Interregional Analysis of the Impacts of Eliminating European Union Milk Production Quotas

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Abstract: An hedonic spatial equilibrium model of the European Union dairy sector is used to evaluate the interregional impacts of eliminating milk production quotas under a variety of domestic policy (intervention prices and domestic production/consumption subsidies) and trade policies (tariff rate quotas and export subsidies). The simulation results indicate that the removal of the EU milk production quotas is welfare improving both only with substantial liberalization of trade. Hence, production quota removal by itself is not a desirable policy alternative for either the EU or the world. Rather, policy reform should involve the joint consideration of domestic and trade policy instruments.

Key Words: market liberalization, policy reform, production quotas, European Union, dairy.

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1. Introduction

The European Union (EU) has huge impacts on the world dairy sector as a major producer, consumer and exporter of milk/dairy products and as one of the more heavily distorted dairy sectors due to both domestic (milk production quotas, intervention prices, production and consumption subsidies) and trade (tariff rate quotas combining import quotas and tariffs and export subsidies) policies. In this context, better understanding of the impacts of alternative liberalization scenarios on the EU dairy sector is crucial. This paper focuses on quantifying the likely interregional price, quantity and welfare impacts of removing EU milk production quotas under a variety of domestic and trade policy scenarios.

An hedonic (milk characteristics), spatial equilibrium conceptual framework is used to empirically model 2 agricultural products (cow and non-cow milk), 2 milk components (fat and protein), 9 EU (Belgium and Luxembourg; Denmark; Finland and Sweden; France; Germany and Austria; Ireland and United Kingdom; Italy and Greece; Netherlands; Spain and Portugal) and a rest of the world (ROW) region, and 10 final products (butter, skim milk powder, whole milk powder, condensed milk, hard and semi-hard cheese, processed cheese, other cheeses, fluid milk, fresh products, casein). The model integrates the following EU dairy policy instruments: i) regional milk supply subject to a regional production quota; ii) intervention prices as floor prices for butter and SMP domestic markets; iii) domestic subsidies for industrial uses of butter and SMP; iv) a production subsidy for casein; v) export subsidies and import tariff rate quotas for each final dairy product. Moreover, GATT import and export commitments are explicitly modelled. On the export side, constraints are introduced for the four categories of subsidized dairy products defined by the GATT agreement. These constraints define an upper bound to the volume and to the value of subsidized exports. Non-subsidized exports can occur in the model. On the import side, we define three regimes of imports (current access, minimum access and overquota) with corresponding tariff rates.

For a given set of policy instruments (a scenario), the model determines the regional milk prices paid to farmers, the regional milk productions, the regional shadow prices for milk components, the regional prices of dairy commodities, the regional productions and consumptions of final commodities, intra-EU trade and trade with third countries for each final dairy product. Finally, the surplus and welfare implications of policy scenarios are computed from the model results.

The model is calibrated using 1995 EU and country specific data on prices, production, consumption, and trade. Special attention is devoted to milk supply. Because of the existence of production quotas, regional milk price is not equal to the regional marginal cost of production but differs by the value of the quota rents. In order to infer the actual marginal cost in each region, we use data from lease quota markets when such markets exist. In order to compare the impact of policy scenarios on market equilibrium and welfare, we define a BASE scenario representing a year 2000 reference ("BASE 2000"). Domestic demands for each product are shifted according to a trend in consumption and regional milk quotas are adjusted to their 2000 level. We also assume that year 2000 GATT commitments on imports and exports are implemented. Finally, we assume that intervention stocks are not allowed. Rather we let the model choose the cuts in butter and SMP prices that implement the spatial hedonic equilibrium.

We focus our attention on the removal of milk production quotas in the EU dairy sector. As a result, all investigated scenarios include elimination of milk production quota. Each scenario differs by the other policy instruments that remain active. Four scenarios are analysed. In the first scenario (No Quota), regional milk quotas are removed while keeping unchanged the other EU dairy policy instruments. In the second scenario (No Quota/No Cons/ Prod Subsidies), quota removal is accompanied by the removal of consumption and production subsidies. In the third scenario (No Quota/ 50% Export Subsidies), quota removal is accompanied by a 50 percent decrease in unit export subsidies. Finally in the fourth scenario (No Quota/No Subsidies), we totally remove consumption subsidies, production subsidies as well as export subsidies. Import quotas and tariffs are maintained at GATT 2000 levels in all four scenarios.

The estimated interregional impacts of these alternative quota liberalization scenarios provide

some insights into the member states political economy that is likely to partially motivate the policy discussion in the Brussels. Hopefully, the insights provided by this interregional quantitative analysis will help to better inform the more general WTO dairy trade liberalization debates.

2. Policy Simulation Results

In order to compare the impact of alternative policy scenarios on market equilibrium and welfare, we define a BASE scenario that represents a "2000 year" reference ("BASE 2000"). Domestic demands for each product are shifted according to consumption trends while regional milk quotas are adjusted to their 2000 level. We also assume that the last year (2000) of the GATT commitments on imports and exports are implemented. Finally, we focus on long-term policy situations where we do not allow the model to build government stocks. We then apply different sets of partial EU policy reforms and compare the results of these scenarios with those of the "BASE 2000" scenario.

Impacts on market equilibrium

A summary of the aggregate/average EU simulation results is presented in Table 1. All results compare each policy scenario with the "BASE 2000" scenario. We first analyse the impacts of these reforms on both domestic and world milk and dairy markets. Table 1 shows that, in response to the quota removal under all scenarios, EU milk production increases. This suggests that even though current EU prices are significantly higher than world prices, the marginal production cost of milk would allow the EU to be competitive in a more liberalized market with the removal of milk production quota. In other words, current EU milk prices are high in large part because they include a large quota rent, meaning that the elimination of production quotas would significantly reduce farm milk price.[i] In all scenarios, milk prices decrease by more than 24 percent (see Table 1). Such decreases are a consequence of the high quota rents and inelastic commodity demand. Comparisons of scenarios 2, 3, and 4 with scenario 1 show that removing the non-quota policy instruments (domestic production/consumption and/or export subsidies) have smaller additional effects on milk price. As the removal of the other policy instruments tends to decrease demand for EU dairy commodities, these additional price effects are limited in part by some

significant supply response. Production level now reacts to the demand shift thus limiting the impact on prices by changes in production.

We can also evaluate the impacts on the shadow values of dairy components (milk fat and protein). As long as export refunds are not decreased (scenarios 1 and 2), the impact of policy reforms varies across components (see Table 1). In scenarios 1 and 2, the shadow value of protein decreases significantly more than the shadow value of fat. This is because the aggregate demand for protein (including domestic demand as well as demand from the rest of the world) is more inelastic than aggregate demand for fat.[ii] In contrast, when the GATT export constraints are less active (scenarios 3) or totally inactive (scenario 4), the impacts of dairy policy reforms on milk component values are roughly equally distributed.[iii] The aggregate demand for protein now includes the rest of the world demand (at the equilibrium, the GATT constraint on SMP exports is no longer binding) and is now less inelastic.

Markets for basic commodities (butter, SMP, and WMP) are greatly affected by quota removal. Demands for these products significantly depend on domestic as well as export subsidies. As shown in Table 2, around 60 percent of the total use of SMP and WMP were subsidized in 1998. SMP utilization mainly depends on domestic consumption subsidies while WMP utilization mainly depends on export subsidies. Butter use is also dependent on consumption and export subsidies but to a lower extent compared to SMP and WMP. Thus, when subsidies are decreased or removed (scenarios 2, 3 and 4), prices and production of butter, SMP and WMP are greatly affected. The magnitude of the impact on prices or production, however, depends on the scenario. When domestic subsidies are removed (comparison of scenario 2 with scenario 1), the SMP market is greatly affected because the share of subsidized domestic consumption represents roughly 40 percent of SMP production and because SMP exports cannot expand (GATT constraint). In this case, SMP price drops by more than 29 percent and its production decreases by 2.4 percent while EU milk production increases. Butter price decreases less because the share of subsidized consumption is smaller (compared to SMP) and because exports can still expand relative to the base scenario export level of butter. The same reasoning applies to WMP market.[iv]

When export subsidies are decreased (scenario 3), the prices of butter, SMP and WMP decrease

in roughly identical proportion. WMP production increases less than butter and SMP production because WMP utilization depends more highly on the subsidized exports to the world market. Finally, when domestic as well as export subsidies are removed (scenario 4), SMP and WMP production decrease significantly because they heavily depend on subsidized markets while butter production is less affected as its consumption is less dependent on subsidies. Note that the exports of these undifferentiated products drops heavily in this case. This suggests that EU has little comparative advantage in the production of such products.

On the other hand, when milk represents a smaller share of the total product value (e.g., fluid milk and cheeses), prices of these "high value-added" products decrease less than the prices of basic commodities (butter, SMP, and WMP) (see Table 1). Because demand for "high value-added" products is mainly an unsubsidised domestic demand, the four scenarios have roughly identical impacts on prices and production of these products. A larger decrease in milk price leads to a larger decrease in the price of "high value added" products as well as a larger increase in their production at a rate that largely depends on the elasticity of domestic demand.

The results presented in Table 1 show the impact of the removal of subsidy instruments on exports. While EU exports of undifferentiated products decrease (butter, SMP, WMP), this it is not the case for more differentiated products. For example, unsubsidized exports of cheese increase in all the scenarios, and cheese exports remain significant in scenario 4. These results suggest that the EU would be competitive on the world market for differentiated dairy products under market liberalizations where milk is produced at marginal cost.

Impacts on welfare

The impact of policy reform on EU welfare is measured by changes in EU producer surplus, EU consumer surplus and cost to the EU taxpayers.[v] The welfare changes reported in Table 1 are expressed in million euros.[vi] Distributional impacts of the scenarios are large. Producer surplus decreases by 7.6 to 8.8 billion euros, while consumer surplus increases by 5.7 to 6.9 billion euros. Note that consumer gains do

no fully offset producer losses. Taxpayers are also greatly affected, with gains that vary between 0 and 2.0 billion euros. These measures provide an empirical benchmark for the potential economic costs of compensation to those agents who suffer losses under the market reforms and liberalizations analysed here.

As an illustration of the conceptual arguments presented above, the results reported in Table 1 indicate that partial liberalizations involving quota removal in the presence of price (tariff and subsidy) distortions do not automatically lead to an increase in aggregate EU welfare or world welfare. If consumption, production and export subsidies remain at their initial level (scenario 1), then EU welfare decreases by 918 million euros. Moreover, in this scenario, "world" welfare is also negatively affected. This illustrates that, in a second best world, quota removal can have ambiguous impacts when other policy (especially price) instruments distort markets.

When domestic subsidies are removed in addition to the milk production quotas (scenario 2), impacts on aggregate EU as well as world welfare remains negative but the loss in EU as well as world welfare are lower than in the first scenario. The removal of domestic subsidies has a small positive impact that does not offset the negative impact of quota removal. Rather it has redistribution effects from producers to consumers. The net impact on aggregate EU welfare due to the removal of domestic subsidies is positive because it decreases deadweight losses due to price distortion both on the production side and on the consumption side. This net effect is small because price changes remain small when comparing scenario 2 with scenario 1. When export subsidies are partially removed in addition to production quotas (scenario 3), the impact on EU welfare is positive while the impact on world welfare is negative. Comparing scenarios 1 and 3 shows that cuts in EU export subsidies have a significant positive impact on EU welfare where consumer and taxpayer gains dominate producer losses. This is essentially due to a large country effect. Because EU is the major exporter on most world dairy markets, a decrease in its exports has a positive impact on world market prices that generates a net EU welfare gain.[vii] The ROW welfare is negatively affected because of the changes in world prices and EU net trade. We find that lowering export subsidies tends to increase world prices for butter and SMP, thus generated losses for

ROW consumers (scenarios 3 and 4). In addition, binding import quotas for these commodities means that EU imports remain constant while the associated import quota rents decrease. Comparison between scenario 2 and 3 suggests that it is a better policy for the EU to cut export subsidies rather than to cut domestic subsidies (see Table 1). Indeed, for an equivalent impact on producers and taxpayers, the second policy has a greater positive impact on EU consumers than the first.

When most instruments are removed (scenario 4), the impact on EU welfare is significantly positive and significantly greater than the negative impact on the rest of the world. As in scenario 3, the ROW welfare is reduced when the EU decreases its export subsidies. In this scenario, total world welfare increases by 410 million euros. The associated policy reform is thus identified as being efficiency improving. These results illustrate that it is only to the extent that price distortions are removed that one can expect production quota removal to improve aggregate welfare. This is an example where relaxing domestic quotas can increase subsidized exports and exacerbate the adverse effects of current pricing policy on efficiency. Alternatively stated, we find that, in a second best world, production quotas can contribute to reducing the distorting effects of other policy instruments on the efficiency of the EU and world dairy sector.

Finally, our analysis provides useful information on the distributional implications of policy reform across EU countries. Table 3 shows that market liberalization tends to decrease milk price and producer welfare in each EU country. However, these impacts are uneven across countries. For example, the Netherlands, the United Kingdom/Ireland and Denmark show the largest decrease in milk price, while Spain and Portugal exhibit the lowest relative price decrease. This is due to the unequal distribution of quota rents. Indeed, a large part of the adjustments in milk price are due to the elimination of production quota rents. As a result, countries with high quota rents (e.g., the Netherlands) are more affected than countries with lower quota rents (e.g., Spain and Portugal).

The impacts of policy changes on regional producer and consumer surplus are also reported in Table 3. While EU milk producers suffer losses under all scenarios, milk producers in regions with larger milk production sectors and/or larger current production quota rents suffer larger welfare losses (e.g.,

France, Germany/Austria, UK/Ireland). These results illustrate that market liberalization can have significant distributional welfare effects between regional producers. As expected, consumers in every region benefit from market liberalization. In most regions, however, the welfare loss to producers is larger than the gains to consumers (see Table 3). However, in two regions (Italy/Greece and Spain/Portugal), consumer surplus increases more than the reduction in producer surplus. This shows the uneven distribution of welfare changes across regions, reflecting the spatial variations in milk production and dairy consumption within the EU. It illustrates that market liberalization can have significant distributional welfare effects across regions.

3. Concluding Remarks

This manuscript investigates the economic and welfare implications of domestic and trade policy distortions. The allows for both domestic and trade policies including both price instruments (import tariffs, export and production/consumption subsidies) and quantity instruments (production, import and export quotas). We know that, in a second best world, partial market liberalization is not always efficiency improving. This is particularly true of quota liberalization in the presence of price (tariff and subsidy) distortions.

The model provides a refined representation of the EU dairy sector, involving milk and the production, trade and consumption of ten dairy products among nine EU regions plus the rest of the world. After incorporating both domestic and trade policy instruments currently used in EU dairy policy, the model is used to simulate the impacts of eliminating production quotas under four alternative partial market liberalization schemes: (1) quota elimination only; (2) quota removal with 50 percent reduction in export subsidies; (3) quota removal with elimination of production/consumption subsidies; and (4) quota removal with both export subsidy reduction and elimination of production/consumption subsidies. These simulation results provide evidence concerning the relative welfare impacts and policy tradeoffs of alternative partial market liberalizations. For example, it is found that, from the EU viewpoint, it is more efficient to cut export subsidies than to cut domestic subsidies.

We show that the removal of the EU milk production quotas is welfare improving both at the EU and at the world level only with substantial liberalization of trade. Market liberalization always implies some welfare redistribution between producers, consumers and taxpayers. However, removing production quota is found to be efficiency improving only with the lowering or removal of subsidies. Indeed, in a second best situation, production quotas contribute to reducing the distorting effects of current EU pricing instruments on the efficiency of the EU and world dairy sector. Alternatively stated, production quota removal by itself is not a desirable policy alternative for both the EU and for the world. Rather, policy reform should involve the joint consideration of domestic and trade policy instruments. This result would be relevant in further EU policy reform discussion as well as future WTO negotiations.

The analysis points to the importance of both efficiency improving policy reform and of welfare redistribution between producers, consumers and taxpayers, and across countries. Several issues remain worth exploring. First, the issue of possible income redistribution needs to be addressed in more direct way. Building on previous literature (e.g., Gardner; Moschini and Sckokai), the analysis of the efficiency of redistribution in a multi-commodity and multi-country framework needs to be refined. Second, the possible role of imperfect competition and its interaction with policy reform need to be addressed. These appear to be good topics for further research.

Table 1. Impacts of the policy scenarios on market equilibrium (in percentage change relative to the BASE 2000 scenario).

	Scenario 1: No Quota	Scenario 2: No Quota/ No Prod/Cons Subsidies	Scenario 3: No Quota/ 50% Export Subsidies	Scenario 4: No Quota/ No Prod/ Cons/ Export Subsidies
Milk				
Production	7.4%	5.5%	5.0%	1.1%
Price	-24.6%	-25.7%	-26.0%	-28.2%
Price of fat	-12.3%	-8.1%	-23.9%	-21.0%
Price of protein	-29.9%	-34.6%	-24.1%	-29.6%
Butter				
Price	-10.0%	-8.0%	-21.5%	-21.1%
Production	12.8%	5.3%	8.2%	-2.8%
Total consumption	6.9%	0.4%	14.7%	9.3%
Subsidised consumption	16.5%	-5.2%	35.4%	16.2%
Exports	52.0%	41.2%	-51.8%	-100.0%
World price	-24.8%	-19.7%	24.7%	47.7%
Skim milk powder				
Price	-19.6%	-29.7%	-17.0%	-30.3%
Production	15.7%	-2.4%	9.6%	-15.1%
Total consumption	17.5%	-2.7%	15.1%	-2.3%
Subsidised consumption	24.6%	-7.3%	21.3%	-6.64%
Exports	0.1%	0.1%	-15.9%	-51.5%
World price	-0.0%	-0.0%	4.8%	15.6%
Whole milk powder				
Price	-10.9%	-12.1%	-19.3%	-29.6%
Production	24.6%	26.6%	4.1%	-13.6%
Total consumption	3.7%	4.1%	6.5%	9.9%
Exports	39.2%	42.3%	1.5%	-31.6%
World price	-14.3%	-15.4%	-0.6%	11.5%
Hard and semi-hard cheese				
Price	-12.6%	-13.3%	-12.8%	-14.0%
Production	6.2%	6.6%	6.3%	7.1%
Total consumption	6.7%	7.0%	6.8%	7.4%
Exports	0.0%	0.8%	0.0%	2.4%
Fluid milk				
Price	-11.2%	-12.3%	-10.9%	-12.4%
Production	1.6%	1.7%	1.5%	1.7%
Total consumption	1.3%	1.4%	1.3%	1.4%
Unsubsidised exports of cheese				
Processed cheese	15.1%	14.9%	18.5%	18.9%
Other cheese	17.9%	19.5%	18.8%	21.4%
Shadow Value of GATT export constraints (Euro/kg)				
Butter	0.000	0.000	0.000	0.000
Skim milk powder	0.395	0.597	0.000	0.000
Cheese	1.036	1.050	0.519	0.000
Other products	0.196	0.210	0.084	0.000
Welfare (10^6 Euros)				
EU Producers	-7,636	-8,012	-8,112	-8,847
EU Consumers	5,926	5,676	6,677	6,906
EU Taxpayers	-280	646	665	1,988
Total EU welfare	-918	-668	42	697
Total ROW welfare	172	174	-140	-291
Total World welfare	-746	-494	-98	407

Table 2. Uses of dairy products according to the final utilization.

	Share of the different uses in 1998 (percent)			Subsidy (percent of EU price)	
	Unsubsidized Consumption	Subsidized Consumption	Exports	Consumption	Exports
Butter	64	27	10	32	57
SMP	42	42	16	35	41
WMP	379	0	64	-	45
Condensed Milk	73	0.0	27	-	8
Cheese	94	0	6	-	31*
Fluid milk	99	0	1	-	-

* on average. Source: ZMP.

Table 3. Impact of the scenarios on regional milk prices, producer surplus and consumer surplus relative to the base 2000 scenario.

		Base 2000*	Scenario 1: No Quota	Scenario 2: No Quota/No Prod/Cons Subsidies	Scenario 3: No Quota/50% Export Subsidies	Scenario 4: No Quota No Prod/ Cons/ Export Subsidies
Milk prices (relative change)						
France		0.265	-23.17%	-24.94%	-25.09%	-28.57%
Belgium/Luxembourg		0.284	-23.94%	-25.04%	-26.06%	-28.73%
Netherlands		0.301	-30.29%	-31.08%	-31.62%	-33.34%
Germany/Austria		0.274	-22.77%	-24.19%	-24.63%	-27.51%
Italy/Greece		0.292	-20.07%	-20.75%	-20.72%	-22.05%
United Kingdom/Ireland		0.273	-31.16%	-32.15%	-32.15%	-33.94%
Denmark		0.303	-31.36%	-31.98%	-32.84%	-34.65%
Spain/Portugal		0.225	-11.25%	-11.65%	-11.92%	-12.89%
Sweden/Finland		0.322	-21.04%	-21.50%	-21.66%	-22.56%
EU		0.277	-24.55%	-25.67%	-25.96%	-28.19%
Absolute changes (million €) **-Producer surplus (PS)** **-Consumer surplus (ΔCS)**						
France	ΔPS		-1,403	-1,517	-1,529	-1,743
	ΔCS		1,111	953	1,303	1,253
Belgium/Luxembourg	ΔPS		-222	-232	-242	-266
	ΔCS		141	131	173	177
Netherlands	ΔPS		-959	-989	-1,008	-1,071
	ΔCS		523	417	541	474
Germany/Austria	ΔPS		-1,828	-1,946	-1,985	-2,217
	ΔCS		1,387	1,356	1,708	1,818
Italy/Greece	ΔPS		-623	-645	-644	-685
	ΔCS		999	996	1,069	1,134
United Kingdom/Ireland	ΔPS		-1,625	-1,681	-1,683	-1,785
	ΔCS		1,021	1,056	1,093	1,185
Denmark	ΔPS		-414	-424	-437	-465
	ΔCS		117	120	133	147
Spain/Portugal	ΔPS		-182	-188	-191	-206
	ΔCS		330	344	337	378
Sweden/Finland	ΔPS		-381	-390	-393	-409
	ΔCS		298	304	320	341
EU	ΔPS		-7,636	-8,012	-8,112	-8,847
	ΔCS		5,926	5,676	6,677	6,906

* Simulated results. Prices are evaluated in €/kg.

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Footnotes

[i] As to the level of quota rents in some European countries, Barthelemy and David report that the market price of lease quota in the Netherlands is as high as 50% of the farm milk price. According to Colman et al., the annual quota value in the UK represents around 30% of the farm milk price.

[ii] The EU domestic demand is rather inelastic for both protein and fat. Due to the GATT export constraints, rest of the world demand for protein is totally inelastic (GATT constraints on SMP, cheese and other product exports are binding in the BASE 2000 scenario) while ROW demand for fat is not (GATT constraint on butter exports is not binding in the BASE 2000 scenario). As a consequence, aggregate derived demand for fat is relatively more elastic than the demand for protein. Because fat and protein supply are strictly joined, market equilibrium adjustment requires a larger cut in the protein price than in the fat price.

[iii] Inactivity of the export constraints implies zero "Shadow Values on GATT Export Constraints" in Table 1. Similarly, lower shadow values indicate less impact of these constraints (compared to higher values).

[iv] The subsidized exports of WMP can still expand because they can be substituted with other subsidized exports (condensed milk) within the GATT "other dairy commodity" subsidized export group.

[v] For simplicity, we ignore the distortionary effects of domestic taxation in our discussion below. This is motivated by the fact that the empirical measurement of its social cost remains difficult.

[vi] For simplicity, Table 3 assumes that the import quota rents are captured by the ROW.

[vii] As shown in optimal taxation theory, a large country exporter may have incentives to tax its exports. Here we analyze reduction in export subsidies; we therefore go in the right direction. See Moschini and Sckokai, for an analysis of optimal choice of instruments.