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Is there a relationship between the prevailing model of agriculture and the structure of the crop and livestock insurance markets?

A comparison between the Czech Republic and Poland

Given the strong dependence of its economic results on natural factors, agriculture is characterised by high exposure to risk. This paper explores the relationship between the prevailing 'model of agriculture' in a country and methods of risk management (in particular, insurance schemes). The Czech Republic and Poland are post-socialist countries which are characterised by different models of agricultural development. While agriculture in the Czech Republic is oriented to industrial farming with large farms, Polish agriculture has a bipolar structure that includes both small, family-owned farms and large agricultural holdings. Various approaches to agricultural insurance schemes may arise from the contrasting models of agriculture, and substantial differences in both the demand and supply sides of the crop and livestock insurance markets indicate different policy approaches to the role of agriculture in the economies of the two countries. In both the Czech Republic and Poland, policy options for farm risk management should consider the balance between budget flexibility and the criterion of efficiency (from the perspective of insurers).

Keywords: risk management, agricultural insurance, agricultural finance

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Introduction

Given the strong dependence of its economic results on natural factors (for example, weather-related factors), agriculture is characterised by high exposure to risk. Farmers face both weather and disease risks, of which the former, especially drought, have been more significant in recent years (Potop *et al.*, 2010). Moreover, shifts in agricultural commodity demand and supply have led to relatively strong volatility of agricultural/agrifood prices. This shows that there is a real need to develop new or modify existing risk management tools (Meuwissen *et al.*, 2001; Meuwissen *et al.*, 2006). Insurance is one of the few financial management tools that can mitigate risks in agriculture (Šturcová, 2013).

The topic of agricultural insurance is complex from three perspectives: the state, the insurance sector and farmers. This paper explores the relationship between the prevailing 'model of agriculture' in a country and the methods of risk management (in particular insurance schemes) adopted. It compares the situation in the Czech Republic, where agriculture is oriented to large-sized industrial farming, with that of Poland, where it has a bipolar structure that includes both small, family-owned farms and large agricultural holdings. Various approaches to agricultural insurance schemes may arise from the different models of agriculture that prevail. In this paper, particular attention is paid to the perspective of agricultural policy in both countries.

Following a brief introduction to crop and livestock insurance, we compare, using Farm Accountancy Data Network (FADN) data from 2009 and 2015, the income and financial situation of agricultural holdings in the Czech

Republic and Poland. Then, we consider different models of agricultural insurance. We compare the situations in the crop and livestock insurance markets (both from the perspective of demand and supply side), with particular attention to the issue of subsidisation. In-depth analysis has been conducted at the sectoral level on the basis of statistical data from 2009 to 2015 provided by supervision authorities and/or ministries of agriculture. We conclude with political recommendations and suggestions for future research.

Crop and livestock insurance

Crop and livestock insurance are purchased by farmers as forms of financial loss protection. State-subsidised crop insurance programmes strengthen existing components of farming safety nets (Shields, 2015). There is a growing body of literature on subsidised crop and livestock insurance, particularly in the United States and Canada where developed systems of agricultural insurance with a relatively high degree of subsidisation exist. For example, the demand for crop insurance in the United States has been explored by Glauber *et al.*, (2002), Sherrick *et al.* (2004) and Goodwin and Smith (2013). Some European countries (such as Spain, Italy and France) have also adopted various solutions (partly subsidised) for risk management in agriculture. Empirical studies dealing with determinants of crop insurance in Europe include Enjolras and Sentis, 2011; Špička and Vilhelm, 2012; Pawłowska-Tyszko *et al.*, 2015 and Santeramo *et al.*, 2016.

As Santeramo *et al.* (2016, p.640) observed, policy makers, irrespective of the country, "often act to encourage participation in crop insurance programmes, most often through

the use of large subsidies". The question of subsidising agricultural (crop and or/livestock) insurance systems depends on various factors, including the share of agriculture in GDP and the percentage of the citizens in a country that live in rural areas (Du *et al.*, 2016). Santeramo *et al.* (2016, p.653) noted that "although subsidised crop insurance programmes continue to proliferate around the world, participation remains sporadic and not well understood in many cases". They added (p.653) that a significant increase in subsidised crop insurance may be stimulated by "the factors that lead a farmer to adopt insurance and to remain insured". An entrepreneur's receptiveness to agricultural insurance is influenced, among other factors, by his/her attitude towards risk (Ginder *et al.*, 2009). Significant risk aversion may lead to the loss of competitive ability and subsequent withdrawal from the market.

Enjolras and Sentis (2011) identified the following key groups of determinants of demand for crop insurance: (a) environmental variables; (b) financial variables (related to capital structure, financial liquidity); (c) variables related to farm organisation and management; and (d) variables related to options of agricultural policies (including the impact of subsidies on premiums for/of crop and livestock insurance). In particular, a change in subsidising a crop insurance system may increase the number of farmers who are able to buy multi-peril crop insurance (MPCI). Only a few empirical studies evaluate the impact of farm size as a determinant of participation in insurance markets. In Italy there are regional differences (northern vs. southern regions) in demand for crop insurance products (Santeramo *et al.*, 2016). This may be explained by the fact that insurance premium rates are different and 'the typical loss ratio' is closer to unity. Several research papers on the issue of mainly crop (less commonly livestock) insurance have focused on the demand side. Goodwin *et al.* (2004), Goodwin and Smith (2013) and Yu *et al.* (2016) looked at dependencies between premium subsides and crop area insured. Some empirical studies (e.g. Goodwin *et al.*, 2004; Goodwin and Smith 2013; Weber *et al.*, 2015) referred to key insurance issues such as risk aversion, information asymmetry and credit market imperfection.

Agriculture in the Czech Republic and Poland

The agricultural sectors in the Czech Republic and Poland differ as a consequence of their contrasting models of development, as well as due to socio-demographic determinants (greater preference for quasi-social farming in Poland). The basic characteristics of the agricultural holdings indicate higher-level intensification in the Czech Republic (Table 1). Moreover, the average economic size of a farm is around ten times larger in the Czech Republic, the total labour input per farm is more than four times greater, and the average farm land area in the Czech Republic is more than ten times higher. This may indicate not only higher capital intensity and larger scale of agricultural production. In the Czech Republic more than 75 per cent of agricultural land (mainly utilised agricultural area) was rented, which is also associated with the dominance of agricultural holdings in the form of legal entities.

Table 2 presents the overall income and financial situation of agricultural holdings in the Czech Republic and Poland. The gross farm income of Polish agricultural holdings was on average only one tenth of that in the Czech Republic. Moreover, the average value of farm assets in Poland amounted to around EUR 170,000 in 2015, whereas in the Czech Republic it was about four times higher. The subsidy rate (expressed as the ratio of total subsidies to total output) was higher in Czech Republic. However, a significant decrease was noted in both countries over the period 2009-2015. This may be explained by differences in price scissors that lead to different dynamics of total output (Seremak-Bulge, 2016). It should be noted that self-financing has played a significant role in the case of averaged farm household in Poland. The debt-to-assets ratio of Czech agricultural holdings (mainly corporates) exceeded 10 per cent both in 2009 and 2015.

Table 1: Economic situation of agricultural holdings in the Czech Republic and Poland, 2009 and 2015.

	2009		2015	
	CZ	PL	CZ	PL
No. farms represented [SYS02]	14,860	725,670	17,210	735,170
Economic size [SE005] (EUR 000)	242	24	251	28
Total labour input [SE010] (AWU)	6.74	1.70	5.62	1.64
Rented UAA [SE030] / Total UAA [SE025] (%)	84.6	29.3	77.3	25.6
Total UAA [SE025] (ha)	226.1	18.4	204.4	18.5
Total output: crops and crop production [SE135] (EUR)	122,369	11,215	164,244	15,065
Total output: livestock and livestock products [SE206] (EUR)	91,519	10,413	107,215	12,673
Total livestock output / LU [SE207]	887.7	780.1	1170.9	1042.3
Gross farm income [SE410] (EUR)	106,329	12,073	151,053	14,800

AWU: annual work unit; LU: livestock unit; UAA: utilised agricultural area; data from 2015 are preliminary
Data source: Farm Accountancy Data Network

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Farm net income / FWU [SE430]	11,230	4,279	16,365	5,709
Total assets [SE436] (EUR)	739,401	134,133	670,476	169,937
Debt-to-assets ratio (%)	15.0	4.9	30.2	5.7
Total subsidies excluding on investments [SE605] (EUR)	76,336	5,164	83,951	5,136
Subsidy rate: total subsides-to-total output-ratio (%)	15.4	9.8	27.6	18.2

FWU: family working unit
Data source: Farm Accountancy Data Network

Models of agricultural insurance

Table 3 provides a comparison of the insurance schemes in the Czech Republic and Poland. Trends in the agricultural insurance markets in these countries are enumerated with short explanations. Selected areas related to the demand and supply sides of agricultural insurance are highlighted.

In the Czech Republic, agricultural insurance has been

Table 3: Agricultural insurance systems in the Czech Republic and Poland – comparison and trends

Topic	Czech Republic	Poland

Risk factors	Crop insurance: hail, fire, storm, flood, landslide, winter frost damage, and/or for some crops spring frost damage, and/or for vine frost damage; drought and rains during harvest are excluded.
	    Livestock insurance: contagious diseases, other mass diseases, injury or death caused by electrical injury or caused by an electricity outage, loss, death or abstraction of farm animals as a consequence of flooding, poisoning, overheating of animal organism, individual losses.
		Crop insurance: As in the Czech Republic (similarities due to very similar climates), but the risk of drought is increasingly perceptible.
		    Livestock insurance: contagious diseases and selected illnesses, hurricane, flood, lighting strike, avalanche, landslide, a sudden fatal accident, robbery during transport.

Legal basis of subsidisation	Crop/livestock insurance compulsory until 1990 but since 1991 voluntary on a contract-to-contract basis. Since 2001 there has been increasing interest in purchasing crop/livestock insurance. State subsidies for insurance schemes have existed since 2004.	Subsidies for crop and livestock insurance premiums (Law of 7 July 2005). Contracts are implemented in accordance with the state budget set out in the Budget Act, Part 32 – Agriculture.
Degree of subsidisation (from the perspective of farmers)	Fifty per cent of the premium paid for livestock insurance as well as for crop insurance. Special crops (e.g. grape, hop, fruit, vegetable, ornamental plants) are eligible for higher rates of subsidy (up to 70 per cent).	Maximum 65 per cent of premiums paid by farmers. Additionally, the amount of subsidies to premiums strictly depends on the sum insured (the upper limit is set by the Executive Acts).
Eligibility criteria for obtaining subsidies	• Fulfilling strict requirements as for SME, consequently family farms may receive subsidies relatively easily. • The amount of the premium is determined by the yield of insured crops per hectare, the insured price chosen, the area of the insured crop, the type of insurance chosen and the agreed amount of farmer's contribution. It will also be affected by the amount of the bonus. • Premium rates vary according to crop type and type of insurance. The premium is always calculated for the entire calendar year and its amount is not changed. The premium for the insurance contract is the sum of the premium for the individual. In insurance for individual crops, rates are increased by 50 per cent, i.e. the basic rate is multiplied by 1.5. The client can also choose to participate in percentages (0, 10 or 25 per cent).	• Contract with insurance companies that entered into an agreement with Ministry of Agricultural and Rural Development. • Subsidies to insurance premiums cannot exceed 65 per cent of the amount of premiums. The upper limit depends on the sum insured (currently 3.5 or 5 per cent depending on the type of plant). • This subsidy represents 60 per cent of the difference between the total amount of claims paid in respect of drought and the amount representing 90 per cent of the silent contributions in the case of damage caused by drought. In the case of non-use, the amount can be used to increase the funds earmarked for subsidies to insurance premiums for crops and livestock.

Supply side: the structure of the insurance market	Similar to oligopolistic competition:
	    Česká pojišťovna; Generali Pojišťovna; Agra pojišťovna; Hasičská vzájemná pojišťovna.
		Similar to oligopolistic competition, although some firms have a relatively small share of the market:
		    PZU (dominant, state-owned insurance firm); Towarzystwo Ubezpieczeń Wzajemnych; Concordia Polska Towarzystwo Ubezpieczeń Wzajemnych; Pocztowe Towarzystwo Ubezpieczeń Wzajemnych; InterRisk Towarzystwo Ubezpieczeń SA Vienna Insurance Group.

Transfer of subsidy from the state to farmers	• Agricultural producers must submit an electronic application on the website of the Support and Guarantee Fund for Farmers and Forestry (PGRLF), the operating body for public subsidies for agri-food and forestry economy.	• Direct transfers of subsidies to insurance companies (on the basis of Executive Acts) are based on the bilateral farmer-to-insurer agreement. • Subsidies to an insurer paid once per quarter, on the basis of a request made by the insurance company. • Insurance companies which have concluded an agreement on subsidies and/or contracts of compulsory insurance of crops and entered into a co-insurance agreement are entitled to a special purpose subsidy to cover part of the compensation paid to farmers for losses caused by drought.
Stimulants / constraints on a farmer's decision to buy insurance	• The structure of the insurance market decides on prices and quality of crop/livestock insurance. • Bonus system offered by insurance firms. • Taking into account the dominance of farms that are legal entities, active attitude to risk management (as is typical for non-agricultural business) is preferred. • Discount on insurance premiums in the form of a refund of part of the premium paid.	• Obligation on the farmer to insure a minimum of 50 per cent of the crop comes from the regulations on direct payments. • In the case of very low penalties (EUR 2 for each uninsured hectare) there would be a lower risk aversion towards this type of insurance.
Future perspectives	• A need for setting up a fund for covering catastrophic risks which cannot be managed by farmers or insurance companies – that may be explained by a strong need to reduce budget expenditures on ad hoc payments. • Crop and/or livestock insurance in the packages for farmers: financial and insurance conglomerates offers packages that include both financial and insurance service (cross-selling), moreover, agricultural insurance products are not a significant part of portfolio of insurance and financial firms.	• Higher amount of public subsidy to premium – reasons explored by political economy (in Poland farmers are relatively important in election process). • Including risk of drought in MPCI. However, inclusion of this risk results in a significant increase of the insurance rate (even MPCI insurance companies have been reluctant to offer crop insurance against drought, implementing new regulations has changed this situation).

Source: own compilation

voluntary since 1991 on a contract-to-contract basis. There is market competition on prices and quality of services among the four main insurance companies offering agricultural insurance (Česká pojišťovna, Generali Pojišťovna, Agra pojišťovna, Hasičská vzájemná pojišťovna). Altogether there were six insurance companies, five of which are joint stock companies and one is the organisational unit of the Austrian Hail Insurance company, offering crop or livestock insurance on the Czech agricultural insurance market in 2015, but there is no independent body that fixes tariffs in the Czech market. Agricultural insurance has become more popular since 2001 due to the introduction of a new state support subsidy for insurance programmes. The national subsidies have been processed by the Support and Guarantee Fund for Farmers and Forestry. Support is granted to agricultural businesses complying with the parameters of an SME. Crop insurance is a more significant part of the Czech agricultural insurance market than livestock insurance, because both the share of crop compensation payments and the share of crop premiums written exceeded the figures for farm animals. Nevertheless, agricultural insurance is not a significant source of income for insurance companies. In recent years, agricultural insurance has often been sold in a complex package of financial products.

In Poland, according to the Law of 7 July 2005 on subsidies to crop and livestock insurance premiums, contracts are implemented in accordance with the Budget Act, Part 32 – Agriculture. The state has also provided for the possibility of granting specific subsidy to cover part of the compensation for the damage caused by drought (Figure 1). These expenses are covered from the Budget Act, Part 83 – Provisions. The number of insurance contracts concluded by farmers is limited by the amount of subsidies allocated to the insurance company. The conclusion of the bilateral farmer-to-insurer agreement is followed by the payment of the contribution paid by the farmer to the insurer and the payment of subsidies by the minister responsible for agriculture. Subsidies are therefore part of insurance premiums owed to the insurance companies.
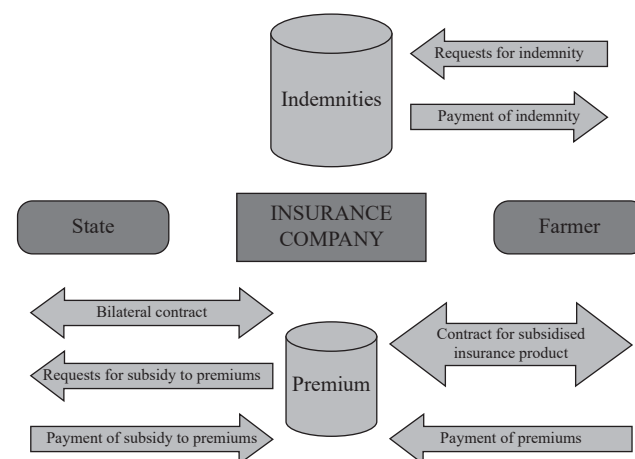

Figure 1: Flow of premium subsidies for crop and livestock insurance in Poland.

Source: own composition based on the Law on insurance of agricultural crops and livestock of 2005

Table 4: Crop and livestock insurance in the Czech Republic and Poland from the perspective of the sector (EUR), 2009-2015.

Description	2009	2010	2011	2012	2013	2014	2015	Change 2015/2009
Czech Republic								
No. crop insurance contracts	3,564	3,836	4,127	4,128	4 246	4,304	4,693	1.32
Sum insured (EUR million)				no data				
Amount of insurance premiums receivables for insurance firms (EUR million)	29.6	34.4	39.8	40.4	39.8	37.4	37.2	1.26
therein: the sum of subsidy to premiums (EUR million)	13.5	15.4	17.1	8.9	9.0	8.8	16.1	1.19
No. livestock insurance contracts	2,210	2,165	2,290	2,172	2,146	2,172	2,150	0.97
Sum insured (EUR million)				no data				
Amount of insurance premiums receivables for insurance firms (EUR million)	10.1	10.0	10.1	9.5	9.2	8.8	8.9	0.88
therein: the sum of subsidy to premiums (EUR million)	3.3	3.3	3.2	2.4	2.9	2.8	3.3	0.99
Area of insured crops (000 ha)	1,412	1,495	1,501	1,500	1,600	1,600	n.d.	
Poland								
No. crop insurance contracts	144,080	134,986	138,425	135,707	151,101	142,492	139,108	0.97
Sum insured (EUR million)	1,501	1,964	2,485	2,888	3,391	3,184	3,273	2.18
Amount of insurance premiums receivables for insurance firms (EUR million)	40.6	51.2	66.0	84.8	89.3	84.9	89.5	2.21
therein: the sum of subsidy to premiums (EUR million)	18.4	24.1	30.7	38.0	39.1	38.5	41.7	2.25
No. livestock insurance contracts	248	279	290	292	307	426	477	1.92
Sum insured (EUR million)	8,782	12,243	13,710	18,891	24,581	57,705	57,260	6.52
Amount of insurance premiums receivables for insurance firms (EUR million)	29.6	39.8	48. 6	59.9	78.1	166.2	164.0	5.55
therein: the sum of subsidy to premiums (EUR million)	13.8	19.4	22.8	29.4	38.5	83.0	81.6	5.92
Area of insured crops (000 ha)	2,808	2,846	3,033	2,751	3,399	3,270	2,824	1.01
No. insured livestock units	235,005	689,200	1,245,670	2,079,000	4,073,830	13,300,000	13,115,432	55.81

Data sources: CZ: reports of Czech agriculture, ČAP (Czech Insurance Association), Agra pojišťovna, PGRLF (Support and guarantee fund for agriculture and forestry); PL: Ministry of Agriculture and Rural Development (based on reports of insurers)

There are no simple regulations in either country concerning the maximum rate that makes farmers eligible to receive public aid. For example, in Poland the maximum amount of subsidy is limited by the percentage of sum insured. A special fund that operates payments of subsidies to premiums is a key feature of the Czech agricultural insurance system.

Subsidised crop and livestock insurance systems

Quantitative data on the level of crop and livestock insurance activity in the Czech Republic and Poland are presented in Table 4. Monetary values (e.g. the sum insured) are expressed in EUR, with exchange rates shown in Annex 1.

Both the number of crop insurance contracts and the amount of insurance premiums receivables for insurance companies have been increasing over a long period in the Czech Republic. According to Land Parcel Information System (LPIS) data, in 2015 the share of insured area to utilised agricultural land was 59 per cent. Approximately 1,500,000 hectares of crops were insured. Crop insurance has been subsidised in the Czech Republic. The loss ratio is much more volatile in the crop production sector than in livestock production because the crop yields and quality are directly affected by adverse weather condition (Ashenbrenner, 2010). The public subsidy for insured farmers has changed in recent years, and was 50 per cent of the premium in 2015 (MZ, 2016). Unlike the crop insurance market, the livestock insurance market has been relatively stable in recent years. There were 2,146 livestock insurance contracts in 2009 and 2,290 in 2015. The highest insurance penetration rate (over 80 per cent) is recorded in cattle insurance; the penetration rate in insurance of pigs and poultry is lower. The public subsidy for insured farmers in 2015 was 50 per cent of premium paid for livestock insurance in the Czech Republic as well as for

crop insurance (MZ, 2016). Regarding the risk of livestock disease in the Czech Republic, the share of livestock insured has been around 80 per cent in recent years.

In Poland in the period 2009-2015 the number of 'quasi-voluntary' crop insurance policies (i.e. Polish farmers are obliged to insure a minimum of 50 per cent of the area sown; this results from the directives on direct payments, but in practice is only rarely enforced) averaged approximately 141,000 per year (Table 4). The number of crop insurance policies and the total sum insured peaked in 2013. Moreover, there was a more than two-fold increase in gross premiums collected from policyholders in the period 2009-2015. That resulted in a nearly two-fold increase in the amount paid in premiums and the share of subsidies to crop insurance premiums averaged 45.6 per cent, which practically corresponds to the statutory subsidising level for such instruments. The average share of subsidies for livestock insurance premiums in the analysed period amounted to 48.6 per cent. In the period 2009-2015, approximately 3 million hectares of crops were insured, representing around 20 per cent of the sown area. A notable drop in insured area was reported in 2015 which may be the result of a lack of foresight by the farmers not treating insurance as a risk management tool. The favourable weather conditions for agriculture in 2013-2014 may have made farmers complacent about buying insurance. This fall in crop insurance occurred alongside an increase in the number of insured animals. In the period 2009-2015 the total received insurance premiums in the agricultural sector (voluntary and mandatory) amounted to approximately EUR 152 million, including voluntary contributions accounting for approximately 24 per cent (EUR 37 million). A similar trend can be seen in the voluntary insurance market. The largest annual sums of compensation for compulsory insurance and voluntary (EUR 102-154 million) were paid in the years 2010-2012. In the 2013-2015 period, the value of these claims amounted to approximately EUR 62.0-65.5 million. The largest sum of compensation, EUR 112.9 million, was

Table 5: Premium, indemnities and loss ratio for crop and livestock insurance in the Czech Republic and Poland (EUR), 2009-2015.

Description	2009	2010	2011	2012	2013	2014	2015	Change 2015/2009 or 2015-2009
Czech Republic								
Sum of premium collected – all crop and livestock insurance (EUR million)	39.7	44.4	49.9	49.9	49.1	46.2	46.1	1.16
Total sum of indemnities paid - all crop and livestock insurance (EUR million)	51.0	29.1	26.0	46.1	38.9	27.1	16.8	0.33
Total loss ratio (%)	128.3	65.4	52.0	92.4	79.2	58.6	36.3	-92.0
Poland								
Sum of premium collected – all agricultural business insurance (EUR million)	120.6	138.3	155.6	156.2	156.2	159.8	176.5	1.46
therein: voluntary crop and livestock insurance	21.8	28.3	40.1	43.4	39.0	39.2	44.5	2.04
Total sum of indemnities paid - all agricultural business insurance (EUR million)	51.4	150.6	102.6	154.5	61.9	65.1	65.5	1.27
therein: voluntary crop and livestock insurance	17.9	16.3	49.1	112.9	20.0	27.6	19.0	1.06
Total loss ratio (%)	42.6	108.9	66.0	98.9	39.6	40.8	37.1	-5.5
Loss ratio for voluntary crop and livestock insurance (%)	82.2	57.5	122.3	260.0	51.2	70.4	42.8	-39.4

Note: the total loss ratio (%) is the ratio of *the total sum of indemnities paid – all agricultural business insurance* to *the sum of premium collected – all agricultural business insurance*; the loss ratio for voluntary crop and livestock insurance (%) refers respectively to this aggregated group of insurance
Data sources: CZ: see Table 4; PL: reports of the Polish Financial Supervision Authority, Ministry of Agriculture and Rural Development

paid in 2012. This situation significantly impacted the gross damage ratio.

At 108.9 per cent, i.e. a 66.3 percentage point deterioration from the previous year, the total loss ratio in the market of agricultural insurance in Poland was the highest in 2010 (Table 5). This change did not occur due to the increase in the damage ratio of subsidised voluntary insurance, because a substantial increase in subsidised insurance damage ratio was noted in 2011-2012. A similar trend occurred in Hungary (Kemény et al., 2012). The situation in the crop and livestock insurance market is very unstable, which affected a strong fluctuation in the gross damage ratio. In the period 2009-2015, compensation paid by insurers (EUR 262 million) exceeded premiums collected (EUR 256 million). The biggest impact on the overall result was seen in 2012, due to the large number of compensation payments throughout the severe winter. It should be noted that the problem of spring frosts is important, particularly in Polish horticulture (Kaczała and Wisniewska, 2015).

In both countries, strong fluctuations in the gross loss ratios (the Czech Republic from 36.3 to 128.3 per cent; in Poland 39.6 to 108.9 per cent) indicate the need for periodic 'monitoring' of regulations on agricultural insurance and, if necessary, changes to the subsidy system.

Discussion

Accession to the European Union (EU) has meant making some changes to agricultural risk management tools in Poland and the Czech Republic. In both countries, there has been an improvement in the economic and financial situations of farmers (Pawlas, 2015). The Common Agricultural Policy (CAP) has underlined the link between rural economies and the environment. That resulted in the transfer of innovations to the region (Jedlička et al., 2014). Agricultural insurance is a very important part of the risk management scheme in the Czech Republic. The system has two functions: it is socially beneficial through reducing the risks associated with agricultural production, ensuring more stable incomes for farmers, and thus contributes to the stability of rural areas (Vávrová, 2010). The demand for private risk management instruments depends strongly on several variables, and the degree of public support (subsidies to premiums) still seems to be crucial (EP, 2016). The system of crop and livestock insurance in Poland is strongly subsidised and covers only 30 per cent of the area sown, whereas the situation in the Czech Republic seems to be quite the opposite.

The crop and livestock markets in both countries (regardless of differences in the scale of production of the agricultural sector or microeconomic intensity and efficiency) strongly depended on public support in the form of subsidies. It should be noted that the issue of subsidised premiums to crop and livestock insurance at country level is affected by determinants related to the competitiveness of the agricultural sector at both the international and EU levels. Risk management schemes have been a policy issue and recipients of public support for a long time: the maximum tariffs were fixed after the WTO Uruguay Round Agreement on agriculture in 1995 (Špička, 2010). The importance of risk

management tools (inter alia, crop and livestock insurance products) will increase in the near future. Given the fiscal sustainability at EU and Member State level, after 2020 the role of income support from Pillar I of the CAP may be weakened. This means that crop and livestock insurance will receive special attention from policy makers. Given the criticism of the CAP budget in terms of its function of redistribution, national agricultural policy measures would more actively be engaged by the Czech Republic and Poland. Despite significant differences both in the demand and supply sides of the crop and livestock insurance markets, subsidised crop insurance products in particular, accompanied by ad hoc payments (if necessary), are regarded as an important component of the farming safety net in both countries. However, taking into account the necessity of balancing the budget, excessive support for these two risk management tools (in particular ad hoc disaster payments) is questionable from the point of view of social justice. The United States experience (vide: The 2014 Farm Bill) shows that the elimination of direct payments resulted in a notable expansion of price risk management instruments, as well as subsidised crop insurance (Shields, 2015). Differences in models of agricultural development result in difficulties in the adoption of relatively uniform (with only a small number of alternative options) risk management tools.

Since, in the Czech Republic, significant power is held by large agricultural holdings and, compared to the agrarian structure in Poland, family farms are not so dominant, the risk exposure is not equal for all farms. Špička and Vilhelm (2012) found that there is a difference between categories between the yield risk character and price risk at farm level. The risk of price fluctuation has a generally more systematic character and is diversified in a more difficult way. On the other hand, the yield risk is more specific. Moreover, the efficiency of crop production insurance (measured by total loss ratios) is higher in small enterprises specialised in field production than in the largest enterprises. Small farms which are typical for specialised production generally face a higher risk of income variability than large farms with mixed type of farming. The insurance efficiency in the largest agricultural enterprises in the Czech Republic is low and insurance represents for these enterprises' costs rather than benefits due to the distribution of risk over a large and diverse territory. As for livestock production, the negative trend in insurance premiums written for farm animals has been caused by the long-term decline in the number of farm animals. This decline surpassed the fall in the insurance premiums written, which corresponds to a stable proportion of livestock insured. An important issue in livestock insurance in the Czech Republic is the extent to which it can influence farm behaviour. Meuwissen et al. (2006) considered incentives for risk management when designing epidemic insurance. They concluded that classifying farms based on their epidemic disease risk and use of deductibles was an important step in aligning incentives with policy goals.

In Poland, falls in purchases of crop insurance (e.g. since 2013 there has been a significant decrease in the purchase of crop insurance policies) is especially alarming. This situation may have occurred due to the high prices of this type of policy (Pawłowska-Tyszko, 2015). The problem currently

faced both by the insurance companies and farmers is still the high cost of a single policy. One of consequences of increased subsidised insurance claims is a limited risk exposure of insurance companies.

As Shields (2015, p.23) stated, "premium subsidies are too generous for farmers, particularly high-income farmers, and expect that farmers would maintain crop insurance coverage at lower subsidy rates", and this viewpoint can refer to the situation in Poland. In both the Czech Republic and Poland, policy options for farm risk management should consider the balance between budget flexibility and the criterion of efficiency (from the perspective of insurers). This also refers to identifying potential paths for development of insurance markets (Soliwoda, 2016). The risk management support in the Czech Republic after 2014 does not use EU funds from the Rural Development Programme; it depends on national financial sources, either in the form of direct support (premium subsidies, ad hoc aids) or indirect support of prevention (disease fund, recovery fund). In order to eliminate any unexpected need for ad hoc aid, it is highly desirable to establish and contribute continuously to a fund for covering catastrophic risks which cannot be managed by farmers or insurance companies (Vilhelm et al., 2015). The problem of how to subsidise risk management tools is also important in the agricultural sectors in some other Central and Eastern European countries, for example Bulgaria (Lefebvre et al., 2014) and Serbia (Zarkovic et al., 2014).

Avenues for further research should include empirical studies at micro level (based on geographical data, GIS, survey-based research). However, utilisation of more complex methods (more example, regression based on GIS data) depends on the quality of databases provided by national FADN liaison agencies.

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Annex

Annex 1: Currency exchange rates 2009-2015.

Exchange rate	2009	2010	2011	2012	2013	2014	2015
PLN/EUR	4.33	3.99	4.12	4.19	4.20	4.19	4.18
CZK/EUR	26.45	25.29	24.59	25.14	25.97	27.53	27.28

Data source: annual averaged data of national banks