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Income Diversification of Farm Households: Relevance and Determinants in Germany

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Abstract:

During recent years, the number of farms able to generate satisfactory income from agricultural production has continuously decreased in advanced economies. The main reasons are the implementation of the Common Agricultural Policy of 1992 and the increasing capitalization of the primary sector. The relevance of income diversification and interest in various development paths of rural households have, therefore, been renewed in political-economic debates in those countries. The aim of this study is to identify factors that determine income diversification in Germany. An econometric model has been estimated based on a comprehensive survey's data. The results show that the main economic incentive for farm diversification is the expected income increase or resource allocation, whereas risk minimization is less relevant. Access to resources (labor, capital) is an important requirement for tapping alternative economic activities. Other significant variables include the education of the farmer as well as his experience in managing the farm. These findings are relevant for designing effective agricultural policy measures to explicitly meet the heterogeneous needs of the rural households.

Keywords: Income diversification, farm household, survey, Germany

1 INTRODUCTION

The worldwide liberalization of agricultural markets and its accompanying agricultural policy reforms enhance the adjustment pressure and uncertainties for both agriculture and rural populations. In the European Union (EU) during recent years, the number of farms generating satisfactory income from agricultural production has continuously decreased due to the reduction of price-induced production incentives and direct payments, as well as the increasing capitalization of the primary sector. This situation encourages farm households in the EU to increasingly consider alternative income sources (i.e., from non-agricultural areas). The relevance of income diversification and the interest in various development paths of rural households have, therefore, been renewed in the center of politically-economic debate.

Nevertheless, diversifying income sources is not a new phenomenon but a longstanding way of life and work for rural households in advanced economies (MACKINNON ET AL., 2008; NEWTON, 2006). However, over time, the forms and image of part-time farming and income diversification have changed. Currently, income diversification is not seen as an indication of deficient (ineffective) agriculture or as an emergency solution, but rather as a long-term strategy of farm households and a contribution to the sustainable development of rural areas. Therefore, multifunctional development and creating employment possibilities have become long-term political objectives for the European Union (EU) in order to preserve and strengthen the viability and economic power of rural areas. In the case of Schleswig-Holstein, Germany, these political objectives are explicitly expressed in the sustainability strategy of the Federal State's government (LANDESREGIERUNG SH, 2004).

The studies generally assume two economic incentives of farm diversification as an objective. That is, farmers either seek to generate a portfolio of income from activities with varying degrees of risk (risk minimization), or they seek to optimally allocate the household's productive assets among different income-generating activities (resource allocation) (RATHMANN, 2007).

These motives indicate that both generated income and factor allocation must be considered on the household level (FULLER, 1990). That is, the allocation of available household resources between farm-internal and external activities - i.e., labor, time - might provide additional income (resource optimization). This is especially relevant in highly seasonal production lines. The majority of studies in this genre addresses agricultural households' labor market participation and is based on farm-household theories. Fundamental empirical work is provided by SUMNER (1982) and HUFFMAN (1980). The studies generally explain the influences of operational (farm-specific), socio-demographical factors, as well as regional characteristics and political measures on labor market participation (MISHRA and GOODWIN, 1997; GLAUBEN AT AL., 2008; HENNESSY AND REHMAN, 2008).

Another motive of income diversification is risk minimization. If the profits from different activities are negatively correlated with each other, it is possible to reduce the variability (risk) of total income by attributing the risk to various activities (ROBISON and BARRY, 1987; NEWBERY and STIGLITZ, 1981). Respective empirical studies are essentially based on a risk-variance approach. In this connection, parameters such as risk attitude, level of income, and farm size have been analyzed (MISHRA ET AL., 2004; MCNAMARA and WEISS, 2005). In spite of the broad literature, there are hitherto only a few studies and approaches, which provide an analysis of all alternative income sources for rural households.

The goal of this study is to identify the degree of farm diversification, and the factors that facilitate or impede it, in the German Federal State of Schleswig-Holstein. The empirical application utilizes a comprehensive data set of 324 rural households. The paper is organized as follows: In the next section, various diversification measures will be discussed and an appropriate index will be identified in order to consider the whole spectrum of possible income sources (Chapter 2). Finally, its determinants will be identified using econometric analysis (Chapter 3).

2 DIVERSIFICATION MEASUREMENT

Various indexes might be used to quantify diversification. In this study we seek to apply a measure that accounts for the number and distribution of activities, as well as for heterogeneity among the alternative activities.

The simplest measure of diversification is the number of produced goods or number of performed activities. However, the information contents of this measure are insufficient because the relative importance (weights) of activities is neglected. Other measures, such as the Herfindahl index and the Berry index, are superior alternatives since they account for the relative importance of income components (JACQUEMIN and BERRY, 1979). However, the heterogeneity of the particular business activities is disregarded in these indexes. Thus, they are not adequate for our analysis.

Information about the links among activities can be utilized by using the diversification index developed by GOLLOP and MONAHAN (1991) (GMI). Despite its advantages, this index has rarely been applied in the field of agricultural economics. The index is defined as follows:

$$GMI = 1/2\left[1 - \sum_i s_i^2 + \sum_i \sum_{k \neq i} s_i s_k \sigma_{ik}\right], \text{ with} \qquad (1)$$

$$\sigma_{ik} = \left(\sum_j \frac{|w_{kj} - w_{ij}|}{2}\right)^{1/2} \quad and \quad 0 \leq \sigma_{ik} < 1, \quad \text{where}$$

s_i , s_k : *Sales(Share) of Product/Activity i resp. k*

w_{kj} : *Share of Costs of Input j in Product/Activity k* .

w_{ij} : *Share of Costs of Input j in Product/Activity i*

Parameter σ_{ik} accounts for the heterogeneity of activities based on the input linkage of the scrutinized products or activities. Thus, GMI not only rises with the increasing number of activities and the uniform distribution of input shares, but also with the advancing diversity of activities. That is, the fewer products or activities are connected with the same resource input, the higher the diversification.

In the case of rural households' diversifying activities, the recording of all inputs and input interdependencies, and hence the heterogeneity component (σ_{ik}), is generally not possible or only possible at very high costs. In the absence of information about inputs costs, POMFRET and SHAPIRO (1980) suggest calculating the heterogeneity component according to a classification system.[1] Based on this reference, GMI is modified and an

[1] In the applied classifications of DESTATIS (2003), the various economic activities are classified by their primary type of activity using a five-digit code. Similar activities are coded with the same digit of the code. The classification system operates so that the activities' coverage is progressively narrower

alternative diversification index is formulated. For the modified GMI_{mod} index holds that:

$$GMI_{\text{mod}} = 1/2\left[1 - \sum_i s_i^2 + \sum_i \sum_{k \neq i} s_i s_k \rho_{ik}\right] \quad (2)$$

with $\rho_{ik} = \frac{z_{ik}}{Z}$ and $0 \leq \rho_{ik} \leq 1$, where

z_{ik}: Dummy variable based on an industry classification

Z: Number of considered sub-layers according to a digit's position in this classification.

Both indexes (GMI, GMI_{mod}) comply with the requirements for the appropriate diversification index with respect to the number, distribution, and heterogeneity of activities, and therefore will be used in the following considerations. Another advantage of these measures concerns the fact that they are scaled in a range from 0 to 1, which alleviates the interpretation of values and relative variations in the whole range. Households with a diversification index that equals "0" are completely specialized on one income source. The closer the value of this index is to unity (1), the higher the degree of diversification.

3 EMPIRICAL ANALYSIS

3.1 Database

This study is based on primary survey work in the German Federal State of Schleswig-Holstein, conducted in February and March 2006. To obtain the necessary data, questionnaires were sent to 1214 farmers, in cooperation with the Agricultural Accounting Association (Landwirtschaftlichen Buchführungsverband, LBV). The response rate was about 28%. The received questionnaires were evaluated for inconsistencies and the final number of 324 records have been utilized for further analysis.

The questionnaire was designed to cover four thematic complexes: i) socio-economic data (including experience, education, farm succession); ii) data about non-agricultural activities; iii) assessment of alternative sources of income and of operational and economic farm's environment (including general valuation)[2]; and iv) information about agricultural production, including agricultural revenues.

Following the classification of the official statistics, the second question bank (ii) contains queries relating to various farm-related income components. Thus, data on the following general income components were collected: (1) lodging and tourism; (2) processing of agricultural commodities and farmer-to-consumer direct marketing; (3) services or contractor; (4) horse pensions, i.e., letting service and infrastructure; (5) renewable energy production; (6) providing recreation and sport events; (7) cultivation

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with the successive addition of digits. Therefore, the difference between two activities at the first digit position in the classification system represents high heterogeneity between the activities compared to when the difference between digits occurs at the further positions (second, third, etc.).

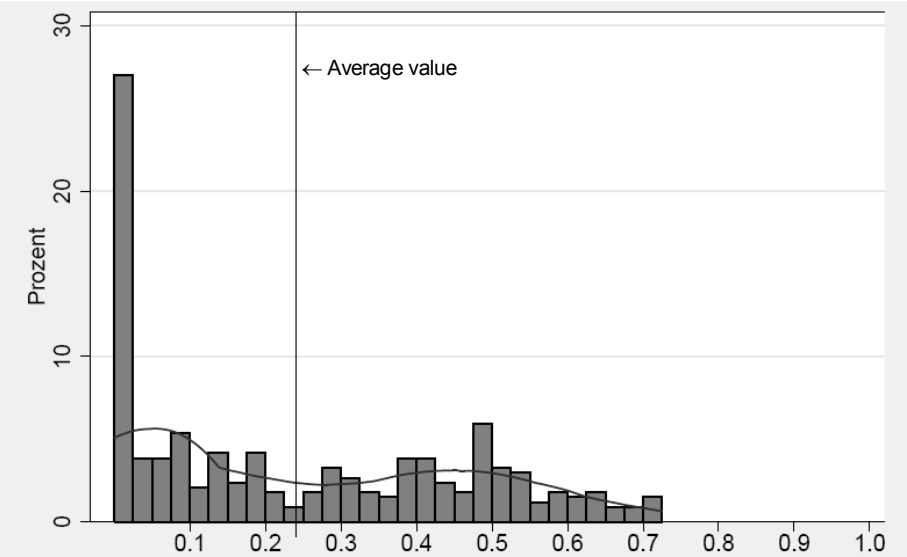
[2] In this question group, statements regarding the general valuation of potential determinants of income diversification have been comprised. The identified valuations have been allocated in six groups via factor analysis. The respective factors will be discussed in Chapter 3.3.

and sale of Christmas trees; and (8) other activities. Since renewable energy production is of high importance for Schleswig-Holstein, the activities in (5) have been further subdivided into four partial activities. Additionally, we collected data on income from non-farm employment as well as capital income. We consider agricultural production as one possible activity of the farm household. Consequently, 14 activities have been identified that form the basis for calculating the degree of income diversification.

3.2 Relevance of income diversification

The degree of income diversification has been calculated via the modified Gollop-Monahan-Indexes (equation 2).[3] GMI_{mod} reaches an average value of 0.240 and a maximal value of 0.720 (Table 1). About 25% of the agricultural farms take the GMI_{mod} values close to zero. Thus, on those (monoactive) farms almost 100% of total household income is generated in agricultural production. Thus, the figures indicate that the sample is relatively heterogeneous with regard to the degree of income diversification. To illustrate the overall structure of the GMI_{mod} we applied the kernel density estimator and histogram. The results are shown in Figure 1.

Figure 1. Income diversification: Distribution of GMI_{mod}



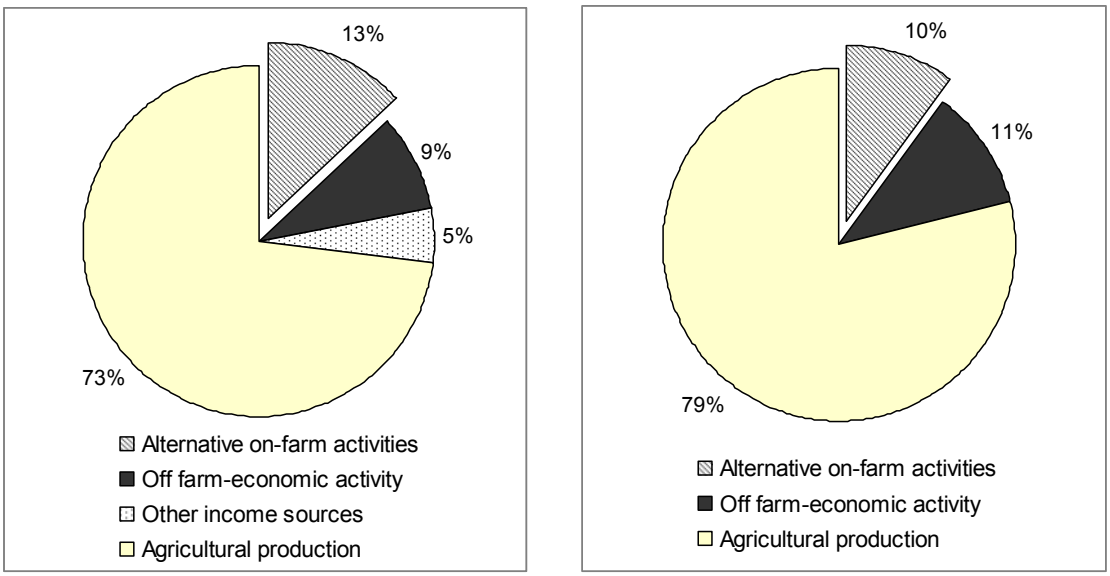
Source: Own calculations.

Even if agricultural production is still a dominant activity in the surveyed sample, the majority of households (three-quarters) are involved in at least one further gainful activity. Figure 2 illustrates shares of various income components on the total household income and the corresponding labor/time allocation. The alternate income sources contribute an average of 27% to the total household income. The diversified farmers generate 9% of their total income through non-farm employment, and a further 5% through other earnings (5%) such as capital incomes, leasing/rental receipts, retirement pension, and other benefits. The remaining 13% of the 'pie' indicates the relevance of the alternative entrepreneurial activities. The majority of those

[3] According to the Classification of Economic Sectors DESTATIS (2003), the share of household income was considered for the distribution component and for the heterogeneity component – a dummy variable.

entrepreneurs reported having diversified through agritourism, direct marketing, services, and renewable energy production.

Figure 2: Relevance of alternative income sources in the surveyed households



a) Share of an activity on the total household

b) Share of an activity on working time

Source: Own calculations.

3.3 Determinants of income diversification

Given the calculated degree of diversification, the second stage of our analysis dealt with its explanation. Following the theoretical considerations, three groups of variables were identified, which are assumed to have an influence on GMI_{mod}. These three groups are: 1) operational (farm-specific) factors; 2) socio-economic characteristics of the household; and 3) the farm's valuation related to factors influencing diversification decisions (Table 1). In the following we elaborate on these three groups:

Operational factors. Determinants belonging to this category are internal (farm-specific) factors such as farm size, production structure, and profile (MISHRA ET AL., 2004; BOWLER ET AL., 1996). Most can be changed in the long run through management decisions. Thus, we can consider them as exogenous variables in the short run decision period, as is the case of our analysis.

As a measure of farm size, agricultural income has been considered. We argue that this measure is the most appropriate since in our view, insufficient agricultural income is the main reason for a farm's income diversification. Thus, we assume that the degree of income diversification decreases with increasing income generated in agricultural production. This hypothesis is partly supported by the mean-variance-approach, as far as agricultural income is considered a measure of farm size. The approach provides theoretical evidence that the working time allocated to off-farm activities decreases with increasing farm size (MCNAMARA and WEISS, 2005). To model the nonlinear effects, we allow agricultural income to enter the model both as a simple term and a quadratic form (GUNTER and MCNAMARA, 1990).

To analyze the effects of farm structure on income diversification, we calculated the farm-internal diversification as indicated in Equation 1 considering agricultural production only. Thus, utilizing information on various product-specific revenues and costs, farm-specific GMIs have been calculated (GMI_Agriculture).

Table 1: Definition and descriptive statistics of used variables

	Definition	Mean	SD	Min	Max
Dependent variable	GMI_{mod} , defined in equation 2	0.24	0.22	0	0.72
Explanatory variable					
Operational Variable	Size: agricultural income, 1000 €	54.98	43.99	-33.13	445.36
	$Size^2$: agricultural $income^2/100$	49.52	126.15	0	1983.47
	GMI-Agriculture, defined in equation 1	0.38	0.15	0	0.69
	Dairy holding (D)	0.55	0.50	0	1
	Crop holding (D)	0.29	0.46	0	1
	Trainee (D)	0.16	0.37	0	1
Socio-economic variable	Agric. Education: technician (D)	0.65	0.48	0	1
	Agric. Education: university/academy (D)	0.21	0.41	0	1
	Non-Agric. education (D)	0.69	0.46	0	1
	Work experience	16.48	9.19	1	46
	Succession secured (D)	0.31	0.5	0	1
	Non-succession (D)	0.07	0.25	0	1
General farm's valuation (factors)	Capital constraints	0	1	-2.42	2.60
	Labor capacities	0	1	-3.05	2.62
	Satisfaction	0	1	-2.71	2.97
	Governmental payments	0	1	-2.84	2.54
	Growth barriers	0	1	-2.08	3.03
	Cooperation	0	1	-2.35	2.12

Note: D: Dummy variable; SD: Standard Deviation.

Source: Own calculations.

We assume that high values of GMI_Agriculture (heterogeneous production) are associated with lower risks associated with total agricultural income. Income stabilization in turn reduces the pressure and probability of tapping new or alternative income sources. However, this theoretical finding has not been clearly confirmed empirically. For instance, the study of VERGARA ET AL. (2004) provides that the increasing variability of agricultural revenues does not affect family households' labor market participation. On the contrary, SERRA ET AL. (2005) found a positive relationship between those variables.

The farms may differ from each other with respect to their production profile. To control for this effect, we introduced two dummy variables in the empirical model to indicate a dairy holding and a crop holding, respectively. Several studies indicate that dairy production requires intensive monitoring: one reason why dairy producers might have less free time for alternative activities (ALLEN and LUECK, 2003; BATEMAN and RAY, 1994; BOWLER ET AL., 1996; MISHRA ET AL., 2004). Thus, we expect a negative relationship between the dummy variable "dairy holding" and the GMI_{mod}. On the contrary, due to the seasonal nature of plant production, crop holdings are expected to allocate their labor time to other activities between harvest periods. Thus, the probability of income diversification is higher on crop farms.

To some extent, farm structure and organization can be described by the labor structure. In the investigated sample, family labor dominates, though many farms employ a considerable amount of non-family hired labor. Thus, we assume that family labor can be substituted by hired labor, which has consequences for the time reallocation of family members. However, research is inconclusive regarding the impact of this substitution on farm diversification. For example, BENJAMIN and KIMHI (2006) argue that using more hired labor enables family members to devote a portion of their time to off-farm activities. On the other hand, hired labor can increase the time a farm operator or manager needs to monitor and manage the hired labor (POLLAK, 1985; SCHMIDT, 1989). This might be especially the case with trainees or apprentices. In order to control for these effects, in our model we introduce a dummy variable indicating the employment of trainees on a farm.

Socio-economic factors play a crucial role in the investigation of the farm households since the decision-making process in those farms is a result of various personal and societal interactions, as well as common goals and plans (GASSON and ERRINGTON, 1993). The literature highlights that the decision rules may vary considerably between farms according to differences in the households' available human capital (education, work experience). Thus, we constructed various dummy variables to capture these effects. Several empirical studies reveal that a high formal education level of the family members (i.e., farm operator, spouse) is positively associated with higher income in non-agricultural professions (HUFFMAN, 1980; BROSIG ET AL., 2007). Accordingly, we assume that non-agricultural education has a positive influence on household income diversification. Regarding the impact of agricultural education, thus far empirical studies have not provided a clear answer. On the one hand, there is evidence that higher agricultural education reduces the farm's inefficiencies and hence increases their productivity (HOCKMANN and PIENIADZ, 2008). The productivity rise can provide surpluses regarding agricultural income level, which in turn reduces the economic incentives for farm diversification. On the other hand, a high agricultural education (i.e., university degree) increases the probability of farm scope extension in activities related to agri-food production (i.e., biogas plants). Additionally, high agricultural education opens further professional possibilities in related sectors such as agricultural consulting and extension services.

Another important factor is experience with managing a farm. To control for this determinant, we constructed the variable "work experience" to represent the number of years the farm had been operated. We assume that having extensive practical experience means having a high level of practical qualifications in managing and operating a farm, as well possessing higher accumulated assets. Both resources (qualifications and assets) increase the probability of entering new farm activities, which leads to higher income diversification.

Succession is another relevant issue in family farms since it is a main mechanism of farm continuity (KIMHI and NACHLIELI, 2001).[4] In this context it is important to distinguish between two opposite options the farm manager might face, i.e., if a succession is secured or if farm succession is not possible. Both options might provide substantial changes in the way a farm is run. For example, TIETJE (2004) shows that part-time farming, also combining agricultural work and off-farm employment, is

[4] We understand family farm succession as being the transfer of business ownership and managerial control to one of the younger inheritors.

typical for the succession process. Thus, if a succession is planned or secured, the farm is usually managed by an operator at the age of retiring. In most cases the farm is already run at least operatively by a younger family member. This suggests that at least one of them (either the 'donor' or the potential successor) can allocate a part of his/her labor time to other activities. If the hypothesis holds, we expect a positive relationship between the variable "succession secured" and GMI_{mod}.

On the contrary, older farmers without a potential successor have less incentives and possibilities to invest in farm business extension or growth. Thus, in this case the farm business usually exhibits a lower degree of income diversification (POTTER and LOBLEY, 1992). We control for the hypothesized effects in our empirical model by introducing two respective dummy variables: succession secured and non-succession.

In the survey, the households were requested to provide statements regarding the **general valuation** of the potential determinants of income diversification. The identified valuations have been allocated in six groups (latent variables) using factor analysis. The respective factors represent theoretical constructs for the following latent variables: capital constraints, labor capacities, satisfaction, governmental payments, growth barriers, and cooperation (see RATHMANN, 2007). The low factor values correspond with a high affirmation of the particular statements provided in the questionnaire. The factors might be interpreted and hypothesized as follows.

The factor "capital constraints" represents a bundle of statements indicating that low quality human capital and high investment costs are the main barriers to income diversification. Thus, the low values of the factor "capital constraints" indicate a household's consent regarding the existence of respective asset constrains. Consequently, we expect that the low values of the factor "capital constraints" are associated with low values of GMI_{mod}.

Furthermore, the low value of the factor "labor capacities" corresponds to a respondent's strong confirmation of free labor capacities' existence. We assume that low values of the factor "labor capacities" support income diversification. Thus, we expect a negative sign by the respective estimate.

If the factor "satisfaction" has low values, it means that the respective household is highly satisfied with the generated agricultural income, the organization of the farm business, and the development prospects regarding the farm's growth and specialization. Thus, satisfaction reduces the economic incentives for farm diversification. Following this view, we assume that "satisfaction" and GMI_{mod} are positively associated.

The factor "governmental payments" indicates the respondents' valuation of direct payments (and decoupling) and governmental support for rural development. In this case the high value of the factor corresponds to a low influence of those governmental payments on a farm's restructuring and investment towards higher diversification in new activities. We expect a negative correlation between this factor and GMI_{mod}.

The fifth identified factor, "growth barriers", relates to restrictions in agricultural production caused by increasing factor prices such as leasing/purchase of land or milk quotas. If "growth's barriers" are relevant for a farm, it is very likely that it will allocate its household resources to alternative activities to gain higher income stabilization. Thus, we hypothesize a positive influence of this factor on GMI_{mod}.

The last factor, "cooperation", is indeed based on one variable. In this case a low factor value indicates that the farmer seeks cooperation to reduce some capital and operating

costs (i.e., via machine circles). However, the impact of this factor is ambiguous since the respective economies of scope might reduce general costs in both diversified and specialized farms.

3.4 Estimation Results

To investigate factors stimulating or impeding income diversification (GMI_{mod}), a Tobit model has been employed.[5] The respective results are shown in Table 2. The relatively high values of the fit measures and the high significance of the test statistics allude to a good model fit and relevance of the included variables.

Table 2: Tobit estimates of diversification model for German farm households

	Explanatory variable	Estimates	Standard errors
Operational Variable	Size: agricultural income, 1000 €	- 0.0025***	0.0005
	Size^2: agricultural income^2/100	0.0006***	0.0002
	GMI-Agriculture	0.2979***	0.0824
	Dairy holding (D)	- 0.0778**	0.0367
	Crop holding (D)	0.0944**	0.0393
	Trainee (D)	0.0618*	0.0360
Socio-economic variable	Agric. education: technician (D)	0.1131***	0.0394
	Agric. education: university/academy (D)	0.1741***	0.0462
	Non-Agric. education (D)	0.0520*	0.0268
	Work experience	0.0027*	0.0015
	Succession secured (D)	0.0455	0.0303
	Non-succession (D)	- 0.0002	0.0521
General farm's valuation (factors)	Capital constraints	0.0387***	0.0130
	Labor capacities	- 0.0359**	0.0141
	Satisfaction	0.0314**	0.0139
	Governmental payments	- 0.0117	0.0123
	Growth barriers	0.0058	0.0124
	Cooperation	0.0017	0.0126
Constant		0.0084	0.0744
Fit measures	R^2_{MZ}	0.340	
	R^2_{McF}	0.720	
	corr, R^2_{McF}	0.506	
	LR$\chi^2_{(18)}$ (Significance level)	134.68***	

Note: ***, **, * indicate that the variable is significant at the 1, 5, or 10 percent level, respectively. Standard errors are given in parentheses. Degrees of freedom for the F-tests are in brackets. We do not report the R^2 values for the profit equation since the estimation provided negative values. R^2_{McF}: McFaddens' fit measure, R^2_{MZ} McKelvey/ Zaviona fit measure. Number of observations: 324.

Source: Own calculations.

With regard to the **farm-specific economic factors,** the estimated coefficients are highly significant in most cases. Our hypothesis regarding the impact's direction (sign)

[5] Tobit model is an appropriate specification if the dependent variable is censored, i.e., if it takes values in the domain between 0 and 1, as is in our case using the GMI_{mod}.

of the variables farm profile (dairy farms, cropping farm) and of the generated agricultural income (size) on the endogenous variables cannot be rejected. Regarding the variable agricultural income, a nonlinear effect on GMI_{mod} could be identified. Increasing agricultural income first decreases the degree of income diversification. However, when agricultural income is 210 000 Euro p.a., an opposite relationship occurs; income diversification increases as agricultural income rises. One explanation of this result might be that in prospering agricultural enterprises, the farm head provides managerial labor as well as labor associated with his owner rights. In this case operational activities on the farm are delegated to hired labor. Consequently, the farm head might allocate some labor time to off-farm activities. The positive significant effect of the variable "Trainee" supports these considerations.

The findings do not confirm our theoretical expectations about the negative relationship between GMI_{mod} and GMI-Agriculture. We interpret the positive sign of the respective estimate as an indicator that risk minimizing is not a main motive for income diversification among the investigated farms. Rather, the optimal resource allocation seems to be of high priority for the farms.

The estimates regarding the socio-economic variable only partly yielded the expected results. The influence of non-agricultural education, as well as work experience, confirms the theoretical assumptions. Moreover, we find a positive and highly significant relationship between the level of formal agricultural education and the degree of income diversification. This finding indicates that farm families with higher agricultural education (head, spouse) are more likely to introduce alternative activities into a farm household and hence to generate novel sources of income.

We find that only three of the considered factors representing the **general valuation** yield expected and highly significant estimates. Consequently, our hypotheses that capital constraints and the prosperity of the agri-business (satisfaction) restrict income diversification and that free labor capacities support diversification are confirmed. Thus, these findings reveal that access to resources (capital, labor) is a necessary condition for increasing the scope of income components. On the contrary, assumptions related to governmental payments, growth barriers, and cooperation could not be confirmed.

Considering, for example, the factor "governmental payments," one interpretation of the insignificant results might be a loss of information due to the reduction of various statement valuations to one factor. However, the majority of both highly diversified as well as specialized farms assert that neither the decoupling of the payment schemes nor the special structural aids influence their decisions towards investments in diversification. Thus, the influence of the thitherto GAP measures on the farm's diversification might be questioned. It is also likely that farms have different access to governmental payments. This could explain why we could not identify any clear and significant influence direction.

4 CONCLUSIONS

Diversification involves the introduction of an alternative activity to a farm household to generate a novel source of income. Our study indicates that the main motivation for income diversification in Schleswig-Holstein is the expectation of higher income after diversification. Non-agricultural activities essentially supplement farm household income and, therefore, are ancillary to the farming component. The estimation results show that different farm-specific and societal factors may influence the household's

access to alternative income sources. Income diversification is generally higher on crop producing holdings and farms with a highly diversified portfolio of agricultural production.

The most significant general conclusion of this research is that, irrespective of a farm's characteristics, income generated in agricultural production has a highly significant influence on the household's decision towards diversification. However, when examined in detail, the farms seem to follow various adjustment paths since the influence of agricultural income is negative and nonlinear. Thus, the results indicate that farms which generate relatively high agricultural income tend to diversify. This is not surprising given that those farms are very likely to have more complex organizational and management structures in that the farmers have sole ownership rights or provide managerial support. The accumulated experiences in managing a farm could have given those farmers further job opportunities in related branches. Thus, a specialization in the labor market might indirectly play a significant role for income diversification. Another possible interpretation is that those farmers behave as business investors, expecting relatively satisfactory capital returns while investing the surpluses generated in agricultural production in new farm activities. Finally, turning to the farm households with low or negative agricultural income, it is important to emphasize that income diversification seems to be a long-term adjustment strategy. Access to resources (labor, capital) plays a pivotal role in generating new sources of income.

The findings indicate that both free labor capacity in terms of hours and the quality of the labor (education, experience) have a significant relevance for a successful diversification strategy. Since access to capital is a significant barrier for the diversification of low income households, one policy recommendation is to differentiate the agricultural measures to explicitly meet the heterogeneous needs of rural households and hence tap the creative energy of the rural population.

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