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The competitiveness of Belarusian agriculture

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The competitiveness of Belarusian agriculture

Executive Summary

In this paper we present preliminary results of an analysis of the competitiveness of agriculture in Belarus. Policy makers need information on competitiveness and the factors that influence it to design targeted and efficient policies in agriculture.

The competitiveness analysis in this paper is based on an established and relatively easy method for measuring competitiveness that provides insights into the distribution of competitiveness across a group of farms. By considering the distribution of competitiveness we avoid the pitfalls of working with average data. These pitfalls arise because averages ignore the fact that farms are very heterogeneous; i.e. that as a rule, very few farms actually resemble the average farm.

The results reveal that for cereals (50.3%) and milk (60.4%) relatively large proportions of the farms in Belarus produce competitively. Competitive farms produce 63% of the cereals and 73% of the milk in Belarus. Hence, competitive farms tend to produce more on average, than non-competitive farms. The results also reveal that many farms in Belarus are far from being competitive. Almost 50% (40%) of the farms that produce cereals (milk) in Belarus are not competitive; the value of their output is lower than the value of the inputs that they use. Hence, their production activity makes Belarus as a whole poorer, not richer.

An important question for policy makers in Belarus is: Why are so many non-competitive farms able to continue producing? In a market economy, land markets and the threat of bankruptcy are disciplining mechanisms that ensure that more competitive farms are able to grow at the expense of less competitive farms. Since these disciplining mechanisms are not permitted to function in Belarus, many farms are able to continue producing output that is of lower value than the inputs that went into it.

Massive subsidies are required to sustain non-competitive production in Belarus. In 2005, support to agriculture accounted for roughly 30% of all budgetary support to the economy, and roughly 10–12% of consolidated budget expenditure. Budget spending on agriculture amounted to 3–4% of GDP in each year between 2000 and 2005, by far one of the highest percentages in the world. In comparison, the EU spends roughly 0.65% of its GDP to support agriculture. The fact that many farms are not competitive despite the exceptional volume of agricultural subsidies in Belarus suggests that a serious reconsideration of the level and targeting of these subsidies is required. It must be possible to achieve more with less.

The fact that roughly 50 and 60% of the cereals and milk production, respectively, is competitive bodes well for the future of agriculture in Belarus. An important analytical challenge is to expand these results over more products and a longer time frame so that we can develop a better understanding of the factors that influence competitiveness. This in turn will help policy makers address the fundamental question of how to foster improvements in the competitiveness of Belarusian agriculture in the future.

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Contents

1. Introduction

Designing appropriate policies for a sector requires accurate information on the competitiveness of the firms in that sector, and on the factors that influence competitiveness. However, competitiveness is a notoriously slippery concept that is sometimes misunderstood and often difficult to measure.

In this paper we present preliminary results of an analysis of the competitiveness of agriculture in Belarus. These results are based on an established and relatively easy method for measuring competitiveness that we have extended to provide insights into the distribution of competitiveness across a group of farms. By considering the distribution of competitiveness we avoid the pitfalls of working with average data. These pitfalls arise because averages ignore the fact that farms are very heterogeneous; i.e. that as a rule, very few farms actually resemble the average farm.

The results presented below are preliminary in the sense that they only consider two outputs; cereals and milk. They can, with appropriate data, be refined to consider individual grains and oilseeds, and other livestock products. As outlined below, future work will focus on calculating competitiveness distributions for more individual products, on tracing the development of agricultural competitiveness over time, and on analysing the determinants of agricultural competitiveness using econometric techniques.

The rest of this paper is structured as follows. In section 2 we discuss different indicators of competitiveness and present the so-called social cost-benefit (SCB) indicator that we employ. We present and discuss our empirical results in section 3, and in section 4 we outline possible extensions of our analysis and discuss the sorts of insights into the competitiveness of agriculture in Belarus, and appropriate policies to increase competitiveness, that these extensions might generate.

2. Indicators of agricultural competitiveness

Numerous indicators of competitiveness have been developed and applied by economists. One approach, going back to seminal work by Liesner (1958) and Balassa (1965) is based on the idea that competitiveness will be 'revealed' by a country's actual trade performance compared with other countries, regions or the world. A variety of 'Revealed Comparative Advantage' (RCA) indices have been developed based on this idea. RCA indices are usually justified on the grounds that most policy-induced distortions are on the import side, and that export performance will therefore provide a genuine reflection of competitiveness. However, this is not the case in Belarus, where there are significant distortions on the export side as well. Furthermore, Ballance et al. (1987) demonstrate that there is a high degree of inconsistency among alternative RCA indices, and that inferences are correspondingly sensitive to the particular index chosen.

A second approach to measuring competitiveness is causal and attempts to measure factors that influence competitiveness, such as the institutional environment, infrastructure, macroeconomic stability and cost structures. At an aggregated level, this has led to indices such as the 'Growth Competitiveness Indicator' (GCI) developed by Sachs and McArthur, and the 'Business Competitiveness Indicator' (BCI) developed by Porter, both of which can be found in the World Economic Forum's Global Competitiveness Report (e.g. WEF, 2006). These 'broad brush' measures are interesting and informative, but they can be rather subjective. Furthermore, our focus here is on specific agricultural products and not the economy as a whole.

For these reasons, we employ the Social Cost Benefit ratio (SCB) analysis to cast light on the competitiveness of Belarusian agriculture. The SCB is one of many indicators that can be calculated using the Policy Analysis Matrix (PAM) framework developed by Monke and Pearson (1989). The PAM combines two accounting identities, one defining profitability as the difference between revenues and costs, and the other measuring the effects of divergences (distorting policies and market failures) as the difference between observed private values and social values that would prevail if the divergences were removed. The structure of the PAM is presented in Table 1, and detailed definitions of the terms in it as well as information on the calculation of the SCB presented below are provided in the Appendix.

The SCB (Masters and Winter-Nelson, 1995) compares the sum of the tradable and domestic input costs incurred to produce a unit of output with the price of this output, with all costs and prices measured in social terms. Hence, the SCB equals the ratio of (F + G) to E in Table 1. The SCB is always greater than 0. An SCB less than 1 indicates that total input costs are less than revenue and that production is competitive. An SCB greater than 1 indicates that total input costs are greater than revenue and that production is therefore not competitive.

Table 1: The Policy Analysis Matrix (PAM)

	Revenue	Costs		Profits
		Tradable inputs	Domestic factors	
Accounting in Private (Financial) Prices	$A = P_i^p$	$B = \sum_{j=1}^{k} a_{ij} P_j^p$	$C = \sum_{j=k+1}^{n} a_{ij} V_j^p$	$D = A - B - C$
Accounting in Social (Economic) Prices	$E = P_i^s$	$F = \sum_{j=1}^{k} a_{ij} P_j^s$	$G = \sum_{j=k+1}^{n} a_{ij} V_j^s$	$H = E - F - G$
Effects of Policy and Market Failures	$I = A - E$	$J = B - F$	$K = C - G$	$L = D - H = I - J - K$

Source: Monke and Pearson (1989).

By considering social as opposed to private costs, the SCB avoids highlights a fallacy that businessmen, policy makers (and some scientists) are sometimes prone into – the fallacy of assuming that any business that turns a private profit is necessarily competitive. A private profit that occurs when A is greater than (B + C) in Table 1 may be partly or completely due to input subsidies (that artificially lower B + C) or output price supports (that artificially increase A). If this is the case, some or all of the private profit (D = A – B – C) is actually due to subsidies or price supports that are being paid for elsewhere in the economy. In the extreme case, all of the private profit is due to subsidies and price supports, and the production in question is actually making the country as a whole poorer and not richer. Only by considering, as does the SCB, the ratio of (F + G) to E is it possible to determine whether a production activity is truly competitive and generating a net social gain for the country

Despite this vital conceptual advantage, a weakness of SCB analysis is that it is usually based on average or 'typical' data for a sector or industry. The conclusions that can be drawn on the basis of average or typical indicators become progressively weaker and potentially more misleading as the heterogeneity of the underlying population grows. Evidence from numerous studies that apply empirical efficiency analysis techniques (data envelopment analysis – DEA; stochastic frontier analysis – SFA) to farm level data in FSU countries points to a very significant heterogeneity, with many farms operating at a great distance from the frontier defined by the best-practice farms. For example, the results of Lissitsa and Odening's (2005) DEA analysis indicate that the distribution of efficiency among large farms in Ukraine in 1999 was bimodal, with one peak in the 30–40% efficiency range, a mean efficiency of 46%, and a second, smaller peak of "star performers" operating at 90–100% efficiency relative to the best practice frontier. This evidence corroborates the observations of farm management specialists who have practical experience with conditions in Ukrainian farming (e.g. Lischka, 2005). The results for Belarus in Csaki et al. (2000) also support the finding of significant heterogeneity among farms.

For this reason, and as outlined in the Appendix, we use farm-level data to calculate SCB distributions for cereals and milk in Belarus. This procedure makes it possible to determine for each product what proportions of the farms in Belarus are characterised by SCBs between 0 and 1 (competitive) as opposed to SCBs that are greater than 1 (not competitive), and what proportions of total production of these products in Belarus occurs on competitive as opposed to non-competitive farms.

The calculation of SCB distributions is a purely descriptive technique, but its use here is motivated by the hypothesis that Belarus has the potential to be internationally competitive in many important crop and livestock products if barriers to competitiveness are removed so that many more farms are able to operate at the levels of efficiency that currently only the very best attain. Rather than focussing on averages, analysts and policy makers need to know which farms are competitive and which farms are not, what causes differences in competitiveness, and what can policy do (or stop doing) to improve the situation.

The data employed is a sample of the Belarus-wide farm-level accounting data from 2005. 1740 farms that produce milk and 1736 farms that produce cereals are included in the sample. In Belarus, all corporate farms are required to file standardised reports on their input use, production and sales each year. This is in contrast to most OECD countries, for example, where much more detailed data are collected from representative samples of farms. Data quality is an important issue in analyses of this nature. Farm managers might distort their reports if they believe that this might influence their tax burdens or eligibility for subsidies. There is no information available on such distortions in the data employed here. But clearly Belarus would be well-advised to implement a modern collection system for farm accountancy data such as that employed in the EU. This would provide policy makers with more detailed, accurate and timely data.

Details on the assumptions made to determine the social prices of inputs and outputs in Belarusian agriculture are provided in the Appendix. Some of these assumptions are clearly rough, and ongoing work is dedicated to refining them. Some assumptions (e.g. the valuation of land) probably tend lead to overestimation of social costs and thus underestimation of competitiveness. On the other hand, we have not yet been able to quantify the impact of budget expenditure on private vs. social costs. We correct most input costs simply by looking at tariff wedges, but some inputs such as capital and energy use are heavily subsidised via budget transfers. This will lead to underestimation of some social costs and thus overestimation of competitiveness.

In addition, some conditions have changed in Belarusian agriculture since 2005. However, most of the factors that affect competitiveness have not. Clearly, the competitiveness of grains and milk production will have benefited from higher world market prices in 2007/08, but there prices are falling again and cannot be expected to remain at such high levels beyond the short term. Furthermore, increasing agricultural output prices (E in the SCB) were accompanied and at least to some extent balanced by increasing prices for key inputs such as fuel, feed and fertiliser (F + G in the SCB). Hence, we are confident that the main results presented below, and their interpretation, remain valid.

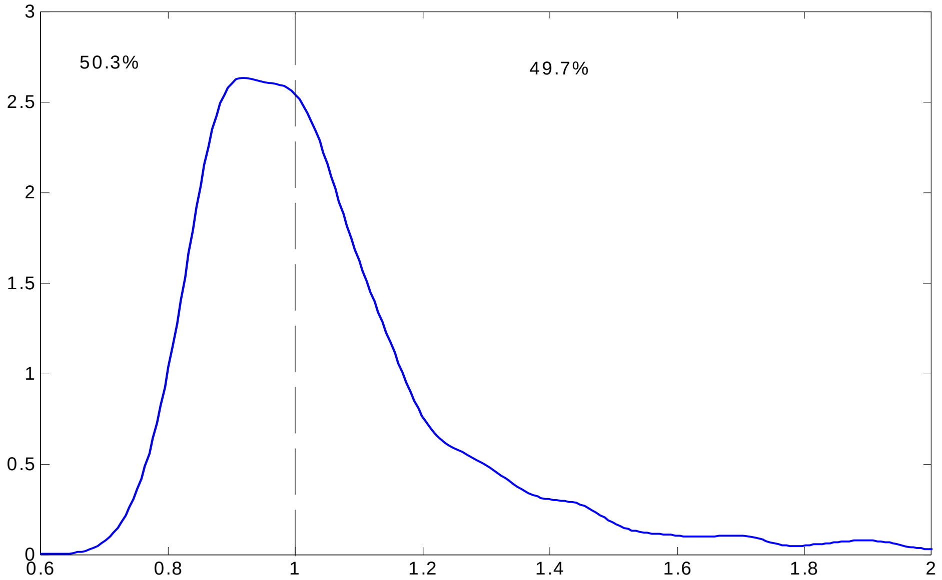
A limitation of the DRC analysis employed here is that it is based exclusively on the large corporate farms in Belarus, and does not consider the individual farms (household plots or peasant farms). This is not an important omission for the major cereals and oilseeds, which are primarily produced on large corporate farms. However, household plots are responsible for a much larger share of the potato, fruit and vegetable, and livestock production in Belarus. Unfortunately, detailed data on methods and costs of production for household plots are not available. This may not be such a handicap for competitiveness analysis, however, as it is arguably the large corporate farms that will determine the international competitiveness of Belarusian agriculture, while the household plots remain primarily subsistence-oriented.

3. Results: Agricultural competitiveness in Belarus

Results of the SCB analysis cereals and milk in 2005 are presented in Figures 1 and 2, respectively, and key results are summarised in Table 2. The distributions reveal that for cereals (50.3%) and milk (60.4%), relatively large proportions of the farms in Belarus produce competitively. For both products, the competitive farms account for a disproportionately large share of the total production by corporate farms; Table 2 shows that competitive farms produce 63% of the cereals and 73% of the milk in Belarus. Hence, competitive farms tend to produce more on average, than non-competitive farms.

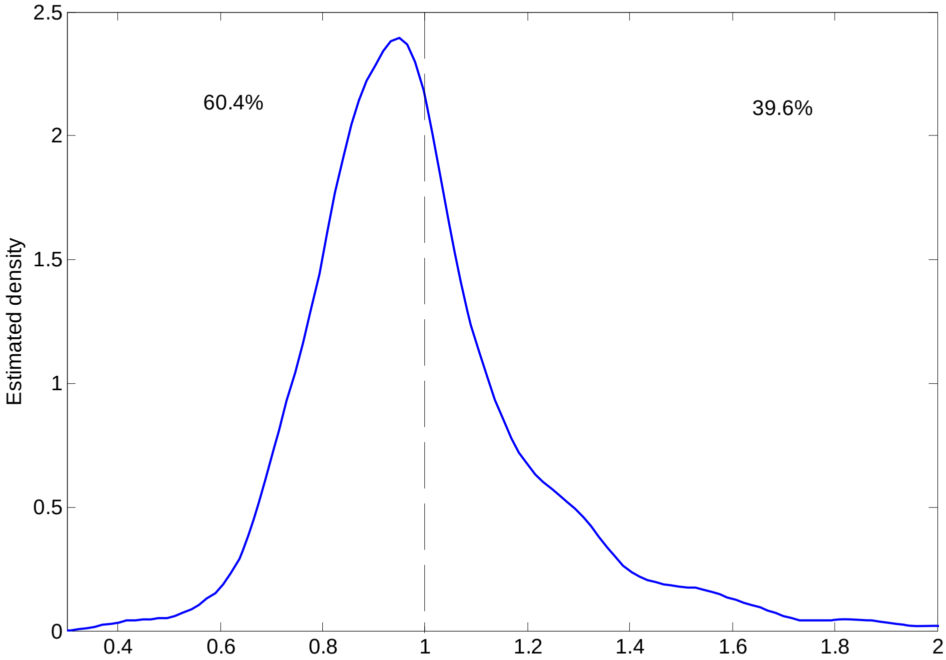
The distributions in Figures 1 and 2 reveal that the great majority of competitive farms have SCBs of 0.8 and greater. In other words, their costs per unit of output account for 80% and more of revenue per unit output. Many farms are clearly operating very near the breakeven point in social cost-benefit terms, and small changes in productivity or prices could shift them from one side of the competitiveness threshold (SCB = 1) to the other. The distributions also show that many farms in Belarus are far from being competitive producers of milk and cereals. Almost 50% of the farms that produce cereals in Belarus are not competitive; the value of their output is lower than the value of the inputs that they use, and their production activity makes Belarus as a whole poorer, not richer. The corresponding share of milk producing farms is just under 40%.

Figure 1: The social cost benefit distribution for cereal producing farms in Belarus, 2005



Source: Own calculations.

Figure 2: The social cost benefit distribution for farms producing milk in Belarus, 2005



Source: Own calculations.

Table 2: Summary of SCB results for cereal and milk production in Belarus, 2005

	0<SCB<1 (competitive)	SCB>1 (not competitive)
Cereals		
Average SCB	*0.98*	
Share of the group in total production volume	63.0%	37.0%
Share of the group in total number of farms	50.3%	49.7%
Milk		
Average SCB	*0.91*	
Share of the group in total production volume	73.1%	26.9%
Share of the group in total number of farms	60.4%	39.6%

Source: Own calculations. Aggregated SCB scores are calculated as in Nivievskyi and von Cramon-Taubadel (2008).

An important question for policy makers in Belarus is: Why are so many non-competitive farms able to continue producing? In a market economy, such farms would not be able to compete on the market for farm land. Other, more competitive farms would be able to bid more to purchase or rent land, and would therefore be able to grow at the expense of less competitive farms. In a market economy, non-competitive farms would also have a more difficult time borrowing money to make necessary investments and to finance crops, etc. If they were unable to repay loans from banks or input suppliers, they would be forced to sell assets such as land or machinery; at the limit, failing improvements in competitiveness, they would eventually be forced into bankruptcy. Hence, land markets and the threat of bankruptcy are disciplining mechanisms in a market economy that tend to 'push' the SCB distribution to the left over time. They do this by ensuring that more competitive farms are able to grow at the expense of less competitive farms, or by allowing new, potentially more competitive farms to be established using assets freed by less competitive farms that have been forced to exit the sector.

Since these disciplining mechanisms are not permitted to function in Belarus, the SCB distribution does not shift to the left as fast as it could, and many farms are able to continue producing output that is of lower value than the inputs that went into it. It may be felt that permitting these farms to continue operating is more socially desirable than what some might consider a 'Darwinistic' survival-of-the-fittest in agriculture. However, it is important to remember that the social losses generated by non-competitive farms must be bourn somewhere else in the economy. In the case of Belarus, massive subsidies are required to sustain non-competitive production. In 2005 the World Bank estimated that support to agriculture accounted for roughly 30% of all budgetary support to the economy as a whole, and roughly 10–12% of consolidated budget expenditure. Budget spending on agriculture amounted to 3–4% of GDP in each year between 2000 and 2005, by far one of the highest percentages in the world and a significant burden on the rest of the economy. In comparison, the EU spends roughly 0.65% of its GDP to support agriculture.

Returning to the results in Figures 1 and 2, note the contrast between the distributions presented in these figures and the average SCBs that would result from the use of aggregated data (in Table 2). For example, it can be shown that the average litre of milk in Belarus was produced at a SCB of 0.91 in 2005. This average result, taken at face value, would suggest that there are no problems with the competitiveness of milk production in Belarus, obscuring the fact that almost 40% of all milk producing farms, and 27% of all the milk produced in the country, are not competitive. This highlights the pitfalls of basing policy on averages, and the main advantage of the disaggregated SCB distribution analysis presented here.

4. Outlook on future work

Future work will focus on refining the analysis presented above by carefully checking and where necessary improving the assumptions made to determine social input and output prices. Furthermore, subject to data availability we will extend the analysis above to more disaggregated products (individual grains and oilseeds, a larger set of livestock products) and more years. Important questions that can be addressed on the basis of this extended analysis include:

- Are farms that are more competitive at producing one product (e.g. wheat) also more competitive at producing others (e.g. barley), or does competitiveness in one product tend to come at the expense of competitiveness in others?
- Are there products for which Belarus is especially competitive or non-competitive? Detailed analysis of Ukrainian data, for example, demonstrates conclusively that only a negligible percentage of the sugar beet production in Ukraine is competitive, suggesting that from an economic perspective this production should be reduced quite drastically;
- Is there any evidence that farms that receive subsidies tend to become more competitive over time, or to become competitive more rapidly than farms that receive less or no subsidies? One argument that is often made in favour of subsidies (often referred to as the 'infant-industry' argument) is that they help less competitive farms to make the investments required to make them more competitive. If, however, the evidence shows that subsidies merely permit farms to continue non-competitive production by relieving them of the necessity to become more competitive, then subsidy programs should clearly be re-thought.

More detailed analysis – for example using information on the location of individual farms in the dataset, their degrees of specialisation, factor intensities, the amounts and types of state support that they receive, the qualification of their managers, etc. – will be used to determine what factors influence whether a farm is competitive. Nivievskyi, von Cramon-Taubadel and Bruemmer (2008) analyze factors that affect the competitiveness and efficiency of milk producing farms in Ukraine using spatial econometric techniques. Their results indicate that competitive farms tend to be found in geographical clusters. This suggests that spill-over takes place between neighbouring farms; in other words that farmers 'look over the fence' at their neighbours and learn from them, so that competitiveness is, to a certain degree, 'contagious'. Their results also show that proximity to milk processing plants that have invested has a positive impact on a farm's competitiveness. This makes sense, because a milk processing plant that has invested in modern equipment depends on a reliable supply of high-quality milk to make the high-end products that are possible with this equipment. Hence, this processing plant will be more willing to help local farms become reliable suppliers of high-quality milk, for example by helping them finance the purchase of better milking and milk cooling equipment.

The fact that roughly 50 and 60% of the cereals and milk production, respectively, is competitive bodes well for the future of agriculture in Belarus. However, the fact that many farms remain non-competitive despite the exceptional volume of agricultural subsidies in Belarus suggests that a serious reconsideration of the level and targeting of these subsidies is required. It must be possible to achieve more with less. Further detailed analysis can cast more light on this issue. Hence, an important analytical challenge for the future is to expand these results over more products and a longer time frame so that we can develop a better understanding of the factors that influence competitiveness. This in turn will help policy makers address the fundamental question of how to foster improvements in the competitiveness of Belarusian agriculture in the future.

References

Balassa, B. (1965). Trade Liberalisation and 'Revealed' Comparative Advantage. The Manchester School, Vol. 33: 99–123.

Ballance, R., H. Forstner and T. Murray (1987). Consistency Tests of Alternative Measures of Comparative Advantage. Review of Economics and Statistics, Vol. 69: 157–161.

Csaki, C., Lerman, Z., and Sotnikov, S. (2000). Production and Productivity: Collective and Individual Sector Compared. In Csacki, C., Lerman, Z., and Sotnikov, S. (2000). Farm Sector Restructuring in Belarus: progress and constraints. World Bank technical paper No. 475. Europe and Central Asia environmentally and socially sustainable development series.

Freinkman, L., Bakanova, M., Polyakov, E., Jedrzejczak, G. Lewis, S., Boyl., G., Shamsiev, B., Mirochnichenko., Y. (2005): Belarus: Window of opportunity to enhance competitiveness and sustain economic growth. World Bank Report No. 32346-BY

Liesner, H.H. (1958). The European Common Market and British Industry. Economic Journal, Vol. 68: 302–16.

Lischka, G. (2004). Farm Management Challenges in Ukrainian Agriculture. In: von Cramon-Taubadel, S., S. Demyanenko & A. Kuhn (eds.): Ukrainian Agriculture – Crisis and Recovery. Shaker, Aachen.

Lissitsa, A., and M. Odening (2005). Efficiency and total factor productivity in Ukrainian agriculture in transition. Agricultural Economics, Vol. 32(3): 311–325.

Masters, W.A., and A. Winter-Nelson. (1995). Measuring the Comparative Advantage of Agricultural Activities: Domestic Resource Costs and the Social Cost-Benefit Ratio. American Journal of Agricultural Economics, Vol. 77: 243–50.

Monke, E. A. and S. R. Pearson (1989). The Policy Analysis Matrix for Agricultural Development. http://www.stanford.edu/group/FRI/indonesia/documents/pambook/Output/pamtoc2.html.

Nivievskyi, O., S. von Cramon-Taubadel and B. Bruemmer (2008). Subsidies, Efficiency and Technological Change of Ukrainian Dairy Farms: Spatial Dependence in the Components of Productivity Growth. Presented at the Vth North American Productivity Workshop 25–27 June 2008, New-York – USA.

Nivievskyi, O. and von Cramon Taubadel, S., (2008): A Note on Measuring and Comparing the Competitiveness of Heterogeneous Production Systems in Agriculture. Presented at the IAMO Forum 2008 'Agri-Food Business: Global Challenges – Innovative Solutions' 25–27 June 2008, Halle (Saale) – Germany.

OECD (Organisation for Economic Cooperation and Development) (2008). Detailed on-line PSE Tables for Russia. Accessed on the 9th of September, 2008.

Pavel, F., and A. Chukhai (2006). Ukrainian Gas Imports: Towards secure and economically reasonable transactions. IER Policy Paper No. V12, Kiev. http://ier.org.ua/papers_en/v12_en.pdf.

Pavel, F., and I. Poltavets (2006). EU Energy Sector Reforms: A benchmark for Ukraine! IER Policy Paper No V7, Kiev. http://ier.org.ua/papers_en/v7_en.pdf.

Pavel, F., and I. Poltavets (2005). Ukraine's Gasoline market: Another "unexpected crisis"? IER. Analytical Paper No A 02/2005. Kyiv. www.ier.kiev.ua.

Rosenblatt, M. (1956). Remarks on Some Nonparametric Estimates of a Density Function. Annals of Mathematical Statistics, Vol. 27: 643–669.

von Cramon-Taubadel, S., E. Elsner von der Malsburg, V. Movchan and O. Nivyevskiy (2007). Poverty Reduction Through Reducing Distortions to Agricultural Incentives: Ukraine Case Study. World Bank Agricultural Distortions Working Paper 06, Washington D.C. http://siteresources.worldbank.org/INTTRADERESEARCH/Resources/544824–1146153362267/Ukraine_0807.pdf

von Cramon Taubadel, S., Nivievskyi, O., and Grueninger, M. (2008): Ukraine: Agricultural Competitiveness. World Bank Policy Note. http://siteresources.worldbank.org/INTUKRAINE/Resources/Ukraine_Agricultural_Competitiveness_June2008.pdf.

World Economic Forum (WEF) (2006). Global Competitiveness Report 2006–2007. http://www.weforum.org/en/initiatives/gcp/Global%20Competitiveness%20Report/index.htm

Appendix: The social cost benefit (SCB) method and the calculation of SCB distributions

The SCB method

To measure the competitiveness of Belarusian agriculture, social cost benefit ratios (SCBs) are calculated for cereals and milk. The SCB is one of many indicators that can be calculated using the Policy Analysis Matrix (PAM) framework developed by Monke and Pearson (1989). The PAM combines two accounting identities, one defining profitability as the difference between revenues and costs and the other measuring the effects of divergences (distorting policies and market failures) as the difference between observed private values and social values that would exist if the divergences were removed. The structure of the PAM is presented in Table A1 (which is identical to Table 1 above).

Table A1: The Policy Analysis Matrix (PAM)

	Revenue	Costs		Profits
		Tradable inputs	Domestic factors	
Accounting in Private (Financial) Prices	$A = P_i^p$	$B = \sum_{j=1}^{k} a_{ij} P_j^p$	$C = \sum_{j=k+1}^{n} a_{ij} V_j^p$	$D = A - B - C$
Accounting in Social (Economic) Prices	$E = P_i^s$	$F = \sum_{j=1}^{k} a_{ij} P_j^s$	$G = \sum_{j=k+1}^{n} a_{ij} V_j^s$	$H = E - F - G$
Effects of Policy and Market Failures	$I = A - E$	$J = B - F$	$K = C - G$	$L = D - H = I - J - K$

Notes:
the subscript *i* refers to outputs and the subscript *j* to inputs;
a_{ij} for (j = *1* to k) are technical coefficients for traded inputs in the production of i;
a_{ij} for (j = $k+1$ to n) are technical coefficients for domestic inputs in the production of i;
P_i^* is the price of output *i*, evaluated privately (* = *p*) or socially (* = *s*);
P_j^* is the price of traded input *j*, evaluated privately (* = *p*) or socially (* = *s*);
V_j^* is the price of domestic input *j*, evaluated privately (* = *p*) or socially (* = *s*);
I measures output transfers;
J measures input transfers;
K measures factor transfers;
D (= *A-B-C*) measures net private profits;
H (= *E-F-G*) measures net social profits; and
L measures net transfers.
Source: Monke and Pearson (1989).

The social cost benefit ratio (SCB: Masters and Winter-Nelson, 1995) equals the ratio of the sum of tradable and domestic input costs to the price of the good in question, or (*F* + *G*) divided by *E* in Table A1 above. The SCB is always greater than 0, and a SCB less than (greater than) 1 indicates that total input costs are less than (greater than) revenue and that production is (is not) competitive.

Calculating SCB distributions

As discussed in the paper, there is evidence that the farms in Belarus are highly heterogeneous. Calculating average or typical SCBs would therefore be of dubious value. For this reason, detailed farm level data is used to calculated SCB distributions for major crop and livestock products. For each farm in the dataset employed (see below), SCBs are calculated for the cereals and milk it produces. For each product, an estimate of the resulting univariate density function of SCBs across all relevant farms is calculated using the kernel-based estimate proposed by Rosenblatt (1956).

Data and assumptions

The data employed is a sample from the Belarus-wide farm-level accounting data from 2005. For each observation in the dataset, information on total and disaggregated input costs and revenues for milk and cereals is available. Table A2 provides an overview of the resulting data structure and numbers of observations, and Table A3 provides information on average input cost shares for crop and livestock production in the sample of farms employed in the SCB analysis.

Table A2: Data description

	Cereals	Milk
Number of farms producing	1736	1740
Inputs used		
Seeds	+	-
Fertilizers	+	-
Energy (Gas, Electricity, Fuel)	+	+
Administrative costs	+	+
Labour	+	+
Other inputs (manure, litter etc)	+	+
Land	+	-
Capital	+	+
Fodder	-	+

Source: Own presentation.

Conversion from private to social prices and costs is based on a variety of assumptions and sources of data:

– Factors for converting revenue from the sale of agricultural output from a private to a social price basis are calculated using information from the World Bank report "Belarus: Window of opportunity to enhance competitiveness and sustain economic growth" undertaken by Freinkman et al. (2005). In this report (p.190) it is said that farm prices in Belarus are depressed below international levels. For example, in 2003 the farmers on average received only 62% of the export price for wheat, 49% for rye, and 89% for milk. However, the report does not provide this information for 2005. To infer a conversion factor for 2005, we use the development of the ratio of farm-gate to world reference (border prices corrected for marketing costs) wheat prices for Russia in 2003–2005, contained in the OECD's PSE tables (OECD, 2008). In Russia this ratio has increased by only 2% from 2003 to 2005 (from 86% to 88%). We assume this increase (from 89% to 91%) in the farm-gate-to-world price ratio for milk, and a somewhat more rapid development (from 62% to 70%) for cereals in Belarus.

Table A3: Cost shares for inputs in crop and livestock production in Ukraine, 2005 (%)

Input	Cereals	Milk
Labour	12.7	23.4
Fodder	--	45.2
Depreciation	19.1	9.7
Fertilizers	26.3	--
Energy	11.7	4.4
Seeds	11.4	--
Other costs (Outside services employed, administrative costs etc)	18.8	17.4

Source: Own calculations.

– Social costs for seeds, fertilisers and fodder are based on private costs corrected for the impact of tariffs. Tariffs are taken from official tariff schedules. For seeds and fodder the conversion factor of 0.95 is used, and 0.9 is used for fertilisers.

– Capital input is measured only as depreciation (i.e. the reduction in the value of assets arising from wear and tear). A conversion factor for capital costs is calculated as the product of a conversion factor for capital assets. The factor for capital assets value is assumed to equal 0.85 based on information about tariffs to agricultural machinery and equipment imports.

– Private Energy costs are corrected for distortions in gas, fuel, and electricity pricing in Belarus. Using the information provided in Freinkman et al. (2005), about the gas and fuel markets in Belarus and comparing with the literature on energy pricing in Ukraine (e.g. Pavel and Chukhai, 2006; Pavel and Poltavets, 2006; Pavel and Poltavets, 2005) we conclude distortions and energy market conditions in the two countries were similar in 2005. Based on this information, we assume a conversion factor of 1.09 (taken from similar study for Ukraine – see von Cramon-Taubadel et al., 2008) for energy costs in 2005.

- Social valuation of land is estimated as in Monke and Pearson (1989) by comparing profits before land costs for as many crops as possible on each farm, and setting farm-specific social land costs equal to the highest profits before land costs observed. This assumption is biased in that it implicitly assumes that 100% of a farm's land could be allocated to the production of the most profitable crop in any given year, which ignores crop rotation restrictions.
- Social costs are assumed to equal private costs for labour and other inputs. Wages have been increasing with economic growth since 2000 and will likely continue to increase in the future. While we are aware of no major distortions on labour markets in Belarus, market wages could be subject to some distortions. For example, if protection of labour-intensive products does inflate market wage rates in Belarus, the assumed equality of social and private labour costs will bias the magnitude of the calculated SCBs upward and correspondingly reduce the shares of competitive farms and production, especially for labour-intensive agricultural products.