

Impacts of Different Policy Options on the EU Dairy Market

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1 Introduction

The dairy market organization of the EU was subject to frequent adjustments, which were due to different market situations and shifts in the objectives of the agricultural market policy. Major modifications were the introduction of the milk quota system in 1984 and the foreign trade regulations as result of the GATT negotiations beginning with the year 1995/96. The reform of the Common Agricultural Policy 1992 touched the dairy market organization only on the periphery. But factors such as declining producer prices, the possible expiry of the quota system in 2000, the WTO II negotiations, and the enlargement of the EU ensure that the milk market policy is included into the "New Policy Reform".

In 1997, the European Commission presented the Agenda 2000 which includes the Commission's approach for a further evolution of the CAP. The Commission defined the policy objectives for the CAP as follows:

- Improvement of the competitiveness of EU agriculture on domestic and external markets,
- food safety and food quality to consumers both within and outside the Union,
- ensuring a fair standard of living for the agricultural community and contributing to the stability of farm incomes including the creation of complementary and alternative income opportunities for farmers and their families,
- integration of environmental goals and
- cohesion within the Union.

The European Commission proposed concrete measures for most individual policy areas with the exception of the foreign trade regulations. These will be negotiated during the new WTO round.

Regarding the dairy sector, the European Commission proposes a partial shift from price supports to direct payments. It is assumed however, that in future there will be further evolution of the milk market organization beyond these proposals. The evolution will reflect the results of WTO II and also the political struggle within and between the Member States and will probably lead to an intensified market orientation. Therefore, in the following paper, different degrees of market liberalization were formulated and the impacts of these policy options are discussed. The impacts of different milk policy scenarios are derived by model simulations based on a partial milk market model. But only the effects on prices and quantities are taken into account. A further analysis including other aspects such as

income, farm reactions and adjustment, structural and regional adjustments is in preparation. The first section of the paper includes a short description of the partial equilibrium model, followed by the dairy proposals of the Commission in Agenda 2000 and their simulated impacts on prices and quantities. A further section includes the results of different scenarios with regard to market liberalization.

2 Partial equilibrium model of the EU dairy market

The partial equilibrium model describing the dairy market of the EU was created in 1995/96 (Frenz, Manegold, Salamon; 1996) as a complement to a sector model (GAPsi) which was used to simulate the effects of CAP (Frenz/Manegold, 1988; Frenz et al., 1995). Using a joint-input, multi-product formulation, the model confronts agricultural production of raw milk with the processing and final consumption of five milk products (fig. 1). While the two main components of raw milk (fat and protein) are kept in balance at all levels of the marketing chain the model describes economic and technical relations between input and output quantities. So far, this model includes 15 regions: 14 European Member States (Belgium and Luxembourg as one) as well as a region, which represents the Rest of the World (ROW). But the model itself is non-spatial, in the sense that transaction costs are omitted. Changes in stocks are not considered, particularly since they must balance out in the course of the time. The EU and the Rest of the World (ROW) are connected by foreign trade (net trade) of the product groups. The model formulation is comparative static, i.e. modifications of policies, prices or quantities lead to a new equilibrium, of which prices and quantities are determined by the model. Model equations can be linear as well as non linear.

The essential assumptions included are:

- Inputs
Agricultural production supplies raw milk to the processing chain. The raw milk is valued by fat and protein. Processed dairy products (fresh milk and cream, butter, skimmed milk powder, cheese, all 'other milk products') are essentially composed of the inputs fat and protein. Input quantities per product weight (input coefficients) are specific for a certain product, but input for a group of products is influenced by the price for the milk product itself and the prices for the inputs. All supplied inputs have to be processed. The values of inputs are derived

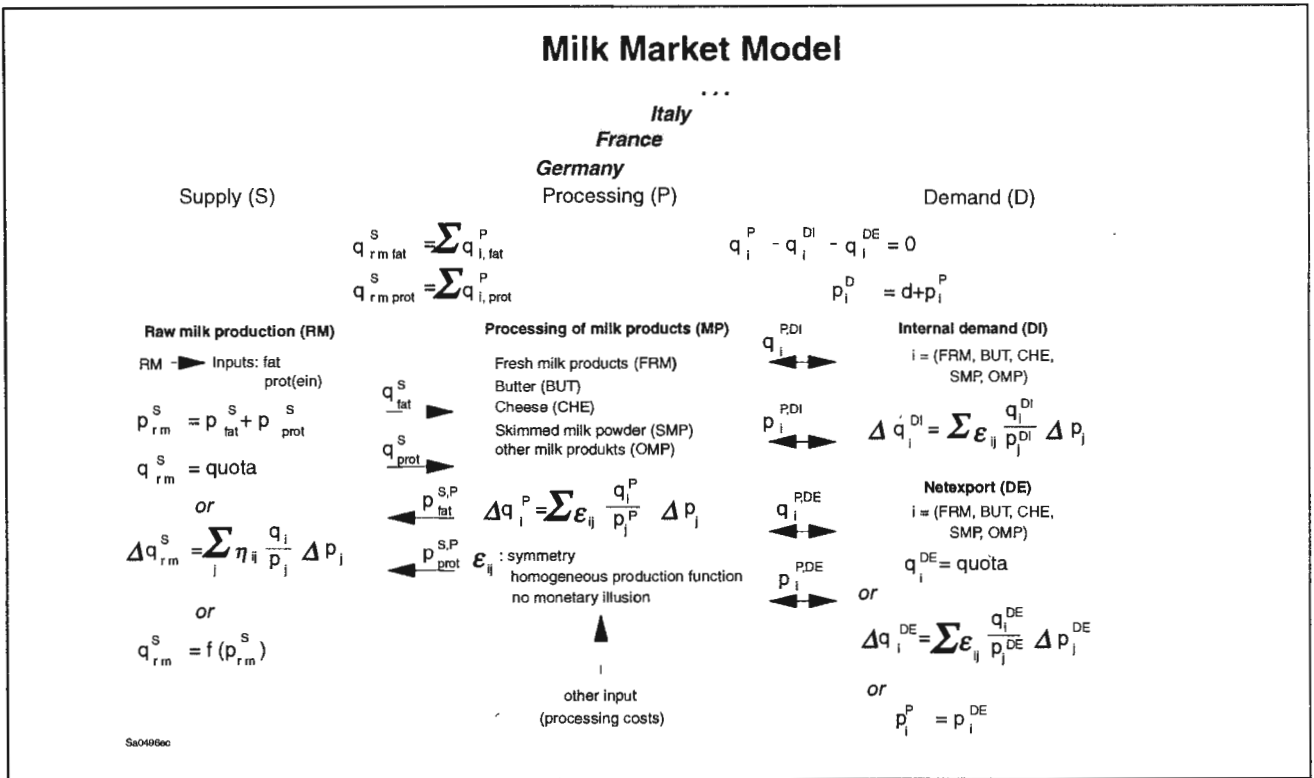


figure 1

- from the prices of butter and skimmed milk powder.
- Prices

The price of raw milk is composed of the prices of fat and protein. Because of handling costs, the producer price of milk is lower at farm gate level than at the milk plant. Changes in the value of inputs in the processing chain are transmitted in equivalent amounts to the producer price.
- Milk supply

If there is a quota for deliveries and the producer price exceeds the equilibrium price, then the input quantities are constant. According to the shadow price of the inputs, the producer price will change without varying the raw milk supply. Otherwise the supply of raw milk is determined by the producer price and, therefore, by the value of fat and protein.
- Demand for dairy products

The demand for dairy products is determined by a linear price-demand-function.

The basic structure of the model is as follows:

$$(1) \quad \Delta q_i = \sum_j \eta_{ij} \frac{q_i}{p_j} \Delta p_j$$

with
 q_i : quantity of product i ,
 p_j : price of product j ,
 η_{ij} : elasticity of quantity of product i related to the price of product j .

The absolute amount of product q_i is derived by adding the quantity of the base to the change Δq_i .

When determining the price function, the quantitative relationship between inputs and processing has to be taken into consideration. The output of milk products is determined by the inputs. The quantity of inputs is limited. The change of quantities induced by price variations is symmetric. This is the consequence of the assumption of profit maximization (Chambers, 1988, pp.130). The quantities under profit maximization remain unchanged, when prices of analyzed factors vary by the same percentage (no money illusion). The attributes mentioned above can be described as follows:

$$2) \quad \frac{\delta E_i}{\delta p_j} = \frac{\delta E_j}{\delta p_i} \quad (\text{symmetry}),$$

E_i as output quantity being positive, and as input quantity negative,

$$3) \quad \sum_j \frac{\delta E_i}{\delta p_j} \frac{\delta p_j}{E_i} = 0$$

It can be derived from (2) and (3), that the sum of the quantity elasticities with regard to price multiplied by the value is zero:

$$4) \sum_j \frac{\delta E_j}{\delta p_i} \frac{P_i}{E_j} E_j P_j = 0 \quad (\text{from (2) and (3)})$$

Limits in quantities and other process conditions with regard to quantities are included as additional equations. Fixed limits have the same effect as a price change which would result in this particular quantity. In the production process, certain amounts of inputs are used per output unit. For theoretical reasons, the inputs are arranged according to the outputs. N outputs ($n=5$) and m inputs ($m=2$) require $(n + nm)^2$ reaction coefficients. The reaction coefficients with regard to the milk products and the prices are given by elasticities.

The set of equations is solved by GAMS (Brooke et al. 1988) using the Solver MINOS.

As base years the individual years 1990 to 1995 are available. The use of each of these base years raises - although different - questions: Because of the planned coupling with GAPsi, 1993 was chosen as base year, even though the data of the three new member states were not yet harmonized for this year and their market situation was still influenced by measures, which were not identical to those of the EU. These countries account for a comparatively small share of total EU; therefore, this error is regarded as negligible. For all base years, the data originate from very different sources and can only be compared within limits. Supply, utilization and food balance sheets of EUROSTAT, FAOSTAT and OECD were used, supplemented by other sources as ZMP, USDA, FAPRI. Prices were mostly derived from ZMP, USDA and other sources.

When forecasts were needed, external sources were used as follows: population forecasts of the FAO, income projections from European Commission, projections of income growth in the Rest of the World (ROW) from FAPRI (FAPRI, 1995). The price projections for the dairy products result from the model. The base year chosen, 1993, was one of very low prices on the world market. The marginal returns of the raw milk utilization on the world market is defined by processing butter and skimmed milk powder. This applies also to export from the EU. Differences in prices between the Rest of the World and the EU were particularly high in 1993 because of very low exchange rates between US-Dollar and ECU at that time.

3 Baseline projections

The proposals of the European Commission, if implemented, will be completed by 2005. Therefore baseline projections have to be provided for 2005. The model described above includes also a forecasting element. By using income elasticities, projections of income and population and a shift factor, in which other influences are combined, the demand for milk products is forecast. The effects on product prices, on prices of inputs, on the processing program of the dairies, and if necessary on raw milk production, resulting

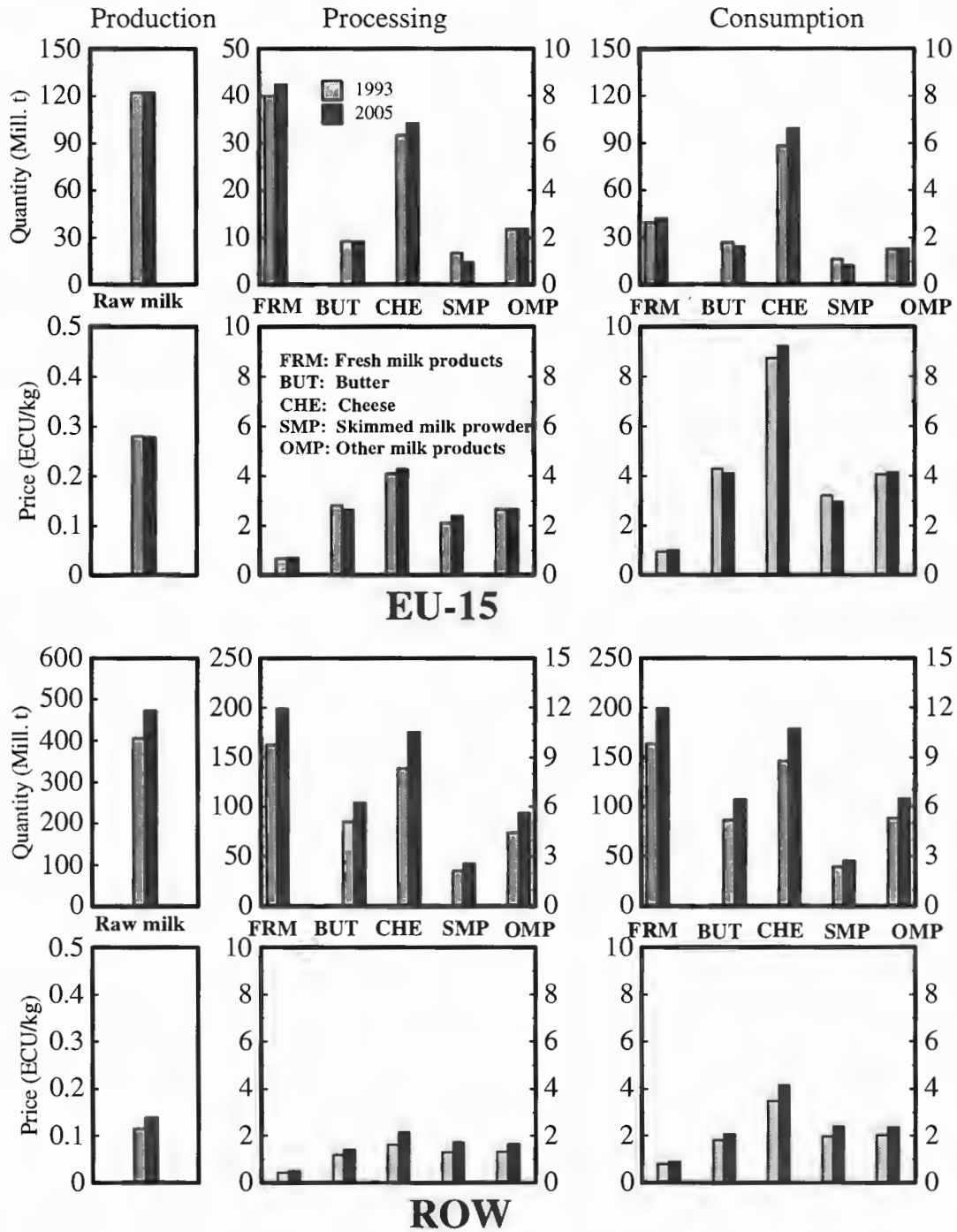
from demand changes are calculated by the model itself. With regard to the following simulations, the model projections were especially adjusted to the published forecasts of the European Commission. These were implemented by using negative shift factors for the demand. Additionally, technical progress in milk processing was included. But in contrast to the projections of the European Commission, milk production and corresponding production of milk fat and protein remained unchanged. Normally, in foreign trade the GATT commitments are taken into account, but in this special case, the surplus quantities estimated by the European Commission were considered as net exports.

Due to the assumed demand changes and shifts in foreign trade, the processing programmes of the dairies are adjusted and lead to price reactions (graph 1). In particular, the proposed reduction in the demand for skimmed milk powder combined with lower net exports will lead to a clear decline in prices of skimmed milk powder on the wholesale level of about 12-13 %. Accordingly, the production of skimmed milk powder will be drastically curbed. With butter, the effect will be less pronounced, since the Commission assumed relatively optimistic export conditions. The decline in butter prices at wholesale level is estimated to be about 6-7 %. Despite limitation in foreign trade of cheese, the rise in demand will imply a price increase at wholesale and retail level. The same applies to fresh milk products and cream. A small unsubsidized exports of cheese, fresh milk and cream are assumed. Decreases in production of 'other milk products' will be due to limitation in the subsidized exports. Decreases in consumption of butter and skimmed milk powder will not entirely be compensated by increases in consumption of other products. This will imply a small decline in producer prices of about a half percent. However, it is assumed that skimmed milk powder and butter marketing subsidies will remain unchanged on the domestic market. If there is a higher-than-assumed demand for dairy products, positive producer price effects could be possible.

In the Rest of the World (ROW), growth in population and income will lead to a higher increase in demand than in the EU-15. The increase is especially high for protein rich products such as cheese. Additionally, restrictions in subsidized imports from the EU-15 will also support price increases. The projections show a substantial rise of world market prices, the price of protein and the derived producer price. In addition, the price of milk fat also increases. Due to the assumed supply elasticity, the producer price increase of about 20 per cent will be relatively small. Milk production might rise around 16 per cent according to the demand development. The processing of all dairy products will rise.

The effects of different policy options are simulated by comparison with the baseline projection "2005".

Projections 2005 (Baseline)



graph 1

4 Impacts of the proposals of the European Commission

The Commission published its proposals on March 18, 1998. In the dairy sector it proposed to

- extend the milk quota regime up to 2006,
- increase the overall quota by 2 %, of which 1% is exclusively reserved for mountain and arctic areas and a fur-

- her 1% is linearly distributed among all Member States,
- gradually decrease support prices; intervention prices for butter and skimmed milk powders will be reduced by 15 %, and the target price of milk by 17 % by 2003. These will be implemented in four equal steps of -3,75 % (intervention prices) and -4.25 % (target price) starting in 2000,

- gradually introduce annual direct payments for dairy cows as compensation for price reductions. The annual premium for milk cows is proposed to consist of four elements
 - a fixed amount per virtual milk cow (quota divided by average yield) of 100 ECU,
 - a supplementary amount per virtual milk cow either for the heightening of the fixed amount (envelope payment max. 45 of ECU) or the grassland premium,
 - a fixed amount per cattle of 35 ECU,
 - a supplementary amount per cattle with a fixed national envelope,
- improve flexibility and simplify the present common market organization.

The following assessment of the proposals covers only the scope of direct market reactions. Direct impacts on the market are incurred by the extension of the quota regime, the increase of the over-all quota and the reduction of the price supports. The effects of the annual payments are excluded because of impracticability (highly aggregated level), although the payments can influence the supply function. The emphasis in the analysis is on the simulation of the effects of quota increase and the decrease of intervention prices of butter and skimmed milk powder by 15 %. Because in the model the producer price is derived from input prices of fat and protein, a simulation of the change in target price is not possible.

In the first step, the quota is expanded by 2% and all intervention prices are cut by 15 % compared to the base year (**graph 2**). Because of internal reasons of the model (symmetry), price reductions imply adjustments in the net trade of skimmed milk powder and butter. Because of these modifications, the Rest of the World will also be affected (**graph 3**). On the processing level in the EU, the measures will lead to a reduction of the butter price of 7 %, compared to baseline projection, and of only 1.7 % for skimmed milk powder. Altogether, the producer price of raw milk will fall by 6,2 %. If the intervention prices are recuded by 15 % compared to baseline, than the producer price will drop by 11 - 12 %.

If the European Commission would change present aids for the internal usage of skimmed milk powder and butter, the wholesale prices for butter and skimmed milk powder in the EU would drop more strongly than 15 %. The shift in foreign trade will also cause adjustments in the Rest of the World especially with regard to the demand of butter and skimmed milk powder. The effects on other products will be very small.

The model results are influenced by the baseline projections. Higher consumption in the EU would involve a rise in the producer price. Compared to such a baseline projection, the proposed policy measures will lead to a greater impact on the prices at different market levels.

5 Impacts of different degrees of market liberalization

Apart from the proposals of the European Commission, other suggestions are discussed which favour a stronger market orientation. In most suggestions, the milk quota regime will be terminated. Additionally, in most cases all intervention measures with regard to the domestic market will be abolished. Differences exist however regarding the possible foreign trade regulations. While some proposals aim at the complete liberalization of the foreign trade, others want to abolish export refunding, but to maintain some import protection. From this spectrum, some policy options were selected, in order to illustrate their impacts on the dairy market. The effects were simulated for the year 2005. Because of uncertainties with regard to the efficiency of the aid measures at the domestic market, these measures were still included.

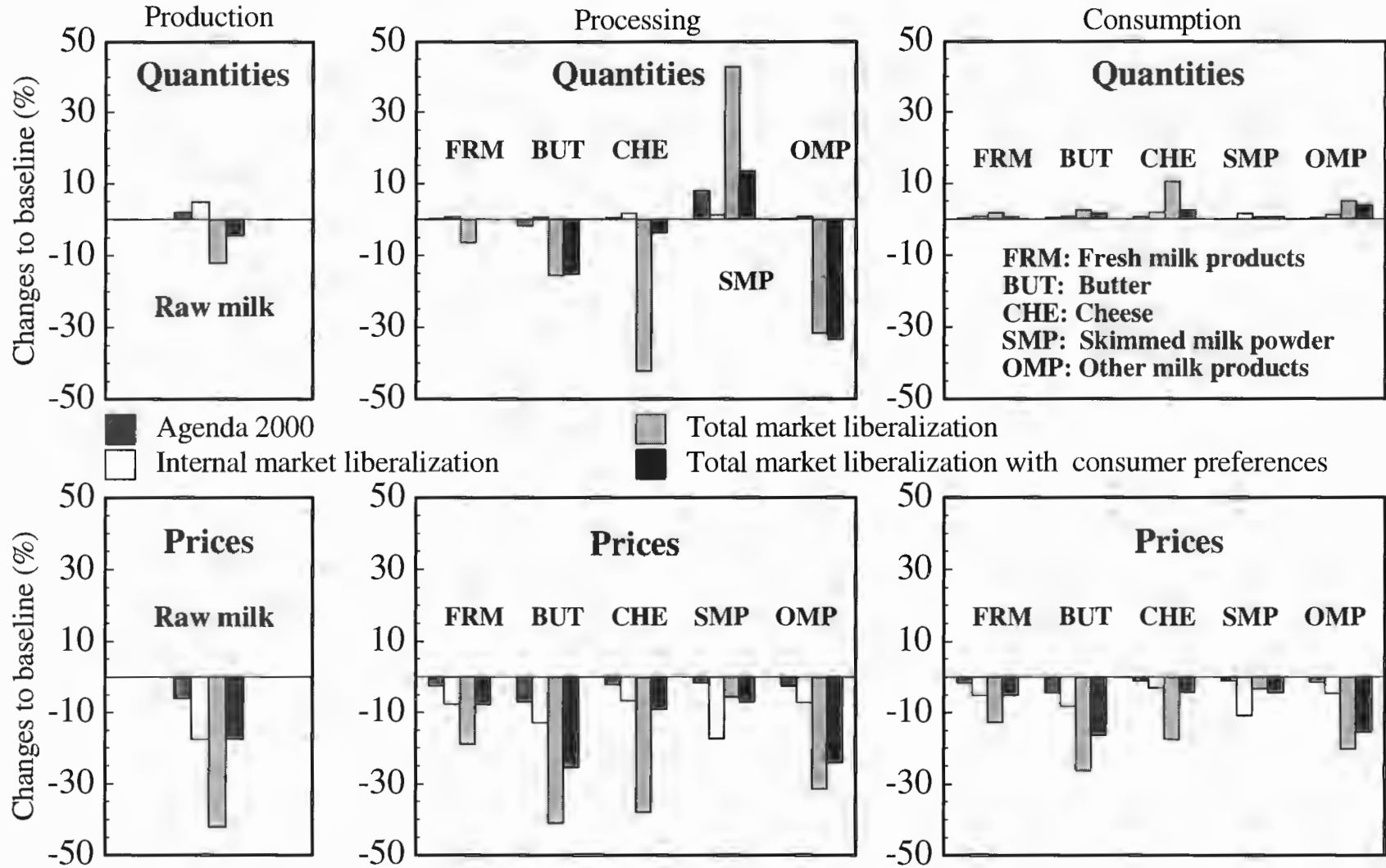
The following policy options were simulated:

- Abolition of the milk quota regime and intervention system,
- total market liberalization of the EU dairy market,
- total liberalization of the EU dairy market, but consumer preferences for EU fresh products and EU cheese.

All simulated policy options will lead to a decline in producer prices for milk. The price decreases range from 18 % to 40 % compared to baseline. These price reactions will be much more pronounced than in the case of the Commissions proposal. Abolition of the quota regime and the intervention system combined with no change in the net exports will result in a drop of the producer prices in the EU of about 17-18 per cent. Because of the abolition of the quotas, the production will rise in the EU. The demand for all dairy products will rise, the additionally produced milk will be consumed within the EU. This is only possible, since the producer prices will fall. The price decrease will be particularly high for butter and skimmed milk powder. The prices will change only slightly, if the minimum access is granted according to the GATT agreement, but the milk production in the EU will decline.

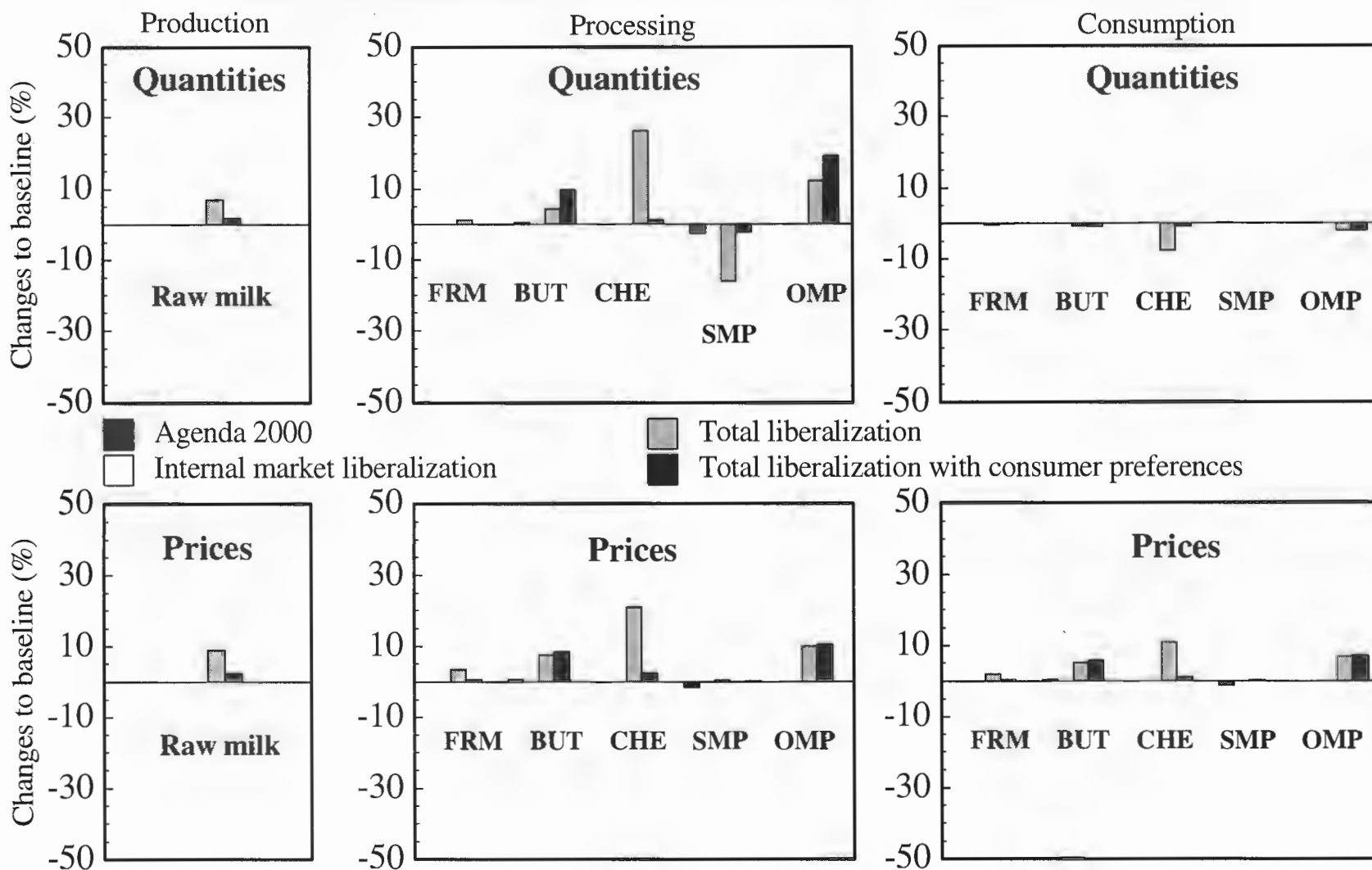
The most marked reaction will evolve under total market liberalization, in which more or less all policy measures will be removed. The world market prices will be applied on the domestic market. Agricultural producers within the EU will react to this scenario with a strong reduction in milk production. In the EU, retail prices will decline for all dairy products. The effect on butter will be particularly pronounced. The consumption of all dairy products will rise in the EU-15. The EU-15 will become a net importer of all dairy products with the exception of skimmed milk powder and other milk products (**graph 4**). With skimmed milk powder, the price difference between the domestic market and the Rest of the World will be comparatively small, therefore, price adjustment will be moderate. Net imports of butter and cheese are very high under this option. In the Rest of the World the producer price and volume of pro-

Impact of different Policy Options in 2005, EU-15

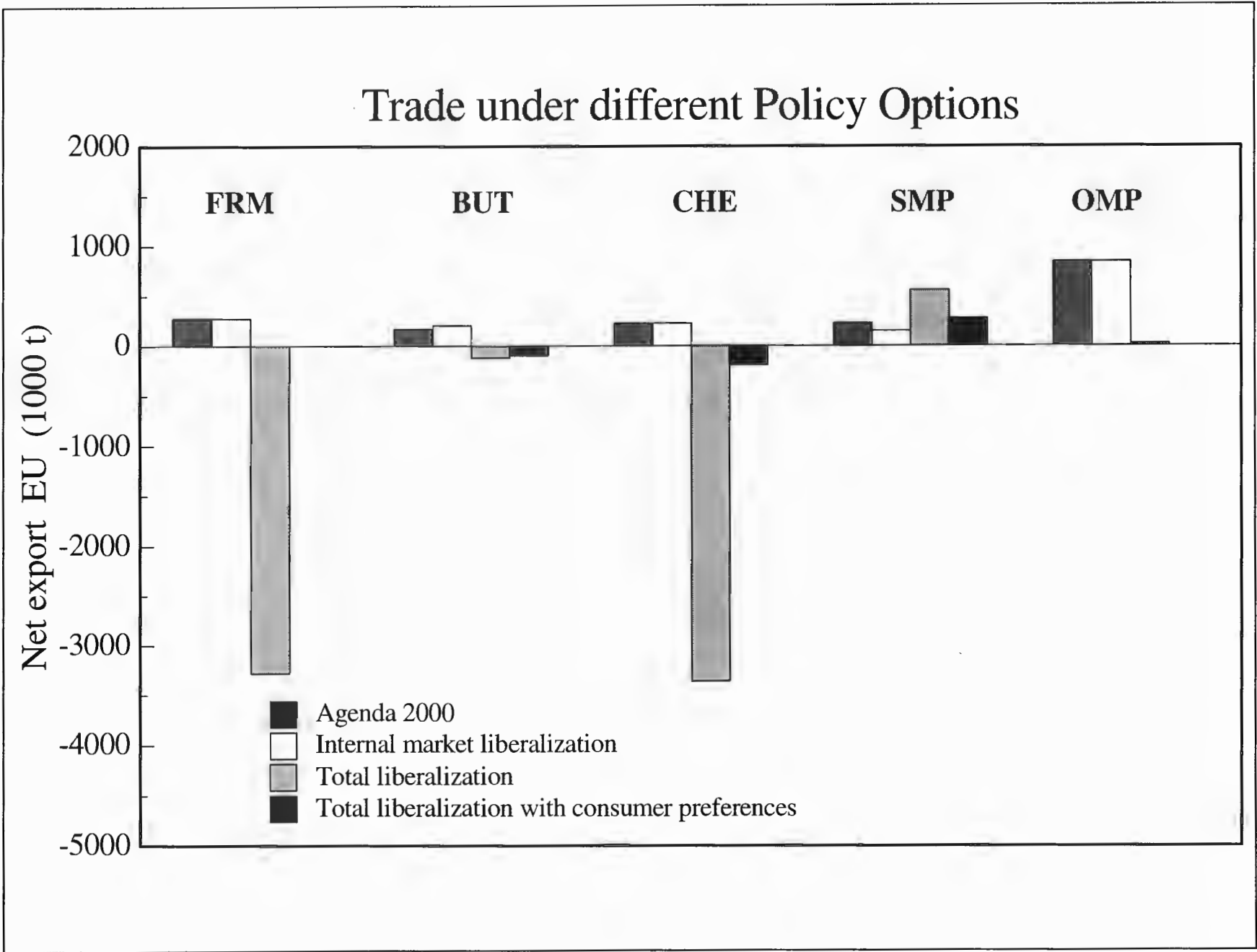


graph 3

Impact of different Policy Options in 2005, Rest of the World



graph 4



duction will rise. The increased production of raw milk will be used in particular for the production of cheese, butter and other milk products. The price rise in these products entails demand losses, compared to the baseline.

Under option 3 consumer preferences for European fresh milk products and cheese are assumed, i.e. despite market liberalization, higher prices could be assumed for these products depending on transaction costs and a higher acceptance of European products. These preferences will cause a shift in foreign trade; net imports of fresh milk products and cheese will not take place. On the other hand, net imports of butter and "other milk products" will increase. To a small extent skimmed milk powder will be exported. The higher prices of fresh milk products and cheese will result in a reduction of the raw milk price of only around 17 - 18 per cent. Domestic producers will reduce their milk production and consumers will increase their consumption to a smaller degree than under total market liberalization. Accordingly, the price rise and production growth will be smaller in the Rest of the World.

Summary

The economic effects of certain changes in the EU dairy regime and of market liberalization are analyzed within the framework of a partial equilibrium model. Using a joint-input, multi-product formulation the model confronts the agricultural production of raw milk with the processing and the final consumption of five milk products. While the two valuable components of raw milk (fat and protein) are kept in balance at all levels of the marketing chain the model describes the economic and technical relations between input and output quantities. Although the model is non-spatial (in the sense of transportation costs being omitted) there is a regional aspect with 14 EU regions (member states) and all other countries as a whole (Rest of the World). Simulation of prospective policy effects in 2005 necessitates a projection of supply and demand for this year, starting from 1993 as a base year.

Different scenarios were considered:

- Expanding the EU milk quota by 2 % and cutting the intervention prices by 15 % (Agenda 2000) compared to the base year will result in decreasing EU producer prices by 6-7 %. Cutting intervention prices by 15 % compared to baseline will lead to a producer price reduction of more than 10 %. The influence on the Rest of the World is very small.
- The abolition of the milk quota regime and the intervention system will lead to a producer price decrease of 18 %, but the milk production in the EU will increase.
- When a very low world market price for dairy products is considered (starting from the world market situation in 1993), market liberalization results in a marked decrease of EU producer price of about 40 %. The decreasing milk production coupled with rising demand makes the EU a net importer of dairy products (with the exception of skimmed milk powder and other milk products). These

imports will lead to an increase in producer prices in the Rest of the World.

- If in the latter case consumer preferences for fresh milk products and cheese allow for price differentials to the benefit of EU producers there are considerably less pressures on EU markets but still big changes in the pattern of trade to the detriment of butter and skimmed milk powder.

Auswirkungen verschiedener Politikoptionen auf den EU-Milchmarkt

Im Rahmen eines partiellen Gleichgewichtsmodells des Milchmarktes wurden ökonomischen Auswirkungen von Änderungen der Milchmarktorganisation und einer Marktliberalisierung untersucht. Das Modell des Milchmarktes beinhaltet neben der landwirtschaftlichen Erzeugung von Rohmilch (bzw. -fett und -eiweiß), insbesondere die Verbundproduktion der Molkereien von fünf Milchproduktgruppen (Frischmilcherzeugnisse einschließlich Sahne, Butter, Käse, Magermilchpulver, andere Milchprodukte) sowie Verbrauch und Außenhandel dieser Produktgruppen. Der Rohstoff Milch enthält zwei wertbestimmende Komponenten, die in unterschiedlichen Relationen in die verschiedenen Produkte eingehen. Das Modell beschreibt die preislich und technisch bedingten quantitativen Beziehungen der In- und Outputmengen. In das Modell einbezogen sind 15 Regionen, und zwar 14 EU-Mitgliedstaaten (Belgien/Luxemburg wurden zusammengefaßt) und eine Region, die den Rest der Welt darstellt. Die Auswirkungen der Änderungen der Marktpolitik wurden für das Jahr 2005 simuliert, was eine Projektion zu erwartender Nachfrageänderungen und ihrer Marktwirkungen gegenüber dem Basisjahr 1993 erfordert.

In der Untersuchung wurden verschiedene Optionen analysiert:

Die Ausdehnung der Milchquote um 2 % und die Kürzung der Interventionspreise um 15 % (Agenda 2000) gegenüber dem Basisjahr 1993 würde zu einem Rückgang der Erzeugerpreise um 6-7 % führen. Die Kürzung der Interventionspreise um 15 % gegenüber der Basisprojektion würden hingegen einen Rückgang der Erzeugerpreise von über 10 % zur Folge haben. Die Auswirkungen auf den Rest der Welt sind gering.

Die Aufgabe des Milchquotensystems würde einen Rückgang der Erzeugerpreise um 18 % implizieren, aber die Milcherzeugung in der EU würde ausgedehnt.

Ausgehend von einem niedrigen Weltmarktpreisniveau (Ausgangspunkt Weltmarktpreissituation 1993) würde eine vollständige Liberalisierung einen Erzeugerpreisrückgang von 40 % zur Folge haben. Aufgrund der sinkenden Milcherzeugung und der steigenden Nachfrage würde die EU zum Nettoimporteur an Milchprodukten mit der Ausnahme von Magermilchpulver und anderen Milchprodukten. Diese Importe hätten eine preissteigernde Wirkung im Rest der Welt.

Falls Verbraucherpräferenzen für in der EU hergestellte Frischmilcherzeugnisse und Käse für den Fall der Marktliberalisierung unterstellt werden, dann wäre der Druck auf die EU-Erzeugerpreise deutlich geringer. Die Außenhandels-situations würde sich zu Lasten von Butter und Magermilchpulver verschieben.

Literature

- Brooke, A., Kendrick, D. A. u. Meeraus, A.: GAMS - A User's Guide. San Francisco 1988.
- Chambers, R. G.: Applied production analysis. A dual approach.- Cambridge 1988.
- Deaton, A. u. Muelbauer, J.: Economics and consumer behavior.- Cambridge 1980.
- EUROSTAT: Erzeugungs-, Verwendungs- und Versorgungsbilanzen für Milch.- Luxembourg 1996.
- FAO: faostat-Datenbank.- Rome 1995.
- FAO: Productions Yearbook 1995.- Rome 1996.
- FAO: FAO quarterly bulletin of statistics.- Various years.
- FAPRI: 1995 World Agricultural Outlook.- Ames 1995.
- Frenz, K.; Manegold, D.; Salamon, P.: Zukunft des Milchquotensystems unter besonderer Berücksichtigung der GATT-Vereinbarungen. - In: Bauer, S., Herrmann, R. und Kuhlmann, F. (Hrsg.): Märkte der Agrar- und Ernährungswirtschaft - Analyse, einzelwirtschaftliche Strategien, staatliche Einflußnahme. - Schriften der Gesellschaft für Wirtschafts- und Sozialwissenschaften des Landbaues e. V., Bd. 33. Münster-Hiltrup 1997, p. 179-191.
- Kersten, L. U. Salamon, P.: Analyse der EG-Milchmarktpolitik. - IflM-Arbeitsbericht 85/1.- Braunschweig-Völkenrode, 1985.
- Kommission der Europäischen Gemeinschaften (KOM-EU): Medium term Projections 1996-2000.- Manuscript Brüssel 15.6.1996.
- Lahmann, M.: Nachfrageschätzungen für Milcherzeugnisse in der EU.- Manuscript Braunschweig 1995.
- OECD: Dairy Indicators.- Various years.
- Salamon, P.; Frenz, K.; Manegold, D.: Entwicklungstendenzen am Weltmilchmarkt unter besonderer Berücksichtigung der GATT-Beschlüsse und die Auswirkungen auf dem Milchmarkt der EU. Milchkonferenz '95, Berlin, 21.-22.9.1995.
- Schons, H.-P.: Vorschätzung des Nahrungsmittelverbrauchs in den Mitgliedsländern der EG(12) und ausgewählten Drittländern für die Zieljahre 1995 und 2000. Schriftenreihe des Bundesministers für Ernährung, Landwirtschaft und Forsten. Reihe A: Angewandte Wissenschaft. H. 421. Münster-Hiltrup, 1993.
- Schmidt, E.: Milcherzeugnis-Nachfrage unter veränderten Marktbedingungen. - Schriftenreihe des Bundesministers für Ernährung, Landwirtschaft und Forsten. Reihe A: Angewandte Wissenschaft. H. 320. Münster-Hiltrup, 1985.
- USDA: PS&D-Datenbank.- Washington 1995.
- USDA: Agricultural Outlook. - Various years.
- USDA: Dairy: World Markets and Trade.- Various years.
- ZMP: ZMP Bilanz Milch.- Various years.
- ZMP: Europamarkt Milch, Butter, Käse.- Various years.
- ZMP: Europamarkt Dauermilch.- Various years.

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