



Gross revenue risk in Swiss dairy farming

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ABSTRACT

This study investigated how agricultural policy reforms, including market liberalization and market deregulation, have influenced gross revenue risk of Swiss dairy producers using farm-level panel data between 1990 and 2009. Based on detrended data, variance decomposition was applied to assess how output prices and yields contributed to revenue risk over 3 different periods: the whole period (1990–2009), the first decade (1990–1999), and the second decade (1999–2009). In addition, the effect of expected changes in animal-based support for roughage-consuming cattle and price volatility on revenue risk was evaluated using a simulation model. Prices were the main contributor to revenue risk, even if the importance of yield risk increased over time. Swiss dairy producers can profit from natural hedge but market deregulation and market liberalization have reduced the natural hedge at the farm level. An increase in price volatility would substantially increase revenue risk and would, together with the abandonment of direct payments, reduce the comparative advantage of dairy production for risk-averse decision makers. Depending on other available risk management strategies, price risk management instruments might be a valuable solution for Swiss dairy producers in the future.

Key words: revenue risk, dairy farming, variance decomposition, agriculture policy reform

INTRODUCTION

Motivation and Goals of the Study

Dairy production involves several risks such as volatile production level and market prices. The US dairy industry, for instance, has experienced a strong increase in price variability due to the reduction in the level of milk price support, an increasing reliance on export markets, and changes in supply and demand (Wolf et al., 2009; Valvekar et al., 2011). For European

producers, risk is expected to increase due to market liberalization (Thompson and Gohout, 2000; European Community, 2001; Meuwissen et al., 2003; Skokai and Moro, 2005). Intensively managed farms (in contrast to pasture-based farms), in particular, may be strongly affected by the price variability of concentrate feed, which can be an important cause of net income risk in dairy farming (Wilson et al., 1987; Schmit et al., 2001).

In addition, milk production may become more risky due to the effect of climate change on fodder yield variability as well as heat stress affecting lactation (Cross, 1994; Kadzere et al., 2002; Chen et al., 2006). Although yield risk is often found to be lower in dairy farming than in crop production (Wolf et al., 2009), strong differences between regions can be observed. For instance, a coefficient of variation for milk yields of 5% was found for Dutch dairy producers (Meuwissen et al., 1999), which is similar to that found for Swedish producers (4.7%), but a much higher yield risk was observed for Italian (Tuscany) farmers with a coefficient of variation of 30.3% (European Community, 2001). Yield levels and yield risk are not only affected by weather conditions but also by the cows' health and farm management. Organic farming, for instance, was found to result in lower and riskier yields than conventional dairy production (e.g., Busato et al., 2000; Trachsel et al., 2000; Sato et al., 2005; McBride and Greene, 2009; Berentsen et al., 2012; D'Antoni and Mishra, 2012).

Empirical studies have found that dairy farmers perceive price risk as one of the most important sources of risk (Martin, 1996; Harwood et al., 1999; Meuwissen et al., 2001; Schaper et al., 2008), and assisting farmers in managing risk is a major concern of agricultural policies in several countries (Bosch and Johnson, 1992; European Community, 2001; Maynard et al., 2005; Tyner et al., 2005). To tailor this assistance to the needs of farmers, it is necessary to quantify how different drivers contribute to revenue risk. Although market liberalization can lead to an increase in price variability for domestic producers, the role of direct payments in farmers' incomes is very important in risk considerations. Because direct payments are a stable, and thus a risk-free, source of income, farm revenues are less variable (Cafiero et al., 2007; Agrosynergie, 2011;

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El Benni et al., 2012). Thus, the effects of direct payments as well as the effects of increasing price volatility need to be taken into account if risks are estimated and future developments are discussed. Furthermore, the allocation of direct payments can affect the comparative risk position of specific farm activities. If, for instance, direct payments are tied to a certain farm activity such as dairy production, this improves the position of this activity in a whole farm portfolio in terms of risk.

The goal of this study was to assess how gross revenue risk in Swiss dairy production has changed over time and might change in the future. The effects of past and proposed policy changes on dairy farmers are of particular importance for Swiss policy makers as grassland-based dairy and cattle farming contribute 40 to 50% to the gross agricultural income in Switzerland. The high contribution of roughage-based livestock production to Swiss agriculture is caused by the natural production conditions (permanent grassland and productive alpine pastures cover 72% of the cultural land; Bötsch, 2004; Jeangros and Thomet, 2004). Furthermore, Switzerland serves as an interesting case study for other countries, as the market and policy environment of farmers has changed considerably over the last 2 decades. From the early 1990s onward, Swiss agricultural policy emphasized the liberalization of the milk market by reducing market price supports and, after a transition period, abolished the milk quota system in 2009. Direct payments based on roughage animal units will be abandoned with the next policy cycle. These developments are expected to affect the gross revenue risk in Swiss dairy production, as well as the riskiness of dairy production compared with other farm activities.

To assess the effects of past and proposed policy changes on revenue risk in Swiss dairy production, we use farm-level panel data of 412 milk-producing farms for the period from 1990 to 2009. Based on detrended data, we first estimated production, price, and revenue risks for each single farm using the coefficient of variation. Second, we applied a variance decomposition procedure to specify if production or price risk was the most important source of gross revenue risk. The analyses were carried out for different periods to test whether the contribution of prices and yields to revenue risk changed with past policy changes. Third, we simulated how changing levels of direct payments and price volatilities would affect farmers' revenue risk using stochastic simulation. This study is the first empirical investigation into the perils faced by Swiss dairy farmers and shows how price, yield, and revenue risk have changed over time. The results indicate the potential of possible risk management instruments in dairy production, which depends, in part, on the extent of risk coming from yields and prices.

Policy and Market Environment of Swiss Dairy Producers

Over the last 2 decades, Swiss agricultural policy introduced various measures to deregulate and liberalize the market. At the same time, more weight was put on decoupled direct payments to (besides internalizing negative effects from agriculture) support the income of farmers. From the early 1990s onward, prices of agricultural outputs decreased due to modifications in the border protection schemes and the abolishment of price and sales guarantees (see e.g., BLW, 2007; El Benni and Lehmann, 2010). Furthermore, starting in 2002 with tariff reductions and the removal of technical barriers to trade, a bilateral trade agreement with the European Union (EU) came into force in 2007 that totally liberalized the market for cheese between both trading partners (Jörin et al., 2006). Since then, no border protection is provided for the “yellow line” (cheese) but producers are compensated by an amount of 0.15 Swiss francs (CHF, where US\$1 = 0.93 CHF) per kg of raw milk that is processed into cheese and by 0.03 CHF per kg if the milk is produced without silage feeding. These support payments were introduced in 2000 and were steadily reduced over time. They are given to the cheese processors who pay higher milk prices to the producers. Thus, for milk delivered to cheese dairies, a 10% price premium is common (Mann and Gairing, 2011). In contrast, the “white line” (e.g., that includes milk powder, butter, and yogurt) still receives support from border protection schemes but all export refunds and internal subsidies (such as butter used in industry) were abolished by 2009 and the financial means were partly transferred into decoupled direct payments (Chavaz, 2010).

An exceptional step—in the European context—toward market deregulation was the decision of the Swiss Parliament in 2003 to abolish the milk quota system in 2009 to allow for a flexible and market-driven supply allocation and to strengthen the competitiveness of milk production (Chavaz, 2010). From 2000 onward, Swiss farmers could trade their individual milk quotas (FOAG, 2000). In a transition period from 2006 to 2009, farmers could transfer their milk quota to a global quota by becoming a member of a milk producer organization (PO) or milk processor organization (PPO). By joining a PO or PPO, milk producers are required to complete a 1-yr (at least) contract that stipulates the quantity and price of milk sales. Although the contracted quantity often matches the amount of the former (individual) quota, the law does not specify whether amount and price must be fixed for 1 yr. In practice, almost 50% of milk buyers have not determined the amount of time for which a price is fixed, but

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