function of the household can be set out as:

\[ U = IF + IW + IH + LF + LW \]

This function can be maximized subject to the constraint functions:

\[ t_F = x_1 + x_2 + x_3 \]
\[ t_W = z_1 + z_2 + z_3 \]

where

\( t_F \) = total time available to the farmer during the period under consideration
\( t_W \) = total time available to the wife during the period under consideration

From (6, 7a, 7b) we obtain the Lagrangean function:

\[ L = IF + IW + IH + LF + LW + \lambda_1 (t_F - x_1 - x_2 - x_3) + \lambda_2 (t_W - z_1 - z_2 - z_3) \]

Equating the partial derivatives with respect to the \( x, z \) and \( \lambda \) variables to zero, we obtain the conditions necessary for the maximum value of this function:

\[ \frac{\partial L}{\partial x_1} = \gamma_1 \cdot \alpha_1 \cdot x_1^{\alpha_1 - 1} \cdot z_1^{\beta_1} - \lambda_1 = 0 \]
\[ \frac{\partial L}{\partial x_2} = \lambda_1 = 0 \]
\[ \frac{\partial L}{\partial x_3} = \gamma_3 \cdot \alpha_3 \cdot x_3^{\alpha_3 - 1} - \lambda_1 = 0 \]
\[ \frac{\partial L}{\partial z_1} = \gamma_1 \cdot x_1 \cdot z_1^{\beta_1 - 1} - \lambda_2 = 0 \]
\[ \frac{\partial L}{\partial z_2} = \gamma_2 \cdot \beta_2 \cdot z_2^{\beta_2 - 1} - \lambda_2 = 0 \]
\[ \frac{\partial L}{\partial z_3} = \gamma_3 \cdot \alpha_3 \cdot z_3^{\alpha_3 - 1} - \lambda_2 = 0 \]
\[ \frac{\partial L}{\partial t_F} = t_F - x_1 - x_2 - x_3 = 0 \]
\[ \frac{\partial L}{\partial t_W} = t_F - z_1 - z_2 - z_3 = 0 \]

2. The conditions are sufficient if \( IF, IW, IH, LF, LW \) are assumed to be positive or zero.
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Equation (11) can be rearranged to

\[(17a) \quad x_3 = \frac{1}{\lambda_1 \gamma_3 \alpha_3 - 1} \]

and (14) can be rearranged to

\[(18a) \quad x_3 = \frac{1}{\lambda_3 \gamma_3 \alpha_3 - 1} \]

Denoting \(\frac{1}{\alpha_3 - 1}\) by \(h\) and \(\frac{1}{\gamma_3 \alpha_3 - 1}\) by \(D\), (17a) and (18a) can be transformed into

\[(17b) \quad x_3 = D \cdot \lambda_1 - h\]

\[(18b) \quad x_3 = D \cdot \lambda_3 - h\]

Substitution of (9) from (12) and rearrangement of the resulting equation gives:

\[(19a) \quad \gamma_1 \cdot x_1 \alpha_1 \beta_1 \cdot x_1 \beta_1 - 1 - \gamma_1 \cdot \alpha_3 \cdot x_1 \alpha_3 - 1 - x_1 \beta_1 = \lambda_3 - \lambda_1\]

Denoting the left-hand-side of (19a) by \(k\), (19a) is transformed to:

\[(19b) \quad x_3 = D \cdot (\lambda_1 + k) - h\]

Since \(\lambda_1 = w\) [see (10)] \(\lambda_1\) can be substituted.

Hence:

\[(19c) \quad \lambda_3 = w + k\]

Substitution of \(\lambda_1\) in (17b) by (10) and \(\lambda_3\) in (18b) by (19c) results in:

\[(17c) \quad x_3 = D \cdot w - h\]

\[(18c) \quad x_3 = D \cdot (w + k) - h\]

Being interested in the changes of \(x_3\) and \(z_3\) if \(w\) changes, we compute the derivation with respect to \(w\):

\[(17d) \quad \frac{dx_3}{dw} = -h \cdot D \cdot w - (h + 1)\]

\[(18d) \quad \frac{dz_3}{dw} = -h \cdot D \cdot (w + k) - (h + 1)\]

Combining (17d) and (18d) we obtain

\[(20) \quad dz_3 = \left(\frac{w}{w + k}\right)^{h + 1} \cdot dx_3\]

Since \(h + 1 > 1\) and \(w\) is a positive variable the relation between the change of the wife's leisure time and the farmer's leisure time is determined by \(k\).

We can put up three conditions:

I  \(|dz_3| < |dx_3|\) if \(k > 0\)

II \(|dz_3| = |dx_3|\) if \(k = 0\)

III \(|dz_3| > |dx_3|\) if \(k < 0\)
Since \( k = \gamma_1 x_1^{\alpha_1} - \beta_1 z_1^{\beta_1 - 1} - \gamma_1 x_1^{\alpha_1 - 1} z_1^{\beta_1} \) the above conditions can be transformed to

\[ \begin{align*}
I' & \quad \left| dx_3 \right| < \left| dz_3 \right| \quad \text{if } z_1 < \frac{\beta_1}{\alpha_1} \cdot x_1, \\
II' & \quad \left| dx_3 \right| = \left| dz_3 \right| \quad \text{if } z_1 = \frac{\beta_1}{\alpha_1} \cdot x_1, \\
III' & \quad \left| dx_3 \right| > \left| dz_3 \right| \quad \text{if } z_1 > \frac{\beta_1}{\alpha_1} \cdot x_1.
\end{align*} \]

These conditions give us some idea of the changes in leisure time caused by the farmer changing the allocation of his labour. Assuming \( \alpha_1 = \beta_1 \), that is, equal productivity of the farmer's and of the wife's farm labour three phases can be distinguished:

1. A full-time farmer normally works more hours on the farm than his wife does (\( z_1 < x_1 \)). Hence, taking up off-farm employment will reduce his leisure time more than that of his wife (condition I').

2. If the farmer increases his non-farm labour at increasing wage rates, there will come a point where he and his wife work the same number of hours on the farm (\( z_1 = x_1 \)) and condition II' is fulfilled.

3. Beyond this point any further increase in off-farm labour by the farmer will result in a reduction of the wife's leisure time which is greater than the reduction of the farmer's leisure time. This situation is characteristic for many part-time farms in Germany.

Furthermore since, usually, \( \beta_1 < \alpha_1 \) condition II' is already fulfilled in a situation where \( z_1 < x_1 \).

However, as the wife's labour productivity will probably improve by both training and learning-by-doing, at least at farms where the wife provides a significant part of the total labour input, \( \beta_1 \) will approach \( \alpha_1 \). Thus, in the long run, leisure time reduction may be compensated for some extent. The implications of these findings for German farms are as follows: If a full-time farmer takes up occasional off-farm employment (= Zuerwerb), he himself will have to provide most of the additional labour. If this process continues, his share of the additional labour time will decline whereas that of his wife will increase. If the farmer takes up full-time off-farm employment, in addition to working on the farm (= Nebenerwerb), then the wife will have to provide most of the additional labour time. Thus the wife will be burdened more heavily than the farmer and suffer a greater loss of leisure time.

However, this burden can be reduced, or even avoided, if such changes are accompanied by an improvement in the wife's labour productivity on the farm.
REFERENCES


