THE CAP AND THE AUSTRIAN AGRICULTURAL SECTOR: IMPACTS OF POSSIBLE FUTURE MILK MARKET REGULATIONS

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Abstract

The European milk market is regulated by a quota system, which is limited by March 2015 for the time being. Using Austrian FADN data and applying a mathematical programming model, the impact of the CAP reform on Austrian farms with milk quota endowments as well as the impact of future milk market regulations after 2015 will be analysed. Possible options include either a continuation of the quota system or its abolishment. The model simulations show that in the scenario referring to 2008 most farms are better off due to the Austrian implementation of the CAP reform compared to a pre-reform situation. Whether farms are better off with or without a milk quota system in 2015 depends on the assumed level of the milk price. However, smaller farms are, on average, better off without a quota regulation.

Key words: 2003 CAP reform, milk quota, mathematical programming, Austria

1. Introduction

The 2003 reform of the Common Agricultural Policy (CAP) and its implementation in Austria in 2005 implicated a change in the impact of policy instruments on the production decisions of farmers: The incentive of agricultural production shall be less influenced by policy instruments and shall stem to a larger extent from agricultural markets, which aims to improve the competitiveness of the agricultural sector. The main measures of the reform are, first, 'decoupling' of direct payments by introducing single farm payments, second, the provision of payments conditional on the maintenance of agricultural land in good ecological condition ('cross-compliance'), and, third, the cutting of direct payments and shifting of these resources form the first to the second pillar of the CAP ('modulation'). Austria opted for the 'historic model' of single farm payments: Based on payments farmers received during the reference period 2000-2002 ('reference payments') and based on the farm-specific 'reference area' in the same period, farm-specific entitlements for farmer are granted. In Austria, not all payments are decoupled: The suckler cow premium and 40% of the slaughter premium remain coupled to the production.

The European milk market is regulated by a milk quota system, which is limited by March 31st, 2015. In 2004, a milk premium was introduced, which was decoupled and integrated into the single farm payments in 2007 as well, and milk quota will be expanded until 2008. Recently, the European Commission (EC) has been signalling that the milk quota system will not be continued after 2015 and is discussing a future milk market regulation these days. In 2008, the recent CAP reform will be evaluated within the scope of the 'health check' of the EC. For the meantime, it seems that the EC is in favour of an expansion of milk quota by about 10%. Possible options for any milk market regulation after 2015 are either a continuation of the milk quota system as it is now or an abolishment of the quota system.

From an Austrian perspective, it is worth while to have at hand results that show effects of the CAP reform 2003 and of possible milk market regulations at farm scale and/or at more detailed regional or structural aggregates. The aim of this paper is, first, to analyse the impact of the implementation of the

2003 CAP reform on Austrian dairy farms, and, second, to gain first insights into the impact of future milk market regulations after 2015. These options will be analysed by modelling the decision making process of farms of the Austrian Farm Accountancy Data Network (FADN) database using a mathematical programming modelling system.

This paper is organised as follows: In chapter 2, the data pool for the model simulations will be introduced. In chapter 3, some details on the mathematical programming model, the scenarios simulated, and the basic model assumptions are presented. Chapter 4 gives, first, an overview of the model results and, second, provides additional information on the results of the respective scenarios. Finally, the results are discussed in chapter 5.

2. Data Pool

The data pool is based on micro data of the Austrian FADN (Farm Accountancy Data Network) from 2000 to 2002 with about 2.300 farms on average. The IACS (Integrated Administration and Control System) database served to complete missing data regarding farm-specific milk quota, agri-environmental measures and less-favoured area payments for the same period. Data from the agricultural census 1999 served to dissolve aggregated position of FADN data (for example, some positions of areas cultivated with certain crops and some positions of livestock). By aggregating up to three farms (according to the IACS database and the agricultural census 1999) into one farm (as is the case in the FADN-database), by excluding farms, which switched from organic to conventional farming (or vice versa), by guaranteeing that each farm is represented in the database in each of the three years, and by taking account only of farms, which still have an endowment of milk quota according to the IACS database 2006, the data pool for our model simulations consists of about 860 farms. Therefore, the selection of farms is mainly given by combining the existent databases as these farms are not selected on the basis of typical or representative farms.[1] Given the databases, all farms can be assigned to the following classifications: regional classification (eight major production regions, five alpine farming zones), management system (organic farming, conventional farming), business type (full or part time farming), seven classifications of farm production specialisation, and farm size according to economic size units.

Five alpine farming zones (see, for example, Tamme et al. 2002) aim to distinguish between farms in mountainous regions and farms in the reminding regions and considers, among other criteria, sloping sites, infrastructure, etc. Zone 0 denotes non-mountainous regions, and zone 4 very mountainous regions. Tables 1 and 2 give a (selective) overview on the farms in the database with respect to the five alpine farming zones.

Only a few farms in the data pool are located in very mountainous regions (zone 4, 4.5% of all farms), but more than a quarter in non-mountainous regions (zone 0, 29.1%); the remaining 66.4% of the farms are located in regions with a distinctive topography. 85% of the farms are full-time farms – the share of farms with this characteristic is lower in very mountainous regions compared to other alpine

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[1] For a selection of the farms in the Austrian FADN database, see BMLFUW (2006).

farming zones. 78% of the farms are specialised in forage production, 16% of the farms have a high share of forestry production, only 0.9% of the farms are specialised in cash crop production with a rather small endowment of milk quota. About a quarter of the farms in the data pool are organic farms – the more mountainous the region is the higher is the share of organic farms in the respective region. Except for farms in zone 0 (non-mountainous regions), all farms of the data pool located in zone 1-4 get less favoured area payments. Regarding the endowment of milk quota, most farms in the data pool (39.1%) have 40 to 100 t of milk quota. In very mountainous regions most farms have less than 40 t; a high share of farms in non-mountainous regions has milk quota of more than 100 t.

Table 1: Selected characteristics of farms in the database (share of farms per alpine farming zone in %)

alpine farming zones	% of farms	Full time farming	Forage production	Cash grain production	Organic farming	Less favoured area payments
zone 0	29.1	85.6	83.2	2.4	13.6	64.4
zone 1	24.8	86.4	84.0	0.9	27.2	100.0
zone 2	21.9	83.5	80.9	0.0	29.8	100.0
zone 3	19.7	86.4	61.5	0.0	32.0	100.0
zone 4	4.5	74.4	69.2	0.0	51.3	100.0
total	100.0	85.0	78.0	0.9	25.8	89.6

Table 2: Selected characteristics of farms in the database (share of farms per alpine farming zone in %)

alpine farming zones	% of farms	milk quota		
		< 40 t	40 – 100 t	> 100 t
zone 0	29.1	20.0	37.6	42.4
zone 1	24.8	18.3	39.9	41.8
zone 2	21.9	19.1	39.4	41.5
zone 3	19.7	34.9	42.0	23.1
zone 4	4.5	64.1	30.8	5.1
total	100.0	24.3	39.1	36.6

3. Farm optimisation model

The basic model used for this research question is FAMOS (Farm Optimisation System), which is documented in Schmid and Sinabell (2006) in detail. This model was adopted for the database and modified for the focus of the analysis. In the following, the model will be briefly presented, and differences to Schmid and Sinabell (2006) will be pointed out: While the database of Schmid and Sinabell (2006) consists of typical farms, the database used here are farms of the Austrian FADN.[2]

In FAMOS each farm model is solved independently using mathematical programming methods. Economic impacts due to reactions of farms on policy instruments and exogenous influences can be analysed at farm level and/or – as is the case for the book keeping farms used here – for certain regional or structural aggregates (e.g. farms within the same region or farms applying the same management system, etc.). In the model, each farm maximises its total gross margin (TGM) on a

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[2] In the literature, many existing models almost exclusively use FADN data to analyse impacts at farm or regional level (see, for example, Schleef and Kleinhanß, 1999, Paris and Arfini, 1999, Arfini et al, 2003, etc).

yearly basis, consisting of the revenue from selling its products from livestock and/or crop production, operating costs, and direct payments (coupled payments, single farm payments, payments of the Austrian agri-environmental programme ÖPUL, and less-favoured area payments). In contrast to Schmid and Sinabell (2006), secondary and off-farm income activities are not considered in this analysis.

In FAMOS, the decision making process based on historical and alternative production and income possibilities is simulated for each farm in the database. These possibilities consist of land use, crop production, livestock production, management, and direct payments, and are endogenously formulated. For the analysis, the management system (organic or conventional production) according to the database is maintained in all scenarios. Yields, resource endowments, positions of direct payments, prices, costs as well as coefficients regarding factor use, feed rations, fertilizer coefficients, etc. are exogenous.

For calibrating FAMOS, the method of convex combinations of historical and alternative mixes (for example, the mix of crops cultivated on agricultural land) is extensively used (see, for example, Dantzig and Wolfe, 1961; McCarl, 1982). For each farm the resource endowments of land, livestock, and milk quota are considered – in contrast to Schmid and Sinabell (2006), labour endowments are not taken into account. Generally, resource demand for production has to be less than or equal their resource endowments. Each farm model can choose regarding its land categories (e.g. arable land, forests, etc.) and its crop production on each land category from three years in the database. In contrast to Schmid and Sinabell (2006), livestock production is determined by the three-year average of livestock endowments. The output of crop production can be either sold or used as forage. For livestock production, young animals can be purchased. Fertilizer can be produced on farm or purchased as well. Like in Schmid and Sinabell (2006), technology and costs of farm activities are based on Standard Gross Margins (BMLFUW, 2002a, 2002b and 200c).

Due to the static nature of the model all scenarios were calculated independently from each other using GAMS (General Algebraic Modeling System). The following scenarios are considered:

1) base-run
The base-run simulates an average situation before the implementation of the decisions of the 2003 CAP-reform (2000 and 2002). This is the reference period for calculating reference hectares and single farm entitlements per hectare.
2) scenario 2008
This scenario represents the CAP-reform 2003 (including the milk market reform): single farm payments are implemented; a milk premium is introduced and decoupled. Milk quota endowments at farm level are reflected by the IACS data according to 2006 and are expanded by 1.76%. Afforestation on agricultural land is not allowed (cross compliance); a modulation of 5% is considered.
3) scenario 2015 – continuation of milk quota system
In this scenario we assume that the milk quota system will continue. Milk quota endowments at farm level are the same as in scenario 2008.
4) scenario 2015 – abolition of milk quota system

In this scenario we assume that there is no milk quota system in place, such that the milk quota at farm-level of 2008 is not binding anymore. Both scenarios representing the year 2015 are calculated with two different assumptions concerning the level of the milk price ('high' and 'low' milk price)

Before turning to the comparative static analysis of the simulations, some fundamental assumptions have to be mentioned: All scenarios have been calculated under the assumption of the Austrian agri-environmental programme ÖPUL 2000-2006; the recent programme from 2007 onwards (with slightly different measures farms can choose from) is not considered. Product and factor prices as well as prices for fertilizers and forage have been adjusted in the scenarios 2008 and 2015 according to assumptions of the Austrian Institute of Economic Research (WIFO), based on OECD/FAO projections (see Rosenwirth and Sinabell, 2007). The milk prices in the simulations are as follows (milk price A-quota, 4.2% fat and 2.4% protein, exclusive of VAT):

- base run: 0.315 Euros/kg
- 2008:   0.336 Euros/kg
- 2015 - quota: 0.315 Euros/kg (high level), 0.296 Euros/kg (low level)
- 2015 – no quota: 0.296 Euros/kg (high level), 0.266 Euros/kg (low level)

The milk price for milk from D-quotas is assumed to be 110% of the price for milk from A-quotas, the price wedge between organic and conventional milk is assumed to be 15%. The price for milk which exceeds the quota at farm level is assumed to be 60% of the price for milk from A-quotas. Consequently, we assume a super levy of 40% of the price for milk from A-quotas. Due to the decoupling of the milk premium in 2007, the milk quota of farms in scenarios 2008 and 2015 is given by the IACS data of 2006 plus 1.76% (i.e. quota expansion according to the milk market reform). Most of the farms have purchased additional quota between 2002 and 2006 such that the quota at farm level increases by 16.4 % on average. If farms increased their endowment of quota between 2002 and 2006, quota costs of 0.12 Euro/kg were considered in the scenario 2008.

Milk yields per cow are based on farm-level data (average 2000-2002) and are increased by 1% per year. The endowment of livestock is constant for all scenarios, only the endowment of milk cows and calves for 2008 (and consequently, for 2015) was exogenously adjusted based on the farm level quota of 2008, based on the ratio calves/cow in the base-run and by taking account of a maximum stocking of 2 livestock manure units/hectare. Yields of crop production are constant for all scenarios. The markets for land and milk quotas are not considered in the model so far. In the scenarios 2008 and 2015, a modulation of 5% for direct payments (coupled payments plus single farm payments) exceeding the threshold of 5.000 Euros was taken into account.

4. Scenario results

4.1. Reference Area and Single Farm Payments per Hectare

The reference period for calculating reference hectares and single farm payments per hectare is 2000 to 2002, which is represented by the base-run. For the farms in the data pool, the mean of reference hectares is 32.3 ha (median = 25.2 ha), the mean of the single farm payments per hectare is 281.3 Euros/ha (median = 289.8 Euros/ha). Figure 1 shows the frequencies of single farm payments per hectare:

Figure 1. Frequencies of single farm payments (SFP, in Euros/ha)
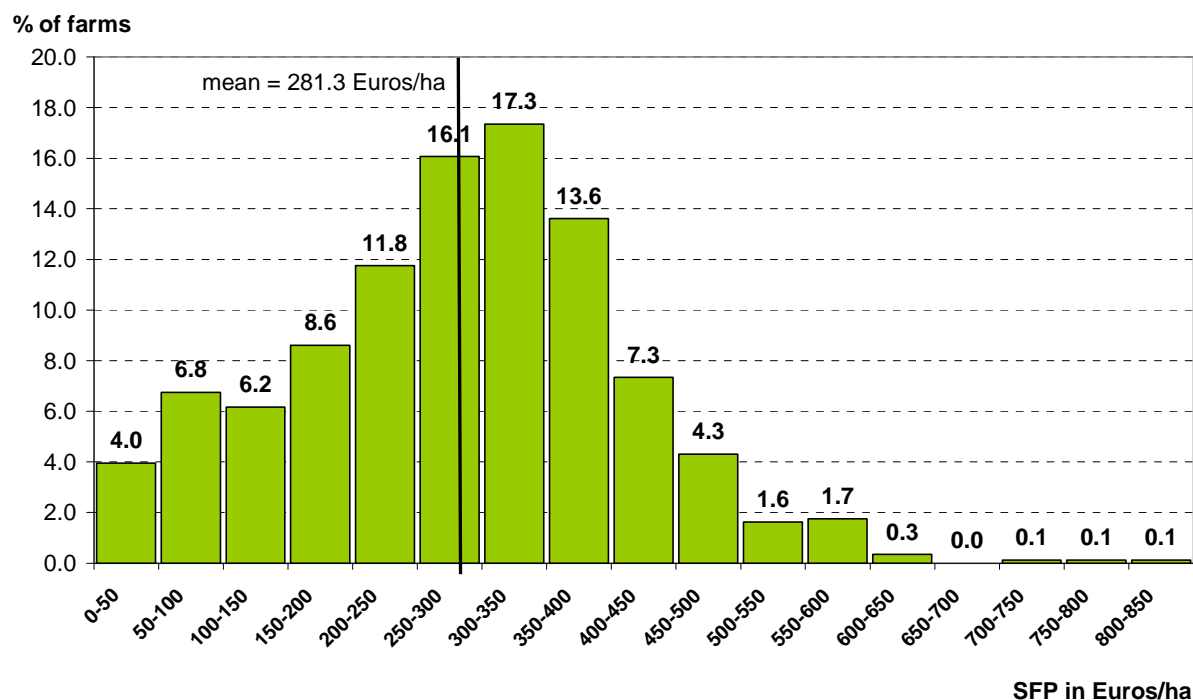
For most of the organic farms (69.4%), but only for 38.8% of the conventional farms in the data pool single farm payments per hectare are lower than the mean of 281.3 Euros/ha. The same applies to 89.7% of the farms in alpine farming zone 4 (very mountainous regions), but only to 20.0% of the farms in zone 0 (non-mountainous regions). The smaller the farms are in terms of milk quota endowments, the higher the share of farms with lower single farm payments per hectare: 75.6% of the farms with less than 40 t of milk quota, 51.2% of the farms with 40-100 t, and 22.6% of the farms with more than 100 t of milk quota have lower single farm payments per hectare. Regarding the specialisation of farms, 40.1% of farms specialised in forage production and 12.5% of farms specialised in cash crop production have lower single farm payments than the average.

4.2. Overview of Model Results

Before turning to the results of the scenarios in detail, an overview is given in table 3: In 2008, TGMs are on average higher, compared to the base run. This is the effect of an average increase in milk quota at farm level (+16.4%) and milk yields per cow, changes in prices and costs, the implementation of the 2003 CAP reform (decoupling, modulation, and cross-compliance), the introduction of the milk premium, and optimal adjustments of farms to these changes. Most farms are better off compared to the base-run, which is indicated by a positive median. In 2015, TGMs are, on average, higher without

a quota than with a quota regulation for the assumption of a high milk price (+0.9%). Assuming a low milk price, farms are better off on average if the quota regulation will be continued.

Table 3. Mean and median on the distribution of changes in TGMs (in %)

Scenarios:	mean	median
2008 vs. base-run	+17.3	+16.9
2015 high milk price:		
2015 (quota) vs. 2008	+0.5	-0.5
2015 (no quota) vs. 2008	+1.4	+0.8
2015 (no quota) vs. 2015 (quota)	+0.9	+0.7
2015 low milk price:		
2015 (quota) vs. 2008	-3.1	-3.5
2015 (no quota) vs. 2008	-4.5	-4.7
2015 (no quota) vs. 2015 (quota)	-1.5	-1.4

4.3. Scenario 2008 compared to base-run

Scenario 2008 represents the situation of a fully implemented CAP-reform (including the milk market reform). Milk yields per cow at farm level increase by 6% compared to the base-run, and milk prices increase according to the assumptions; milk quota at farm level increase by 16.4% on average. Compared to the base-run (a situation before the CAP-reform) TGMs increase by 17.3% on average. Most farms in the data pool are better of as indicated by the median of +16.9%. Table 4 shows the results for certain regional and structural characteristics:

Table 4. Statistics on the distribution of changes in TGMs (scenario 2008 compared to base-run)

	% of farms of total sample	mean (in %)	median (in %)
total sample		+17.3	+16.9
alpine farming zones:			
zone 0	29.1	+18.4	+18.8
zone 1	24.8	+17.9	+16.7
zone 2	21.9	+18.5	+17.9
zone 3	19.7	+15.0	+14.1
zone 4	4.5	+10.3	+8.5
specialisation:			
Forage production	78.0	+18.7	+18.4
Cash grain production	0.9	+10.0	+9.4
milk quota:			
< 40 t	24.3	+6.6	+9.1
40 – 100 t	39.1	+16.7	+15.7
> 100 t	36.6	+24.9	+23.5
management system:			
conventional farms	74.2	+18.5	+18.4
organic farms	25.8	+13.7	+13.4

Increases in TGMs are lower in mountainous regions than in non-mountainous regions (zone 0) and lower for organic than for conventional farms; most of the farms in mountainous regions have less milk quota and produce organic. For smaller farms with a milk quota of less than 40 t increases in TGMs are moderate (+6.6%) compared to farms with a high endowment of milk quota. On average, small farms have a lower quota endowment in 2008 compared to the base-run (-7%), whereas farms with more than 40 t have a higher quota endowment (for example, for farms with more than 100 t the farm-specific quota increases by 32% on average).

4.4. Scenario 2015 (with quota) compared to scenario 2008

Assuming that in 2015 the milk quota regulation continues, milk prices are – by assumption – lower than in scenario 2008. Milk yields per cow are assumed to further increase by 1% per year, the quota endowment at farm-level equals the level of scenario 2008. In comparison with scenario 2008, TGMs increase by 0.5% on average assuming a high milk price in 2015 and decrease by -3.5% on average assuming a low milk price (see table 5). However, most farms in the data pool are worse off for both price assumptions.

Table 5. Statistics on the distribution of changes in TGMs (scenario 2015 with a quota regulation compared to scenario 2008)

		high milk price		low milk price	
	% of farms of char.	mean (in %)	median (in %)	mean (in %)	median (in %)
total sample		+0.5	-0.5	-3.1	-3.5
alpine farming zones:					
zone 0	29.1	-0.1	-1.2	-3.8	-4.9
zone 1	24.8	+0.1	0.0	-0.8	0.0
zone 2	21.9	+0.2	0.0	-0.6	0.0
zone 3	19.7	+0.2	0.0	-0.4	0.0
zone 4	4.5	0.0	0.0	-0.1	0.0
specialisation:					
Forage production	78.0	+0.7	-0.4	-3.1	-3.7
Cash grain production	0.9	-2.2	-2.7	-4.5	-5.3
milk quota:					
< 40 t	24.3	-1.2	-1.2	-3.4	-3.1
40 – 100 t	39.1	-0.3	-0.9	-3.8	-4.0
> 100 t	36.6	+2.5	+1.7	-2.0	-2.8
management system:					
conventional farms	74.2	+0.7	-0.3	-3.0	-3.5
organic farms	25.8	-0.2	-0.8	-3.3	-3.6

While TGMs for most of the farms in non-mountainous regions (zone 0) decrease on average, farms in mountainous regions are slightly better off on average for high milk prices, but worse off on average for low milk-prices. Most farms specialised in forage production have lower TGMs for both assumptions on the level of the milk price. Most of the smaller farms with a milk quota of less than 100 t are worse off compared to 2008, only larger farms are better off on average assuming a high milk price. One reason for this is that average milk yields per cow are higher for larger farms than for

smaller farms. Assuming a high milk price, only conventional farms with higher average milk yields per cow than organic farms are better off compared to 2008.

4.5. Scenario 2015 (without quota) compared to scenario 2015 (with quota)

Assuming an abolishment of the quota system in 2015, changes in TGMs in comparison with the results for a continuation of the quota system in 2015 are given in table 6:

Table 6. Statistics on the distribution of changes in TGMs (scenario 2015 without a quota system compared to scenario 2015 with a quota system)

		high milk price			low milk price		
	% of farms of total sample	mean (in %)	median (in %)	mean of absolute difference (in Euros)	mean (in %)	median (in %)	mean of absolute difference (in Euros)
total sample		+0.9	+0.7	+393	-1.5	-1.4	-1.197
alpine farming zones:							
zone 0	29.1	+0.6	+0.3	+135	-2.0	-1.7	-1.562
zone 1	24.8	+0.2	0.0	+101	-0.4	0.0	-312
zone 2	21.9	+0.2	0.0	+90	-0.4	0.0	-315
zone 3	19.7	+0.3	0.0	+133	-0.2	0.0	-110
zone 4	4.5	+0.1	0.0	+30	0.0	0.0	-5
specialisation:							
Forage production	78.0	+0.9	+0.7	+328	-1.7	-1.7	-1.367
Cash grain production	0.9	+0.5	+0.4	+70	-1.1	-0.9	-878
milk quota:							
< 40 t	24.3	+1.6	+1.1	+538	0.0	-0.2	+71
40 – 100 t	39.1	+1.4	+1.2	+808	-1.1	-1.1	-476
> 100 t	36.6	-0.1	-0.1	-149	-3.0	-3.0	-2.812
management system:							
conventional farms	74.2	+1.1	+0.8	+475	-1.4	-1.4	-1.170
organic farms	25.8	+0.4	+0.5	+155	-1.7	-1.4	-1.273

In scenario 2015 without a quota system, milk prices are assumed to be lower than for scenario 2015 with a continuation of the quota system. Differences in TGMs between these two scenarios are quite moderate. However, for the assumption of high milk prices, TGMs are by 0.9% higher, on average, without a quota regulation compared to the situation with a quota regulation (most farms are better off); for the assumption of low milk prices TGMs are, on average, by -1.5% lower on average (most farms are worse off). For a high level of milk prices in 2015, especially smaller farms (with a quota up to 100 t at farm level) have higher TGMs, on average, without a quota regulation; larger farms have lower TGMs on average. Assuming a low level of milk prices, there is no difference on average for small farms whether there is a quota regulation in place or not; most big farms are worse off. Conventional farms gain more (loose less) on average from an abolition of the quota system than organic farms. From a regional point of view, positives (negative) changes in TGMs are highest for farms in non-mountainous regions, but almost zero for farms in very mountainous regions. One

explanation for smaller farms having higher TGMs without a quota regulation than with a quota in place shows figure 2 and figure 3:
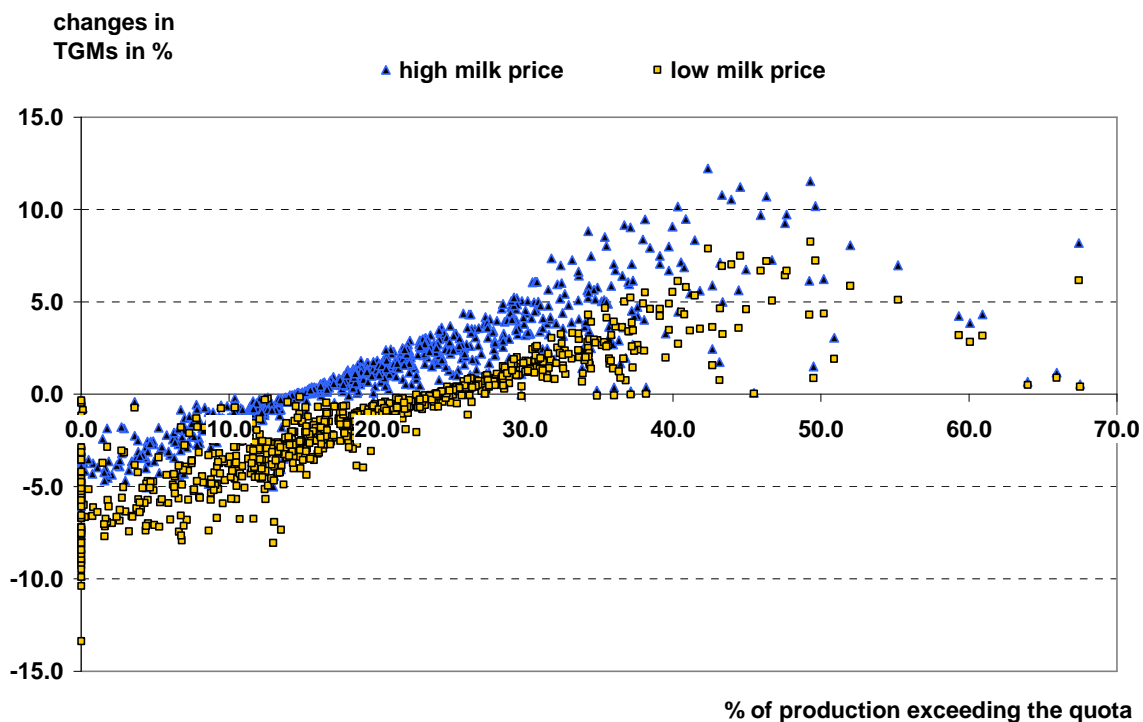

Figure 2. Changes in TGMs (2015 without quota vs. quota) in relation to the share of milk production exceeding the quota on total milk production
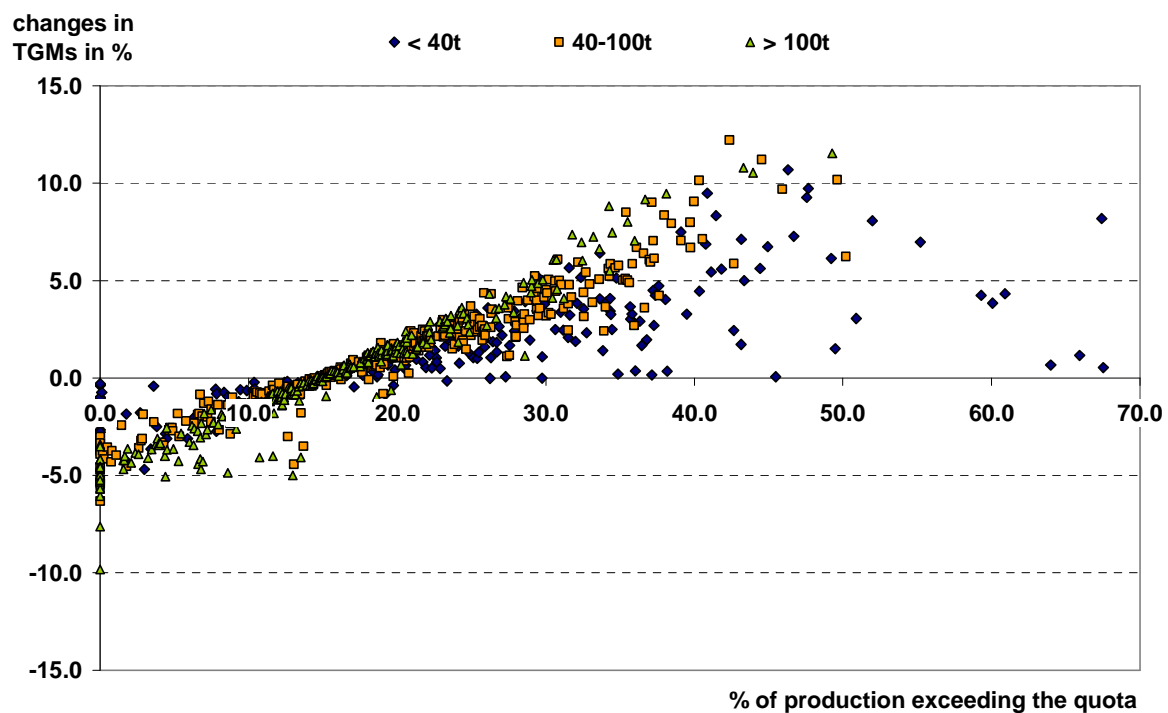

Figure 3. Changes in TGMs (2015 without quota vs. with quota) in relation to the share of milk production exceeding the quota on total milk production – high milk price

For the assumption of a high (low) milk price, farms, whose milk production exceeding the quota is more than about 15% (25%) of their total milk production, are better off without a quota regulation compared to a situation with a quota regulation in place (changes in TGMs are positive).[3] Figure 2 (for a high milk price) shows that especially for small farms with a quota of less than 40 t, the share of milk production exceeding the quota is relatively high in contrast to larger farms: On average, excess production beyond the quota for smaller farms (quota of less than 40 t) is 24.8% of total production, for farms with 40 to 100 t 19.9% and for farms with more than 100 t 15.1%.[4] Without a quota, the super levy on excess production (and, thus, a lower price for milk beyond the quota) becomes invalid. On average and assuming a high milk price, revenues from milk production are 4.1% higher without a quota than with a quota for farms with less than 40 t (for farms with 40-100t: mean = +2.4%, for farms with more than 100t: mean = 0%).

5. Summary and conclusions

One aim of the 2003 CAP reform with its main instruments decoupling, modulation and cross-compliance is to lessen the extent by which production incentives of farmers are influenced by policy instruments. The main incentives shall be provided by agricultural markets themselves. The quota regulation of the European milk market is limited by March 31st, 2015, and the European Commission has been signalling that the milk quota system will not be continued after 2015. In 2008, the recent CAP reform will be evaluated within the scope of the 'health check' of the EC. Possible options for any regulation after 2015 are either a continuation of the milk quota system as it is now or an abolishment of quota.

To gain first insights into the impact of possible future milk market regulations on Austrian dairy farms, the Farm Optimisation System FAMOS (Schmid and Sinabell, 2006) was adopted and modified. Using Austrian FADN (Farm Accountancy data network) data, we, first, analyse the impact of the CAP reform 2003 and the full implementation of the milk market reform. Second, we compare the results of a situation with a milk quota and of a situation with no milk quota in 2015.

The data pool is based on micro data of the Austrian FADN from 2000 to 2002, which is completed by IACS data and data from the agricultural census 1999. Taking account only of FADN farms, which have an endowment of milk quota according to the IACS database of 2006, the data pool consists of about 860 farms. 4.5% of the farms in the data pool are located in very mountainous regions with a small endowment of milk quota, more than a quarter are located in non-mountainous regions with a high share of farms having more than 100 t of milk quota. Most of the farms are part-time farms, which are specialised in forage production; a quarter of the farms produces organic.

The static model maximises total gross margins (TGM) on a yearly basis for each farm, consisting of revenues from selling livestock and crop production, operating costs, and direct payments (coupled

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[3] This result is independent of the underlying assumption of increases in milk yields per cow.

[4] Assuming no increase in milk yields per cow, the average share of production exceeding the quota on total milk production is 16.4% for farms with a quota of less than 40 t, 11.0% for farms with 40 – 100 t, and 6.4% for farms with more than 100 t (mean of all farms in the data pool = 10.6%).

payments, single farm payments, payments of the agri-environmental programme, and less favoured area payments). In the base-run, which simulates an average situation before the implementation of the 2003 CAP reform, single farm payments per hectare are calculated. These payments are implemented in a scenario, which simulates the effects of the CAP reform (including the milk market reform: introduction of a milk premium, decoupling of the milk premium, increase of milk quota endowments) and refers to 2008. For 2015, we distinguish between a situation with a milk quota regulation and a situation without a quota regulation. Price assumptions for all scenarios are provided by the Austrian Institute of Economic Research (Wifo).

On average, farms in the data pool have reference hectares of 32.3 ha and single farm payments per hectare of 281.3 Euros/ha. Farms with lower entitlements are mostly organic farms, farms in very mountainous regions, and/or farms with less than 40 t of milk quota. Due to the CAP reform and given the model assumptions, most farms are better off in 2008 than in the base-run; TGMs increase by 17.3% on average. These increases are lower in mountainous regions, for organic farms, and for farms with only a small endowment of milk quota. Assuming a quota regulation in 2015, TGMs for most of the farms in non-mountainous regions, organic farms and for most of the smaller farms with less than 100 t of milk quota, respectively, are lower compared to 2008. One reason for this is that smaller or organic farms, respectively, have lower milk yields per cow relative to bigger or conventional farms.

In 2015, changes in TGMs between the scenario with a quota regulation and the scenario of an abolition of milk quota are quite moderate. However, assuming high (low) milk prices, TGMs are higher (lower) on average without quota. Especially smaller farms (with an endowment of up to 100 t of milk quota) have higher TGMs, on average, without a quota regulation. Conventional farms gain more (loose less) on average from an abolition of the quota system compared to organic farms. From a regional point of view, positive (negative) changes in TGMs are highest for farms in non-mountainous regions, but almost zero on average for farms in very mountainous regions. One explanation for smaller farms having higher TGMs without a quota regulation than with a quota regulation is that especially for small farms with less than 40 t of milk quota the share of milk production exceeding the quota is higher than for larger farms. Without a quota, a levy on excess production (and, thus, a lower price for milk beyond the quota) becomes obsolete, such that on average, revenues from milk production are 4.1% higher without a quota than with a quota for farms with less than 40 t.

Given the model assumptions, the results show increases in TGMs in the CAP reform scenario compared to the base-run for most of the farms in the data pool. To draw conclusions on whether farms are better of with or without a milk quota regulation a range of possible levels of the milk price in 2015 was defined, yielding different results for regional and structural aggregates. Assuming a high milk price, the results point into the direction that smaller farms (in terms of milk quota endowment) are better off if the milk quota regulation is abolished. Interpreting these results one have to take into account that markets for land and quotas have not be taking into account in the model so far. The degree of excess production beyond the quota indicates the competitiveness of dairy farms. Generally, milk production regularly exceeds the quota in Austria, indicating relatively low marginal costs of milk production in some regions (see Rosenwirth and Sinabell, 2007). In this analysis issues of the 'health check' like other implementations of single farm payments (for example, using a regional

approach instead o the historic approach) were not considered, which might yield different results, especially for farms with milk quota.

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