Removing EU milk quotas, soft landing versus hard landing

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Abstract— **This paper analyses EU dairy policy reforms and mainly focus on EU milk quota removal scenarios. The model used to evaluate the scenario is a spatial equilibrium model of the dairy sector. It integrates the main competitor of the EU on world markets, Oceania, as well as the main importing regions in the rest of the world. The paper first assesses the impact of the Luxembourg scenario in the prospect of a new WTO agreement in the future. It then provide a quantitative assessment of the impact of the abolition of EU milk quotas on the EU dairy sector either through a gradual phasing out or through an abrupt abolition of milk quotas. Compared to a status-quo policy, the Luxembourg policy leads to a 7.6 percent milk price decrease and a 1.9 percent milk production increase. A gradual increase of milk quotas as recently proposed by the European Commission (+ 7% over 6 years) generate a 9% drop in the EU milk price (compared to the Luxembourg scenario) and an increase in production by 3.5%. A complete elimination of quotas leads to an additional 1% increase in production and an additional 3% drop in the EU milk price. As compared to the baseline scenario, in the Luxembourg scenario in 2014-15, producers gain 1.3 billion €, whereas in the same year they lose 2.6 billion € in the soft landing scenario. As such the direct payments are more than sufficient to compensate producers for the loss of producer surplus in the Luxembourg scenario, but fall short to achieve full compensation in the soft landing scenario.**

Keywords— **milk quota, policy reform, soft and hard landing.**

I. INTRODUCTION

The EU dairy policy has undergone several changes over the last 30 years. The most significant of these changes were the introduction of the milk quotas in 1984, and more recently the 2003 CAP reform (Luxembourg Agreement). The Luxembourg Agreement not only deepened the reform of the 1990s, but further completed it by including the dairy sector, as well as by decoupling the direct payments from production. As regards dairy it implied significant declines in support prices for butter and skimmed milk powder as well as significant reductions in the intervention purchases. As a result the intervention prices no longer act as strict floor prices. These price cuts are partly compensated for by newly introduced milk premiums. The milk quota regime was prolonged till 2014-15. In the upcoming evaluation of the CAP (Health Check in 2008) the future of the quota regime will be at the core of the discussions. Many countries are now in favour of an expiry of the quota regime. Milk production quotas were increased by 2% in April 2008, and the European Commission has proposed to increase them by 1 percent per annum from 2009 to 2013.

In this paper, we evaluate the impact of alternative scenarios of dairy policy. Namely, we analyze the Luxembourg reform, the recent EC proposal (soft landing) and a hard landing scenario.

II. CONCEPTUAL FRAMEWORK

The analysis of dairy policy reforms relies on the integrated use of a model which takes into account the whole dairy chain, starting upstream from primary milk production and ending downstream with consumer demand for processed dairy products. At the primary supply level the model takes into account that milk is produced using a dairy cow herd, (compound) feed and roughage feed, among which grass from pasture land. The primary supply model also recognizes that milk and beef might be jointly produced and also takes into account beef output. The supply model also takes overtime improvements in milk yields into account. On average over the period 2008-2020, milk yields (autonomously) increase by

1.03% and 1.21% per annum for the EU15 and EU10 respectively. These yield increases, which vary over countries, are based on empirical estimates. As regards the policy side, the milk quota policy is taken into account with respect to national quota levels and fat correction to deal with actual fat composition of milk. In case of binding milk quota this implies that an estimate of the value of the quota rent has to be used (see more detailed discussion below). Also the direct payments received by dairy producers, which are considered to be fully decoupled, are accounted for.

To deal with the downstream part of the dairy chain, a processing model is used, which consists of a partial equilibrium model of the dairy sector. It has two key features. First, it is a hedonic model that explicitly models the processing technology of milk into final commodities. Milk is valued through the value of its two main components (fat and protein) in the final dairy commodities and the underlying technology is consistent with milk availability (quantity of components used in the process of final commodities cannot exceed the available quantities of milk components). Second, the model is spatial and is disaggregated at the country level, which allows for the modelling of trade between countries. As regards the policy side, the main instruments used to support milk prices are integrated (intervention prices, domestic and exports subsidies, import policy).

Formally, we denote I_1 the subset of producing and exporting regions (EU, Oceania) and I_2 the subset of importing regions (Asia, Africa and Middle East, America, CIS and rest of Europe). The inverse supply function for milk in region i $(i \in I_1)$ is denoted $S_i(X_i)$ with X_i the quantity of milk collected. Because milk is a bulk product, we do not allow trade of raw milk between regions. We denote $Y_{i,k}$ the production of the processed commodity k in region i. Production of commodity k involves different components that are an integral part of raw milk and that are "rearranged" and allocated among processed commodities. We denote $\alpha_{i,s}$ the quantity of the s^{th} component per unit of raw milk produced in region i and $\gamma_{k,s}$ the quantity of the s^{th} component per unit of processed commodity k. Under a Leontief technology, the transformation of raw milk into processed commodities must satisfy:

$$\sum_k Y_{i,k}\gamma_{k,s} \le X_i \alpha_{i,s} \qquad \forall i \in I_1, s \quad (1)$$

Equation (1) ensures the balance in the allocation of component s in each producing region i. In addition to milk components, the production of commodity k also involves labour and capital inputs, which are provided at a marginal cost function $c_{i,k}(Y_{i,k})$.

The inverse demand function for each final commodity k in region i is denoted by $D_{i,k}(Z_{i,k})$ where $Z_{i,k}$ denotes the consumption of commodity k in region i.

Trade across regions involves transportation cost. We assume a constant marginal cost for transportation of commodity k from region i to region j and denote it $t_{i,j,k}$. Trade flows, denoted by $XD_{i,j,k,ex,imp}$, represent the quantity of commodity k that is transported from region i to region j under the export regime ex (of region i) and under the import regime imp (of region j). We distinguish subsidized exports (ex = "*sub*") from non subsidized exports (ex = "*nsub*"). The per-unit export subsidy for commodity k is denoted by $ES_{k,ex}$. Obviously, $ES_{k,\text{"nsub"}} = 0,\ \forall k$. On the import side we consider import tariffs and tariff rate quota (TRQ). TRQs are modelled as an import quota associated with a low tariff (imp="*min*") and over quota imports associated with a higher tariff (imp="*ovq*"). We also consider the case where no tariff prevails (imp="*no*"). The per-unit import tariff for commodity k is denoted by $IT_{k,imp}$. Obviously, $IT_{k,\text{"no"}} = 0,\ \forall k$. Finally, note that $XD_{i,i,k,\text{"nsub"},\text{"no"}}$ is the quantity of commodity k that is both produced and consumed in the same region i. The trade flow constraints across regions are:

$$\sum_{j,ex,imp} XD_{i,j,k,ex,imp} \le Y_{i,k} \qquad \forall i \in I_1, \forall k \quad (2)$$

$$Z_{i,k} \le \sum_{j,ex,imp} XD_{j,i,k,ex,imp} \qquad \forall i,k \quad (3)$$

In any region, these equations guarantee that exports plus domestic use cannot be larger than domestic production (equation 2), and that domestic consumption cannot exceed domestic production plus imports (equation 3).

We integrate the full set of EU dairy policy instruments. The milk quota constraint is written as:

$$X_{"EU"} \leq \overline{X}_{"EU"} \quad . \qquad (4)$$

The constraint on the volume of subsidized exports[1] is written as:

$$\sum_{j \neq "EU",imp} XD_{"EU",j,k,"sub",imp} \leq \overline{XE}_{"EU",k} \qquad \forall k \qquad (5)$$

On the import side, the TRQ is written as:

$$\sum_{i \neq j,ex} XD_{i,j,k,ex,"min"} \leq \overline{XI}_{j,k} \qquad \forall j,k \qquad (6)$$

where $\overline{XI}_{j,k}$ denotes the tariff rate quota associated to commodity k in the the j[th] country.

As a basis for representing resource allocation, we consider the following optimization problem:

$$Max_{X_i, Y_{i,k}, Z_{i,k}, XD_{i,j,k,ex,imp}} QW(X_i, Y_{i,k}, Z_{i,k}, XD_{i,j,k,ex,imp}) = \sum_{i,k} \int_0^{Z_{i,k}} D_{i,k}(u)du - \sum_i \int_0^{X_i} S_i(u)du - \sum_{i,k} c_{i,k}(Y_{i,k}) - \sum_{i,j,k,ex,imp} (t_{i,j,k} - ES_{k,ex} + IT_{k,imp}) XD_{i,j,k,ex,imp} \qquad (7)$$

Subject to (1)-(6),

$X_i \geq 0, Y_{i,k} \geq 0, Z_{i,k} \geq 0, XD_{i,j,k,ex,imp} \geq 0$.

The quasi-welfare function (7) is equal to the sum of producer and consumer surpluses across all regions minus the total cost of labour and capital in the processing sector minus the total cost of transportation. The solution to (7) can be shown to generate a competitive resource allocation (see Chavas *et al.* [1]). We derive the equilibrium on:

- the milk market in producing and exporting regions: production, price (country level);
- the intermediate products markets: fat and protein prices (country level);
- the dairy products markets: production, price, subsidized and unsubsidized consumption (country level);
- trade: imports, subsidised exports, unsubsidised exports.

III. EMPIRICAL MODEL

The spatial equilibrium model of the world dairy industry gives a complete picture of the EU-25 dairy sector as well as its trade relationships with the main importing or exporting areas in the world. We provide in Table 1 a list of the parameters of the model, the list of policy variables that affect the results (a full set of these policy variables composes a 'scenario') and a list of the outputs of the results of the model.

A. Product, country and period coverage

The applied model integrates an agricultural product (cow milk), 2 milk components (fat and protein), and 14 final dairy products (butter, skim milk powder, whole milk powder, condensed milk, casein, liquid milk, cream, fresh products and five categories of cheese: fresh, semi hard, hard, processed, blue and soft cheese).

Three groups of countries are modelled: EU25, Oceania and importing regions (Asia, Africa and Middle East, America, CIS and rest of Europe).

- EU: the model included each of the 15 Member States (with Belgium and Luxembourg being aggregated). It has been enlarged to the 10 New Member States. Among them, the three main producers (Poland, Hungary and Czech Republic) are explicitly introduced and the seven other countries are considered as an aggregate. These countries are Cyprus, Estonia, Latvia, Lithuania, Malta, Slovenia and Slovakia. All of the 25 European Union regions are considered both as a supplier of milk and dairy products and as a demanding region for dairy commodities. They can trade among each other or with the rest of the world.

1. In this setting, we assume that constraints on subsidized exports apply for each product (as it is the case for butter or SMP). In practice, some constraints apply for a group of products (cheese for example or other dairy products). To take this into account in the empirical model, we define constraints that apply for a group of products rather than individual products.

Table 1: List of the main parameters, policy variables and outputs of the dairy industry model

	Countries	Parameters	Policy Variables	Results
RAW MILK	EU25 regions	Elasticity of supply	Quotas	Milk production
	Oceania	Lagged adjustments	Decoupled payments	Milk price
		Quota rents		Price of components
		Technological progress		
		Fat and protein content		
FINAL PRODUCTS	EU25 regions	Processing costs	Production subsidies (casein)	Production
	Oceania	Fat and Protein composition	Intervention price	Consumption
		Demand function (subsidised and non subsidised)	Consumption subsidies (butter, SMP)	Prices
TRADE	EU25 regions	Transportation costs	Subsidized Export constraints	EU intra trade
	Oceania	Import demand functions (RoW)	Import access commitments	EU exports to RoW
	RoW regions		Import tariffs	EU imports
			Export subsidies (EU)	Oceania exports
				RoW imports
				World prices

- Oceania: because Oceania is the main exporter of dairy products in the world, the model includes Oceania as an exporting zone. Oceania is modelled as a supplying region only. It produces milk and processes it into dairy commodities that are then exported on world markets. The domestic consumption in Oceania is assumed to be price inelastic. The exports are thus the difference between production and a fixed consumption. We thus consider that the 25 European Union countries compete on international markets with another exporting region, Oceania (New Zealand and Australia). Note finally, that Oceania can export to the EU.

- Importing countries: the four importing regions that are distinguished are the main importers of EU-25 and Oceania's products, which are: CIS (Commonwealth of Independent States) and the rest of Europe (including Turkey), Asia, Africa and Middle East countries, and America. For each importer, we model import demand functions based on estimated import demand elasticities (Hadj Ali-Kein and Soregaroli [2]).

The model is multi-periodic and takes into account year by year changes in demand conditions (change in the demand due to non price effects such as income changes, taste changes, etc.) and in supply conditions (technological changes). The model includes trends in demand that were estimated using historical data on consumption (over a long period, about 30 years depending on countries and products) which are used as shifters of the demand function for each dairy product in each country or group of countries. This is needed to analyse market conditions over the simulation period (till 2014-15). A specific work was devoted to the estimates of autonomous demand trend that can be found in Bouamra Mechemache et al. [3]. The aggregate annual average trend is estimated to be 0.2% in fat equivalent and 0.5% in protein equivalent. For new member countries, autonomous trend estimates are not available; we thus had to make some assumptions. For importing countries in the rest of the world, we assume an autonomous demand trend of 2% percent per year. The model also incorporates a dynamic element in the supply side. The milk supply curve of a given year for each EU member country depends on past prices and cow stocks. For Oceania, a technical rate of progress of 1% per year is assumed.

B. Domestic and Trade policies

The following domestic policy instruments are taken into account:

- Price support : Minimum price for Skimmed Milk Powder (SMP) and butter, consumption subsidies for SMP and butter, production subsidies for casein;
- Direct payments: decoupled payments;
- Supply control: Production quotas including the fat correction element;
- Milk premium (decoupled), Beef premium (might be partly coupled);
- Estimated single farm payment (SFP) or single area payment (SAP) at the sector level.

Trade policies (export and import policies) are modelled for EU25 member countries as well as for importing regions in the rest of the world. Both export and import policies are modelled for EU25. We consider that EU25 countries benefit from exports subsidies up to the limit imposed by the WTO. Per-unit export subsidies are differentiated according to the importing area. We implement minimum and current access quotas as well as the corresponding tariffs and over quota tariffs. Trade within the EU-25 is unrestricted.

In our modelling, domestic and export subsidies are endogenously determined. Then changes in the intervention prices (and in quotas) will affect domestic and export subsidies. However, there is no commitment on their level. They are rather adjusted each year to take into account market conditions. They are set in order to make the domestic price of butter and SMP as close as possible to the intervention price. As long as subsidies are authorized, two situations can arise at the equilibrium. In the first one, the domestic price of butter (SMP) is equal to the intervention price. This means that there exist some positive subsidies which are given to fat products (protein products) in order to sustain the demand. In the second situation, the domestic price of butter (SMP) is greater than the intervention price. This corresponds to the situation where all subsidies given to fat products (protein products) are set to zero. However, the demand is sufficient to maintain domestic prices greater than the intervention price.

The model also includes trade policy for Africa, America, Asia and the rest of Europe. As we model only the demand for imports from these regions (net imports demand), we only integrate the import policy in the model. Over quota tariffs are implemented. We model the tariff rate quota for cheese in America.

C. Quotas and marginal costs

For each EU25 region, we use a linear milk supply function which is a simplified form of a more sophisticated milk supply model developed by Jongeneel and Ponsioen [4], Jongeneel and Tonini [5]. The simplified milk supply equation that is used in the model corresponds to a long-run supply equation. For EU-15 member state countries, due to the existence of a quota system since 1981, estimating the supply function was difficult. In particular, the supply curve depends on the level of quota rents in each EU15 member country.

To highlight the main characteristics of the milk quota policy as it is functioning at member state level, we provide in Table 2 a number of characteristics of dairy sector. Based on this table, the following observations can be made. First, member states are differing with respect to farm structure and possibilities to benefit from economies of scale. Second, most EU15 Member States have a regime of free quota trade. Sometimes hybrids of free and regulated trade or exchanges are in place. Trade limitations could provide an explanation for structural under production, whereas it seems reasonable to assume still binding quota at the country as a whole. Third, countries facing binding quota are expected to show a valuation of quota rights which is significantly different from zero. Information provided in table 2 should be interpreted in an indicative way. Where prices are significantly above zero this signals binding quota. When quota prices are close to zero (like for example for Sweden and United Kingdom) this indicates that those countries might be on the edge or even under producing as compared to the available reference quota amount. As regards the new Member States, non-zero quota values were observed for Czech Republic, Poland and Latvia. They signal binding quota for these countries, whereas most other new Member States are likely to under produce. Fourth, several countries apply regional restrictions to quota tradability, which might be a source of inefficient allocation. It can even explain why some countries might under produce (for example due to below-quota production in inefficient and disadvantaged regions), whereas at the same time the more productive regions in such a country face binding quota and non-zero quota prices. When looking further back in time, it can be observed that regional restrictions tend to be relaxed over time (e.g. Germany).

The other key element of milk supply is the initial quota rent which determines the value of the shadow milk price (marginal costs) in the initial year. Some econometric estimates of marginal costs exist in the EU (see Wieck [6], Moro et al. [7], Cathagne et al. [8]). As the model covers all EU member states, a full set of marginal costs estimates is required. The set of estimates from Moro et al. and Sckokaï [9] is used in the present analysis. Rather than relying on aggregate time series estimates, these estimates for the EU-15 were based on a detailed micro-analysis using FADN data. Thus the same methodology was applied to each EU member state. Since in recent years in Sweden and UK the quota is no longer binding (while there is quota trade among producers) for these member states the milk supply relationship was further adjusted to reflect quota rents equal to zero (or equivalently marginal costs being equal to the base year's milk price).

Because quota rents are a key parameter of the analysis two sets of estimates from the above studies were selected. The estimates of long-run marginal costs which could be considered as upper bounds of marginal costs are used as a standard assumption. As an alternative for the sensitivity analysis, their medium-run marginal costs are used. Estimates of medium marginal costs integrate all variable inputs plus the cost of hired labour and costs of cow stocks and machinery and building investments. Long run marginal costs include all these costs plus the cost of land.

Table 2: Member State specific information about milk production, quota (without land) re-allocation mechanism, and quota valuation

Country	Belgium	Denmark	Germany	Greece
Production / quota	At quota level	At quota level	Over production	Under production
#dairy cows/holding	35	75	36	14
Quota trade	Regulated and free trade (within family and potential siphon of 40%)	Regulated Trade (Exchange System) ; since 2001 a 1% siphon	Regulated trade (Exchange System) system	Free Trade (5% siphon)
Quota price	€0.37/kg (regulated);	€0.42/kg- €0.62/kg	€0.30/kg – €0.70/kg	Unknown
Regional restrictions to quota re-allocation	Yes	-	2 regions from 2007	No
Modeling choice	Binding quota	Binding quota	Binding quota and structural overproduction	Binding quota and structural underproduction

Country	Spain	France	Finland	Ireland
Production /quota	At quota level	Under production	At quota level	At quota level
#dairy cows/holding	18	36	18	42
Quota trade	Regulated trade	Regulated trade	Free trade and regulated trade; tax deduction for buyer	Regulated trade (Exchange system) (30% siphon for priority pool)
Quota price	€0.27/kg	€0.15/kg	€0.28/kg (free trade); €0.04/kg (regulated)	Range from €0.10 to 0.28€kg (priority pool price 12 cent);
Regional restrictions to quota re-allocation	Yes	Yes	Yes, 7 regions	Yes, transfers restricted to purchaser areas
Modeling choice	Binding quota	Binding quota and structural underproduction	Binding quota	Binding quota

Country	Italy	Netherlands	Austria	Portugal	Sweden
Production / quota	Over production	At quota level	Over production	At quota level	Under production
# dairy cows/holding	25	54	9	15	41
Quota trade	Free trade	Free trade; tax deduction for buyer	Free trade	Free trade, but 7.5% siphon reduction	Free trade; tax deduction for buyer
Quota price	€0.35/kg (high productive region)	€0.70/kg	€0.50-0.70/kg	€0.24/kg – €0.35/kg	€0.07/kg -€0.20/kg
Regional restrictions to quota re-allocation	Yes, no transfer from mountains, or LFA to plains	No	No	Yes, no transfer from vulnerable to non-vulnerable regions	Yes, 2 regions
Modeling choice	Binding quota and structural over production	Binding quota	Binding quota and structural over production	Binding quota	Non-binding quota

Country	United Kingdom	Czech Republic	Hungary	Poland	Other 7 NMS
Production / quota	Under production	Under production	Under production	Over production	Under production
# dairy cows/holding	80	42	14	4	-
Quota trade	Free trade	Free trade	Free Trade	Free trade;	Lithuania: auction; Estonia: quota traded with cows; Latvia: free trade.
Quota price	€0.02/kg - €0.05/kg	€0.07/kg	€0.07/kg -	€0.15/kg	Latvia €0.10/kg
Regional restrictions to quota re-allocation	No, except a small one for some Scottish islands	No	No-	Yes, 16 regions	No for Lithuania, Estonia and Latvia
Modeling choice	Non binding quota	Non binding quota	Non-binding quota	Binding quota and structural over production	Non-binding quota

Table 3: Actual milk price and marginal cost (€/kg, 2000)[2]

	BL	DK	DE	GR	ES
Milk price	0.286	0.338	0.309	0.315	0.274
Medium run marginal cost	0.156	0.228	0.169	0.232	0.147
Long run marginal cost	0.197	0.301	0.252	0.313	0.193
LRMC in % of milk price	69%	89%	82%	99%	70%
	FR	IE	IT	NL	AT
Milk price	0.310	0.284	0.393	0.322	0.300
Medium run marginal cost	0.195	0.162	0.261	0.178	0.169
Long run marginal cost	0.257	0.213	0.306	0.206	0.193
LR MC in % of milk price	83%	75%	78%	64%	64%
	PT	FI	SE	UK	
Milk price	0.249	0.333	0.343	0.292	
Medium run marginal cost	0.228	0.219	0.270	0.163	
Long run marginal cost	0.281	0.261	0.304	0.227	
LRMC in % of milk price	113%	78%	89%	78%	

Table 4: Comparison of quota rents (in % of milk price)

	BL	DK	DE	GR
Inra Wageningen 2002	32%	42%	45%	37%
Lips and Rieder 2005	20%	26%	20%	0%
This study	31%	11%	18%	1%
	ES	FR	IE	IT
Inra Wageningen 2002	38%	35%	49%	37%
Lips and Rieder 2005	24%	22%	31%	23%
This study	30%	17%	25%	22%
	NL	AT	PT	FI
Inra Wageningen 2002	36%	46%	27%	24%
Lips and Rieder 2005	23%	17%	0%	15%
This study	36%	36%	0%	22%
	SE	UK	EU15	
Inra Wageningen 2002	15%	43%	39%	
Lips and Rieder 2005	10%	27%	22%	
This study	11%	22%	21%	

EU15: weighted average, Sweden and UK non corrected

[2] Marginal costs estimates and farm milk price from Sckokaï [9] using FADN data. Not included correction to Sweden and UK marginal costs which amount to 0.030 and 0.058 euro/kg respectively.

Table 3 summarizes the best-estimates for the year 2000 and shows the marginal cost estimates for both the medium and long-run. As Table 3 shows, in EU15 member states, the medium-run marginal costs range from 50 to 70% of the farm milk price while long-run marginal costs are approximately 20 to 30% higher than medium-run marginal costs. The long run marginal cost estimates reported in Table 3 are on average very similar to the ones used by Lips and Rieder [10]: our long run marginal costs are 81 percent of the milk price compared to 82 percent in Lips and Rieder (cf. Table 4 where estimates from Lips and Rieder [10] and Inra Wageningen [11]). Whereas the average marginal cost or quota rent estimates are rather similar, estimates for individual countries might substantially deviate from each other.

IV. BASELINE AND SCENARIOS

The baseline for the analysis of policy reform scenarios (Baseline) represents a continuation of the pré-Luxembourg agreement situation, including the 1995 Uruguay Round trade agreement. It thus represents a status-quo situation where the dairy policy implemented is the one in place in 2003.[3] Three scenarios are analysed and compared to the baseline.

- *Luxembourg*: it is the policy as defined in 2003 (Luxemburg agreement). It implies a stepwise reduction of SMP and butter intervention prices by 15 and 25 percent respectively. The milk quota are gradually increased in the period 2006-07 – 2008-09 increasing the total EU-25 quota by 1.1 percent to 136 million tons. Direct payments are progressively introduced reaching 35.5 €/t in EU15 countries and 24.85 €/t in EU10 countries in 2010-11. In addition to the Luxembourg agreement, we assume that a new WTO agreement is signed on the basis of the Falconer proposal of autumn 2007. It consists of a reduction of the import tariffs, an increase in import quotas and a complete elimination of export subsidies. The changes are progressively introduced over a 6 year period (2009-10 to 2014-15).

[3] To simplify the analysis and the comparison of scenarios, EU10 countries are modelled as if they were part of the EU in 2003.

- *Soft Landing*: the design of the soft landing scenario follows the recent proposition of the European Commission with a 2 percent increase in milk quotas in 2008 followed by a further quota increase by 1 percent per annum from 2009 to 2013. All other elements of the domestic and trade dairy policies are those assumed in the Luxembourg scenario. In particular, a WTO agreement is introduced over a 6 year period.
- *Hard Landing*: Rather than gradually increasing milk quotas, another option to remove quotas is to eliminate the quota system in one go. This scenario assumes an elimination of quotas in 2013-14 in addition to the assumptions of the Luxembourg scenario. This scenario is mainly designed to be compared to the Soft Landing scenario.

V. SCENARIO ANALYSIS

We start describing the baseline scenario before analysing the impact of the Luxembourg scenario relative to the Baseline. We then analyse the quota removal scenarios.

A. Baseline

In the Baseline, the EU domestic price hardly changes (figure 1). Given the high level of support prices (for both SMP and Butter) in the baseline, the domestic prices of butter and SMP are equal to the intervention prices in 2003-04 and stay to be so over time. As a result the EU farm milk price does not change. The EU utilizes both consumption and export subsidies to sustain butter and SMP prices. However, the increase in demand allows the EU to use less domestic and export subsidies to sustain the domestic prices of butter and SMP. At the end of the period, the EU no longer utilises subsidies to support SMP price. This is because the demand for protein in the EU increases over time while the demand for fat remains roughly stable. Then SMP price goes up and the farm milk price slightly increases. Milk quotas are binding in all EU member states. As quotas are binding the cost reduction is translated in an increase in quota rent but the production does not vary. Because the domestic demand gradually increases over time and the production remains constant, the EU exports decrease over time. This explains why world market prices increase.

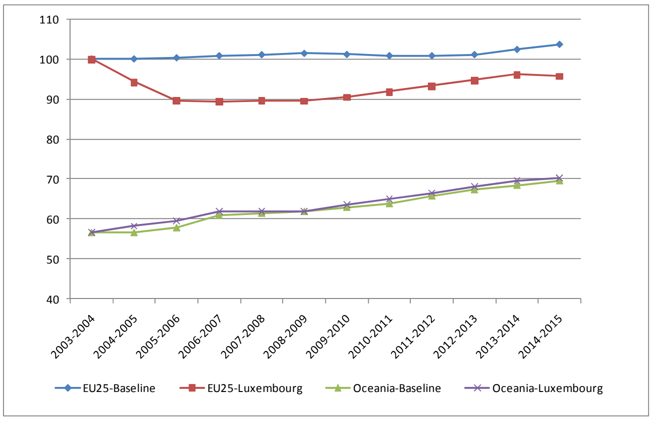

Figure 1: Impact of the Luxembourg reform on raw milk prices in EU 25 and in Oceania

B. Luxembourg scenario in the context of a new WTO trade agreement

In the Luxembourg scenario, the EU25 farm milk price is significantly affected. Three phases can be distinguished:

- The EU milk price first sharply declines till 2005-06 in response to the decrease in the intervention prices of butter and SMP.
- Then it remains roughly stable until 2008-09. A smaller decrease in the intervention price and a slight increase in production quotas are compensated by the increase in domestic demand.
- It regularly increases afterwards. This is because the SMP domestic price is no longer at the intervention price. Then the increase in demand induces an increase in the SMP price which explains the increase in farm milk price.

Thus, the impact on farm milk price of a change in the demand for dairy products crucially depends on the initial domestic prices of butter and SMP.

The Luxembourg reform has a small impact on farm milk price in Oceania. At the end of the period this impact is negative. The increase in EU production is larger than the increase in its consumption generated by the price decrease. Thus, as compared to Baseline, the EU exports are larger which explains that Oceania milk price shows a relative decrease.

At the end of the period, relative to the baseline, the price of butter is significantly lower while the price of SMP is significantly higher (Table 5). As the baseline shows, without the reform, the EU would have utilized subsidies in 2014-15 to sustain butter price while she does not use subsidies to sustain domestic price of SMP. In the Luxembourg scenario, the decrease in the intervention price of butter causes the decrease in the domestic price which is now equal to the new intervention price. This decrease in butter price induces a decrease in the milk price as well as a decrease in the price of dairy products (cheese, liquid milk). As a result the consumption of dairy products increases. This means that the demand for protein increases relative to the baseline. This in turn causes the price of SMP to be higher than in the baseline.

Table 5: Impact of the Luxembourg scenario on dairy markets, index 100: Baseline scenario 2014-2015

	Farm milk	Butter	SMP	WMP
EU25				
Price	92.4	76.3	104.1	98.4
Production	101.9	97.6	90.0	152.2
Exports		18.7	73.3	289.8
Oceania				
Price	101.0	112.9	100.4	98.4
	Cheese	**SHC**	**Fluid milk**	
EU25				
Price		96.7	98.0	
Production	101.5	106.0	100.4	
Exports	142.5	272.9		
Oceania				
Price		98.1		

Over time the EU production of dairy products is more and more oriented towards the production of final consumption dairy products. This is at the expense of the production of industrial products as the global milk production, thanks to the quota regime, increases by less than 2 percent. As compared to the baseline, the EU production has slightly increased due to the quota enlargement implied in the Luxembourg Agreement. The EU consumption has also increased in response to the decrease in dairy product prices. Since the increase in production is larger than the increase in domestic consumption, the EU still increases her exports to the world market, which negatively affects Oceania prices and productions.

The impact of a new potential WTO agreement on milk price is quite small. Actually, the additional impact of a WTO agreement on milk price depends on the magnitude of three effects. First, the reduction in tariffs and/or an increase of import quotas in importing areas has a positive impact on prices as it increases the demand for dairy products in the rest of the world. Second, the reduction of EU tariffs and the increase of import quotas may have a negative impact on domestic prices since it increases access to the EU market. Third, by lowering the wedge between domestic and world market prices, the removal of export subsidies also has a negative impact on domestic prices. According to common wisdom removing the export subsidies has a strong negative impact on EU prices. This is only true, however, if export subsidies are needed to support prices given the reduction in prices generated by the Luxembourg reform. Given the increase in domestic demand in the EU and the quota policy, our results suggest that under the Luxembourg reform the EU will no longer use export subsidies to sustain butter and SMP prices in the future. Removing them therefore has no market effect. As a result, the impact of the new agreement on raw milk prices would be small and slightly positive for the EU.

C. Quota removal, soft landing versus hard landing scenario

When quotas are gradually increased, the farm milk price in the EU is roughly stable while in the Luxembourg scenario it increased from 2008 to the end of the period (Figure 2). In 2014-15, the EU milk price drops by 9% compared to the Luxembourg scenario.

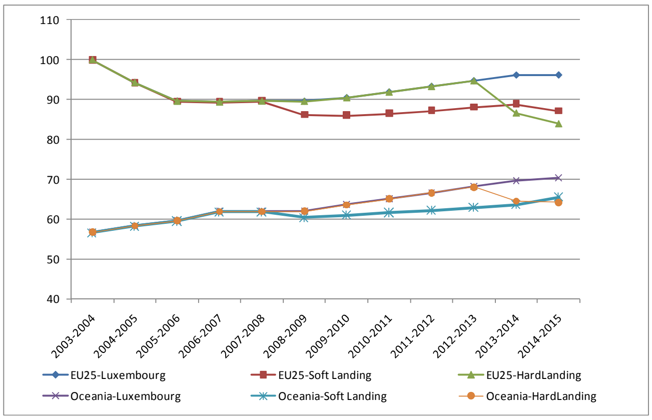

Figure 2: Impact of a soft or hard landing scenario on the EU25 and Oceania raw milk price

The drop in price is due to the increase in milk production by 3.5%. Both the production and exports of dairy commodities increase following the increase in milk production while their prices decrease (Table 6).

Table 6: Impact of the soft landing scenario on dairy markets, index 100: Luxembourg scenario 2014-15

	Farm milk	Butter	SMP	WMP
EU25				
Price	90.9	85.7	94.8	94.3
Production	103.5	104.2	105.6	123.1
Exports		100.0	112.9	142.8
Oceania				
Price	93.2	97.3	94.7	94.0
	Cheese	SHC	Fluid milk	
EU25				
Price		94.0	95.3	
Production	102.2	105.7	100.9	
Exports	123.6	138.4		
Oceania				
Price		93.6		

The price of butter drops more than the price of SMP. This is because the EU cannot export more butter without subsidies on the world market. As a consequence the additional butter production needs to be consumed in the EU. This can only be achieved by a significant drop in the butter price. On the contrary the increase in SMP production is absorbed by a higher EU consumption as well as through an increase in EU exports. Because EU exports increase, the world market price for dairy products will go down by 3 to 6 percent depending on the product. This has a negative impact on the farm milk price in Oceania, which drops by 7 percent.

Table 7: Impact of the hard landing scenario on dairy markets, index 100: Luxembourg scenario 2014-15

	Farm milk	Butter	SMP	WMP
EU25				
Price	87.5	80.7	93.1	92.5
Production	104.6	105.6	108.0	132.7
Exports		100.0	119.3	160.7
Oceania				
Price	91.3	96.6	93.0	92.0
	Cheese	SHC	Fluid milk	
EU25				
Price		91.4	93.5	
Production	102.6	106.6	101.2	
Exports	126.5	142.7		
Oceania				
Price		92.2		

With a complete quota removal, the reduction in milk price is higher due to a larger increase in production. Actually, in 2013, the EU increases its production by 4.6% by removing the quota system. This 1% additional increase in production explains the additional 3% drop in the EU milk price. This also suggests that in the soft landing scenario, fully removing quota in 2014-15 would not provoke a large dramatic change in dairy market equilibrium.

The main difference between soft landing and hard landing is then mainly in the transition phase. Because changes are smoother in the soft landing case, this scenario is better from an industry point of view. Thus, the time evolution of capacities of production might be easier to manage.

D. Impact on producers surplus

As compared to the baseline scenario, in the Luxembourg scenario in 2014-15, producers gain 1.3 billion €, whereas in the same year they lose 2.6 billion € in the soft landing scenario (Table 8). As the scenarios show very different evolutions of prices, the average gains or losses over the period 2004-2014 significantly differ from the numbers given for the year 2014-15. As such the direct payments are more than sufficient to compensate producer for the loss of producer surplus in the Luxembourg scenario, but fall short to achieve full compensation in the soft landing scenario.

Table 8: Impact of the reforms on EU-25 producer surplus (billion €)

	Luxembourg		Soft Landing	
	2014-2015	Average 2004-2014*	2014-2015	Average 2004-2014*
Market effects	-3.1	-3.7	-6.5	-5.0
Direct payments**	4.4	3.9	3.9	3.6
Net effect	**1.3**	**0.2**	**-2.6**	**-1.4**

*Average: the annual change is the net present value calculated using an interest rate of 4% in real term.
** Direct payments are evaluated including the modulation.

VI. CONCLUDING REMARKS

The Luxembourg Agreement (while taking into account a new WTO agreement following the Falconer proposal) leads in 2014-15 to a nearly 8 percent decrease in the EU milk price as compared to a baseline representing the pré-Luxembourg status quo. For some years the price decline might even be larger.

As compared to the Luxembourg scenario, gradually phasing out milk quota (soft landing) implies a significant further milk price decline (-9%). This is due to the predicted increase in EU milk production by about four percent. The expansion of EU milk production will lead to significant increases in EU net exports to the world market, which in turn will create a strong downward pressure on world market prices. Over time prices show a smooth and stable pattern in this scenario.

The hard landing scenario led to a 12 percent milk price decline. This goes parallel with an expansion of EU milk production by 4.6 percent. The 1 percent additional milk production as compared to the soft landing scenario, suggests that fully removing the quota in 2014-15 in the latter scenario is not likely to provoke a large dramatic change in the dairy market equilibrium.

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