The role of subsidies in managing the operating risk of agricultural enterprises

Úloha dotací v řízení provozních rizik zemědělských podniků

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Abstract: The paper examines the relationship between the farmers' operating risk and current subsidies. Focused at the commodity level, the analysis is based on a sample survey of costs and yields of two crops (winter wheat and rapeseed) and two livestock commodities (cow milk and fattening cattle) carried out in 2005–2007 in the Czech Republic. The risk analysis relates to the growing conditions, crop yields and the livestock productivity. The future role of the subsidies as the risk management tool in the farming business, as well as the position of this instrument against the other risk management instruments is analysed. The break even analysis and the Monte Carlo simulation are used as analytical tools. The results indicate that the current subsidies have an impact on the stability of the farmers' income. Partially or fully decoupled payments serve as a "financial pillow" increasing the level of the farmers' income and extending the farmers' decision-making possibilities. Furthermore, the current subsidies reduce the variability of the farmers' income. The current subsidies are a suitable complement to other commonly used risk management tools primarily designed to reduce the farmers' and farm income variability.

Key words: risk management, agricultural policy, direct payments, income stability, Monte Carlo simulation

Abstrakt: Příspěvek zkoumá vztah mezi provozním rizikem zemědělců a provozními dotacemi. Analýza byla provedena na komoditní úrovni a vychází z výběrového šetření nákladů a výnosů dvou komodit rostlinné výroby (pšenice ozimá a řepka) a dvou komodit živočišné výroby (mléko a výkrm skotu), realizovaného za roky 2005–2007 v České republice. Analýza rizika je vztažena k výrobním oblastem a úrovni výnosů plodin, respektive k užitkovosti zvířat. Analýza zohledňuje současnou i budoucí roli provozních dotací jako nástroje řízení příjmových rizik v zemědělském podnikání se zřetelem na vymezení jejich pozice vůči ostatním používaným instrumentům „risk managementu". Pro účely analýzy byly využity analýza bodu zvratu a simulace Monte Carlo. Výsledky ukazují, že provozní dotace mají přímý vliv na stabilitu příjmů farmářů. Platby částečně nebo plně oddělené od produkce působí jako „finanční polštář" zvyšující úroveň důchodu zemědělců a rozšiřující prostor pro rozhodování. Provozní dotace rovněž snižují variabilitu příjmů zemědělců. Provozní dotace jsou vhodným doplňkem k jiným běžně užívaným nástrojům řízení rizik, primárně určeným ke snížení rizika variability příjmů zemědělců a zemědělských podniků.

Klíčová slova: řízení rizik, zemědělská politika, platby oddělené od produkce, stabilita důchodu, simulace Monte Carlo

Agricultural production has always been exposed to many risks. The main groups of risks result from the specific characteristics of the agricultural sector and from the trends in the agrarian policy – the risks connected with the effectiveness of the market, the risks connected with adverse weather conditions and livestock infections, the financial risks and the institutional risks resulting from policy modifications.

Since the second half of the 90^{s} of the 20^{th} century, discussions on the topic of risk management in agriculture have been taking place at a global level. From that time, it has been possible to quote papers focused on the spectrum of the most frequently used risk

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management tools in agriculture (e.g. Harwood et al. 1999; Dismukes et al. 2004; Špička 2006; Svatoš 2007; Michalski 2008). Most professional papers are devoted to the issue of agricultural insurance as the most active and functional tool supporting stability in the field of agricultural business (e.g. Vávrová 2005, EC – JRC 2006). The OECD study (2000) may be considered as the first significant and relatively comprehensive study of risk management in agriculture.

Risk management strategies can be grouped into three categories (Holzmann, Jorgensen 2001): risk prevention, risk mitigation and risk coping strategies. Prevention and mitigation strategies focus on income smoothing, while coping strategies focus on consumption smoothing. *Prevention strategies* are intended for reducing the probability of a downside risk. These are introduced before a risk occurs. Reducing the probability of an adverse event occurring increases the producers' expected income and reduces the income variance with a positive impact on wealth. These strategies include, for example, technological choice, training, disaster prevention (flood monitoring, irrigation etc.) and prevention of animal diseases. Whereas preventive strategies reduce the probability of the risk occurring, *mitigation strategies* reduce the potential impact if the risk were to occur. Risk mitigation strategies can take several forms, for example, portfolio diversification, informal and formal insurance mechanisms, vertical integration, contracting, off-farm work, hedging, counter-cyclical programs (such as in the USA) or income tax smoothing systems. *Coping strategies* can relieve the impact of the risk once it has occurred. The main forms of coping consist of the individual dis-saving/borrowing, migration, selling labour or the reliance on public or private transfers. In this case, the important role of the government lies in providing agricultural support programs like calamity funds and other measures to manage sanitary or phytosanitary crises, safety nets, ad hoc state aid, social assistance etc.

The uncertainty of future incomes of farmers complicates both the short-term production decisions and the long-term planning. Not only output prices, input costs and expected yields, but also the decoupled direct payments are the key drivers of the producers' decision-making about resource allocation and product portfolio. All the above mentioned types of risks cause the variability of the farmers' income and are relevant to agricultural policy. According to the published impact assessment of the CAP Health Check (EC 2008), the CAP now mainly relies on the Single Payment Scheme as an income stabilisation tool, by providing farmers with a fixed payment regularly. As mentioned by the European Commission (2008), farm incomes vary widely across the EU. The distribution of income within the Member States varies greatly as well. The analysis done from 1998 to 2003 has shown that more than half of all EU-15 farms (54%) experienced a drop of income; and each year more than one quarter (about 28 %) of farms in the EU incurs a loss greater than 30%. The thesis that direct payments have an income stabilizing effect is backed up by the argument that the percentage of farms with negative income variations has fallen compared to the early 1990s. This trend was considerably influenced by the rising direct payments (EC 2008).

The risk related role of decoupled payments is mentioned by Bečvářová (2007b) who affirms that decoupled payments are a suitable element in the CAP reform, not only because it meant a movement towards a more market oriented policy, but also by offering the possibility of implementing the economic growth stimulated by the support of the meaningful production structural changes. At the present, this is done through using their static (wealth) effect, the dynamic (investment) effect and the risk-related effects.

The article is organized as follows: The first part is devoted to the risk analysis of the selected agricultural commodities under various production conditions and under various intensity of production. The analysis is aimed at setting the role of direct payments (1st pillar of the CAP) in the income risk management of agricultural enterprises. Then, the impact of the current subsidies on the level of operating risk is measured. Finally, public expenditures on the risk management in agriculture in the EU and in the USA is considered.

MATERIAL AND METHODS

The results are based on a sample survey of product costs and yields of agricultural companies (with double-entry book-keeping) which has been carried out annually by the Institute of Agricultural Economics and Information. The survey is based on the improved cost calculation methodology originally authored by Novák (1996). It covers 260–280 companies in average. The following commodities represent crop and livestock production: winter wheat, rapeseed, milk and fattening cattle. These commodities statistically ensure the sufficient representativeness of the sample. The analysis covers the period 2005–2007 in order to avoid the distortion of the results by the extremely good and adverse years. The different agricultural policy in the Czech Republic before 2004 is the other reason for choosing the three-year time horizon. The evaluation of operating risk relates to the growing conditions, crop yields and livestock productivity. The classification by growing conditions describes the real natural conditions more precisely than the LFA classification.

A. Growing conditions:
- Corn and sugar beet growing region (C & B) – flat or slightly undulating landscape, the elevation under 350 m, the average annual air temperature above 8°C, the average annual precipitation under 600 mm, black or brown soil.
- Potato growing region (P) – upland or hilly landscape, the elevation between 350 and 500 m, the average annual air temperature between 7°C and 8°C, the average annual precipitation between 600 and 700 mm, brown soil or slightly podzolic soil.
- Potato-oats and mountain growing region (PO & M) – hilly or mountain landscape, elevation exceeding 500 m, the average annual air temperature under 7°C, the average annual precipitation over 700 mm, podzolic soil.

B. Interval of crop yields and livestock productivity – see Table 1.

Many methods with various degrees of complexity can be used for the risk estimation. The most widespread methods for measuring operational risk are the calculations based on the gross margin, namely the break-even analysis and the safety ratio. The break-even point is the threshold when the total revenue received equals the total costs associated with the output (TR = TC). The risk-related relevance of the break-even analysis is embodied in the margin of safety that answers the question of how much output or sales can fall before a business reaches its break-even point. The break-even analysis may be applied both ex post and ex ante.

The well known formula for the break-even calculation mentioned by Synek et al. (2003) should be modified regarding the decoupled direct payments affecting the farmers' decision making. The break-even points can then be rewritten as

$$TR = TC$$

$$p \times q + DP = v \times q + F$$

Break-even quantity of product

$$q_k = \frac{F - DP}{p - v}$$

Break-even producer price

$$p_k = \frac{v \times q + F - DP}{q} = v + \frac{F - DP}{q}$$

where: p is the producer price per 1 production unit, q is the real or planned quantity of product per time unit (most often per calendar year), v embodies the average variable costs, F means the total fixed costs per time unit (most often per calendar year) and DP represents the value of direct payments per year. Decoupled direct payments can be considered as the revenue-side parallel of total fixed costs.

Variable costs include the variable costs for crop and livestock production.
- For crop production: costs of seeds (seedlings), fertilizers, crop protection, other direct material, fuel, energy, water, contract work, maintenance and own repairs (crop related) and crop insurance. Staff costs are not included because these are calculated as direct costs which are not variable.
- For livestock production: feedstuffs and bedding, medicaments, other direct material, fuel, energy, water, contract work, maintenance and own repairs (livestock related) and livestock insurance.

Fixed costs cover direct fixed costs, costs of supporting activities, factory overheads and administrative overheads.

The calculation of the gross margin in livestock production in this study is specific. The costs in livestock production are expressed differently for milk (dairy cows) and meat (cattle). Whilst the costs for dairy cows are calculated as the total costs per 1 dairy cow and year (including the by-product and born calves), the costs for cattle are calculated per 1 quantity unit (kg of live weight) excluding by-products (manure). The calculation of costs was dependent

Table 1. The intervals of crop yields and livestock productivity used in the analysis

	1st interval	2nd interval	3rd interval	4th interval
Winter wheat (t/ha)	≤ 4.00	4.01–5.00	5.01–6.00	> 6.00
Rapeseed (t/ha)	≤ 2.70	2.71–3.30	3.31–3.80	> 3.80
Milk (l/year)	≤ 4 750	4 751–5 660	5 661–6 570	> 6 570
Fattening cattle (kg*/100 FD)	≤ 78.0	78.1–95.0	> 95.0	–

*kg = kilogram weight gain (kg w. g.), FD = feeding day on the production region and natural conditions and took into account the cattle herd turnover; this means costs from the birth of the calf to finishing off with the beef. A simplification in the cost calculation was used depending on the gains in cattle breeding. This means that the costs per live- weight (in the relevant intervals of gain) were expressed as the cost of gain modified by an averaging factor, where the factor is a ratio between the average cost per live- weight and the average cost of gain in the relevant year. This factor roughly reflected the herd turnover. The simplification meant that the real herd turnover was not calculated, but an average factor for the relevant year was used to calculate the cost of live- weight in each interval of gain.

In this paper, the main criterion of risk assessment is the probability of making a loss. Therefore, the safety ratio (SR) was used as the indicator for risk estimation. This was based on the break-even analysis and measures the relative distance from the break-even point. For example, a safety ratio of 50% means that the absolute difference between the real yield (q) and the break-even yield (q_k) was 50% of the real yield. The lower the safety ratio, the higher is the probability of making a loss. This indicator is suitable for the ex post risk assessment. The safety ratio calculation is written

$$SR\ (\%) = \frac{q - q_k}{q} \times 100$$

The median value of the safety ratio was computed to show the level of the safety ratio at 50% probability. The standard deviation describes the variability of each distribution.

The Monte Carlo sampling model was applied to show the risk rate of various agricultural commodities under different production conditions. Using the Monte Carlo sampling is closer to a "real-world" simulation. The Monte Carlo methods are useful for modelling the phenomena with a significant input uncertainty and allow the effect of varying the level of inputs on the final output to be analyzed. In the simulation, the possible values with a probability distribution are defined for each uncertain variable. The simulation calculates numerous scenarios of a model by repeatedly picking values from the probability distribution of the uncertain variables.

Generally, assume that there is one dependent variable y and n independent variables denoted by $x_i = x_1, x_2, \ldots, x_n$. Independent variables are random, defined by the probability distribution Φ_{xi}. The relationship can be written as

$$y = f(x_1, x_2, \ldots, x_n)$$

Consequently, the matrix of $x_i^{(j)}$ (where j is denoted by 1, …, N) can be made using random number generator. The matrix can be written as

$$y^{(j)} = f\left(x_1^{(j)}, x_2^{(j)}, \ldots, x_n^{(j)}\right)$$

The final data file was processed by the common statistical analysis methods. In this paper, the main descriptive statistics were computed – mean, median, standard deviation, variance, skewness, kurtosis, coefficient of variability, minimum and maximum.

The probability $Pr\ (y \leq y_0)$ of selected variable y_0 can be estimated as

$$\Pr(y \leq y_0) \approx \frac{Nr\left(y^{(j)} \leq y_0\right)}{N}$$

where $Nr\ (y^{(j)} \leq y_0)$ is the number of trials, if $y^{(j)}$ does not exceed the entered value y_0, and N describes number of all trials. About 10 000 trials for each simulation were calculated. The computation was at a confidence level of 95%.

Let us assume that there are four uncertain variables in break-even calculation – the producer price (p), crop yields or livestock productivity (y), variable costs (VC) and fixed costs (FC). For each uncertain variable in the simulation, the possible values with a probability distribution are defined. Because of the limited data, the triangular distribution was chosen for the variables p, VC and FC. The triangular distribution describes a situation where the minimum, maximum, and the most likely values to occur are known. The probability distribution of natural yields (y) was described using the BetaPERT distribution which can also be used in the same situations as where the triangular distribution could be used but the difference is that the underlying distribution is smoothed to reduce the peakedness of the standard triangular distribution. The BetaPERT distribution fits better the natural phenomena. Each year in the three year period represented one of the distribution parameters (Min, Max, and Likeliest). The correlation between crop yields and producer prices was considered, using the Spearmen rank correlation.

Let us assume also that the current subsidies are defined as the payments for current operations linked to production, and not investments. The current subsidies are usually not conditioned by writing a business plan. Direct payments were considered in crop production (SAPS and Top-Up per hectare) and in livestock production (Top-Up per livestock unit). The indirect support was estimated in livestock production as payments for the supported production of own fodder crops. The probability distribution of the current subsidies was described using the triangular distribution because the SAPS payments in CZK are affected by the exchange rate and therefore do not fit a uniform distribution.

Drawing on the conceptual analysis mentioned above, the study primarily focuses on whether the current subsidies add to the risk reduction of agricultural commodities. Because the level of the current subsidies does not vary greatly across the types of classification, the risk-reduction effect is similar in each category. That is why the impact analysis is focused on the aggregate level of the Czech Republic. The results also reveal if the less favoured growing conditions imply a higher probability of making a loss and if the higher crop yields/livestock productivity imply a less risky production of agricultural commodities.

RESULTS AND DISCUSSION

Results of the risk analysis are presented in Tables 2–5. Table 2 shows the median value of the safety ratio for each type of classification; Table 3 gives the information about the variability of the safety ratio and Table 4 contains the statistics of the SR distribution without current subsidies (for the whole Czech Republic). The results in Table 5 embody the statistics of the SR distribution including current subsidies (again, for the whole Czech Republic).

The median and standard deviation describe the level of the safety ratio at a 50% probability (i.e. income level) and the variability of the safety ratio (i.e. income stability). In average, the analysis revealed a higher rate of risk in livestock production compared to crop production. Rapeseed production has the highest median value of the safety ratio and a relatively low variability. Thus it can be considered as a less risky business, probably because of the relatively high producer prices and the increased demand for the biodiesel fuel between 2005 and 2007. Producer price was identified as the most risky factor affecting the safety ratio. The income level (median) of wheat does not differ significantly from that of the rapeseed because of the sharp rise of the wheat prices during 2007. However, the variability between wheat and rapeseed is different. The standard deviation of wheat

Table 2. The median value of the SR – without current subsidies (%)

Farm category	Winter wheat	Rapeseed	Milk	Fattening cattle
Total CR	17.70	22.76	–20.45	–115.39
C & B	22.88	18.79	–22.60	–130.69
P	12.68	23.28	–20.50	–109.43
PO & M	2.77	21.80	–18.20	–136.69
1st interval	–63.21	–41.70	–57.40	–629.24
2nd interval	–1.60	24.57	–41.62	–167.30
3rd interval	25.74	35.97	–24.33	–21.50
4th interval	44.26	39.77	–1.41	–

C & B = corn and beet growing region, P = potato growing region, PO & M = potato-oats and mountain growing region
Source: Own calculation

Table 3. The standard deviation of the SR – without current subsidies (%)

Farm category	Winter wheat	Rapeseed	Milk	Fattening cattle
Total CR	22.71	12.12	7.10	20.83
C & B	19.62	13.19	5.82	31.85
P	26.09	11.98	7.21	34.11
PO & M	30.76	13.22	7.70	33.09
1st interval	248.46	35.74	13.91	10 418.82
2nd interval	29.80	11.62	7.14	32.02
3rd interval	22.43	7.89	6.22	10.77
4th interval	14.20	8.11	5.20	–

Source: Own calculation

is much higher due to the higher price volatility of wheat in the three-year period.

The safety ratio of milk production and fattening cattle is negative which means that the real livestock productivity is lower than the break-even productivity without current subsidies. Milk production has a higher profitability and a lower variability than fattening cattle. In milk production, there has been a steadily increasing productivity (milk yield) and the milk price has not significantly fluctuated. Therefore, the standard deviation of the safety ratio of milk production is very low. Fattening cattle has been making losses in the recent years because of the insufficiently high producer prices to reach the break-even point.

Regarding the analysis in the different growing conditions, winter wheat shows a well-marked increase of risk in the less favoured areas (PO & M growing region), unlike rapeseed and livestock commodities. The lower level of the safety ratio and the higher variability of the wheat safety ratio in less favoured areas can be seen. The effect of natural conditions on the growing of rapeseed is smoothed by the different character of rapeseed compared to wheat. Wheat can be used either as food wheat (higher quality implies a higher price) or as feed wheat (lower quality implying a lower price). The quality of wheat diminishes as the growing conditions worsen. Unlike wheat, the best natural conditions for growing rapeseed are in the potato growing regions. However, in the Czech Republic the appropriate cropping pattern for growing rapeseed is actually not observed and rapeseed is also grown under unsuitable natural conditions as well as in the inadequate extent. The yield differs widely but the demand for rapeseed oil is still high. That is probably why the rapeseed prices are not always lower under the adverse growing conditions. Livestock production depends on the weather condition to a smaller extent than crop production. Slight differences of the median and standard deviation in various natural conditions are thus reasonable.

Table 4. Statistics of the SR (%) distribution – without current subsidies (total CR)

Statistic	Winter wheat	Rapeseed	Milk	Fattening cattle
Mean	15.28	20.42	–21.02	–118.11
Median	17.70	22.76	–20.45	–115.39
Standard Deviation	22.71	12.12	7.10	20.83
Variance	515.56	146.98	50.36	433.99
Skewness	–0.4612	–0.8698	–0.4190	–0.6832
Kurtosis	2.59	3.51	3.12	3.53
Coefficient of Variability	1.49	0.5937	–0.3376	–0.1764
Minimum	–74.79	–38.60	–53.48	–218.54
Maximum	57.17	45.32	–0.68	–67.33

Source: Own calculation.

Table 5. Statistics of the SR (%) distribution – including current subsidies (total CR)

Statistic	Winter wheat	Rapeseed	Milk	Fattening cattle
Mean	84.54	75.98	4.51	–26.90
Median	85.27	76.65	4.94	–25.46
Standard Deviation	5.10	4.44	5.95	14.08
Variance	26.04	19.75	35.37	198.17
Skewness	–0.7532	–0.7958	–0.4263	–0.6007
Kurtosis	3.45	3.68	3.17	3.44
Coefficient of Variability	0.0604	0.0585	1.32	–0.5232
Minimum	61.18	54.15	–23.07	–95.62
Maximum	94.57	85.66	22.07	9.36

Source: Own calculation

The results in the intervals of crop and livestock yields confirm the assumptions. The higher the crop yield or livestock productivity, the less risky is the business. The commodities in low-yield intervals show a lower median and a higher standard deviation of the safety ratio. That goes for all the examined commodities. The extreme value of the standard deviation of the safety ratio in the first interval of fattening cattle was caused by the negative gross margin in 2007 (due to the concurrence of a sharp drop of price and an increase of variable costs in 2007). A negative gross margin indicates that it would be better not to produce the commodity in this case.

Tables 4–5 and Figures 1–4 give details about the risk-related effect of current subsidies. There are several kinds of risk-related effects of the current subsidies. Firstly, the current subsidies can increase the level of the safety ratio (i.e. higher median and mean of SR) and make commodities more profitable. Secondly, the current subsidies can reduce the variability of the safety ratio and the commodity becomes less risky (i.e. lower standard deviation, variance and coefficient of variability). The risk-related effect of the current subsidies can also be estimated using its skewness and kurtosis. Skewness is a measure of the asymmetry of the probability distribution of a real-valued random variable. All the distributions

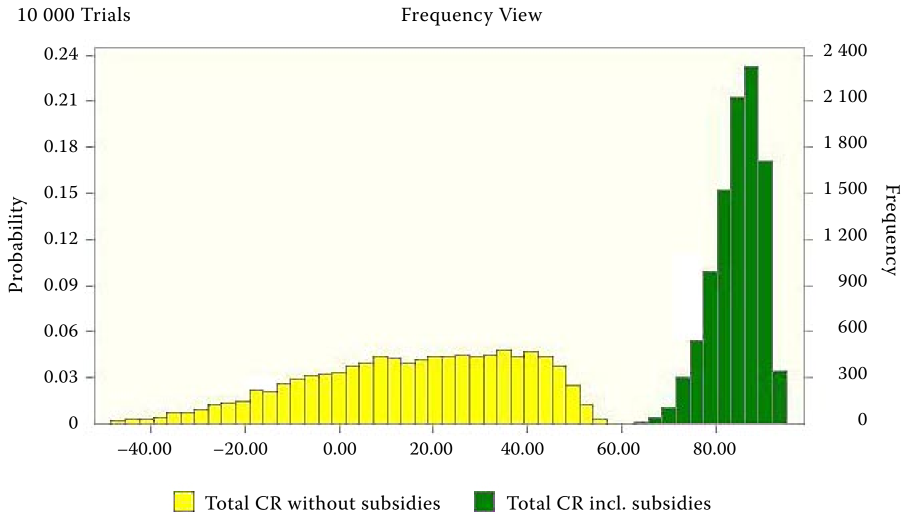

Figure 1. The impact of current subsidies on the SR (%) distribution – winter wheat
Source: Own calculation

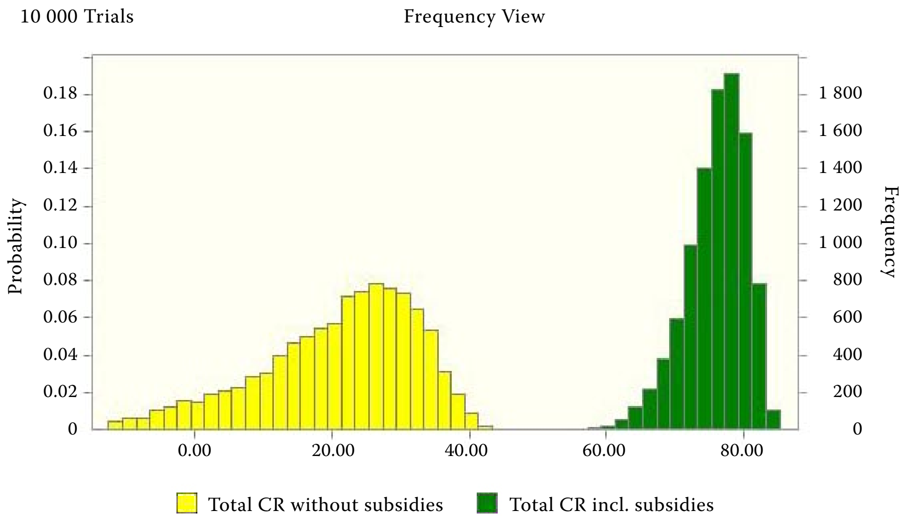

Figure 2. The impact of current subsidies on the SR (%) distribution – rapeseed
Source: Own calculation

are left-skewed and the deviations from the mean are going to be positive. However, the current subsidies have no significant effect on the asymmetry. Kurtosis is a measure of the "peakedness" of the probability distribution. As shown in Figures 1–4, the current subsidies can imply a markedly higher probability of the SR values near the mean in the case of wheat and rapeseed. Thus the current subsidies make crop production less risky.

The impact of the current subsidies on the income variability depends on the volatility of the commodity price. Generally, changing weather conditions affects crop production more than livestock production and the price volatility of crops is more considerable. This is the reason why the current subsidies have a stronger effect on the income variability in crop production (Figures 1, 2 vs. Figures 3, 4). Furthermore, the current subsidies are mostly non-purpose fixed direct payments and farmers can use these funds for farm modernization, the application of improved inputs or other risk management measures. This is the indirect risk-related effect of current subsidies.

To show the risk-related effects of the current subsidies in the context of agricultural policy, it is essential to make a brief international comparison of risk management policies. Table 6 presents the value of transfers from risk management policies in the EU and USA. Nevertheless, the OECD (2008) does not consider direct income payments as risk-related measures, as they do not reduce the income variability. This statement contradicts the findings of

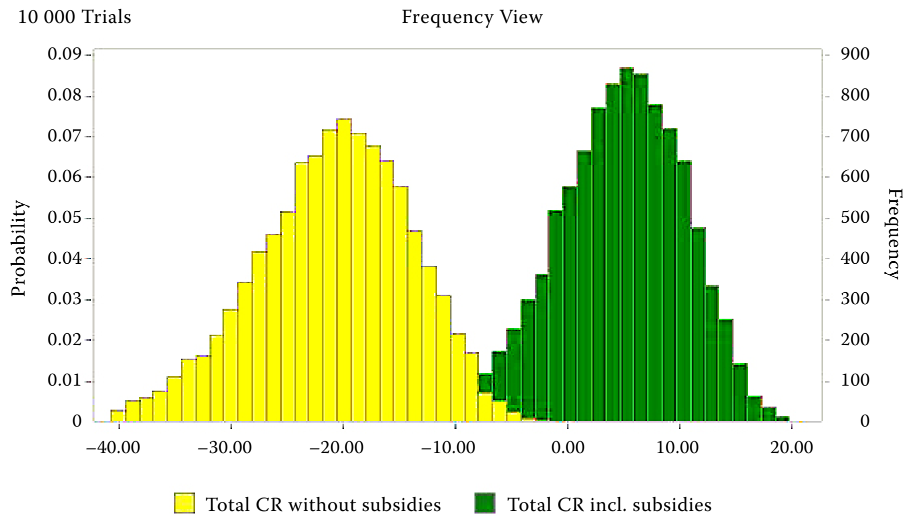

Figure 3. The impact of current subsidies on the SR (%) distribution – milk (dairy cows)
Source: Own calculation

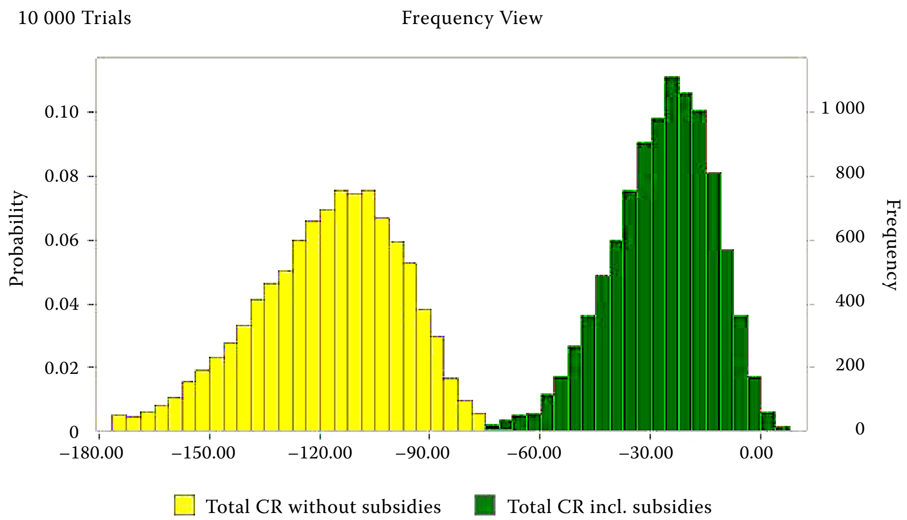

Figure 4. The impact of current subsidies on the SR (%) distribution – feeding cattle
Source: Own calculation

this analysis as well as the findings of the European Commission (EC 2008).

Market price support measures (MPS) dominate over all other risk reduction measures in terms of the support level. Market price support is defined as transfers from consumers and taxpayers to agricultural producers from policy measures that create a gap between the domestic market prices and the border prices of a specific agricultural commodity, measured at the farm gate level (OECD 2008). Domestic measures such as administered prices triggering intervention purchases and private storage can reduce domestic price fluctuations by preventing prices from falling below a given limit. But since the Uruguay Round Agreement on agriculture in 1995, which banned the countercyclical border measures

Table 6. Transfers from risk management policies in the EU and USA (1992–1997, 2002–2007)

Million EUR	European Union		United States	
	1992–1997	2002–2007	1992–1997	2002–2007
Risk reduction measures in PSE	58 005	51 308	14 109	13 352
Private storage/non marketing	0	0	0	3
Water management[1]	205	187	334	238
Certified seeds/breeds	0	77	0	0
Technical assistance/extension	163	401	1 902	3 005
Pest and disease control	863	1 189	397	866
Market price support	56 773	49 454	11 476	9 240
Risk reduction measures in GSSE	164	605	713	928
Water management[2]	0	0	267	237
Inspection (GSSE)	164	605	446	691
Ex ante risk mitigation/coping measures in PSE	367	469	2 948	5 879
Variable payments based on output[3]	210	157	211	2 650
Variable payments based on current A/An/R/I[3]	8	5	2 325	0
Variable payments based on non-current A/An/R/I, production required[3]	0	0	0	0
Variable payments base on non-current A/An/R/I, production not required[3]	0	0	0	1 930
Insurance subsidies	149	308	412	1 298
Futures markets subsidies	0	0	0	0
Income tax smoothing schemes	0	0	0	0
Ex post risk mitigation/coping measures in PSE	418	1 131	553	856
Disaster relief payments	337	940	553	856
Ad hoc assistance	0	0	0	0
Social assistance/labour replacement	80	191	0	0
Debt rescheduling/write-off	0	0	0	0
Total PSE	91 397	104 094	24 089	31 860
Total risk related measures in PSE	58 790	52 909	17 610	20 087
% share in total PSE	64	51	73	63

Notes: A/An/R/I = Area/Animal number/Receipts/Income

Totals can be distorted by rounding off

[1]Subsidies for water use and investment assistance in irrigation and drainage systems on the farm

[2]Infrastructure assistance for water management off the farm

[3]All payment with a variable rate label, except those classified as disaster relief payments or insurance subsidies

Source: OECD (2008)

(variable levies), the maximum tariffs have been fixed, but countries can react to the world price fluctuations by modifying the applied tariffs and applying special safeguard measures within the WTO rules. All the OECD countries have the price stabilising support for at least some commodities. Although the share of the MPS in the Producer Support Estimate (PSE) has been decreasing for a long time, it still remains an important component in most countries around the world.

As shown in Table 6, the EU and the USA have different risk management support programs. In 2002–2007, the MPS accounted for over 47% of the PSE in the EU, while it was slightly below 30% in the USA in the same period. In absolute figures, the total risk-related measures in the PSE are much higher in the EU than in the USA. On the other hand, the share of risk-related measures in the PSE is higher in the USA. This is because the USA supports more ex ante risk mitigation/coping measures than the EU, namely variable payments based on output and insurance subsidies.

Payments with a variable rate (or so-called countercyclical payments) are implemented explicitly to stabilise farmers' receipts (ex ante). They only generate transfers when the receipts are below the target level. Canada and the United States are two countries where the variable rate payments are most significant, reflecting the traditional higher exposure to climatic risk and recourse to the insurance and stabilisation payments. Payments with a variable rate other than insurance subsidies or disaster relief payments include various deficiency and stabilisation payments paid per 1 tonne, per 1 hectare, per 1 animal head or based on receipts or income. Variable payments based on output in the USA include loan deficiency payments, marketing loan gains and storage payments providing producers with the interim finance to help them to store, rather than to sell, their commodities when market prices are typically at the harvest-time lows. In the USA, variable rate payments based on non- current parameters for which production is not required are the countercyclical payments introduced in the 2002 Farm Bill and the Crop Market Loss Assistance.

Both programs – the loan deficiency payments and the countercyclical payments – pay producers when prices are low. However, the programs differ in several aspects. Loan deficiency payments are paid on the current production; they accrue when the prices fall below the prescribed loan rates, and are limited only by the size of the crop and the price level. Countercyclical payments are paid on a historical base production; they accrue when the prices are between the prescribed target prices and the loan rates, and are limited by these government-set prices and the historical base. The Federal Government has set the rules for these programs to ensure that both programs are not implemented for the same price drop.

The subsidies to agricultural insurance systems are widespread. The USA have a long history of subsidised crop insurance systems. There is a special Federal Crop Insurance Program which offers a more complex, multi-peril agricultural insurance aimed at covering the losses in revenues, not only yields. As pointed out by the EC – JRC (2006), the premium subsidies in the USA correspond to 58% of the total risk premiums. The US Government also provides funds for the administrative costs of the insurance companies and reinsurance. The total support thus provided to insurance amounts to 72% of the total premiums. The European subsidies to insurance premiums are around 32%. On the other hand, a more complex insurance coverage is usually more expensive for farmers, so that the average premium rates in the USA (9%) are much higher than in Europe (4%).

In the context of the WTO negotiations, price support, deficiency payments or stabilisation payments based on output are generally notified in the Amber Box (i.e. those to be reduced). Many insurance programs also do not meet the conditions laid down to ensure they are minimally market distorting and insurance subsidies are often notified as non-commodity specific *de minimis* support as in the USA.

CONCLUSION

All agricultural policies affect the farmers' risk environment and behaviour. Direct income payments that provide a stable (fixed rate) transfer to income can have risk impacts and enter into farmers' risk management strategies. The results of this study indicate that the current subsidies (partially or fully decoupled direct payments) have an impact on the farmers' income stability.

In the context of the agrarian policy measures, the current subsidies can be considered as a suitable complement to the conventional risk management tools primarily designed to reducing the farmers' and farm income volatility. Some parallel risk-related effects of the current subsidies were found. Fixed rate payments play an important role in increasing the level of farmers' income as well as in extending the farmers' decision-making possibilities. The current subsidies also help farmers to reduce the income variability. Furthermore, farmers can use the current subsidies for the improvement of farming technology.

This is the indirect risk-related effect of the current subsidies.

The impact of the current subsidies on the farmers' risk exposure depends particularly on the commodity price fluctuation because producer price was revealed as the most important factor affecting the safety ratio. The current subsidies have a stronger effect on the income variability in crop production. This is because changing weather conditions influence crop production more than livestock production and the price volatility of crops is thus higher. For this reason, the further revision of the CAP should consider the role of direct payments more in smoothing the market price shocks. The price safety nets, such as countercyclical payments and loan deficiency payments in the USA, are unsuitable for implementation in the EU because these schemes are viewed as trade distorting and will be reduced in the future.

The study also demonstrated what the less favoured conditions and crop/livestock productivity imply the risk rate of agricultural commodities. Generally, the higher the crop yield or livestock productivity, the less risky business is. The risk rate in various less favourite conditions depends on the demands of each crop on growing conditions.

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