Global implications of national price policies on the wheat market – quantitative assessment of world market effects

Globální dopady národních cenových politik na trhu pšenice – kvantitativní hodnocení efektů světového trhu

J. Ziolkowska, K. Jechlitschka, D. Kirschke

Department of Agricultural Economics, Humboldt University of Berlin, Berlin, Germany

Abstract: Price policy instruments are common political measures to influence the supply and export of agricultural products. Different price policies have thus different influence on national agricultural markets. These policies can also influence the world market and third countries provided that the exporting country places a high share of its production on the world market. Using a Cobb-Douglas market model we quantitatively assess global implications of national price policies in the EU-27, Russia, and the US (as leading wheat exporting countries) on the world market price for wheat and on welfare, foreign exchange, and producer surplus in third countries. The results prove that increasing protectionist price policies in the EU-27, Russia, and the US would only slightly influence the welfare in third countries. This policy would however bring about a higher decrease of foreign exchange and producer surplus in third countries.

Key words: price policy, protectionism, WTO, wheat market

Abstrakt: Nástroje cenové politiky patří mezi běžné politické nástroje ovlivňující nabídku a export zemědělských produktů. Různé cenové politiky mají tudíž rozdílný dopad na národní zemědělské trhy. Tyto politiky mohou rovněž ovlivnit světový trh a trhy třetích zemí za předpokladu, že exportující země umístí výraznou část své produkce na světové trhy. Použili jsme Cobb-Douglasův tržní model ke kvantifikaci odhadů dopadů národních cenových politik EU-27, Ruska a USA (jako hlavních exportérů pšenice) na světové tržní ceny a na ekonomický efekt, zahraničně-obchodní směnu a produkční přebytky ve třetích zemích. Výsledky prokazují, že protekcionistická cenová politika EU-27, Ruska a USA ovlivní ekonomický efekt pro třetí země pouze mírně. Tato politika však s sebou nese stále větší pokles zahraniční obchodní směny a produkční přebytky ve třetích zemích.

Klíčová slova: cenová politika, protekcionismus, WTO, trh pšenice

INTRODUCTION AND RESEARCH QUESTION

Wheat is the most important cereal crop in the world. In 2007, the world wheat production amounted to 607 million tons (FAO 2008) and the biggest wheat exporters were the United States, Russia, the European Union (EU-27), Canada, and Argentina (OECD 2007). In the EU, internal prices of wheat and other cereals have been, on average, higher than the world market prices. In order to support national producers, the export of the European cereal crops is still subsidised. On the one hand, this protectionist policy supports the national production; on the other hand, it has international implications as it influences other countries. In terms of the current WTO negotiations and political debates on the necessity of trade liberalisation in agricultural markets, international implications caused by national policies in the leading wheat exporting countries pose relevant questions for political and scientific discussions. Also with regard to the current price policy in the wheat market in the US and its influence on the world market price of wheat, questions on the effects and implications of

national price policies of the leading wheat exporting countries are still open.

In the context of price policies, the wheat market has been analysed in several other studies. Miljkovic (2004) investigated the relations between the protection of low-income farmers and government spending patterns on the cereal market in the US. Similarly, Love and Rausser (1997) analysed the implications of flexible and fixed policy instruments on the wheat market in the US on economic welfare. Beak and Koo (2005) examined price dynamics in the US and Canadian hard red spring (HRS) and durum wheat markets while Sekhar (2003) investigated the price formation mechanism in the world wheat market and its implications for agricultural trade liberalization in India. Sarris (2000) measured the instability of the world market prices of cereals (thus also wheat) while Covaci and Sojková (2006) investigated wheat efficiency and productivity development in Slovakia. In his study, Jeníček (2007) analysed competitive products (e.g. grains) and non-competitive products from the perspective of world trade tendencies, international trade prices, and globalisation aspects. With regard to the policy evaluation, studies are known discussing the questions of price policies in agricultural markets in the OECD and the European Union in the globalisation process (Bielik et al. 2007). Apart from these studies, comparative investigations have been conducted for the United States and the European Union (Mohanty, Peterson 1999). Most research regarding the wheat market is focused on one country. However, no recent studies are known analysing the question on global implications of the national price policies explicitly.

This paper extends the research in this field and provides new insights into the analysis of the wheat market policies from the national and global perspective. In the paper, we quantitatively assess the impact of price policies in the EU-27, Russia, and the US on the wheat market in third countries. As opposed to the EU price policy in the wheat market, in the United States, no price instruments are implemented for supporting cereal producers since 2002. The national wheat prices and the world market price are, therefore, the same. In Russia, an export tax is used as a political instrument since 1992 (excluding the years 1997 and 2004) (OECD 2007).

With regard to the different price policies in the analysed leading wheat exporters, we investigate the implications for the rest of the world (third countries) and focus our research on changes of the world market price of wheat as well as on welfare, foreign exchange, and producer surplus in third countries. The results contribute, therefore, to the current discussions on trade liberalisation presenting effects for the world market price of wheat and for other world countries.

METHODOLOGY AND DATA

We analyse global implications of the national price policies in the wheat market by means of a Cobb-Douglas market model according to Kirschke and Jechlitschka (2002). For this model, we define the supply and demand functions including the following variables: world market price, national demand and supply prices, national demand and supply quantities, and demand and supply price elasticities for the respective countries. We adopt the world market price for wheat according to the notifications at the US Gulf Ports in 2006 and 2007 as an average (142.8 €/ton) and abstract simultaneously from the additional transport costs. We estimate the national supply and demand prices of wheat using the NPC Indicators (Nominal Protection Coefficient) developed by the OECD; both the Producer NPC (for estimation of supply prices) and the Consumer NPC (for estimation of demand prices). The producer NPC measures the ratio between the average price received by producers (at farm gate), including payments based on output, and the border price (at the farm gate). The consumer NPC measures the ratio between the domestic price paid by consumers (at the farm gate) and the border price (at the farm gate) (OECD n.d.). Thus, these indicators reflect a ratio between the national and border prices and allow estimating producers and consumers prices. This estimation is necessary as demand prices for wheat are not available in any official data base. According to the estimations, three different price policies were identified for the analysed countries on the wheat market: free trade in the US, export subsidy of 7% in the EU-27, and export tax of 10% in Russia.

We use the OECD data base to identify the national demand and supply quantities as well as the FAPRI (Food and Agricultural Policy Institute) and the USDA (United States Department of Agriculture) data base for specifying the demand and supply price elasticities (FAPRI 2007; USDA 2007). Following, we calibrate the model on the basis of the supply and demand constants for the defined supply and demand functions (formula 1 and 2).

$$q^s(p) = c \times p^{s(\varepsilon^s)} \quad (1)$$

$$q^d(p) = d \times p^{d(\varepsilon^d)} \quad (2)$$

where:
p^s – supply price
p^d – demand price
q^s – supply quantity
q^d – demand quantity
c – supply constant
d – demand constant
ε^s – supply price elasticity
ε^s – demand price elasticity.

In order to reflect the current situation on the world market of wheat, we integrate the third countries in the model as the "rest of the world" and assume a free trade situation in the world market of wheat. Due to the wide definition of the "rest of the world" comprising several world countries, no information on price elasticities is available. Therefore, we assume the demand and supply price elasticities on the same level as in the US. In order to analyse relations in the wheat market between the analysed exporting countries and the third countries, we adjust the national demand and supply prices and link them with the world market price.

The model variables in the basis scenario are presented in Figure 1.

In the basis scenario, we assume that the market is cleared (the market balance is zero) and abstract simultaneously from the stocking possibility.

The analysis is based on statistical data from the year 2005, in which all of the analysed countries have a positive trade balance; however, each of them conducts a different price policy on the wheat market. The trade surplus in the wheat market for the third

Russia

p^s	p^d	p^w		Supply	Demand	Surplus
128.50	128.50	142.80		47.70	38.40	9.30
			Calibration parameter	4.09	0.48	

Constants:		Price elasticities:	
c	d	of supply	of demand
11.7	79.6	0.29	–0.15

EU

p^s	p^d	p^w		Supply	Demand	Surplus
152.80	152.80	142.80		132.54	125.63	6.91
			Calibration parameter	4.52	0.22	

Constants:		Price elasticities:	
c	d	of supply	of demand
29.3	568.0	0.3	–0.3

US

p^s	p^d	p^w		Supply	Demand	Surplus
142.80	142.80	142.80		57.29	31.19	26.09
			Calibration parameter	5.68	0.07	

Constants:		Price elasticities:	
c	d	of supply	of demand
10.1	454.6	0.35	–0.54

Third countries

p^s	p^d	p^w		Supply	Demand	Surplus
142.80	142.80	142.80		382.90	425.20	–42.30
			Calibration parameter	5.68	0.07	

Constants:		Price elasticities:		Balance
c	d	of supply	of demand	0.0
67.4	6 196.5	0.35	–0.54	

Figure 1. Cobb-Douglas market model for Russia, the EU-27, the US, and third countries (basis scenario)

Source: Authors' calculation

countries is negative which means that we assume the third countries as wheat importers and do not distinguish Argentina and Canada or other big wheat exporting countries separately.

RESULTS AND DISCUSSION

Price policy implications on the world market price of wheat

The basis situation in the model reflects the current price intervention in the analysed countries: export subsidy in the EU-27, export taxation in Russia, and free trade in the US. As free trade is most recommendable from the welfare point of view, we investigate an equilibrium world market price for wheat under free trade. Thus, provided the liberalisation in the analysed wheat markets, the world market price for wheat would amount to 143.7 €/ton and would be only by 0.6% higher than the given world market price in 2006 and 2007. Thus, the liberalisation of the current price policies in the leading wheat exporters would have a very small effect on the world market price of wheat.

Apart from liberalisation, the national protectionist price policies can generally influence the world market price of wheat. Currently, in the wheat market in Russia, an export tax is implemented. A relevant question for the development of market tendencies could be the impact of the protectionist price policy (export subsidy) in Russia on the world market price for wheat. The current EU price policy is already a protectionist policy, thus, the analysis reflects changes of the world market price by different protection rates. In the US, free trade is implemented, thus, the analysis shows a hypothetic situation of an export subsidy.

The results show that increasing protection rates in the wheat market in Russia, the EU-27, and the US bring about a decrease of the world market prices (Figure 2).

The analysed situation of the export subsidy means that national prices are higher than the world market price which also stimulates the higher wheat supply. Consequently, world market prices are decreasing. The highest price decrease was found for the protectionist policy in the EU-27. At the protection rate of 50%, the world market price of wheat would decrease by 6.1% compared to the world market price of wheat of 143.7 €/t in the situation of trade liberalisation in the wheat market and would thus amount to 134.9 €/t. While implementing the protectionist price policy in the US, the world market price of wheat would decrease to 139.5 €/t at the protection rate of 50% and to 141.3 €/t provided the protectionist price policy in Russia.

Price policy implications on the third countries

Price policies in the leading wheat exporting countries influence the situation on the wheat market in third countries. In order to quantitatively assess the extent of this impact, we focus our investigations on the changes of welfare, foreign exchange and producer surplus in third countries by different protection rates in the EU-27, Russia, and the US.

The results show that increasing export subsidies on the wheat market in the EU-27 or implementing this price policy in Russia and in the US would slightly increase welfare in third countries. The highest

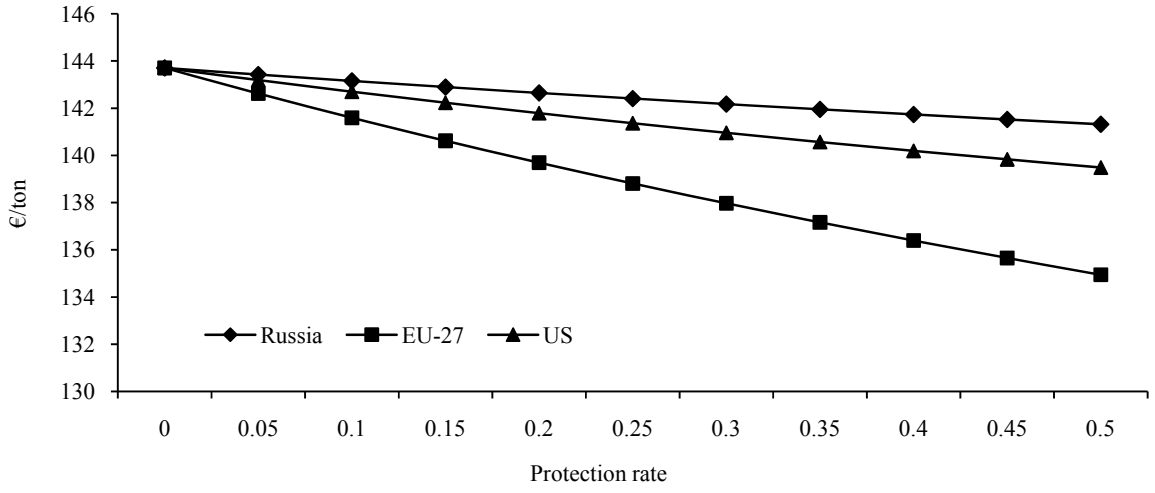

Figure 2. World market prices for wheat by different protection rates in Russia, the EU-27, and the US

Source: Authors' calculation

welfare increase in third countries of 450 million € is effected by the protectionist policy in the EU-27 at the protection rate of 50%. However, increasing export subsidies in the EU-27, Russia, and the US would bring about a considerable decrease of foreign exchange and producer surplus in third countries (Figures 3 and 4).

The highest losses of foreign exchange of 48% (2 753.8 million €) and producer surplus of 8% (3 326.8 million €) (compared to the free trade situation) would result as an effect of the protectionist price policy in the EU (by the protection rate of 50%). Implementing the same protectionist price policy in the US would result in a decrease of the foreign exchange in the third countries by 23.5% (1 347.1 million €) and producer surplus by approximately 4% (1 612.8 million €), compared to the free trade situation. The policy of export subsidy implemented in Russia would have a very small impact on foreign exchange and producer surplus in the third countries, which would decrease by 13% (766.5 million €) and 2% (914.4 million €), respectively.

CONCLUSIONS

Different price policy instruments in the leading wheat exporting countries influence the situation in

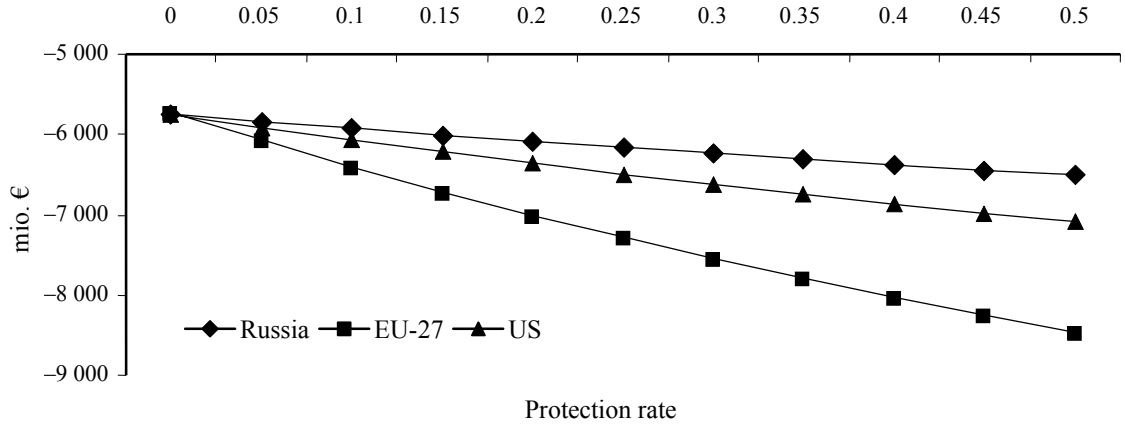

Figure 3. Foreign exchange in third countries by different protection rates in Russia, the EU-27, and the US

Source: Authors' calculation

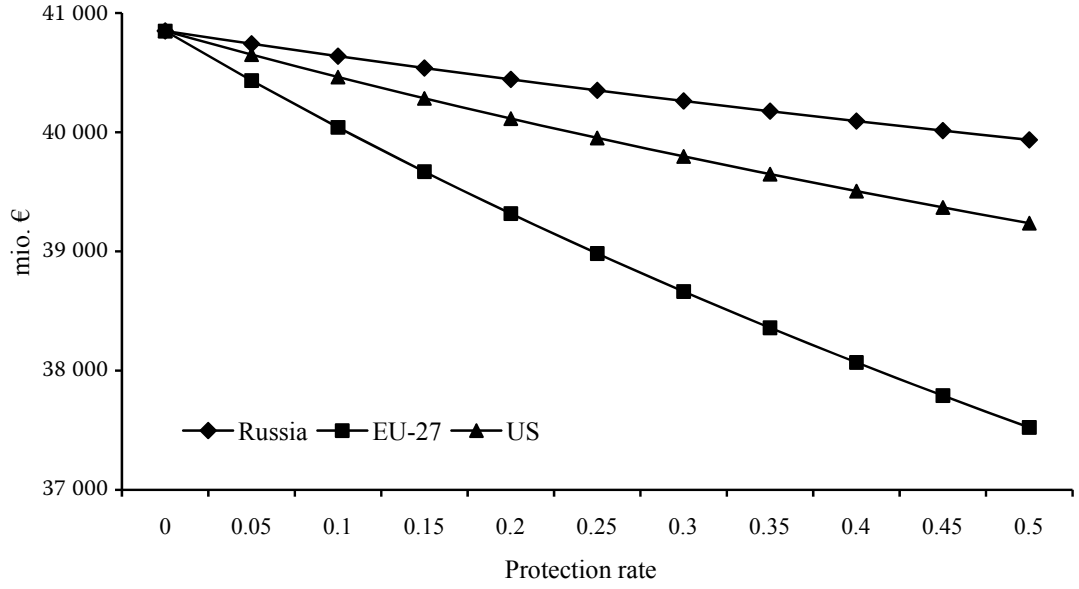

Figure 4. Producer surpluses in third countries by different protection rates in Russia, the EU-27, and the US

Source: Authors' calculation

the world market of wheat. The investigations prove that the liberalisation of the current price policies in the analysed leading wheat exporters would have no significant impact on the world market price of wheat. However, the lowest wheat price in the world market (134.9 €/t) would result from a protectionist policy in the EU-27 at the protection rate of 50% which denotes a decrease of 6.1 % compared to the equilibrium price of wheat (143.7 €/t) in the situation of trade liberalisation.

The protectionist price policy and increasing export subsidies in the EU-27, Russia, and the US would also have a rather small effect on welfare in third countries. The highest welfare increase in the third countries of 450 million € would be effected by the protectionist policy in the EU-27 at a protection rate of 50%. However, this price policy, especially in the EU-27, would bring about a high decrease of foreign exchange (2 753.8 million €) and producer surplus (3 326.8 million €) in third countries.

The investigations emphasise that national price policies in the analysed leading wheat exporters have global implications; protectionist policies in the leading wheat exporters are disadvantageous for producers but advantageous for consumers in third countries. Hereby, price policies in the European Union have most significant implications on the third countries, compared to the other analysed leading wheat exporters such as the US and Russia.

REFERENCES

Beak J., Koo W.W. (2005): Price Dynamics in the North American Wheat Market. In: American Agricultural Economics Association Annual Meeting, Providence, Rhode Island, July 24–27.

Bielik P., Juríček P., Kunová D. (2007): The comparison of agricultural support policies in the OECD and the EU countries from the perspective of economic globalization processes. Agricultural Economics – Czech, *53* (8): 339–348.

Covaci S., Sojková Z. (2006): Investigation of wheat efficiency and productivity development in Slovakia. Agricultural Economics – Czech, *52* (8): 368–378.

FAO (2008): Wheat production. Available at http://faostat.fao.org/site/567/DeskopDefault.aspx?20ID=567 [Quoted 12. 03. 2008].

FAPRI (2007): Elasticities. Available at http://www.fapri.iastate.edu/tools/elasticity.aspx [Quoted 01.12.2007].

Jeníček V. (2007): World commodity trade in the globalisation processes. Agricultural Economics – Czech, *53* (3): 101–110.

Kirschke D., Jechlitschka K. (2002): Angewandte Mikroökonomie und Wirtschaftspolitik mit Excel. Verlag Franz Vahlen, München.

Love H.A., Rausser G.C. (1997): Flexible public policy: the case of the United States wheat sector. Journal of Policy Modeling, *19* (2): 207–236.

Miljkovic D. (2004): Agricultural trade, commodity programs, and income protection in the United States. Journal of Policy Modeling, *26*: 41–46.

Mohanty S., Peterson E. (1999): Estimation of Demand for Wheat by Classes for the United States and the European Union. Journal paper J-1S053 of the Iowa Agriculture and Home Economics Experiment Station, Ames, Iowa.

OECD (2007): OECD-Statistics. Available at http://stats.oecd.org/wbos/default.aspx [Quoted 20. 11. 2007].

OECD (n.d.): Producer and Consumer Support Estimates – OECD Database 1986–2004. User's Guide.

Sarris A. (2000): Has world cereal market instability increased? Food Policy, *25*: 337–350.

Sekhar C.S.C. (2003): Price formation in world wheat markets – implications for policy. Journal of Policy Modeling, *25*: 85–106.

USDA (United States Department of Agriculture) (2007): Commodity and Food Elasticities. Available at http://www.ers.usda.gov/Data/Elasticities/ [Quoted 06. 12. 2007].

Arrived on 10th December 2008

Contact address:

Jadwiga Ziolkowska, Humboldt University of Berlin, Department of Agricultural Economics, Chair for Agricultural Policy, Philippstr. 13, Haus 12A, 10099 Berlin, Germany
e-mail: jadwiga.ziolkowska@agrar.hu-berlin.de