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Measuring the effects of integration of the Polish agriculture with the European Union

1. Introduction

It is common knowledge that one of the most complex issues in the process of Poland's accession to the European Union will be the integration of the Polish agriculture.

The importance of agricultural issues stems from the weight of the sector in the Polish economy. The contribution of agriculture to total GDP is falling through still relatively important at 5% in 1997 (compared with 2% in the EU). The agricultural labour force still holds the quarter's share of total employment (in the EU - 5%). Agriculture products play an important role in the Polish foreign trade. They represent 11% for exports and imports (in case of the EU the numbers are 7.4% and 9.6% respectively).

Moreover, it is expected that the process of integration of the Polish agriculture will be lengthy, burdensome and challenging because of low competitiveness of the sector vis-à-vis the EU agriculture. It is worth stressing that the sector produces some 5.5% of gross value added, but employs 27% of total workforce. Although output per hectare is satisfactory by EU standards, output per farmer is merely 25-30% of this in the European Union.

The reasons of low competitiveness are multiple and complex.

The Polish agriculture is characterised by low degree of marketability. 52% of farms >1 ha. produces for their own purposes and only surpluses are located on the market.

The serious problem is farm structure. The average farm area in Poland is 7.8 hectares. The area of 70% of farms does not exceed 7 hectares. Most of them remind of a chessboard. Almost ¼ is split in 6 plots (European Commission, 1999, p. 41). In case of some 4% of farms, the distance between the most remote plots exceeds 10 km.

The Achilles' heel of the Polish agriculture is machinery. In 1996 there was one tractor for 14 ha. of agricultural land and an average tractor is more than 18 years old! A serious problem is the scarcity of so called peripheral equipment such as potatoes harvesters, manure spreaders or combine harvesters. The small size of most Polish farms where fields are often small, irregularly shaped and scattered makes the collective use of agricultural machinery economically ineffective.

The melioration infrastructure leaves a lot to be desired. 15% of agricultural land is to be meliorated and 19% of melioration infrastructure is fully depreciated.

An urgent problem of the Polish agriculture is unemployment. The number of jobless (registered and unregistered) amounts to 2 million people and the unemployment rate (including the unregistered) is twice as high as in urban areas.

What is worse, Poland lacks a long-term agriculture policy. The policy conducted by subsequent governments (of all political breeds) focuses on counteracting existing difficulties and preventing sectoral tensions from spilling over the whole economy. As a consequence, the Polish authorities concentrate on extending intervention system (augmenting intervention prices and including new products) and introducing restrictive trade policy measures, which protect the Polish market from imports from the third counties and which are in accordance with the *European Agreement* and Poland's WTO commitments[1]. The government justifies a growing protectionism in Poland's agricultural trade in a rather Machiavellian way. Raising customs duties, which will, unavoidably, lead to higher food prices, has to prevent the Polish consumers from a "price shock" at the moment of Common Agricultural Policy adoption. Moreover, picking up the degree of protectionism before the new WTO Round in Seattle is to improve Poland's negotiation position.

A certain symptom of a new approach to policymaking is the document *Coherent Structural Policy of Development of Rural Areas and Agriculture* adopted by the government in July 1999 (Ministerstwo Rozwoju Gospodarki Żywnościowej, 1999).

The document identifies major problems of rural areas, the Polish agriculture and natural environment.

The main challenge of the Polish agriculture policy is to suppress the deterioration of farmers' income. The second objective is to improve labour productivity so that the Polish farming sector could compete on the Single Market. The *Coherent Structural Policy of Development of Rural Areas and Agriculture* set three subordinate goals contributing to the achievement of the major aims formulated above. These include:

- creating the conditions of sustainable development of rural areas, protecting natural environment and cultural heritage,
- restructuring, which will increase the ability of the Polish agriculture to respond to changing market conditions,
- improving living standard of rural population.

The achievement of these goals is impeded by scarce finance.

The programme assumes the following structure of expenditures (see graph 1).

In the pre-accession period, the policy will be financed, to an increasing extend, by pre-accession funds. It should be born in mind that it has one basic limitation – co-financing. It is estimated that Poland will have to engage at least 60 million euro[2] to get access to the EU resources[3].

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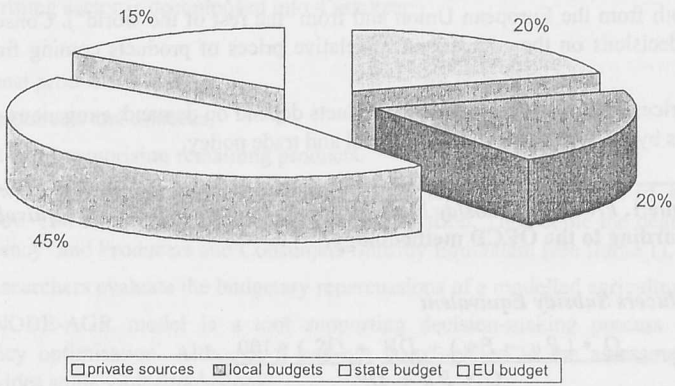
[1] The prime example of such a measure may be raising a tariff rate for yoghurts imported from the European Union from 9% to 35% (Rzeczpospolita, 1999,b).

[2] The minimum of public expenditure – 25% has been assumed. It means that for every 3 euros from the EU budget, Poland has to involve 1 euro.

[3] The sum comprises only co-financing of SAPARD programmes. The amount should be corrected by co-financing of ISPA and PHARE SPP aiming at rural development.

Graph 1. The structure of expenditure on rural development



The evident drawback of the *Coherent Structural Policy of Development of Rural Areas and Agriculture* is that the document lacks the estimates of the proposed policy costs, although the authors present the detailed structure of the spending to be incurred (cf. Graph 1).

There is, therefore, unmet demand for quantitative studies, whose objective would be to get insight into the consequences of integration of the Polish agriculture with the European Union for the Polish farming sector and for the economy as a whole. Such analyses would permit to define an optimal agricultural policy aiming at achieving specified goals and allowing for painless adaptation of CAP principles. Such researches would calculate the costs of an optimal agricultural policy, which would have to be incurred by consumers, producers and state budget. Quantitative analyses would also permit to specify the effects of an optimal agricultural policy on production and farmers' income.

2. Modelling agriculture policy – quantitative analyses of the Common Agricultural Policy adoption

The first simulation of the effects of different agricultural policies was conducted by Orłowski and Czyżewski (Czyżewski, Orłowski, 1993)[4]. An analytical tool was a general equilibrium NOBE-AGR model.

A starting point of the analysis is the calculation of demand for agricultural products. It consists of 4 components: private consumption, intermediary use, public consumption (demand called by intervention agencies) and exports (to the European Union and "the rest of the world").

[4] Although the authors themselves considered the simulation as an exercise – a dummy run of the NOBE-AGR model, we will pay special attention to it, as the NOBE-AGR model is the predecessor of other models used in other analyses, such as the POLAGR model.

Private consumption is determined by autonomous consumption and the share of expenses on a given agro-food product in disposable income. Export demand depends on price competitiveness of the Polish exports on world markets and economic performance in countries - recipients of the Polish argo-food exports.

At next stage, demand is divided by two supply sources - domestic production and imports (both from the European Union and from 'the rest of the world"). Consumers base their allocation decisions on the comparison of relative prices of products coming from the different sources.

Prices of agricultural and food products depend on demand, exogenous path of reaching world prices by the year 2000 and agricultural and trade policy.

Frame 1. ***Producers Subsidy Equivalent*** **and** ***Consumers Subsidy Equivalent*** **(according to the OECD methodology)**

Producers Subsidy Equivalent

$$PSE = \frac{Q * (P_H - P_W) + DP + OS) * 100}{Q * P_H + DP}$$

where:
Q- output
P_H- domestic price,
P_W- world price,
DP- direct payments,
OS- other payments.

Consumers Subsidy Equivalent

$$CSE = Q_C * (P_H - P_W)$$

where:
Q_C- consumption

Import prices are determined by world prices and the degree of protection of the Polish market from foreign competition.

Export prices are domestic prices diminished by export subsidies and augmented by trade policy instruments applied to the Polish agro-food exports by the third countries.

Prices multiplied by domestic production calculated by the model constitute gross farmers' income. The latter diminished by investment expenditure and augmented by budgetary transfers are confronted with average income from non-agricultural activities. The confrontation results in in-/outflow of rural labour from agriculture. The scale of migration depends on income relation. It was assumed that if income relation equals 1, farmers have no incentive to move and if income relation is nil, 50% of rural workforce take up non-agricultural activities. At the next stage, linear curve depicting interdependence between income relation and rural employment intercepting these two, extreme points was determined.

The agricultural policy modelled by Czyżewski i Orłowski consists of five groups of instruments:

- intervention activities,
- export subsidies,

- variable levies,
- direct budgetary transfers,
- subsidies to non-agricultural means of production.

The farming sector is decomposed into 4 markets:

- cereals,
- milk and meat products,
- potatoes, sugarbeets and oilseeds,
- residual category comprising remaining products.

Czyżewski and Orłowski have assumed a few measures of effects of a simulated agricultural policy. The all-important measure is income relation. Then come the degree of agro-food self-sufficiency[5] and Producers and Consumers Subsidy Equivalent (see frame 1).

The researchers evaluate the budgetary repercussions of a modelled agricultural policy.

The NOBE-AGR model is a tool supporting decision-making process as well as agricultural policy optimisation. Although it has not been applied to the assessment of CAP adoption, it provides some vital conclusions.

First and foremost, **it demonstrates that successful long-term agricultural policy must be conducted with a wide range of instruments.**

The above thesis is well exemplified by looking into the consequences of intervention purchases[6]. It turns out that intervention purchases, paradoxically, leads to a fall in agricultural production. It happens so, because they push up prices, which results in drop in private consumption and intermediary use. The improvement of income relation is achieved at consumers' cost – CSE increases.

To be socially optimal, the system of intervention purchases must be propped up by additional policy instruments, such as variable levies (contracting import) and export subsidies (promoting export). Under such circumstances, income relation is maintained, although prices decrease. Consumers and producers gain, although the policy entails high budgetary costs.

The most multi-dimensional quantitative analysis of the consequences of integration of the Polish agriculture with the European Union was conducted by Orłowski (Orłowski, 1996).

A tool of the analysis is the POLAGR model, which is the modified version of NOBE-AGR model. The former is based on three fundamental assumptions. Firstly, it is assumed that prices of goods and production factors are flexible and determined by demand and supply. Agricultural output is assumed to be inelastic in a short run and depends on decisions based on past price relations taken in the previous period. In case of eight agricultural products, prices do not clear the markets. If they exceed world prices, the model calculates the amount of variable levies and export subsidies. The variables clearing markets are the amount of export or import restoring equilibrium between domestic supply and demand.

The next assumption concerns the mobility of production factors. They are mobile except for labour and capital employed in agriculture. They are mobile in a longer run (more than one year).

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[5] These are the evident reminiscences of Article 38 of the *Treaty of Rome* setting up the targets of the Common Agricultural Policy.

[6] The researchers consider the introduction of intervention purchases on a meat market.

Special attention should be paid to modelling employment in the Polish agriculture. The model consists of two modules. The first one depicts decisions undertaken by young farmers (below 35 years old) concerning the allocation of their labour between different occupations. They are expressed as a function of number of new job offers in non-agricultural sectors, income relation expressed as the ratio of an average farmer's income to an average wage and number of farmers below 35 years old.

$$zatrudnienie = a * zatrudnienie_{t-1}^{0,747} * ofpracy_{t-1}^{-0.873} * reldoch_{t-1,t-2,t-3}^{0,234} * e^{u91*0,095} \quad (1)$$

where:

zatrudnienie - number of farmers below 35 years old,

ofpracy - number of new job offers in non-agricultural sectors,

reldoch - income relation (the ratio of an average farmer's income to an average wage; an average from three last periods),

u91- impulse dummy depicting rapid rise in urban unemployment in 1991

The second module describes decision process by all farmers. It is given by the following equation:

$$al = a * reldoch_{t-1,t-2,t-3}^{0,983} * trend^{-0,027} \quad (2)$$

where:

al. - labour allocation (the ratio of labour suppied by farmers to agriculture to labour suppied outside agriculture),

reldoch - income relation (the ratio of an average farmer's income to an average wage; an average from three last periods),

trend - trend variable.

The analysis conducted by Orłowski identifies the determinants of farmers' income, argues for the need of active agricultural policy, formulates its optimal objective and models it in the light of imminent adoption of CAP principles.

A starting point of the analysis is an important observation that the prime aim of the Polish agricultural policy should be reducing excess employment. The thesis emerges after looking into some statistical data. The Polish agriculture employs 4 times more farmers per hectare than the Western European farming sector. With a comparable level of output per hectare, all parameters per farmer are several times smaller in Poland. The reduction of excess employment will, therefore, lead to the better use of economic resources, the growth of productivity and the improvement of farmers' income.

Of great significance for policymakers is the identification of determinants of relation of average farmers' income[7] to average wage in the economy. The sensitivity analysis conducted by Orłowski brings some interesting interdependencies. The analysis starts from the generation of steady state path based on some assumptions concerning macroproportions (see table 1) and assuming no active agricultural policy. The second step is the observation of the fluctuations of income relation resulting from changes in economic indicators chosen by the researcher.

[7] It is worth stressing that the subject of analysis is not an average income from farming, but an average farmer's income. This distinction is of great importance, as one third of farmers' revenues comes from non-agricultural activities in Poland (European Commission, 1996).

Table 1. The base solution – main indicators

GDP	4.4% (yearly average)
Personal consumption	3.7% (yearly average)
Fixed capital formation	7.0% (yearly average)
Number of farmers	Reduction of people employed in agriculture from 3,3 million w 1991 to 2,4 million in 2010

Source: Orłowski, 1996, p. 10.

The corollaries are as follows:

- The higher the growth rate, the bigger the risk of fall in income relation. This interdependence stems form the fact that higher growth rate is accompanied by higher growth of productivity in non-agricultural sectors and higher growth of real wages.
- The higher the real appreciation of the zloty, the bigger the risk of fall in income relation. This result is due to the fact that the appreciation lowers the competitiveness of the Polish agricultural products and leads to a drop in the volume of the Polish food export and consumes farmers' income.
- The higher the efficiency gains (understood as growth of value added exceeding growth of output), the smaller the risk of fall in income relation.

It can be easily seen from the table 1 that Poland cannot afford the policy of fast adoption of CAP prices. The costs of such policy amount to 7 billion, doubling and violating Poland's WTO commitments[8].

High prices result in increased output and depressed domestic consumption. As a result, in 2010 production surpluses are twice as big as in 1991.

Income relation is 50% above the base run level, which, obviously, discourages farmer from searching for job outside farming. The number of farmers in 2010 is 15% higher than in 1991. To sum up, fast adoption of CAP prices does not resolve the major problem of the Polish agriculture – excess employment.

The policy of fast approach to EU prices accompanied by the system of firm's supply controls (the second scenario) leads to much lower costs - 2.5 billion USD, as price support and EU prices are applied within production quotas.

The policy stabilises income relation on a level 20% above the base run. Although it is financially feasible (Aggregate Support Measure does not exceed Poland's WTO commitment), it does not support the restructuring of the Polish agriculture. It does not result in increase in productivity, as the number of the employed in the Polish farming sector augments and output per farmer diminishes.

[8] The Aggregate Support Measure (ASM) is the support granted to an agricultural product or to an agricultural producer. It is calculated in monetary units and on per-year basis. According to the Uruguay Round Agreement, the ASM for Poland amounts to 3.6 bilion USD in 1998, 3.4 bilion USD in 1999 and 3.3 bilion USD in 2000. (Wielostronne negocjacje handlowe RU, 1994)

Table 2. Assumptions and results of simulation of effects of CAP adoption

Assumptions		Fast path	Fast path/ output reduction	Last moment integration
		the adoption of CAP prices by the year 2000	the adoption of CAP prices by the year 2000 combined with firm supply controls	the adoption of CAP prices after Poland becomes a member of the EU
results				
macroeconomic impact				
GDP (%%)	*	4.2	4.2	4.4
accumulation (%%)	*	5.6	6.4	6.9
public consumption (%%), including	*	3.8	3.7	3.7
food (%%)	*	1.5	1.4	1.6
other goods (%%)	*	4.7	4.5	4.6
agriculture				
income relation (farmer's income/ wage	**	172.4	133.9	131.6
employment:				
in millions USD	***	2780	2651	2416
as % of total	***	18.1	17.3	15.8
average farm area in ha	***	7.4	7.8	8.6
output per farmer	**	216.4	164.1	184.6
costs				
costs in millions USD	***	6.9	2.5	1.2
PSE (%%)	***	43.5	23.8	14.1

EXPLANATORY NOTES:

*- yearly average growth rate in the years 1991-2010

**- base solution=100

***-in 2010

Both scenarios are detrimental to the Polish economy as a whole.

The impact of both policies on long-term growth rate of GDP is similar, nonetheless modest, reaching 0.2 per cent points. What is worrying, disadvantageous changes occur in the decomposition of economic growth. It is, to an increasing extent, driven by private consumption, whereas the role of investments in the economy diminishes. It is due to several factors. Firstly, high spending on export subsidies result in high budgetary deficits that reduce government savings. Secondly, lower level of disposable income of non- farming population and higher expenditures on food lead to reduction of households' savings. These two effects may be compensated by growth of farmers' savings, but the risk of crowding out more productive investments in non-farming sectors by less efficient agricultural investments appears.

Furthermore, both policies endanger the development of food processing industry.

Keeping prices low until the transition period (the years 2005-2010, as assumed by the researcher[9]) is neutral for the Polish economy – both trajectories are convergent.

Its cost totalling 1.2 billion USD does not appears before 2005. The policy permits to shift the financial means from economically unjustified price support policy to profound restructuring.

Orłowski proposes the model of optimal agricultural policy, thanks to which the Polish agriculture has the better chance to be well prepared for the integration with the EU.

He suggests two solutions:

- scenario 1 – creating the system of incentives to encourage old farmers to retire[10],
- scenario 2 – promotion of outflow of farmers from agriculture to other activities in rural areas.

The first solution constitutes a certain burden on the social security system. Its costs estimated at 300 million USD[11] are to be incurred by state budget. On the other hand, the programme is successful in reducing excess employment. The number of farmers decreases to 14.2% of total workforce. The average income of people employed in the sector goes up by 20%. Productivity improves by 10% due to the change of age structure of the Polish farmers.

Pro-growth effects of the policy are, however, modest. Long-term growth rate increases merely by 0.1 percent point above the base-run level.

The policy of promotion of outflow of farmers from agriculture to other activities (scenario 2) is not easy to implement for several reasons:

- high level of unemployment in the economy,
- hidden unemployment in non-agricultural sectors,
- growing labour supply having its sources in demographic trends,
- modernisation of the Polish economy leading to increase in labour productivity and reducing demand for labour.

[9] This assumption will not be fulfilled. Poland does not claim the grace period in the field of Agriculture.

[10] Note a subtle distinction – the researcher does not propose early retirement, but retirement of people above the normal retirement age.

[11] Relatively small budgetary costs result from a low ratio between an average pension for farmer and average wage.

Moreover, labour mobility in Poland is quite low. Outflow of rural labour towards urban areas may significantly increase unemployment pressures in cities and lead to undesirable social tension. What is more, creating new workplaces in rural areas may call for the development of physical and social infrastructure, which seems to be a huge task. Last but not least, special emphasis should be put on setting up the schemes of vocational training, which is difficult and costly.

The costs of job promotion policy are estimated at 2 million USD and are similar to the costs of price support. Nevertheless, the latter will be incurred indefinitely, whereas the former have a definite time horizon – 15 years (the time needed for the policy application). The latter just counteract unfavourable phenomena, whereas the former solve the problems.

The policy of promotion of outflow of farmers from agriculture to other activities has far-fetched pro-effectiveness consequences. Productivity in agriculture grows by 50%. Rural employment drops to 10% of total workforce and is one third lower than in the base run. An average farm area grows to 13 ha, which is quite satisfactory result by current EU standards. The average income of people employed in the Polish agriculture rises by 42%.

Both scenarios have positive macroeconomic impact. Economic growth is higher than in the base run. Its main determinant are investments. Higher level of personal income (both rural and urban[12]) leads to higher savings and investments. Sound public finances allow for growth rate of public savings. Low prices of agricultural products result in increase in private consumption.

It may be clearly seen that both policies are more advantageous for farmers, for the Polish agriculture and for the economy as a whole than price support.

The message from the Orłowski's analysis is clear. Introducing CAP-like price support system is economically unjustified. The huge resources to be spent on price support should be rather devoted to the policy aiming at reducing excess agricultural employment.

3. Macroeconomic impact of compensatory payments – what to measure?

Being a CAP member (with full scope of rights and obligations) means being entitled to compensatory payments (see frame 2).

Frame 2. Compensatory payments

Compensatory payments are income transfers introduced in order to prevent income losses due to lower prices owing to the 1992 CAP reform.
For arable farming, the compensatory payments are "direct income transfers for eligible farmers" and depend on average crops and constant premium. Eligible farmers are these who have enrolled in a set-aside scheme.
In meat and milk sectors (suckler cows, male bovine animals, sheep, goat) the main aim of compensatory payments is to limit production.

Source: European Commission, 1996, Jurcewicz, Kozłowska, Tomkiewicz, p. 129, 145-146

[12] In price support scenarios, these who financed the system were consumers.

Obtaining access to compensatory payments is regarded as the absolute priority of accession negotiations and the Polish authorities make the Polish entry to the EU conditional on getting the funds. There is a lot to fight for. It is estimated that Poland may receive ca. 3.3-4.3 billion euro a year from the CAP budget, which means that an average farm may get about 1500-2000 zloty (Sekcja Analiz Ekonomicznych Polityki Rolnej, 1998).

The Polish policymakers seem to forget that such huge official transfers have significant macroeconomic implications. The latter have not been evaluated so far. Therefore, it is imperative to look into the consequences of compensatory payments for the Polish agriculture and for the economy, as a whole. The points to explore should include:

- **Income and wealth**. Compensation payments lead to increase in land owner's income. Because their beneficiaries are free to choose how the subsidy should be spent, they can increase current consumption, invest in non-agricultural activities, invest in land improvement or increase savings. The impact of compensatory payments on basic macroproportions (GDP components) and economic growth is difficult to predict and it should be investigated. Moreover, there is a risk that the transfers will be of little benefit to people working on the land. As land rental is a quite common practice in Poland, potential winners may be non-farming, urban landowners. This questions the economic and social rationale of such a policy.
- **Competitive position.** The impact of compensatory payments on competitive position of the Polish farming sector vis-à-vis the EU agriculture is ambiguous. In the short or medium term, the subsidies are likely to improve the competitiveness of the Polish agriculture by relieving liquidity constraints, which may facilitate modernisation of the sector and reduce production costs. It must be, however, stated that the competition problems of the Polish farming sector seem less linked to production costs in primary agriculture than to inefficient food processing industry. The latter does not benefit from compensatory payments. Thus different policy (e.g. fostering rural investments) is needed.
- **Equilibrium restoring.** Compensatory payments may be the factor restoring equilibrium on agricultural markets. It is quite likely that in the conditions of transforming economy, the transfers will not play this role satisfactorily. It is difficult to set up the "benchmark" equilibrium point, as supply of agricultural product is unstable and consumer preferences are highly changeable.
- **Interaction with other sectors and local effects.** It is important to explore leakages through which compensatory payments affect other sectors (industry, services and households). One of such can be increase in food prices, which affects welfare and consumption patterns of the Polish society. The other may be increase in urban households' income by capturing a part of the transfers by non-farming landowners.
- **Macroeconomic variables.** Compensatory payments provide a cash injection for the economy. Increase in purchasing power is potentially inflationary. This effect can be, theoretically, neutralised by real appreciation of the zloty due to capital inflow in the shape of official transfers from the EU.
- **Capital markets.** Compensatory payments may lead to serious distortions on capital market. Increase in land prices can spark off demand for credit called by farmers, as the value of land as collateral goes up. It may crowd-out more productive investments in non-subsidised sectors or result in the growth of real interest rate.

- **Labour market**. The impact of the transfers on labour supply and demand is indeterminate and should be looked into. On the one hand, increase in income in the sectors comprised by compensatory payments schemes may encourage people to take up rural occupation in the subsided areas. On the other hand, the transfers affect cropping patterns – a shift from labour-intensive production (*e.g.* potatoes) to subsided capital intensive sectors such as cereals or livestock can be observed. As a result, demand for rural labour is likely to decline.
- **Restructuring**. Structural development could be stimulated by compensatory payments if increase in land prices incites landholders to sell land. On the other hand, high prices reduce turnover of the trade-in farmland, which impedes the process of land concentration. High prices are also considered to be entry barrier to farming and, what is much worse, to food processing industry located in rural areas.

As it can be easily seen from the above, **the impact of compensatory payments on the Polish economy is, by no means, determinate and it should be explored thoroughly by the Polish economists**. What is interesting, the effects of the compensatory payments granted to Poland for the Polish agriculture and for the whole economy were investigated by our western partners – there are at least two such quantitative analysis conducted for the European Commission. It is not surprising. It suffices to say that every third farmer in the enlarged European Union would be a Pole. Furthermore, the costs of extending all CAP benefits to six applicant countries are estimated to reach 5 billion euro (Rowiński, 1999, p. 176).

One of the research mentioned above was conducted by Tabeau (Tabeau, 1996). The analytical tool was a general equilibrium model. Tabeau assumed that Poland will become the UE member in 2000 (it has already turned out to be too optimistic) and that the compensatory payments granted to Poland in the years 2000-2004 will amount to 2 billion euro a year, which will be the equivalent of 2% of GDP.

The pro-growth effects of compensatory payments are insignificant. The subsides are estimated to accelerate economic growth by 0.4 percent point a year. It is projected to be driven by private consumption of rural households.

Contrary to expectations, compensatory payments lead to deterioration of income relation, because as income goes up, demand for agricultural products diminishes.

There is a chance that compensatory payments will result in outflow of rural labour to other sectors of the Polish economy – industry and services. The reduction of excess employment will, paradoxically, bring about drop in productivity of agriculture production, as potential migrants will be young and educated farmers.

Compensatory payments influence cropping patterns, as well. One may expect a shift from potato cultivation (at present Poland provides 7.5% of world potato production and potato cultivation covers 10.5% of arable land), which is not eligible for the subsidies to cereals, oilseed or pulses[13].

[13] That is why, Poland has proposed setting up common market organisation of potatoes in the draft position in the field of Agriculture.

4. Trade effects

Another issue calling for quantitative assessment is trade in agricultural products between Poland and the European Union. *The European Agreement* establishing association between Poland and the European Union does not provide the formation of a free trade area in agricultural products and liberalisation in this field is partial and selective. The concessions of the European Union comprises:

- reduction of customs duties (by 30-100%) for different agricultural products on the date of the entry of the *Interim Agreement* comprising part III of the *European Agreement on coming* into force, *i.e.* on March 1, 1992;
- reduction of tariff equivalents of variable levies by 60%,
- reduction of tariffs and increasing tariff rate quotas;
- setting up minimal prices for soft fruits every year.

For its part, Poland is obliged to lower tariff rates by 10 percent point for about ¼ of the Polish agricultural imports from the European Union on March 1, 1992 and to liberalise the access to its processed food market on January 1, 1999 at the latest.

It can be seen that the most of liberalisation and adjustment processes will take place shortly after the date of Poland's accession to the European Union, as Poland does not claim any transition period in the field of Agriculture accepting the burden of liberalising all remaining tariff and non-tariff barriers. This decision has far-fetched consequences. It means that by January 1, 2003 (the date of declared Poland's readiness for the EU membership) the Polish agriculture must be capable of competing against the EU farming sector. It also means that the years separating Poland from the date of accession should be spent to conducting the deep restructuring of the Polish agriculture.

Significant changes will also occur in agro-food trade between Poland and the European Union. It is expected that the share of agricultural imports from the EU in meeting domestic demand will rise. Such a conclusion can be easily drawn form the analysis of trends in the Polish exports and imports. At present, the Polish exports are only slightly higher than before signing the *European Agreement*, whereas imports have doubled. As a result, Poland has become a big net importer of the EU agro-food products and trade balance turned negative and reached above 500 million USD (Piskorz, 1998, p. 44). What is worse, these trends seem difficult to be suppressed, let alone reverted (Ciepielewska, 1999). High growth of imports (30% per year in the period 1990-1997) is accompanied by much slower dynamics of export (10% per year).

It must be, however, stated that the European Union experts express similar fears about "the inundation of the Single Market with the Polish food". It seems quite likely, they argue, as prices of the Polish agricultural products are often many times lower than in the European Union (Rzeczpospolita, 1999,g).

It is, therefore, useful to conduct quantitative studies to get insight into future tendencies in Polish-European Union agricultural trade and to quantify trade creation and trade diversion effects. An elegant tool of such research is a partial equilibrium model.

The quantitative analysis of trade effects of liberalisation of trade in agricultural products in the light of the *European Agreement* was conducted by Kawecka-Wyrzykowska, Ciepielewska and Mroczek (Kawecka-Wyrzykowska, Ciepielewska, Mroczek, 1992).

Because of difference between import protection instruments applied to agricultural products by Poland and by the European Union, the economists presented different approach towards modelling the Polish agricultural imports and the Polish agricultural exports.

From the point of view of a Polish exporter, the main benefits from trade liberalisation results from the opportunity of increasing export value. He or she can achieve this aim in two ways: by increasing the export volume, which is cheaper for a foreign consumer because of tariff reduction[14] or by increasing export price by preference margin (the difference between price with and without tariff). The choice between the two depends on import price elasticity in the European Union and supply elasticity in Poland. Obviously, an exporter benefits most from augmenting price by the whole degree of tariff reduction. It is more probable that an importer will be also interested in raising his or her profit margin. The division of preference margin between an exporter and an importer depends on the negotiation power of both sides.

The impact of tariff reduction on agro-food exports can be described by the following formula:

$$\Delta Ex = p_0 X_0 \frac{t_0 - t_1}{100 + t_1} \gamma_{ex} + p_0 X_0 \eta \frac{(t_1 - t_0)[1 - \gamma_{ex} - \gamma_{im}(1 - \gamma_{ex})]}{100 + t_0} + \quad (1)$$

$$- p_0 X_0 \gamma_{ex} \eta \frac{(t_1 - t_0)^2 [1 - \gamma_{ex} - \gamma_{im}(1 - \gamma_{ex})]}{(100 - t_1)(100 + t_0)}$$

where:

ΔEx- export increment due to trade liberalisation,

p_0 - export price before liberalisation,

X_0 - export volume before liberalisation,

t_0 - tariff rate before liberalisation,

t_1- tariff rate after liberalisation,

γ_{ex} - exporter's share in preference margin for an importer included in the interval <0,1>,

$\gamma_{im}(1-\gamma_{ex})$- importer's share in preference margin for an exporter included in the interval <0,1>.

The influence of tariff reduction on export of agricultural goods, which are comprised by production quotas, is given by the following equation:

$$\Delta Ex = (K_{n-1} \frac{t_{n-1} - t_n}{100 + t_n} + y_n K_0 \eta \frac{t_0 - t_n}{100 + t_n}) \gamma_{ex} \quad (2)$$

where:

ΔEx- export increment due to trade liberalisation,

n- time,

K_0- base quota (value) – quota multiplied by average export price,

K_{n-1}- production quota in a previous year,

t_0- tariff rate before liberalisation,

t_n- tariff rate in a previous year,

y_n - ratio of increase of tariff rate quotas.

γ_{ex} - exporter's share in preference margin for an importer included in the interval <0,1>

[14] The analysis will be limited to the impact of tariff reduction only. The effects of variable levies will not be considered, as variable levies were tariffied.

The analysis conducted by Kawecka-Wyrzykowska, Ciepielewska and Mroczek brings some interesting conclusions[15]:

If the upper limits of quotas are not exhausted (as it takes place in case of the Polish exports to the European Union), the Polish agricultural exports grow to these limits. Such scenario is quite probable, as the Polish agricultural export to the European Union is price elastic and the Polish agriculture faces demand barrier on the home market[16]. If the quotas are exhausted, the sole source of benefit for an exporter is taking up preference margin. An exporter cannot benefit from lowering the price for a foreign consumer, as price reduction cannot result in increase in supply because of quotas.

For calculating the growth of the Polish agricultural import the formula similar to the equation 3 was applied.

The numerical results are insignificant – the biggest increment in agricultural imports amounted merely to 24 million euro. The reasons behind such results are numerous. Many of them originate from the methodology of the estimates. First and foremost, the research is focused on assessing the direct consequences of the reduction of customs duties. All other trade impediments, which will be gradually phased out in the process of Poland's joining the Single Market, (such as non-tariff barriers) are neglected. Furthermore, the research does not consider cross effects – the effects of trade liberalisation for production and consumption of complementary and supplementary agricultural products "made in Poland". Although most imported agricultural goods does not have close, let alone perfect Polish substitutes because of diverse climate conditions as well as different technologies, some categories may be treated as distant substitutes, *e.g.* bananas *versus* apples. Cross effects may be significant in case of some processed food (*e.g.* cheeses and yoghurts).

The research does not consider trade diversion effect, measuring of which calls for the acquaintance of substitution elasticity and the possession of the detailed information on agricultural imports by country groups (the European Union and "the rest of the world").

The western experts express the misgivings that the integration of the Polish agriculture with the European Union will lead to huge production surpluses. In their opinion, this will be the most likely Polish farmers' reaction to high institutional CAP prices. The quantitative analysis of consequences of CAP adoption for the Polish agriculture conducted by Piskorz and Plewa (Piskorz, Plewa, 1995) denies these speculations.

An analytical tool is a partial equilibrium model ESIM. Its purpose is to analyse different agriculture policies (one such a policy is CAP adoption) from the Polish perspective and in the context of the situation on the world market. The agricultural sector is disaggegated into 25 plant and animal products for 14 specified countries or country groups. The model balances demand with supply for individual products by generating world equilibrium prices. Domestic prices are separated from world prices with various instruments of trade and agricultural policy such as regulated prices, production quotas, tariffs and exchange rate.

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[15] We abstract from numerical results, as they are insignificant –they oscillate around a statistical error. The order of magnitude stems from partial and selective liberalisation in agricultural trade.

[16] According to the European Commission's estimates, the growth rate of demand for food in the years 1998-2003 will not exceed the growth rate of real income, i.e. 2% (Ciepielewska, 1999).

The authors consider different scenarios diversified by the date of Poland's accession to the European Union, the length of transition period, the amounts of production quotas granted to Poland and productivity growth in the agricultural sector. Theses scenarios are confronted with non-integration base run scenario[17].

The most important conclusion from the analysis is that every scenario of CAP adoption results in drastic increase in prices of many agricultural products. Many of them would more than double (sugar, beef and milk). Some of them would stagnate or decrease insignificantly (wheat, rye, eggs, poultry and pork). Such price relations should incite farmers to raise supply of agricultural goods. It turns out that the numerical results do not confirm such a hypothesis. In particular, in case of most agro-food products, projected production is lower than in non-integration base run scenario. Attractive prices would, theoretically, stimulate production if supply is not be curbed by production quotas. In case of some animal products (meat), faster production growth is projected. It does not result in export surpluses, but permits to reduce import that fills the gap between domestic production and demand. Only in case of beef, growth of export to the third countries is observed. Selling excess beef supply on the world market calls for export subsidies to make up the difference between world and CAP prices.

To sum up, it must be emphasised that the western experts' fears about drastic agricultural production growth after CAP adoption by Poland are exaggerated. The experiences of the Mediterranean countries, where after the EU accession no production response to high, regulated prices was observed, confirm the statement.

It should be born in mind that the Polish agriculture characterised by low productivity and high fragmentation is not able to respond to both positive and negative signals from the market.

5. *Status quo*, integration with the EU or free trade?

In wider, international context the Polish agricultural policy is set up by Gawron, Gruda and Zawadzka (Gawron, Gruda, Zawadzka, 1993). The researchers applied the United States Department of Agriculture's SWOPSIM model (*Static World Policy Simulation Modelling*). The system is characterised by high level of integration of home market with international environment and extended foreign trade module. It calls for high level of aggregation of statistical data and exceptionally restrictive assumptions, such as perfect substitutability of home and foreign goods.

The adoption of the model designed to analyse the agricultural policy conducted by the United States on the Polish ground is risky[18]. It is hard to believe that Poland – a small open economy, is able to influence international trade in agricultural products.

The researchers consider three "handbook" scenarios: *status quo* – association with the European Union, regional integration (CAP adoption) and free trade.

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[17] As the scenarios considered will not be verified – time schedule of Poland's accession to the EU is by far too optimistic, the special emphasis would be put on the conclusions that can be drawn form the analysis.

[18] It is worth stressing that the United States provide 41% of world maize production, 24% of tobacco production and 11% of world wheat production.

The results confirm the theorems of international economics.

Firstly, the association with the European Union does not bring any significant quantitative and qualitative changes. Insignificant increase in prices is accompanied by negligible growth of agricultural production and marginal adjustments in consumption and import.

Secondly, regional integration (CAP adoption) leads to high prices, huge production surpluses and bloated budgetary costs of administrating common market organisations.

Thirdly, **the best solution is free trade**. It leads to creating trade flows depicting comparative advantages. In the conditions of unrestricted trade, Poland's export specialities would be potatoes, rye, sugar, wheat, beef, mutton, pork, and poultry[19]. For these products, decline in world prices caused by growth of export from Poland was observed.

6. Conclusions

1. The aim of the paper was to demonstrate different applications of quantitative methods in modelling Poland's agricultural policy in the light of integration of the Polish farming sector with the European Union and in assessing the effects of the Common Agriculture Policy adoption.
2. It was pointed out that successful integration of the Polish integration with the European Union requires deep restructuring. The finance are scarce, therefore they should be used in an effective way.
3. It resulted from the quantitative analyses conducted by the Polish economists that the aim of the agricultural policy should be reducing excess farm employment. The suggested ways of achieving this goal were promoting the creation of jobs for farmers in rural areas or/and the creation of incentives to retirement of old farmers. The quantitative analyses proved, beyond all possible doubt, that CAP-like price support is expensive (Piskorz, Plewa, 1995) and economically ineffective (Orłowski, 1996).
4. The quantitative analyses give insight in trade effects. They permit to calculate trade creation and diversion effects. The consequences of trade integration at the stage of Poland's association with the EU are insignificant, as the liberalisation in agricultural trade provided by the *European Agreement* is partial and selective. The Polish economists have not undertaken the calculation of both trade effects after Poland's inclusion in the Single Market so far. It may result from the fact that the remaining impediments are mainly non-tariff barriers, which are less "visible" and difficult to tarrify.
5. The quantitative analyses permit to dispel Poland's and EU fears about the consequences of integration of the Polish agriculture with the European Union. The prime example are the misgivings about huge increase in agricultural production, as the Polish farmers' response to high institutional EU prices. The researches conducted by the Polish economists exclude such a possibility.

[19] The Poland's share in world potato production is 7%. Poland provides 6% of world sugarbeets production. Poland is also a significant producer of meat with the share of 1.3% of total world production.

6. The agricultural issues seem to be at the centre of the Polish public opinion's concern. The quantitative analyses on the consequences of CAP adoption should be welcomed by the opinion circles – journalists, politicians, social activists and academics, as they deliver concrete argument in favour or against integration. Fair discussions based on them would play an important part of information campaign proceeding the referendum, in which the Polish society will decide about future Poland's development as well as the tomorrow of the Polish agriculture.

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