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The persistence of small dairy farms in Austria from an economic perspective

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Abstract

In the international comparison the structure of milk production in Austria is small scale. The present study presents two theoretical approaches to explain the persistence of small dairy farms in Austria: the opportunity cost principle and the theory of the agricultural household. With regard to the first one it is debatable whether the flat rates really can represent the costs of own production factors in their alternative uses in small enterprises. An illustration on the basis of production cost accounts shows that small dairy farms with no possibilities for the utilization of their own production factors (especially for labour) can cover the production costs by revenues only. Secondly it is argued that agricultural production is likely to continue in small dairy farms as long as the enterprise contributes persistently to the household income of the family. Indicators from the Farm Accountancy Data Network (FADN) of voluntarily participating farms in Austria support the notion that labour is allocated efficiently between the enterprise and the household in small operations in order to achieve maximum total income. The study proposes arguments according to which it can be expected that rather small dairy farms are going to be a prominent presence in Austrian agriculture also in the future.

Keywords: Small dairy farms, production costs, farm household, opportunity costs, FADN

JEL codes: Q12, R20

1 INTRODUCTION

In international comparison Austrian dairy farms are rather small. Since accession to the EU in 1995 the number of dairy farms in Austria has decreased by 44 percent. Contrary to expectations small dairy farms exhibited a high rate of persistence as the number of small farms remains significant. In 2007 the average milk quota per farm was about 64 tons; almost half of the Austrian dairy farms held less than 40 tons of quota (BMLFUW 2008). This compares with an average milk quota per dairy farm of some 131 tons in the EU-27 (JANKO 2009). Smaller dairy farms are usually subject to higher production costs and a competitive disadvantage relative to larger entities (KIRNER 2003). Hence, smaller farms are expected to be the first to abandon production in a harsher economic climate, as e.g. brought on by further liberalisation of the markets. But this expectation did not materialise in recent developments in the alpine regions of Austria. The present study presents the theory explaining the persistence of small farms derives the corresponding hypotheses and tests them empirically.

2 STRUCTURAL CHANGE OF MILK PRODUCTION IN AUSTRIA

Since accession to the EU in 1995 the number of dairy farms in Austria decreased from almost 78,000 to some 43,500 in the year 2007/08, corresponding to a decline of 44 percent. In the mountainous areas the decline was somewhat less, i.e. 39 percent versus 54 percent in other areas. As shown in Table 1, smaller farms abandoned milk production more frequently than bigger businesses. In the year 1995/96, approximately 71 percent of the dairy farms had less than 40 tons of milk quotas while by the year 2007/08 the corresponding share had declined to 47 percent. In contrast, the share of enterprises with more than 100 tons of milk quota rose from 3.4 percent to 19 percent during the same period. The move to bigger operations has been observed in both mountain farms and non-mountain farms. Despite these developments, the structure of milk production in Austria remains small scale, and a large number of small dairy farms continue to maintain its competitiveness in milk production.

Table 1: Proportion of dairy farms by size classes in tons of milk quota in 1995/96 and 2007/08

	Farms in 1995/96			Farms in 2007/08		
	Up to 40 t*	>40 - 100 t	>100 t	Up to 40 t	>40 - 100 t	>100 t
All dairy farms	71.3	25.3	3.4	47.2	33.9	19.0
Mountain farms	74.0	23.4	2.6	50.0	33.7	16.4
Non-mountain farms	66.0	29.1	4.9	39.9	34.4	25.6

* Milk quota classes according to the Green Report (BMLFUW 2008)

Table 2 shows the share of farms which experienced different changes in their milk quotas (as an indicator of milk production) during the last 12 years. Almost one quarter of all farms with less than 40 tons of milk quota in the year 2007/08 have a history of quota decrease. Almost 55 percent of these farms increased quota by up to 25 percent, and another 20 percent at least doubled their original quota. These data reveal that more than half of the dairy farms with less than 40 tons of milk quota did not change their milk production significantly. But one quarter of these enterprises is likely to reduce milk production or abandon it completely in the respective period. Naturally in farms with more than 40 tons of milk quota in the year 2007/08, the share of those who had increased their quota was higher.

Table 2: Distribution of farms in 2007/08 by their change in milk quotas since 1995/96, by size classes in tons of milk quota

Change in milk quota	Farms			
	All	<= 40t*	>40 <= 100 t	>100 t
Negative	14.2	24.2	7.2	2.1
0 to 25 percent	39.0	54.5	33.9	10.5
>25 to 50 percent	14.7	10.5	20.8	13.9
>50 to 100 percent	15.7	7.1	22.0	25.6
>100 to 200 percent	11.1	2.6	11.9	30.3
> 200 percent	5.3	1.1	4.1	17.6

* Milk quota classes according to the Green Report (BMLFUW 2008)

3 THEORETICAL BACKGROUND AND METHOD

The following analysis is based on the assumption that in the long-run milk is produced in competitive farms while in other farms production is going to cease sooner or later. Whether small dairy farms can be considered to be competitive is discussed subsequently on the basis of two approaches: the calculation of production costs and the theory of the agricultural household.

3.1 Costs of production

The currently most frequent approach to evaluate the competitiveness of farms and agricultural enterprises is the calculation or estimation of production costs: A firm as well as an enterprise is considered to be competitive if it remunerates the production factors employed by at least their market prices (opportunity costs); farmland is supposed to deliver a market-based rent (SCHMITT et al. 1996). Small dairy farms usually exhibit high opportunity costs for own production factors, especially for unpaid (family) labour, yielding high production costs.

While there are general problems associated with the production cost method, namely that full costs can lead to false farm management decisions and that they support statements about the competitiveness of enterprises and agrarian regions only for the long run and for single-product firms (see BRANDES 2000, 285), the present study attends specifically to the value of unpaid family labour. The high opportunity cost of family labour is particularly important in small family farms, because it results in high production costs which are considered as an indicator for weak competitiveness and consequential a low chance of survival to these enterprises.

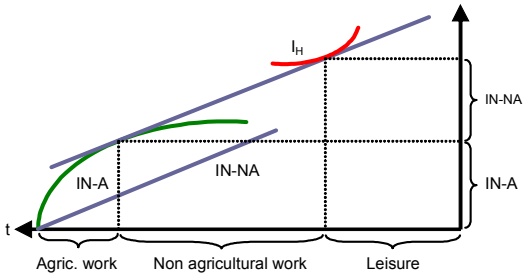
It is debatable to what extent an assumed wage rate per labour hour and standard labour requirements correspond to the real opportunity cost of labour in family farms, particularly if a uniform wage rate is applied for a whole region. In this context SCHMITT (1992) points out that the opportunity cost of family labour often is assumed too high as age, education and working time (which is frequently limited if not devoted to agriculture) are not conducive to remunerate the farm manager's efforts by the general wage rate in the market. Thus the impact of different off-farm employment opportunities of family labour on agricultural production costs will be evaluated critically using data of the International Farm Comparison Network (see www.ifcnnetwork.org).

3.2 The role of the agricultural household

The characteristics of a family farm point to the fact that the enterprise is embedded into a socioeconomic system including the family and a household (see e.g. VOGEL and WIESINGER 2003). Therefore in order to better understand the competitiveness of small family farms it might be useful to contemplate the different possibilities and forms of income acquisition off the farm, in addition to income generated by the cultivation of lands and forests or animal husbandry. Agricultural households which obtain only a small part of their overall household income from farming may well have to be treated differently, with respect to their competitiveness, than those which rely significantly on revenue earned by agricultural and forestry activities.

The accounts of farms who participate voluntarily in the Farm Accountancy Data Network reveal that off-farm employment and off-farm income is extraordinarily important in Austria (BMLFUW 2008). In farms with a total standard gross margin (SGM) of up to 20,000 Euro (covering about half of all farms) the income from agriculture and forestry covered less than half of the consumption of the respective households. More than half of the household income originated from off-farm employment and social transfers. Only in farms with total standard gross margins of more than 35,000 Euro (approximately one quarter of the farms) income from agriculture and forestry exceeded the consumption expenditures of the farm operator's families.

The farm household model provides a theoretical framework of this phenomenon (see SCHMITT et al. 1996). First introduced by TSCHAJANOW (1923), later refined by LEE (1965) and NAKAJIMA (1986), the theory implies that the labour of an agricultural household is allocated on-farm and off-farm in accordance with the maximisation of utility (Figure 1). Based on the assumption that marginal income declines with the amount of time spent on-farm (decreasing marginal revenue of labour), marginal revenue of on-farm labour will at some point equal that of off-farm labour, and household members will start to devote some of their labour to off-farm activities. Usually on smaller farms the point of indifference between on- and off-farm incomes will be at a lower level of farm labour, and total household income will rely to a lager extent on off-farm activities. Nevertheless, in case of an adequate income derived from dairy farming and in case of low opportunity costs of off-farm labour, a farmer will continue with milk production (see WEISS, 1999).



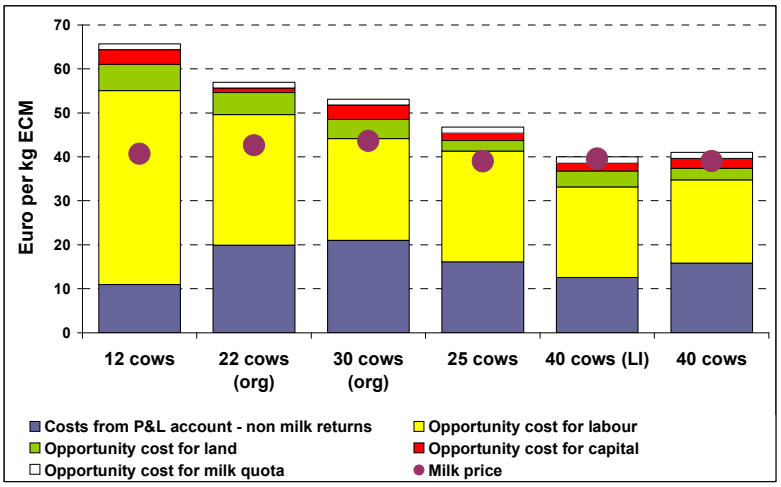
Abbr.: IN-A: income from agriculture; IN-NA: income from non-agriculture; I_H: Utility indifference curve of the household.
Source: Adapted from SCHMITT et al. 1996
Figure 1: Farm household model

Empirical data characterising the role of the enterprise and the household in small dairy farms are available from the Farm Accountancy Data Network in Austria. The analysis of these data produce indicators on the farm, its enterprises and inputs, revenues from and expenditures for agricultural and forestry activities, cash flow as well as characteristics of the agricultural household, including labour, sources of income and personal capital formation.

4 RESULTS

4.1 Production costs

Annual international comparisons of milk production costs and its components attribute relatively higher costs to small family farms, especially in mountainous areas (see e.g. KIRNER 2003). This is due primarily to high opportunity costs for family labour which is valued, as usual in this and similar comparative studies, assuming a uniform wage rate per labour unit employed. As shown in Figure 2 there is a significant decrease in costs with increasing farm sizes in Austria. For example, a farm with twelve dairy cows can cover only two thirds of production costs by the milk price (proceeds from the sales of beef and direct payments having been taken account of in the calculation of "costs" according to a profit and loss statement). Farms with 40 dairy cows were able to almost completely cover production costs in the year 2008, thus confirming the high competitiveness of these enterprises.



Abbr.: ECM = Energy Corrected Milk, org = organic farm, LI = low input grazing farm
Source: own calculation
Figure 2: Costs of milk in six types of Austrian dairy farms in 2008

These results lead to the question why small dairy farms continue to produce even if their production costs (thus estimated) are far from being covered by their operations. A tentative answer may be obtained by a closer look at the model calculations for the first two enterprises in figure 2, having 12 and 22 dairy cows, with varying opportunity costs of family labour and their impact on the costs of production (see Figure 3).

For the dairy farm with 12 cows and the corresponding activities around the farm, an input of 2,550 labour hours (Lh) is required, for the organic farm with 22 cows 3,380

Lh. If the entire labour employed is valued with a uniform rate of 12 Euro, the milk price does not cover production costs (above those covered by revenues from beef and direct payments), i.e. the factors of production: labour, land, capital and quota rents are not remunerated at the imputed market prices. Here we take on board only one point of critique by SCHMITT (1992), namely the possibility that the labour used on farm may not be employed to full extent for the generation of income off the farm.

It is conceivable that only one person can generate income from off -farm employment while the other persons in the farm household are unable to pursue off-farm activities (due to age, education, child care etc.) and the labour time is restricted to some 1700 hours per year (as a rule). This person's unused labour could be used on farm with an opportunity cost of zero (as is the case for the other family members). Imputing this opportunity cost for labour results in considerably lower production costs overall in both farms. Another case is also conceivable, namely that for this person there is only seasonal labour available off-farm, a case that is frequently observed e.g. in tourist regions; only the labour hours accruing for the seasonal labour should then be valued with a wage rate. Under this condition the production costs of milk would be covered completely.

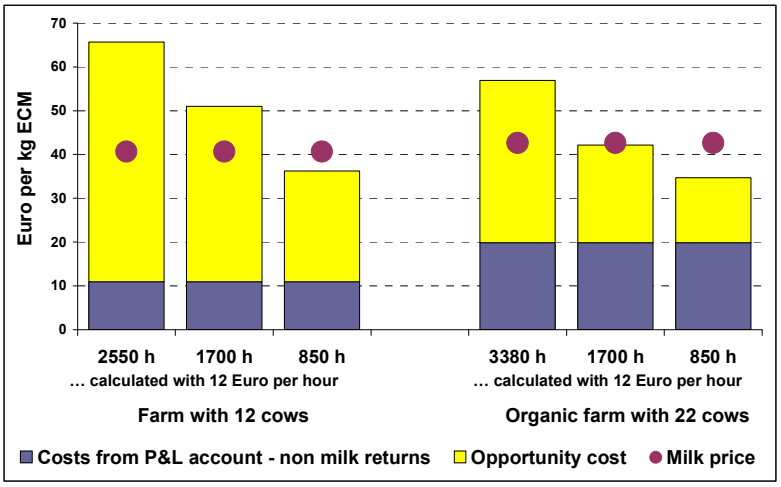


Figure 3: Production costs as a function of labour hours for which remuneration can be obtained through off-farm activities

4.2 Indicators of farms and households

Table 3 presents economic and management indicators of dairy farms in Austria by size classes in 2007. The enterprises are classified by their standard gross margins into small-scale (up to 12,000 Euro), medium-size (>12,000 up to 35,000 Euro) and large-scale farms (>35,000 up to 120,000 Euro) (BMLFUW 2008, 292). The indictors of the farms vary substantially by size class: Income (profit) originating from agriculture and forestry in the medium and large-scale enterprises per unpaid family labour exceeds that in the small-scale enterprises by 100 and 300 percent, respectively. The difference is even more pronounced in terms of income from agriculture and forestry per farm and in terms of the cash flow.

Table 3 displays two more indicators of the farms, namely depreciation and net investment; both inform about the economic sustainability of the farming enterprise. Generally it is assumed that investments should balance at least the amount of depreciations in order to secure the long-term viability of an enterprise. That condition seems to be met on average for all size classes of farms. But the highest net investments, some 12,900 Euro, occurred in the large-scale enterprises - a hint that these are willing to expand. Small-scale farms, on the other hand, made net investments of almost zero.

Due to significantly higher off-farm incomes in smaller farms, the economic indicators of the households vary less than those of the farms. With an earned income of some 15,500 € per household working unit (HWU) on average, HWUs of small-scale farms earned 18 percent less than those of medium-sized enterprises, but the distance to the large-scale farms was still close to 100 percent.

Table 3: Economic indicators of small-, medium size and large-scale FADN dairy farms in Austria, 2007

Economic indicator	Unit	Small-scale farms	Medium-size farms	Large-scale farms
Cash Flow I	€/farm	15,933	34,893	71,918
Net income from agriculture and forestry	€/farm	8,439	22,983	50,062
	€/AWU[1]	7,176	15,603	27,775
Depreciation	€/farm	7,494	11,910	21,856
Net investments	€/farm	359	4,913	12,869
Earned income	€/HWU[2]	15,478	18,909	28,574

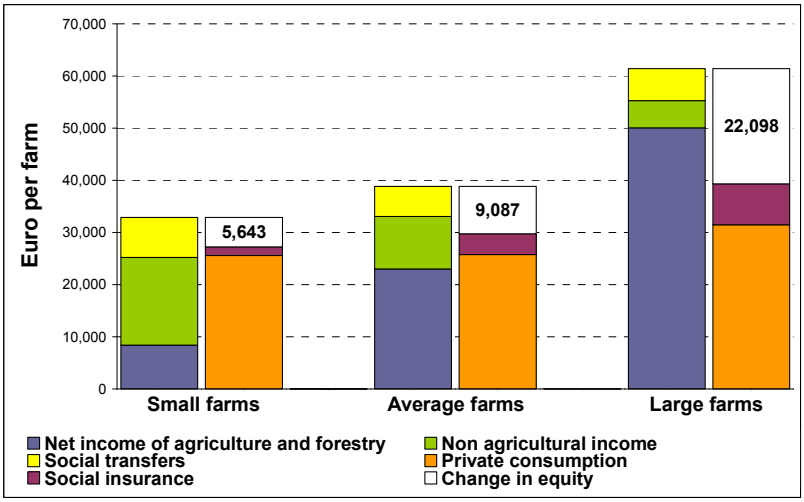
Small farms: >6,000 <= 12,000 Standard Gross Margin (SGM)
Average farms: > 12,000 <= 35,000 SGM
Large farms: > 35,000 < 120,000 SGM
[1] unpaid agricultural working unit per year; [2] household working unit per year
Source: FADN Data 2007 (own calculation)

A major indicator of the agricultural household is its equity capital formation as a criterion for the growth of a family business over time. It depends on total income and consumption of the household. In 2007 the equity capital formation of dairy farms in all three size classes (according to SGM; SDB in BMLFUW 2008, 292) was positive on average. But equity formation per farm increased with farm size from 5,643 Euro to 22,098 Euro (Figure 4).

The composition of total income varies strongly. While in farms with more than 35,000 Euro SGM over 80 percent of total income originates from agriculture and forestry related activities, the share of farm income in farms with less than 12,000 Euro was only some 25 percent. On the other hand, non-agricultural activities contributed more than half to total income in small-scale farm households, the remainder being social transfers. In large-scale farms, non-agricultural income is secondary. Differences in the amounts of social transfers (including family allowance, retirement pension, and unemployment compensation) reflect differences in the social structure by farm size classes.

Private consumption (cost of living) varies not as much by farm size, but the contributions to the farmers' social insurance organisation rise significantly with farm size in accordance with the increase of the "standard value" of the farm. Consequently,

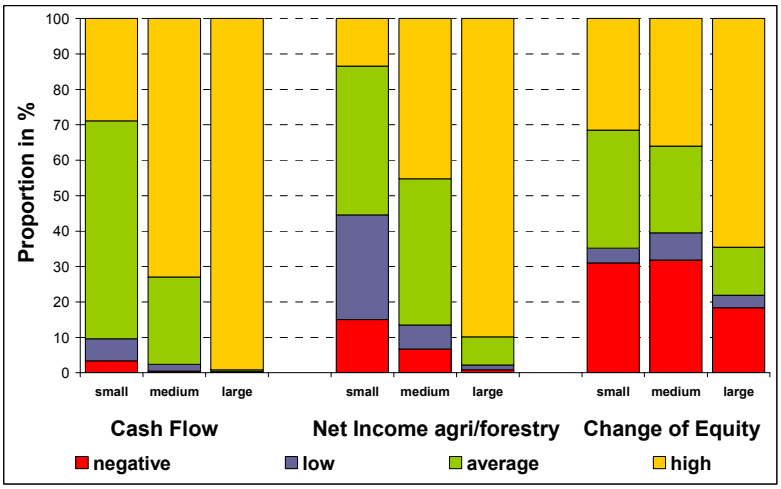
households in the group of large-scale farms incurred 6,000 Euro more private consumption than households in the smaller size classes (Figure 4).



Small farms: >6,000 <= 12,000 Standard gross margin (SGM)
Average farms: > 12,000 <= 35,000 SGM
Large farms: > 35,000 < 120,000 SGM
Source: FADN-Data 2007 (own calculation)
Figure 4: Level and composition of household incomes and changes in equity by farm sizes of Austrian dairy farms

Up to now we focused on the averages of farm indicators in different size classes. Now we address the question of how these indicators are distributed within size classes. Figure 5 shows the distribution of cash flow, income originating from agriculture and forestry, and equity capital formation by size classes. In 2007 almost all farms had a positive cash flow; only 3 percent of the small-scale farms came up with a negative amount. A major share of the small-scale farms (62 percent) exhibited a cash flow of between 5,000 and 20,000 Euro. Income from agricultural and forestry activities was negative in 15 percent of the small-scale farms.

In 30 percent of these farms, agriculture-related incomes were between 0 and 5,000 Euro, in 42 percent between 5,000 and 20,000 Euro, and 13 percent of them earned incomes exceeding 20,000 Euro. With respect to equity capital formation the differences by farm size were less pronounced as with respect to incomes from agriculture and forestry. Some 31 percent of the small-scale farms recorded negative equity formation; almost the same share applied to medium-sized farms while the corresponding share was 18 percent in large farms. In one third of the small-scale farms equity capital formation amounted to between 2,500 and 10,000 Euro and another 32 percent added more than 10,000 Euro to their equity.



Cash flow and net income from agriculture and forestry: low: >0 until 5,000 €; medium: >5,000 until 20,000 €; high: >20,000 €;
Change in equity: low: >0 until 2,500 €; medium: >2,500 until 10,000 €; high: >10,000 €;
Figure 5: Share of farms exhibiting different levels of indicators, by farm size class

5 DISCUSSION AND CONCLUSIONS

Although structural change is continuing in the Austrian dairy sector an analysis of the performance of farms in different size classes supports the expectation of high persistence of small-scale farms. The bulk of farms operate at a significantly smaller scale than what frequently is considered to be an economically optimal size; a high proportion of dairy farms still produce less than 40 tons of milk annually. The present study follows up on some explanations of why dairy farms in Austria continue production in the longer-term even at supposedly suboptimal size.

An explanation is provided by the opportunity cost principle. While conventional calculations of production cost are using flat rates to value input use in agriculture, it is questionable whether these values reflect the actual possibilities to earn returns in alternative uses of the respective production factors, especially in utilisations off the farm. Frequently the costs of own factor inputs are overestimated, resulting in production costs that are overrated and leading to the conclusion that the competitiveness of small-scale farms is low. With model calculations we illustrate how different utilization possibilities of labour affect production costs. It follows that the persistence of a small farm increases as its possibilities to use own production factors off-farm profitably subside.

Even with high production costs, family farms are likely to continue their production activities if these increase the household income of the family sufficiently, i.e. if the profit from farming exceeds the opportunity cost of the inputs used (labour, land and capital) in agricultural production. Analyses in this study show that households in small-scale dairy farms in Austria can increase their total income significantly by engaging in off-farm earning activities with the goal to achieve, on average, positive equity capital formation even if income from farming is low. Similar conclusions follow from production cost calculations and indicators with respect to the agricultural household (KIRNER and GAZZARIN 2007). Thus the theory of the agricultural household

leads to the conclusion that small family farms are set to represent Austrian agriculture also in the future although structural change continues.

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