Who Is Telling the Truth?
Synthetic Uniformly Structured or Econometric
Country Specific Models – A Model Comparison
Based on the Luxembourg Agreement

Ernst-Oliver von Ledebur[1], Petra B. Salamon[1] and Gerald Weber[2]

[1] Federal Agricultural Research Centre, Institute of Market Analysis and Agricultural Trade Policy, Bundesallee 50,38116 Braunschweig, Germany
[2] Humboldt University Berlin, Institute of Agricultural Economics and Social Sciences, Luisenstr. 56, 10099 Berlin,Germany.

Who Is Telling the Truth?
Synthetic Uniformly Structured or Econometric Country Specific Models – A Model Comparison Based on the Luxembourg Agreement[*]

Ernst-Oliver von Ledebur[**], Petra B. Salamon[**] and Gerald Weber[***]

Abstract

The paper discusses differences in the approaches of the different partial equilibrium models, one of which is a synthetic model (GAPsi), and the other an econometrically estimated model (AGMEMOD). For example, distinctions are to be found in the general approach of the outlay of the models as the synthetic model incorporates only prices impacts and some shifts, while the econometric model also includes other influencing factors. Price formation in GAPsi comprises a system including policy measures such as price differentiations, whereas AG-MEMOD's key price formation is based on an key-price equation, or respectively, the price transmission. Here policy instruments are modelled directly as explaining variables. These differences induce certain deviation in the model results for our example beef when the Luxembourg Agreement is simulated.

Key words: partial equilibrium model, CAP, Luxembourg Agreement, projections, econometric estimation.

Introduction

Policy reforms and impact analysis thereof are recurring topics on the European Agenda. An overview of economic models used in this respect can be found in van Tongeren et al. (2002) covering partial and general equilibrium models in principle. Even though the group of partial equilibrium models consists mainly of synthetic models of the SWOPSIM type, some others are econometrically based. The most well-known and widely used econometric model is FAPRI's GOLD model, and the econometric model AGMEMOD, based principally on this model, was developed (www.ag-memod.org)[*] for the EU. The following paper deals with a comparison of the econometrically estimated AGMEMOD model and the synthetic model GAPsi. The intention is to derive important features of partial equilibrium models and their impacts on model results. A focus is set on the respective model structures and model results to give insights into the interaction of both model types. The analysis is based on an experiment that tackles questions of the current agricultural policy decisions, namely the Luxembourg Agreement. Here the proposed levels of traditional agricultural policy instruments within the first pillar of the CAP partly replaced by premiums and decoupled from production are key issues. In order to focus this analysis on some methodological and technical aspects, the scope will be the EU before the enlargement in May, 2004. To allow for a comparison, models and results are adjusted as far as possible. The focus is set on the beef sector in Germany.

1. Model structures

1.1 General approach

GAPsi is an international agricultural sector model. It is conceived not so much as a projection device but as a tool for policy simulation. The acronym, in German, stands for **C**ommon **A**gricultural **P**olicy **si**mulation. The model is located at the Institute of Market Analysis and Agricultural Trade Policy of the Federal Agricultural Research Centre (FAL), where it was developed and used for various policy analysis projects. It is part of the "FAL model group" hosted and operated by the economic institutes at FAL. The roots of GAPsi trace back to the 1980s when Frenz (1982) analysed the effects of trade instruments and subsidies on agriculture. Further developments and details are described in Frenz and Manegold (1988), and in von Ledebur and Manegold (2004). Using a multi-product formulation, the model confronts agricultural production of goods with the processing, final consumption and trade. While the supply and demand components are kept in balance at an EU level, the model describes economic and

---

technical relations between input and output quantities. In principle, the basic economic relationship is as follows:

$$\Delta q_i^L = \sum \varepsilon_{i,j}^L \frac{q_i^L}{p_j^L} \Delta p_i^L \qquad (1)$$

with

      q = quantity;
      i = products 1, … , n;
      j = products 1, … , n;
      p = price 1, … , n;
      ε = elasticity;
      L = level (produced, processed, consumed, traded).

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. Policy instruments are implemented as price components or increments as well as restrictions. Crop production, harvested area and yield are considered separately thus leaving production to be determined by multiplication indicating non-linear elements. Moreover, there are certain model variants in which quadratic equations are used for modelling (non-quota) milk supplies. So far, the model is synthetic with model parameters taken from literature, which are generally uniform across the EU regions. Those parameters meet general theoretical requirements like symmetry, adding-up restriction, homogeneity, no monetary illusion. As transaction cost of trade is omitted, the model itself is non-spatial. So far, this model includes 13 regions: Germany, North-West Europe, Benelux, France, Mediterranean, Scandinavia, Poland, Hungary, Rest of CEECs, NAFTA, South-America, Oceania and Rest of the World.

Based on features of FAPRI's GOLD model, the econometric model AGMEMOD was developed in 2000. AGMEMOD stands for **Ag**ricultural sector in the **Me**mber states of the EU and Newly Associated States: Econometric **Mod**elling. Here in principle, econometric country models of EU member states are interlinked in the AGMEMOD partnership to derive the effects of policy changes in different EU countries and across the EU. The main focus was not only to analyze the impact of policy adjustments, but also to generate baselines for the agri-food sector so that future changes in the economic environment can be anticipated. Technically, AGMEMOD is not an optimization model but a non-linear equation system describing agricultural production and the respective markets that are usually represented by production, ending stocks, consumption, export and import. Here, one variable (in most cases export or import) is defined to ensure market clearing. The general form of the equations is displayed as follows:

$$q_i^L = a_a + \sum a_{i,j}^L p_i^L + \sum a_n^L v_n^L \qquad (2)$$

with

> q = quantity;
> a = parameter;
> i = product 1, … , n;
> j = product 1, … , n;
> v = non-price variable;
> n = variable 1, … , n;
> p = price 1, … , n;
> L = level (produced, processed, consumed, traded).

Under certain conditions (1) can be deduced from (2). Price formation is regulated via special price linkage equations which derive local prices from a key price taking into account relations of production to consumption (3) or a key price equation (4) which is a behavioural equation describing the price formation on the principle market of the EU. Price equilibriums in each market are found by the interactively running models for countries representing a very large part of EU agricultural output. Concerning the key prices, they are adjusted until extra-trade export-demand equals extra-trade export-supply:

$$p_i^C = a_0 + a_{1_i}^C p_i^K + a_{2_i}^C \frac{q_i^{C,S}}{q_i^{C,D}} + a_{3_i}^C \frac{q_i^{K,S}}{q_i^{K,D}} + \sum a_{n,i}^C v_{n,i}^C \tag{3}$$

$$p_i^K = a_0 + a_{1_i} p_i^W + a_{2_i}^C \frac{q_i \sum^{C,S}}{q_i \sum^{C,D}} + \sum a_{n,i} P_{n,i}^{EU} \tag{4}$$

with

> C = country x;
> K = key price country;
> S = supply;
> D = demand.

Basically, the approach assumes microeconomic properties like symmetry, homogeneity, adding-up restriction, and absence of monetary illusion. But due to the fact that the parameters of the models are econometrically estimated, some restrictions in this respect have to be accepted. Data on the actual performance of the agri-food industry consider on the one hand developments in the economic factors, and on the other hand, changes in policy measures. GAPsi and AGMEMOD don't feature transaction costs and are therefore regarded as a non-spatial models. Both assume homogenous goods and trade take place in pooled world markets. Policy impacts are conducted in such a way, that simulation results are compared with a projection generated under the 'status quo' conditions without a certain policy change so that these simulations show a likely impact, but are not forecasts, as many other influences are likely to affect

the actual outcomes. More details on the German AGMEMOD can be found in Salamon and von Ledebur (2004a) and Salamon and von Ledebur (2004b). In the following section, certain aspects of GAPsi and AGMEMOD are highlighted and compared to deduce their likely effect on model results. Here we will focus on the beef sector.

1.2 Supply

In GAPsi, animal productivity (Yld_{irt}) is assumed to be dependent on changes in domestic (consumer) prices $\Delta Pdom_{irt}$. Specific annual or regional shifts can additionally be included ($sYld_{irt}$) (5). The production of the beef sector in GAPsi is modelled as dependent on annual economic growth ($rGrow_{rt}$) and a constant (transmission) elasticity ($\eta Grow_{ir}$), that according to producer price changes (ΔPpr_{jrt}), stands for the effect of investment in the sector. Product or period specific shift factors can be set. Thus, for animal products the conditions under (6) must be complied with as supply is defined by the identity: productivity times the amount of animals used in production in period t ($SS_{irt} = Yld_{irt} * QN_{irt}$).

$$Yld_{irt} = (1 + sYld_{irt} * Yld_{ir(t-1)}) + EY_{irt} * \Delta Pdom_{irt} * Yld_{irt} / Pdom_{irt} \tag{5}$$

$$SS_{irt} = (1 + \eta Grow_{ir} * rGrow_{rt} / 100) * SS_{ir(t-1)} + \sum_{ij}\{\eta S_{ijr} * (SS_{ir(t-1)} / Ppr_{jr(t-1)}) * \Delta Ppr_{jrt}\} \tag{6}$$

In AGMEMOD, the production is defined by the number of slaughtered animals and by slaughter weight. The slaughter weight (7) is determined by a trend and to a small degree by the share of calf slaughtering and by the premiums adjusted price:

CCSLWDE = 265.1075 -7.535129 * CCKCVDE/BCKTTDE) +0.014416 ((BVPRMDE/CCICIDE/GDPDDE)+(CCMBP*EXREDE/GDPDDE/CCSLWDE(-1))) + 1.110522 TREND70 + 19.99237 DUM-L91 + -3.569838 DUM-D91 - 1.983612 DUM-XBSE2 (7)

with

    CCSLWDE = slaughter weight;
    CCKCVDE/BCKTTDE = calf slaughter in Germany;
    BVPRMDE = beef producer price;
    CCICIDE = price index beef production;
    GDPDDE = general price index;
    CCMBP*EXREDE/GDPDDE = male beef premium in relation to the general price index;
    TREND70 = trend variable starting in the year 1970;
    DUM-L91 = dummy variable for change in level beginning in 1991;

DUM-D91 = trend starting in year 1991 (to compensate for re-unification);
DUM-XBSE2 = dummy for the years with BSE impacts.

In contrast to the situation by slaughter weight the schemata to acquire the number of slaughterings is more complex as it includes three components: cow slaughtering, calf slaughtering and other cattle slaughtering. These different types of slaughtering are endogenous. The slaughtering of other cattle is influenced by a bundle of variables including other endogenous variables which describe developments in the cattle stock, economic variables like price relations and premiums, and dummy variables concerning the German re-unification. The cattle stock variables and the prices are endogenously determined by separate equations. As can be seen, the matrix of influencing factors in AGMEMOD is much more detailed than in the synthetic model GAPsi. This is both a blessing and a curse as this more complex structure of AGMEMOD also has to be estimated. Signs of the variables came up as expected, but some explaining variables had to be removed to achieve this goal, and high levels of significance of estimated variable have occasionally been missed. Problems were caused especially by policy variables which had to be rejected due to too low significance, like the suckler cow premium.

$$
\begin{aligned}
\text{CCKOTDE} = {}& 666.4216 + 0.268595\ (\text{CCCCTDE}(-1) + \text{CCSMTDE}(-1)) - 0.038808 \\
& \text{CCCCTDE}(-2) + 96.11325\ \text{DCCCTDE}(-1) - 3.28073\ \text{BCCCTDE}(-1) + \\
& 0.390203\ \text{CCPRMDE/PKPRMDE} - 2.117113\ \text{BCQSCDE}\ 116.3595 \\
& (\text{CCMBP} * \text{EXREDE/GDPDDE}) + 312.1457\ (\text{CCMBP}(-1)*\text{EXREDE}(-1)/\text{GDPDDE}(-1)) - 0.264927\ \text{DUM-T91} + 1.93036\ \text{DUM-XBSE2} \qquad (8)
\end{aligned}
$$

with
CCCCTDE = beginning stocks of cattle;
CCSMTDE = imports of cattle;
DCCCTDE = beginning stocks of dairy cows;
BCCCTDE = beginning stocks of suckler cows;
CCPRMDE/ PKPRMDE = price relation beef to pigs;
BCQSCDE = suckler cow quota;
CCMBP*EXREDE/GDPDDE = male beef premium in relation to the general price index;
DUM-T91 = trend starting in year 1991 (to compensate for re-unification);
DUM-XBSE2 = dummy for the years with BSE impacts.

1.3 Market clearing

Neglecting eventual changes in carry-over stocks, foreign trade or net export demand is defined as the difference between regional supply and regional domestic human consumption within GAPsi. Net exports can be restricted by limits resulting from the international WTO agreement. Overall world supply (SS_{in}) equals overall world demand for food (Dcs), feed (Dfd),

if available for seed (*Dds*) and net export (*Dex*) but with world net exports adding up to zero (11). This overall market clearing in GAPsi is technically implemented by minimising the difference between world supply and world demand. The obtained price-quantity equilibrium is determined internally in the model.

$$\sum_r \{Dcs_{irt} + Dfd_{irt} + Dds_{irt} + Dex_{irt}\} = \sum_r \{SS_{irt}\} \tag{11}$$

Unlike GAPsi, AG-MEMOD's food markets consist of at least five components (production, demand, imports, exports and stocks) which are determined by four separate equations. To ensure market clearing, one component is defined as market closure and calculated by an identity (12). This concept is identical for all EU countries, but the market closure variable may vary according the country regarded. In the case of beef in Germany, exports are defined as a market closure variable whereas imports and beef stocks are endogenously determined by different equations. On the EU level, net export supply must be equal to specified net export demand, otherwise price adjustments will guarantee the market equilibrium. The concept is comparable to the approach of GAPsi at a regional level.

$$SPR + SMT + CCT(-1) - UDC - UXT - CCT = 0 \tag{12}$$

with

    SPR = production;
    SMT = imports;
    UDC = total domestic demand;
    UXT = exports.

1.4 Price formation

With regard to prices, GAPsi differentiates between different price levels starting with a uniform world market price. Any region including the EU as a single market has its own border price which is dependent on the region's foreign trade status either a c.i.f. or a f.o.b. price. Further prices regarded are domestic market prices, producer prices, and consumer prices. The product specific price wedges include transaction costs and may correct for quality differences. Trade barriers also cause price differentials. The price system implemented in GAPsi additionally allows the depiction of impacts of some CAP instruments and can be summarised as in Figure 1. Since all regional prices are expressed in national currency the annual exchange rates are accounted for exogenously. For practical reasons prices in the EU member states and acceding countries are declared in Euros, while the prices in other regions are expressed in US $. So under the CAP the domestic (or intervention) price plus the coupled share of premiums (see also OECD, 2001) equal the incentive price which drives supply in GAPsi. After decoupling of the premiums it is assumed that they affect only to a reduced share the incentive pro-

ducer's price. As mentioned, agricultural policy instruments are implemented as adjustments in the price system.
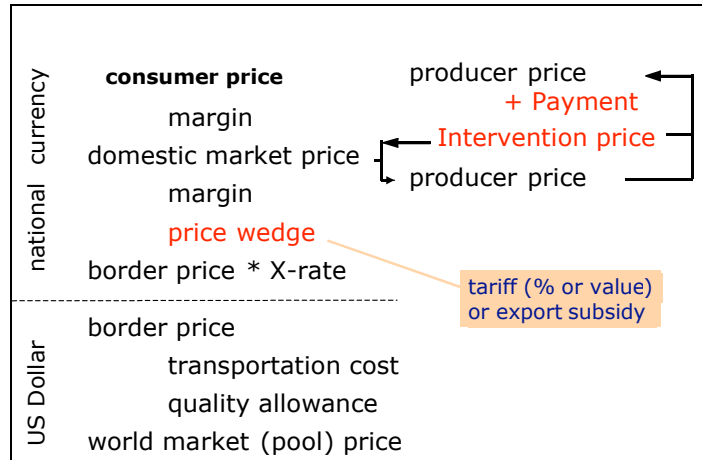

Figure 1. Price system in GAPsi

In the combined AGMEMOD model only three prices are generally included, producer prices for primary products, wholesale prices for processed products and world market prices for externally traded products. At the moment world market prices are exogenously implemented. At the individual country level, commodity prices are linked to key prices at the EU level. These are further used to clear the markets in the combined EU model. For example, the key prices for beef are endogenously determined in the German model.

$$BVPRMDE = 311.1426 + 266.0278(BVPNE*EXREDE/BVPIN*EXREDE)+ 0.354823(BVPIN*EXREDE), -0.0861186(CCMBP(-1)*EXREDE(-1)/CCSLWDE(-1)),+ -0.0698032(BVSPRDE(-1)) + 0.006315BVUDCDE+0.011134 (BVSXL- BVTRQ)) \quad (13)$$

with

BVPRMDE = German price for beef;
BVPNE*EXREDE = world market price for beef;
BVPIN*EXREDE =intervention price for beef resp. basic price;
(CCMBP(-1)*EXREDE(-1)/CCSLWDE(-1)) = male bovine premium per slaughter weight; BVSPRDE(-1) = production of beef;
BVUDCDE = domestic demand for beef;
BVSXL- BVTRQ =difference between export limits of subsidized exports and tariff rate quotas of beef.

215

These key prices are then engaged in the price determination of the beef markets in other EU countries (e.g., in France). This implies that German key prices combined with other endogenous variables like self-sufficiency rates of Germany as well as of France determines 'domestic' prices for poultry in France. For each commodity and year, net export supply will be calculated as the difference between estimated variables of domestic supply (production and beginning stocks) and estimated variables of domestic demand (domestic consumption, waste and ending stocks). The sum of net export supplies across all EU member states determines the EU net export supply. The EU commodity markets will close by equalising EU net export supply with the EU net export demand which are determined through WTO commitments, relative EU market prices and world market prices. Supply and demand in the member states and therefore, in the entire EU, will change until an equilibrium is attained on the EU market. In summary, AG-MEMOD is solved through an iterative process, which brings all EU commodity markets in all years in equilibrium with respect to supply of exports on the one hand and demand for exports on the other hand.

1.5 Policy instruments

As mentioned above, the main agricultural policy instruments as well as the related trade policy instruments are in general implemented in GAPsi by adjustments of increments in the price system. Quantitative restrictions on production or trade are introduced by upper limits on the relevant variables, which cause adjustments in other variables of the market balance. In this respect minimum access and export commitments concerning subsidized exports can only be regarded as net-trade restrictions. Complex policies with which this type of instrument is simultaneously associated, (minimum) price arrangements like intervention prices, and a relation to export refunds exist but are difficult to model. So the following instruments are included in the case of the beef market: beef intervention-price or basic price, average beef premium, beef subsidised export limit, beef tariff rate quotas. In contrast to this approach, in AGMEMOD most policy instruments are implemented as separate explanatory variables within equations and have been estimated econometrically. Only in very few cases are premiums modelled as price increments. With beef as an example we have introduced the following policy instruments: beef intervention-price or basic price, suckler cow quota, special beef premia quota, suckler cow premium, male bovine premium represented by the special beef premium (bull, 1st payment), beef subsidized export limit, beef tariff rate quotas.

1.6 Feedback to other markets and other countries

Within GAPsi and AGMEMOD most market interactions are modelled by cross-prices in production and demand. These refer also to the interaction between feedstuff and the livestock sector. Some exceptions can be found concerning the interactions between the dairy sector and the beef sector within AGMEMOD. Here the milk production, or rather the dairy quota, in-

fluences the dairy cow stock which has an impact on several other variables, e.g., slaughtering and slaughter weight (for details see Salamon and von Ledebur, 2005). Inside the EU the interaction between the different member states is governed by the relevant key-price equation, respectively the price transmission equation. Trade between member states is not hampered by taxes or transaction costs, which also applies to GAPsi. Here an unique price is assumed throughout the EU in the base year, but different price changes in the member states might occur due to policy impacts. Prices are endogenously solved at the world market level induced by the market clearing of the pooled world market for each product, taking consideration of exchange rates, transaction costs and some policy instruments. Trade of each model region of GAPsi is simply represented by its resulting net trade. Due to this, specific bilateral trade arrangements can not be explicitly simulated in GAPsi.

2. Model implementation: data, parameters, exogenous variables

The GAPsi's database includes quantities of annual data from 2000 onwards which were exclusively obtained from FAOStat. Prices and additional indicators were generated based on FAO-ESC, OECD, USDA, CAP-Monitor, the German Statistical Office as well as from the German Federal Ministry of Consumer Protection, Food and Agriculture. In contrast to GAPsi, AG-MEMOD is primarily based on data derived from EUROSTAT's NewCronos. Data of prices and policy variables are supplemented by different sources like EU Commission, ZMP, Oil-world, CAP-Monitor, the German Statistical Office as well as the German Federal Ministry of Consumer Protection, Food and Agriculture. Because of the econometric estimation of model parameters, data, if available, start with the year 1973. Exchange rates and inflation as well as overall economic growth and annual population figures are exogenous to the models and derived from different sources. As GAPsi is a synthetic model, parameters are taken from literature or own modelling experience. But meat demand elasticities (with regard to own price, cross prices and income) are calibrated using a maximum entropy approach. Estimation of parameters for AGMEMOD are based on the period 1973 until 2000, and were carried out with EVIEWS. In general in the equation, different types of dummy variables were integrated to capture effects concerning the German re-unification process but also the effects of the BSE crisis. Both models are programmed in GAMS and use CONOPT as a solver. Although both models are technically recursive dynamic, additional deviations in results may occur because GAPsi's projections are generated in a step-wise approach whereas AGMEMOD's are solved in one step over the projection period.

3. Simulations and results

Based on the two partial equilibrium models, simulations were conducted in order to show the impact of the adjustments regarding CAP instruments under the Luxembourg Agreement compared to the Agenda 2000. The simulations cover the period between 2004 and 2010 – a fair medium term projection period. In addition to the already agreed upon cuts in intervention prices and the distribution of additional quotas, cuts in intervention prices for butter and skimmed milk powder, and especially the decoupling of premiums, were considered. In both models similar approaches were carried out. While policy measures on the dairy market are expected to have indirect effects on the beef market due to coupled production, the effect of decoupling is particularly complex to estimate and model since its amplitude and rhythm differs among member countries. To depict the effect of decoupling on markets, basically the same strategy was chosen. Originally the direct income transfers were decoupled and were regarded either as production cost subsidy or as an integral part of producer incentive price. When the premiums become part of the single farm payment, they will be decoupled, but it must be expected that part of the decoupled premiums will still be treated as an 'incentive' to production. Therefore production decisions will react more pronouncedly to changes in market conditions. Table 1 summarises the framework of the simulations for the beef meat market.

	2002	2003	2004	2005	2006	2007	2008	2009	2010
CAP Livestock Variables									
Beef intervention price	278.0	243.3	243.3	243.3	243.3	243.3	243.3	243.3	243.3
Butter intervention price	328.2	328.2	328.2	311.8	295.4	279.0	279.0	279.0	279.0
SMP intervention price	205.5	205.5	205.5	195.2	185.0	174.7	174.7	174.7	174.7
Suckler cow premium	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0
Male bovine premium	210.0	210.0	210.0	210.0	210.0	210.0	210.0	210.0	210.0
Butter consumption subsidy	39.7	39.7	39.7	31.8	23.8	15.9	15.9	15.9	15.9
SMP feed subsidy	75.0	75.0	75.0	60.0	45.0	30.0	30.0	30.0	30.0
Ewe premium	19.3	20.9	20.0	20.3	20.7	20.9	21.0	21.0	20.8
German milk quota (applied)	27 953	27 953	27 953	28 093	28 235	28 375	28 375	28 375	28 375
German suckler cow quota	639.5	639.5	639.5	639.5	639.5	639.5	639.5	639.5	639.5

Table 1. Policy assumptions for simulations (prices in €/t; quotas in t)

In Figure 2, which was generated by the two different models, the projected beef market conditions in Germany are depicted. In general, quantity projections of supply and demand on the beef market are in line. Domestic supply of beef as well as demand declined a bit more within GAPsi. Both models differ more clearly with regard to the underlying price projections as can be seen in Figure 2. GAPsi projected constant domestic prices as well as producer incentive prices. In contrast in AGMEMOD, producer prices show a decline of about –5% at the end of

the period regarded, reflecting the less pronounced drop in production. Fluctuations of net-trade were much more distinctive under AGMEMOD, as net-trade, export or imports and variations changes in stocks occurred.

Simulating the Luxemburg Agreement led to a pronounced decrease in the producer incentive prices in GAPsi, whereas the domestic price basically remained unchanged (Figure 3). So this reaction was directly induced by the decoupling because the premiums had been modelled as increments of the producer incentive price. The domestic price in GAPsi changed only marginally due to adjustments in the market situation. AGMEMOD told a different story. Coupled premiums were an integral part of the beef market and acted as production cost subsidies so that the market price covered about 30% of the producer price (Kleinhanss et al. 2003: 10). When these premiums were decoupled, the producer prices were increased to partly make up for rising production costs due to the loss of the direct subsidies. But these raised prices were not high enough to totally compensate for the premium effect. Therefore, after a short period when the cattle herd was de-stocked and the production increased, the beef production decreased again. In GAPsi the decline of the producer incentive price directly introduced a drop in production, but the magnitude of both was within the same range. As cattle stocks were not regarded in GAPsi, the results did not show any impact of the de-stocking process in production. In summary, the impacts of the Luxembourg Agreement were a bit more pronounced in GAPsi than in AGMEMOD.

In both models the demand for beef was only negligibly affected, and due to higher prices in AGMEMOD consumption declined marginally. While the results of the model GAPsi showed a smooth adjustment of the net trade (net-export) index to the market development, the net-trade index of the projections of AGMEMOD indicates a more abrupt adjustment of the trade figures which follow the development of the production figures. This different model behaviour is related first to the market closure in AGMEMOD as it is implemented by allowing one of the trade figures to adjust residually given exogenous world market conditions. Secondly, the behaviour is caused by the fact that GAPsi clears all markets, minimising the difference between supply and demand of markets over all model regions, allowing GAPsi to find smoother paths for price quantity equilibrium in all model regions.
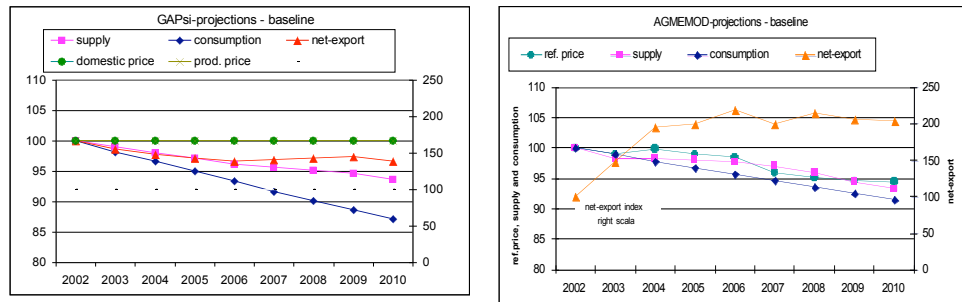

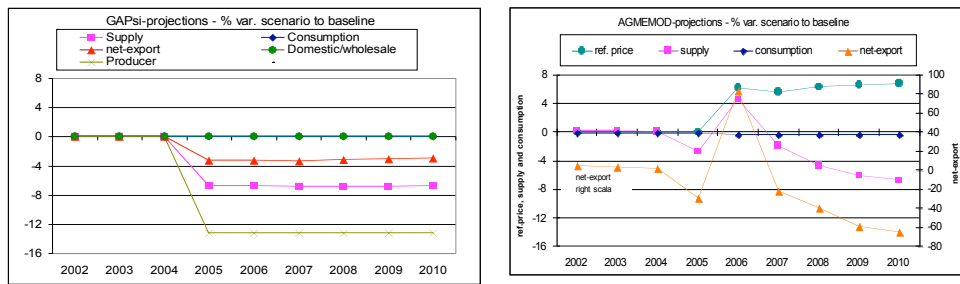**Figure 2.** Baseline results of GAPsi and AGMEMOD for Germany, index 2002 = 100.

219

Figure 3. Deviations from baseline models price projections, index 2002 = 100.

4. Qualification and Conclusions

AGMEMOD and GAPsi are partial equilibrium models of a different nature, where GAPsi is a synthetic model and AGMEMOD, in contrast, is an econometrically estimated model. Due to their different natures, distinctions are to be found in the general approach outlay of the models. The synthetic model in general incorporates price-related impacts and some shifts while the econometric model also includes other influencing factors like composition of animal stocks. Price formation in GAPsi comprises a system which includes policy measures in the form of price differentiations, whereas AGMEMOD's price formation is based on an key-price equation, or respectively price transmissions. Here policy instruments are directly modelled as explaining variables. Both approaches have their shortcomings as GAPsi, e.g., doesn't include developments in animal stocks and certain factors. In the case of AGMEMOD, the endogenous treatment of the world market still has to be implemented to allow for appropriate feedback effects.

To improve policy impact analysis, a standard approach for implementing newly established policy variables which cannot be econometrically estimated might prove helpful. Due to the fact that erratic disturbances often occur in agricultural markets, e.g., due to weather fluctuations, an assessment of related risks might improve the results of both models. These differences in the models, as well as some shortcomings, have induced certain deviation in the model results. So the baseline projections of the beef market show a more marked decline when GAPsi is used, but when the Luxembourg Agreement is simulated impacts are quite comparable. In total, the reactions to policy changes in the time path seem to be more flexible when AGMEMOD is used. A wider range of deviations occur concerning net-trade. Here aspects of different variable sets and the missing stock changes in GAPsi are to be highlighted. Distinctions in the price reaction have already been mentioned above. Due to the pricing system in GAPsi, the incentive price will here indicate a somewhat contradictory result so that AGMEMOD will reflect the situation more precisely. So both models can simulate the Luxembourg Agreement with quite reasonable results, but both models present advantages and shortcomings.

References

CAP-Monitor (continuously updated): *Your Comprehensive Guide to the Common Agricultural Policy of the European Union*, London.

ERS-USDA, *Economic Research Service of the United States Department of Agriculture*, http://www.ers.usda.gov/data/macroeconomics/index.htm#BaselineMacroTables.

EUROSTAT, *Statistical Office of the European Union*, http://epp.eurostat.cec.eu.int/pls/portal.

FAOSTAT, FAO (Food and Agriculture Organisation of the United Nations) database [http://faostat.fao.org/faostat/collections].

FAO-ES, Economic and Social Department of the Food and Agriculture Organisation of the United Nations [http://www.fao.org/es/esc/prices/PricesServlet.jsp?lang=en].

Frenz K. and Manegold D. (1988): "Lineares Modell zur Bestimmung von Preis- und Mengenwirkungen einer restriktiven Agrarpreispolitik in der EG", *Arbeitsbericht des Instituts für landwirt-schaftliche Marktforschung*, 88 (1), Braunschweig.

Frenz K. (1982): *Die Wirkung von Handelsinstrumenten und Subventionen im Agrarsektor*, Landbauforschung Völkenrode, Sh. 61, Braunschweig.

Ledebur O. von and Manegold D. (2004): *GAPsi simulations – updated baseline and EU enlargement under the Mid-Term-Review scenario*, working-paper 5/2004 of the Agricultural Economic Division of the FAL [http://www.ma.fal.de/en/index.htm?page=/en/research.htm].

Salamon P. and Ledebur O. von (2005): AGMEMOD-Partnership – A Tool to Analyse Policy Changes on the Agri-Food Sector: The Impact of the Mid-Term-Review on the German Agricultural Sector, Braunschweig [http://www.ma.fal.de/en/index.htm?page=/en/research.htm]

Tongeren F.W. and Meijl H. van (eds.) (1999): *Review of applied models of international trade in agricultural and related resource and environmental modelling*, Agricultural Economics Research Institute, Report 5.99 (EU-Fair VI-CT 98-4148, interim Report 1).

OECD (2001): *Decoupling: A conceptual Overview*, Paris.

ZMP(several years): ZMP-Bilanz (several markets), ZMP, Bonn.