Macedonian livestock, dairy and grain sectors and the EU accession impact

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Abstract: The Republic of Macedonia is in the process of integrating into the European Union (EU) and adjusting its policies through reforms in policy, regulations and institutions. This paper attempts to provide an answer to the question: what would be the impact on the Macedonian livestock, dairy and grain sectors of Macedonia integrating into the EU. In order to forecast the impact of the EU accession, the research uses the partial equilibrium model as a comprehensive tool for modelling the complex nature of the agricultural markets. The model simulation foresees the changes of the modelled sub-sectors in production, net-trade and income. The baseline scenario predicts a positive development for almost all selected commodities, with the exception of the beef sector, which is highly uncompetitive prior to the accession. Three EU accession scenarios foresee positive developments in the beef, lamb and cow's milk markets, while a negative development is expected in the pig meat and grains markets.

Key words: agricultural policy, European Union integration, partial equilibrium model

The Republic of Macedonia is situated in the Southern part of the Balkan Peninsula, with the total surface area of 25 713 km² and the total population of approximately 2.05 million. The agricultural area comprises almost one half of the total area of the country, one half of which is pastures and the other half is arable land. Nearly one third of the arable land is used for cereal crops, where wheat is the dominant crop with 50% of the cereals, followed by barley and maize with 45%. The large areas of pastures and grains are used as a feeding stuff for the livestock production. In terms of the intensity of production (yields of grains and pastures), Macedonia is generally lagging behind the EU 27 average.

The importance of agriculture for the national economy is shown by its approximately 12% share of the GDP, which rises to 16% if the food industry is included. Furthermore, the agricultural character of the Republic of Macedonia is indicated by the share of labour engaged in agriculture, representing about 20% of the total labour in the country.

By signing the Stabilisation and Association Agreement with the EU in 2001, Macedonia started the process of adjusting its policies through the reforms in policy, regulations and institutions (Erjavec and Dimitrievski 2008). This agreement provided an opportunity for a more intensive access to the EU market. In December 2005, Macedonia became a Candidate Country for the EU membership and in 2012 it is still waiting for a starting date for the accession negotiations. Despite some reforms, the Macedonian agricultural policy is significantly different in the scope of support and the type of measures as compared to the EU Common Agricultural Policy (CAP) (Volk et al. 2012). Hence, the question arises: what is to be expected for the Macedonian livestock, dairy and grain sectors when Macedonia becomes part of the EU?

When trying to forecast the impact of the EU accession on Macedonian agriculture, some key determinants of the CAP must be taken into account. However, the CAP as a "moving target" is posing a challenge for the researchers and policy makers to estimate the potential future developments. Models, as a simplified representation of the real situations by identifying and presenting the relationships among the most important factors (Greene 2008), are thus more and more often used for "forecasting significant economic events [as] a source of power" (Howitt 2005, p. 5).

The agricultural market is quite complex because it is integrating a number of commodity markets and taking into account the relationships among the different markets, the allocation of the production inputs, the relative prices of the substitutes, the governmental policy, the population size and living standard, etc. The need for a simultaneous analysis of multi-commodity markets brings up the need

for comprehensive market models such as the partial equilibrium models. Partial equilibrium models describe the specific sub-sectors or groups of agricultural sub-sectors, analysing in detail both sides of the equation between supply and demand, the price formation, the interdependency of agricultural inputs and outputs between different product lines, the policy impact on supply and producers' income, etc. They have proven to be a useful tool for assessing the impact of market-price measures on agricultural markets, as well as the changes in the internal and international market (Bienfield et al. 2001; Jensen et al. 2002; Erjavec and Kavcic 2005).

There are several partial equilibrium models with a wider or global coverage, such as the FAPRI, the OECD-Aglink, the CAPRI, the ESIM, etc. (European Commission 2009). The European Commission also had an initiative to build a model in order to predict changes that would occur in the common European market and in the market of each Member State from the enlargement in 2004. This initiative was realised within the AGMEMOD partnership by using the AGMEMOD model. The successful application of the model initially was a reason for extending its use to providing answers to other questions, such as the CAP reform, as well as assessing the strength of the potential candidate countries.

There are partial equilibrium models for Macedonian agriculture too. The first attempt was a single-product model for pig meat only (Hristovska 2005). Multi-commodity models were built for the livestock-feed sector: the comparative-static model from Pelling

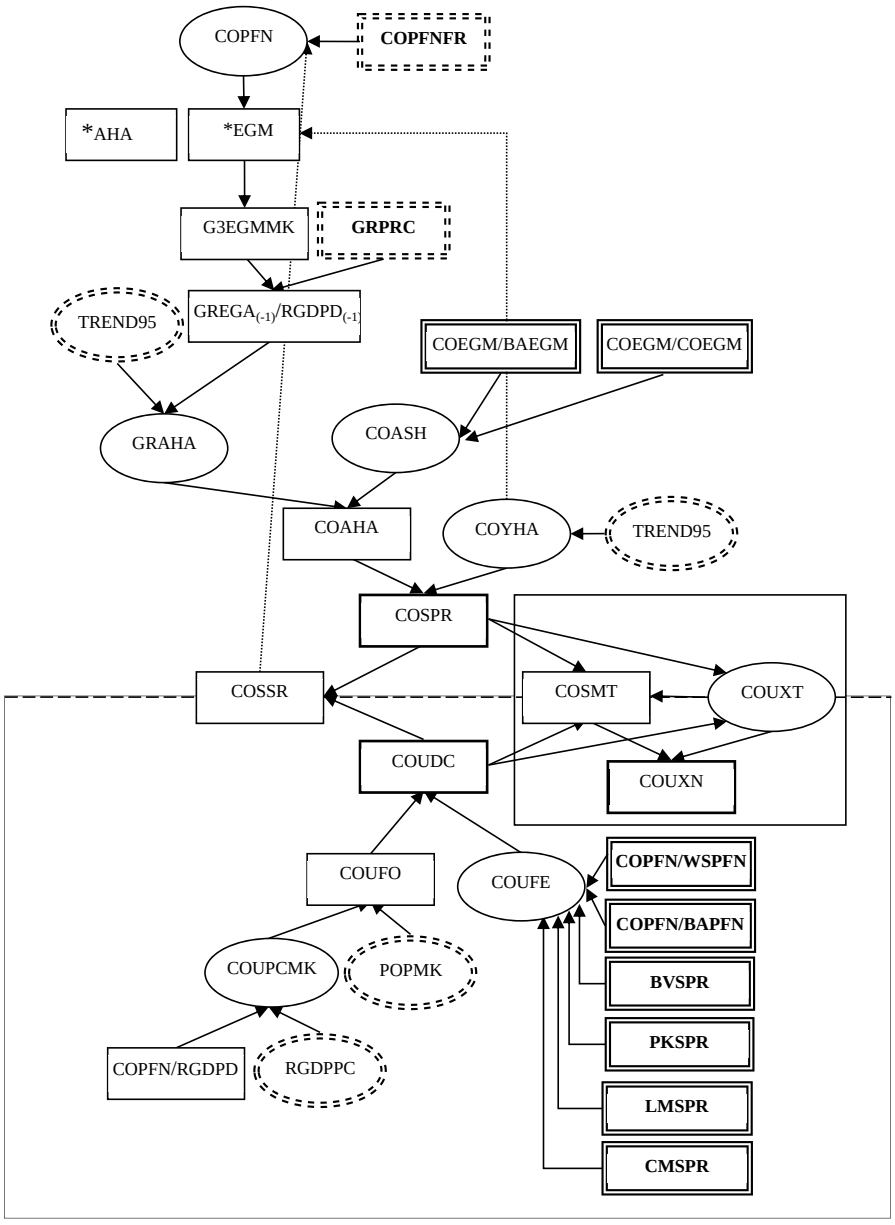

Figure 1. Sub-model for maize (mnemonic based on Hanrahan et al. 2007)

(2007), the dynamic synthetic models from Regoršek (2010) and Kotevska (2010). The latest two models also apply the AGMEMOD methodology.

The objective of this paper is to present an application of the partial equilibrium model in the case of the Macedonian grains, livestock and dairy sectors, estimating the effects of different EU accession scenarios. The method chapter gives a description and illustration of the partial equilibrium model used. The results and discussion of the model on the four analysed scenarios, as well as the implications of the model for the sector, are presented afterwards. Finally, the conclusions and recommendations are given.

METHOD

The partial equilibrium model was used as a method to evaluate the future development of the selected Macedonian agricultural sectors. The AGMEMOD model structure (Salamon et al. 2008; Chantreuil et al. 2012) served as a basis for the development of the Macedonian model. The partial equilibrium model is based on a regression analysis of different items in the food balance sheet for grains, meat and milk.

The food balance sheet, as a comprehensive picture of the country's supply and demand for certain commodity during a given reference period (OECD 2007), gives the total quantity of products produced in the country, added to the total imported quantity, on one side, and the exported quantity and the quantity used for the livestock feeding and human consumption on the other side. Balances are based on the official statistics from the State Statistical Office for the period 1995–2008, filled in by the expert opinion where no information was available.

The projections, up to 2020, are based on a multiproduct linear regression of certain model variables for the period from 1995 to 2008. The regression coefficients were included in the model and then calibrated in accordance with the theoretical foundations as well as the principles of the AGMEMOD, which makes the model synthetic rather than econometric.

The complexity of the model can be observed from the diagram of the sub-model for maize (Figure 1). It shows the set of data included: modelled variables

Table 1. Modelled and derived variables in the commodity sub-models

Models	Modelled variables	Derived variables
Grain models – wheat – barley – maize	price grain area share in grain area yield per hectare feed use consumption per capita export	reaction price expected revenue per hectare adjusted expected revenue per hectare average expected revenue per hectare area (of a single commodity) production food use total domestic use self-sufficiency rate import net-trade
Meat models – beef – pig meat – lamb	price breeding heads (in beef model: dairy cows, suckler cows) gain per head slaughtered heads slaughter weight consumption per capita export (except in sheep model)	reaction price breeding heads in beef model: total cows weighted number of breeding heads offspring production production food use revenue total domestic use self-sufficiency rate import (except in sheep model) net-trade
Milk model – raw cow's milk	price dairy cows yield per head consumption per capita export	reaction price production revenue food use total domestic use self-sufficiency rate import net-trade (as surplus/deficit of raw milk)

The expected revenue per hectare is a product of yield and commodity price, while the adjusted expected revenue is derived from the average expected revenue by adding the direct aid related to the sector observed. Revenue in meat and milk model is calculated as a sum of the nominal farm price and the reaction price (direct aids) expressed per unit of production.

(single-lined ovals), derived variables (single-lined boxes), exogenous variables (double-lined ovals), as well as endogenous variables modelled in the others sub-models (double-lined boxes). For each individual commodity, a sub-model is built, which is later integrated into the single model. The model includes seven commodities, grouped into three sub-models with similar structures (Table 1). Thus, the grain group includes the wheat, barley and maize sub-models, the meat group includes beef, pig meat and lamb sub-models, and the milk sub-model covers the market of the raw cow's milk, without taking into account its processed products.

The model is based on a few basic assumptions about the price formation, supply and demand factors, and some macroeconomic indicators:

– The country is small, opened to external markets and dependent on the level of world prices; the link with the external markets is through the price projections of the key agricultural markets from the combined AGMEMOD model (thus indirectly including the impact of the world economic crisis);
– The products are homogeneous, aggregated at the sector level; there are no significant changes in factors affecting the supply (climate, market size, market structure or technological progress) and demand (consumers' tastes and habits);
– The real GDP and GDP deflator projection up to 2013 are taken from the Ministry of Finance, and for the period 2014–2020, a growth rate of 4% and 2% is taken, respectively; the population growth is calculated on the basis of a trend analysis including a UN forecast for a growth rate of 0.22% (United Nations 2004); the model assumes a stable exchange rate for the Euro currency (61.27 den/€).

The model analyses four scenarios (presented in detail in Table 2). The baseline scenario is the first scenario, which gives a future projection of the selected sub-sectors without the EU accession and a change in the policy measures, but includes an increase of the budget for the support of agriculture for the next years as planned and projected by the Ministry of Agriculture, Forestry and Water Economy (MAFWE 2009). This scenario gives an answer to the question of whether this governmental behaviour will have an impact on the agriculture sector. Unlike the baseline scenario, the other three scenarios assume the EU accession in 2015. One of them (EU-PC) does not involve a change in the national agricultural policy, but assumes price adjustment (appropriate increase or decrease) due to the integration into the common European market. The price adjustment is assumed in all scenarios with the EU accession. This assumption

Table 2. Scenarios overview

Scenario	Description
Baseline (MK-BS)	Policy: 2008–2012 as expected from the MAFWE (2009) 2013–2020, policy as in 2012
Price Convergence (EU-PC)	Policy: as scenario MK-BS Market integration: in 2015 Price convergence: by using multipliers
EU Optimistic (EU-OPT)	*Pre-accession policy: as the scenario MK-BS* –Post-accession policy: Introducing the CAP in 2015 National ceiling as expected from the MAFWE (2009) Due to the large pre-accession budget, it assumes a greater topping-ups rate from the national budget, as was the case with Slovenia in 2004 – Measures: Different amount of regional payments for pastures (80 €/ha), arable land (250 €/ha) and perennial crops (500 €/ha) Coupled payments allowed only for beef and lamb, total 3.5% of the national ceiling No historic payments Price convergence: as the scenario EU-PC
EU Pessimistic (EU-PES)	*Pre-accession policy: as the scenario MK-BS* –Post-accession policy: Introducing the CAP in 2015 National ceiling is 75% of the EU-OPT values Topping-ups from the national budget is fixed at 30% in the period 2015–2020 – Measures: Regional payments – equal per unit capacity for arable land and pasture No coupled and historical payments Price convergence: as the scenario EU-PC

is based on experiences from the previous enlargements in 2004 and 2007, indicating that the adjustment of domestic prices of agricultural products at lower or higher prices in the EU occurred in the first few years after the EU accession. The direction, the intensity and the rate of change depend on the level of prices in the pre-accession period and the level of market support in the period before and after the accession. In addition to price adjustment, the other two scenarios (EU-OPT and EU-PES) assume the application of the CAP, but with different levels and measures of support.

RESULTS AND DISCUSSION

Baseline scenario

The baseline scenario shows a positive development for all sub-sectors, except for beef (Figure 2). The supply of pig meat, lamb and cow's milk is rising in the observed period (the average in 2018–2020 in comparison with the average in 2006–2008) by more than 30%; the increase in grains is about 15%, while the reduction in the supply of beef is about 5%.

A major factor for increasing the production in the projections for Macedonia, as well as worldwide, is the technological progress (expressed in the yield trends), thus the lower yield levels in Macedonia is a reason for the smaller increase in the supply of grains. However, the projections show an increase in the grain area, which combined with the stable or lower-level increase in yields, leads to the projections for increasing production. Despite the global projection for increasing production of maize and stagnating production of barley (European Commission 2009), the production structure in Macedonia changes at the expense of reducing the area of maize and barley, while increasing the share of wheat and other grains. The low or nil usage of maize for the ethanol production and barley for the human consumption are explanation for this trend in Macedonia. The main driving force in the grain sub-model is the governmental support, which in addition to the market price significantly increases the producers' revenue. The second factor that would direct the positive development of these markets is assumed to be the potential growth of livestock, or more specifically the projections for increased production of pig meat (+35%), lamb meat (+53%) and cow's milk (+47%).

The expected increase of revenues for pig meat and lamb producers forces the positive development for these two sub-sectors. The relatively protected price of pig meat is an additional factor that maintains the good position of this product in the domestic market. In the sheep sub-sector, the increased producer income is expected to come from the increasing governmental support as well as the growing trend of the international market prices.

The projections show a large potential for the development of the milk market, although there are no projections for the increase in the farmers' income. The increase in the milk production is expected to be due to the continuity of the increase in productivity per cow, as well as the growing trend of the number of cows. However, some recent developments in the milk market in Macedonia, i.e. the impact of the one big dairy crisis, make these projections uncertain due to the unknown impact it had on the herd size, as well as the financial capability of farmers for further investments and loans.

The negative development of the beef sub-sector in Macedonia is due to the present trend of reduction in the number of suckler cows and the weak competitive position in the international market where the sector receives a much greater public support.

In terms of trade position, the baseline confirms the importance of the lamb production, as the main export-oriented commodity from the livestock sector, but also projects that the country will become a net exporter (although on a lower level), concerning the cow's milk and wheat. For all the other analysed

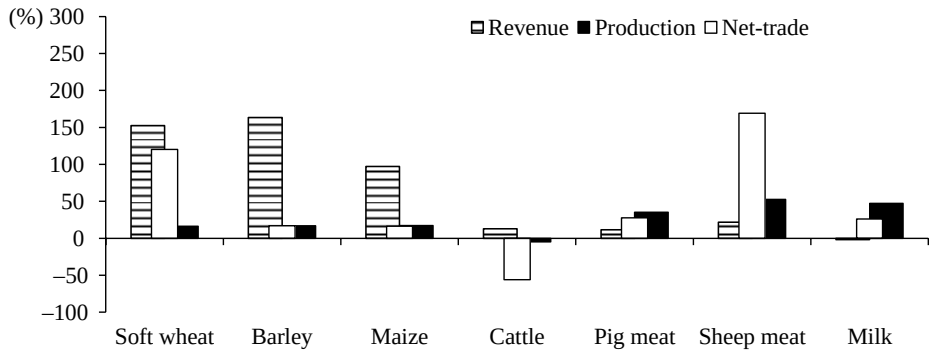

Figure 2. Cross-sector comparison of the baseline scenario (average 2018–2020 vs. average 2006–2008)

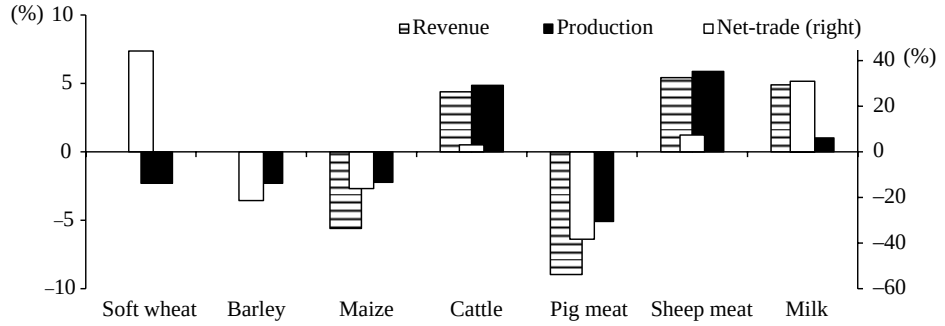

Figure 3. Cross-sector comparison in the EU-PC scenario (comparison of the EU-PC average 2018–2020 with the baseline scenario average 2018–2020)

commodities, the country will continue to be a net importer.

Price convergence scenario

The price convergence scenario assumes a price reduction for pig meat only, while for the other modelled commodities it assumes an increase in prices after the accession.

In this scenario, the higher pig meat price in relation to the European market assumes a reduction of the price after the integration into the common market. Furthermore, the development of the pig meat market is expected to reflect on the grain market, particularly concerning the maize and barley markets, which are major inputs in the pig production. The small increase of the price of grains (about 4%) fails to compensate the negative development of pig production (6.15% decrease in breeding sows and 5.04% decrease in pig meat production).

The projections for the other products show a slight improvement. The assumed increase in the price of beef and lamb by 11% and milk by 8% projects an improvement of about 5% relative to the baseline (Figure 3).

Complete EU accession scenarios

In the EU accession scenarios, the biggest benefit comes from the higher level of prices and a significantly larger budgetary support for the observed products. The scenarios include the implementation of the CAP decoupled support, thus the larger benefit goes to the extensive productions, such as beef and sheep production (Figure 5). When comparing the two EU accession scenarios, a development in the same direction with a different intensity is evident (Figures 4 and 5). The EU-OPT scenario includes a higher direct support and thus has a stronger development. On the other hand, the EU-PES scenario, which is only 75% of the EU-OPT budgetary support and includes only regional payments, intensifies the negative market development of grains, and at the same time reduces the positive development of other markets (up to +10%), especially of the beef market.

Compared to the baseline scenario (average 2018 to 2020), the EU scenarios (average 2018–2020) forecast a reduction in the grain supply (–20.7% in the EU-OPT and –25.6% in the EU-PES) and an increased consumption of grains (from +2.1% up to +7.5% in the EU-OPT and –0.5% in the EU-PES), as a result of the increased number of livestock. These changes lead to

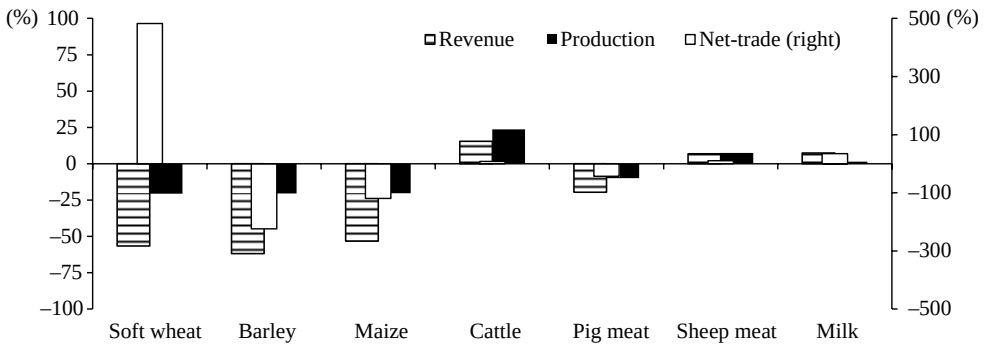

Figure 4. Cross-sector comparison in the EU-OPT scenario (comparison of the EU-OPT average 2018–2020 with the baseline scenario average 2018–2020)

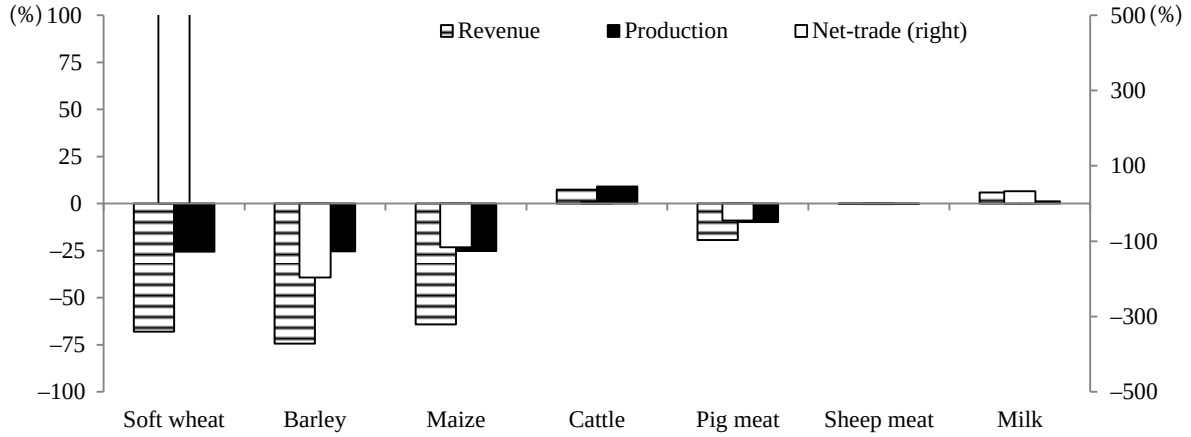

Figure 5. Cross-sector comparison in the EU-PES scenario (comparison of the EU-PES average 2018–2020 with the baseline scenario average 2018–2020)

deepening of the import dependence of the country for these products.

Models of agricultural sectors of the EU-10 in their pre-accession projections (Erjavec and Donnellan 2005; Erjavec et al. 2006) show a strong positive development for the beef markets in the new member states from the Central and Eastern Europe after the accession. A strong positive development relative to the baseline scenario is also expected for the Macedonian beef sector (+24.6% increase in supply in the EU-OPT and 9% increase in supply in the EU-PES). However, since it is highly uncompetitive compared to the other EU countries prior to accession, this limits its positive development afterwards.

The most affected sector in the EU scenarios is the pig meat sector, as a result of the price decrease (–10%) but also due to the removal of the governmental support after the accession. The supply of pig meat decreases (by 9.9%), while the consumption increases (by 8.8% in the EU-OPT and 9.7% in the EU-PES).

Unlike the baseline scenario, the EU scenarios project made a small, almost negligible change in the trade position of beef, lamb and cow's milk, while further increasing the import dependence from grains and pig meat.

THE IMPLICATION OF THE MODEL AND ITS RESULTS

The integration of the national agricultural policy with the CAP of the EU is quite a complex process, which requires a strong political, institutional and analytical capability (Erjavec et al. 2009). Therefore, the accession negotiations with the EU should be approached seriously with an early assessment of the effects from the application of the CAP.

Partial equilibrium models have been proven as a useful tool for the analysis of price support measures; however, the contribution of the model into the accession impact analysis is showing the direction and relative intensity of the changes (Erjavec et al. 2006). The results of the model in absolute values should be taken with caution because of the unpredictability that goes along with the nature of the agriculture itself, coming from its biological character, the dependence on climatic conditions, as well as the uncertainty of the broader economic and political environment. In addition, the model does not include more details about the impact of surrounding conditions on the development of agriculture, for example, the availability of loans, the pace of the knowledge transfer, the technology progress, etc. It is based on the economic behaviour, following the price as a market signal, while the emotional behaviour of farmers is not explicitly included (Salputra et al. 2011). All these questions give space for the discussion and the future development of the model.

The projections for the unfavourable development of certain sub-sectors after the EU accession should not be interpreted as a signal to divert production. On the contrary, these findings should be an initiating signal for the government and farmers to use the remaining time in order to prepare for the more competitive market, as well as for the higher sanitary and quality requirements of the EU market.

CONCLUSION

The paper presents an application of a partial equilibrium model in assessing the impact of the EU accession on some Macedonian key agricultural markets. The model confirms the expected potential

for the development of the livestock and grain sectors and the importance of the appropriate agricultural policy for improving competitiveness in the European integration process for the accessing country. It proved to be a useful tool for understanding the effects of the application of different agricultural policy measures.

The model foresees a positive development of the modelled sub-sectors. Projections of the baseline scenario predict a positive development for almost all selected commodities, with the exception of the beef sector, which is highly uncompetitive prior to the accession. Different EU accession scenarios (EU-PC, EU-OPT and EU-PES) foresee positive developments in beef, lamb and cow's milk markets while a negative development is expected in the pig meat and grains markets. The development in the EU scenarios (optimistic and pessimistic) is in the same direction, but with a varying intensity among the sectors.

Although this research is the latest one concerning the Macedonian livestock, dairy and grain sectors, taking into account the period up to 2008 and partly including the effect of the global economic crisis, and supplements the previous analysis and model, its dynamic character requires regular updates with new data and checking of results. This gives an opportunity for further testing and improvement of the model.

Finally, Macedonian agriculture also includes some other strategically important agricultural commodities, which take a larger share in the production structure of the country or for which the country has a comparative advantage (such as tobacco, wine, some types of fruits and vegetables). Thus, in order to get a more accurate picture of the effect that the EU accession will have on the overall agricultural sector, they should also be included in the partial equilibrium modelling tools.

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