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INTERNATIONAL AGRICULTURAL TRADE RESEARCH CONSORTIUM

Economic Transition in Central and East Europe,
and the Former Soviet Union:
Implications for International Agricultural Trade

Von Witzke, H. and S. Tangermann, eds.

1998

ECONOMIC REFORM IN THE NEWLY INDEPENDENT STATES
OF THE FORMER USSR:
EFFECTS ON AGRICULTURAL PRODUCTION AND TRADE TO 2005

David J. Sedik, William M. Liefert, and Peter Liapis[1]
U.S. Department of Agriculture, Washington, D.C., USA

Introduction

During the 1980s, the Soviet Union was the world's top importer of grain, with annual imports averaging 36 million tons. Since the economic reforms that began in the Newly Independent States (NIS) of the former USSR in 1992 have intended to transform the economies from centrally planned to market-oriented systems, they could substantially change the countries' production, consumption, and trade of agricultural goods, with consequences for world agricultural markets. In the early 1990s, a number of Western studies attempted to forecast these changes.[2]

This paper has two purposes. The first is to compare these studies' commodity forecasts, as well as assumptions about reform, with the actual changes to date in NIS agriculture, given that about 5 years have elapsed since the NIS countries began serious reform. The second is to present our forecasts as to how agricultural production, consumption, and trade in the NIS region could change from the present time to 2005.

Given the difficulty in the early 1990s of predicting what specific reform program the USSR (or its successor states) would adopt, the objective of these earlier studies was not necessarily to forecast what would actually happen to the commodity structure of NIS agriculture 5 to 10 years after „reform" began. Rather, the purpose was to forecast changes based on the general premise (fleshed out with specific assumptions) that fairly ambitious reform was pursued. We examine these studies less to evaluate the accuracy or quality of their specific predictions, and more so to compare the assumptions they make about the nature and effects of reform with the NIS' actual reform experience. This helps us to formulate our own reform assumptions for forecasting from the present to 2005.

The most important prediction of these earlier studies is that major market-oriented

[2] See Liefert, Koopman, and Cook (1993), Koopman (1991), and Tyers (1994). Though they do not use forecasting models in their analysis, Johnson (1993) and Tangermann (1993) make some general predictions as to how reform could affect NIS agriculture. Although Liefert et al. was published in 1993, it was written in 1991.

reform would not only end large grain imports, but also transform the NIS region into a big net exporter of grain. Two of the studies forecast post-reform net grain exports for the region in excess of 30 million tons. One reason for the exports, concerning the demand side of the NIS grain economy, is that reform would contract the livestock sector, mainly because its relatively high production and transaction costs make it uncompetitive vis-a-vis the world market. The sector's downsizing would lower NIS demand for feed grain, freeing output for export. On the supply side, the studies assumed that reform would raise productivity, and thereby output, within the grain economy.

Although the reform changes to date have in fact substantially reduced NIS grain imports, they have not yet turned the region into a grain exporter. In 1996, the NIS region was a modest net importer of grain (3-4 million tons). The studies correctly predict a drop in livestock production, and therefore a decline in NIS demand for feed grain (livestock production and herds have actually fallen more than the studies projected). However, grain output in the region has decreased substantially. In both 1995 and 1996, total NIS grain production (cleanweight) was about 120 million tons, only two-thirds of Soviet average annual output during 1987-1991. Production has dropped mainly because yields have decreased, rather than increased as the studies assumed. Yields have declined largely because reform has severely worsened agricultural producers' terms of trade (a development not anticipated by these studies), thereby reducing input use.

The main assumptions behind our forecasts concern growth of real GDP (which affects consumer income and thereby demand) and agricultural productivity. In both cases we assume modest growth. We assume productivity growth will not be high because of poor prospects for the institutional reform of NIS agriculture, specifically involving land markets and ownership rights, necessary to improve incentives to use resources more productively.

We predict that by 2005 NIS net grain imports will fall almost to zero, and that the region could become a small net exporter of coarse grains (though not of corn). We also forecast that NIS imports of meat, which from 1991 to 1996 rose from about 1 to over 2 million tons, will remain high, at somewhat less than 2 million tons. The main changes in NIS agricultural trade since reform will therefore not be reversed. Rather than importing large amounts of feed grain to maintain artificially high levels of livestock production, the region will directly import meat, reflecting its apparent comparative disadvantage in meat production.

The NIS region as referred to in our study includes all 15 countries of the former USSR. The forecasts presented for both our and others' work are for the NIS region in the aggregate, with trade values measuring the region's net imports or exports vis-a-vis all countries outside the region. Also, we limit our study to forecasts for grain and meat.

Previous Studies of the Effect of NIS Reform on the Region's Agriculture

The starting point for research concerning the effect of economic reform and trade liberalization on NIS commodity production and trade was the calculation by Cook, Liefert, and Koopman (1991) of producer subsidy equivalents (PSEs) and consumer

subsidy equivalents (CSEs) for Soviet agricultural products in 1986 (table 1).[3] The main findings of Cook et al. are that for most commodities, both agricultural producers and consumers were highly subsidized.

Although the previous studies examined in this paper differ in terms of their specific assumptions about reform and its effects, they share the key general assumptions that reform (1) reduces (or totally eliminates) subsidies and taxes to agricultural producers and consumers (as measured by PSEs and CSEs); and (2) results in greater integration into the world economy, which means that world prices become the main determinant of domestic prices.

Liefert, Koopman and Cook (1993) uses the PSE and CSE calculations from Cook et al. as the basis for forecasting how economic reform and trade liberalization in the former Union would change agricultural production, consumption, and trade for specific commodities. The study employs a model constructed from SWOPSIM (Roningen et al. (1991)), a spreadsheet-based modeling framework used to create a static, global, net trade model for agriculture. The model is partial equilibrium, with constant elasticity supply and demand curves for each country (36) and commodity (22 per country). Table 2 gives the assumptions of the reform/liberalization scenario. The main ones are the elimination of all subsidies and taxes to agricultural producers and consumers (as measured by PSEs and CSEs), free trade such that world prices completely determine domestic prices, productivity improvements in the crop and livestock sectors, but no change in consumer income.

Liefert et al. assumes that the effects of liberalization on production, consumption, and trade should play themselves out within about 5 years. Table 3 presents the forecasts. The NIS countries become a major exporter of wheat (compared to large imports before reform), though large imports of corn continue. Reform/liberalization substantially increases meat imports (3.6 million tons compared to 0.9 million in the base year (1986)).

Koopman (1991) updates the PSE and CSE estimates to 1989 (table 1), and refines the net trade projections of Liefert et al. (again using a SWOPSIM model). He presents results for 3 reform scenarios, based on different assumptions about the nature and degree of reform. The results given in table 4 are from his reform scenario that appears to come closest to the actual reform experience of the NIS countries to date. This scenario assumes that consumer subsidies are eliminated, producer subsidies (as measured by PSEs) continue, no productivity gains occur in agriculture, and consumer real incomes decline 20 percent. The reform adjustment period is again assumed to be about 5 years.

Koopman's main result is that the NIS region switches from being a large grain importer

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[3] A PSE for a good is the difference between domestic producers' *incentive price* and its world trade (or border) price (using an economically meaningful exchange rate for conversion). A commodity's incentive price equals the domestic producer price plus per unit subsidies in the form of government policy transfers. A CSE for a good is the difference between the good's trade price and domestic consumers' incentive price, where the latter equals the price consumers pay minus any per unit policy transfer subsidies. Positive PSEs/CSEs indicate support to producers/consumers, while negative values indicate taxation.

to a large exporter. Net exports of wheat balloon to over 30 million tons, while exports of coarse grains other than corn reach 17 million tons. Imports of corn remain fairly stable at 16 million tons, while meat imports rise to 1.1 million tons.

Tyers (1994) utilizes previous work by Koopman, Liefert and Cook to examine the effects of reform/liberalization on agriculture by the year 2000, using a dynamic, partial equilibrium model of world agriculture. Tyers assumes that all support and taxes to agricultural producers and consumers is eliminated (as measured by the PSE and CSE estimates in Koopman, updated to 1990). He also assumes reform-induced increases in consumer income and agricultural productivity (as measured by crop yields and feed conversion; see table 2). He presents forecasts based on both a high and low reform scenario; since the low reform scenario seems to correspond more closely to the actual reform experience, results from that scenario are reported.

Like Koopman, Tyers also forecasts that a reformed NIS region would become a major grain exporter, with net exports of wheat equaling 27 million tons by 2000, and of coarse grains (including corn) 14 million tons (table 5). Meat imports are projected to fall to a slight 73,000 tons.

About 5 years have elapsed since the NIS countries began to reform (to varying degrees), the same general period of time that Liefert et al. and Koopman allot in order for the effects of reform to play themselves out. It would therefore be revealing to compare not only the commodity forecasts of the 3 studies, but also the assumptions underpinning the predictions, with the agricultural performance and reform experience of the NIS countries to date.[4] However, comparing these studies' forecasts with the current situation is not a straightforward exercise, given that each of the studies has a different base year and projection end-year (Tyers presents results for 2000). Also, the studies were based on specific assumptions about reform, many of which either explicitly or implicitly involve a more ambitious reform program than the majority of NIS countries have adopted to date. Table 6 presents the 1996 figures for meat and grain production, consumption, and trade in the NIS region, for use in the comparisons.

The actual declines in production and consumption of both grains and meat have been much greater than Liefert et al. and Tyers predicted (Koopman gives results only for trade, not for production and consumption). Tyers' projected end-period grain production of 231 million tons is nearly twice the actual total NIS grain output in 1996 (119 million tons). The studies are generally more optimistic (or less pessimistic), relative to developments to date, for production than consumption. This is indicated by the fact that the studies generally *overestimate* the improvement in the agricultural trade balance of the NIS region (in all three studies trade is determined as the difference between domestic consumption and production).[5] This is particularly true for grain: in 1996 the NIS region imported 3-4 million tons, while Koopman and Tyers forecast net grain exports of over 30 and 40 million tons, respectively. Concerning trade in meat, Koopman forecasts imports of 1.1 million tons, and Tyers imports of 73,000 tons,

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[4] Sedik et al. (1996) analyzes agricultural reform and performance in Russia from 1992-1995.

[5] The terms *overestimate* and *underestimate* are used in this context to mean that a forecast was either too high or too low compared to the historical record in 1996.

compared to actual 1996 imports of 2.2 million tons. Liefert et al.'s forecast of 3.6 million tons of meat imports is the only prediction of a trade balance for total meat or grain worse than the actual record.

Certain of the studies' assumptions about NIS reform correspond well to actual experience to date. Subsidies to consumers have been generally ended, subsidies to producers substantially reduced, and trade controls in most countries are not strong. However, the main reason these studies' forecasts contrast so much with the current record is that some of their assumptions differ significantly from actual experience to date. To begin with, productivity performance for both crops and livestock to date has been much worse than the studies assumed. Although Koopman assumes no productivity increases, Liefert et al. assumes that grain yields rise by 10 percent over the projection period, and productivity in the livestock sector by 20-25 percent. For the Russian part of his model, Tyers assumes increases in grain yields of 8 percent, and for ruminant and nonruminant meat, 2 and 6 percent, respectively. In actuality, productivity has worsened since reform. For example, in Russia from 1991 to 1995, the grain/meat conversion rates for beef, pork, and poultry have dropped by 16, 35, and 17 percent, respectively, while grain yields have fallen about 17 percent compared to the immediate pre-reform years (1987-1991).

The reasons why the studies' productivity assumptions exceed actual performance is discussed at greater length in the next section. However, one reason is that the studies do not account for the severe worsening of agriculture's terms of trade following price liberalization. From 1990 to 1996, agricultural input prices in Russia rose about 5 times as much as output prices. The deterioration of producers' terms of trade has substantially reduced farms' input purchases and use. For example, since 1990, mineral fertilizer use in Russia has fallen by about 70 percent. The decline in use of material inputs has decreased both yields and production. PSE's capture subsidies from government policy transfers and the gap between domestic and international prices. The PSEs computed for Soviet agriculture therefore failed to capture the implicit subsidies to producers that resulted from a state-set pricing system where prices for agricultural inputs were fixed much lower (relative to the real costs of production) than were prices for agricultural output.

The better-than-the record assumptions about productivity growth and ignoring of the deterioration of producers' terms of trade result in an overestimation of output. The overestimation of livestock production in turn results in overestimation of grain consumption. The studies also overestimate demand for agricultural goods because their assumptions about changes in real consumer income are more optimistic than the record to date. From 1991 to 1996, the calculated average per capita real wage in Russia (as measured by the relationship between the nominal average wage and an index of consumer prices) has fallen 62 percent, with similarly large decreases in other NIS countries. As a result of the decline in consumers' real wages, demand (and therefore consumption) for food with high income elasticity, such as meat and other livestock products, has dropped substantially. However, Liefert et al. assumes no reform-induced change in real income for the NIS region, Koopman assumes a drop of only 20 percent, and Tyers declines of 20-30 percent for most of the NIS countries (from 1990 to 2000). The main reason Liefert et al. overestimate meat imports (3.6 million tons compared to an actual 2.2 million in 1996) is that by ignoring any decrease in consumer income, the study overestimates meat demand.

Forecasting Changes in NIS Agriculture to 2005

The modeling framework we use to forecast changes in NIS agricultural production, consumption, and trade from the present to 2005 is the Country-Link System, a multi-region and multi-commodity system of country and regional models developed by the Commercial Agriculture Division of the Economic Research Service (ERS), USDA. The country-link system consists of 46 country and regional models, covering 25 commodities, a U.S. agricultural sector model (FAPSIM), based in Fortran, and „linker," software and systems that convert all models to Fortran for simultaneous solution and generation of output. Country/regional models are spreadsheet-based, many in Lotus 1-2-3, some in Supercalc. About half of the country models utilize the Country Projections and Policy Analysis (CPPA) model-builder designed at ERS (Hjort and van Peteghem (1991)). The forecasts presented are for the NIS region in the aggregate, though they are generated using three separate CPPA models--for Russia, Ukraine, and the 13 remaining NIS countries collectively. The results from the 3 models are aggregated to obtain NIS totals.

Each country or regional model within the link system is a dynamic partial equilibrium model which projects agricultural production, consumption, and trade each year from MY (marketing year) 1997/98 through MY 2010/2011 for crops and from CY (calendar year) 1998 through CY 2011 for livestock products. Models are structured as series of equations for supply and demand of the various crops and livestock products. The residual between supply and demand is net trade. Crop production is forecasted using area and yield functions. Each crop area function depends on current crop prices for each of the 10 crops, while yield functions depend on lagged own prices and an exogenous productivity trend. Livestock products usually have production functions, which depend on meat prices and exogenous productivity trends.

Macroeconomic performance, country policies, and supply and demand elasticities are exogenous for the model forecasts. Commodity prices are determined endogenously through an iterative process in which global supply and demand balance is attained for each commodity for each year of the projection period.

Forecasting changes in the NIS commodity structure from the present to 2005 is less ambitious than forecasting changes that began at the start of reform in 1992, because the economy has now attained a more stationary state than previously. As table 6 shows, reform has already greatly restructured agricultural production, consumption, and trade in the NIS region. The main reason for the restructuring has been major reform-induced changes in relative prices (of both inputs and output) and consumer real incomes. The policy changes responsible for altering prices and incomes have been price liberalization, combined with economy-wide reduction or elimination of subsidies to both producers and consumers, and movement toward the integration of the domestic economy into the world economy. Price liberalization fundamentally changed prices by having them move to better reflect real costs of production, while integration into the world economy (with only modest trade controls) resulted in prices moving toward world market levels.

Given that the studies previously examined all use partial equilibrium models, any attempt to account for changes in such variables as terms of trade and consumer income could only be done through bold assumptions. What made such assumptions

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particularly difficult was the tremendous inflation the NIS countries experienced during the early reform years (typically over 1,000 percent).

In most NIS countries price and trade liberalization began sufficiently long ago (the early 1990s) that the major adjustments in prices and incomes have had enough time to play out and are now ending. A general indicator that relative prices and real incomes are beginning to stabilize is that inflation in the NIS countries has fallen substantially. In 1996 in most countries of the region it was below 50 percent, with even better performance predicted for 1997. Low inflation means that nominal prices and incomes cannot change by large enough magnitudes to significantly alter relative prices and incomes. More specifically, the deterioration in agricultural producers' terms of trade has stopped, and, at least for some producers, the terms will probably soon improve. Also, average real consumer incomes in Russia and most other NIS nations have generally stopped falling, and in some countries are rising modestly. Stable relative prices and real incomes will mean less change in production, consumption, and trade of agricultural commodities.

As with the earlier studies, our forecasts depend heavily on assumptions we must make for certain reform-sensitive variables. Our first major assumption is that there are no changes in trade policy, which means that the existing moderate controls on agricultural trade in most NIS countries continue (for example in Russia, no quantitative restrictions, and import tariffs ranging from 5 to 30 percent). The second assumption, supported by recent evidence, is that the terms of trade of agricultural producers in the NIS region do not continue to worsen, but rather are fixed over the projection period.

The next assumption is that real GDP grows modestly over the projection period. For 1997, we assume real GDP falls 2 percent in Russia and Ukraine, and grows 0.6 percent in the rest of the region. We then assume that growth begins in Russia and Ukraine in the late 1990s (while growth in the rest of the region is a bit higher), and that during 2000-05 the countries of the region grow annually at about 3-3.5 percent. Our assumed growth rates are lower than in the faster reforming countries of Central Europe (Poland, Hungary, and the Czech Republic) in recent years. This reflects our belief that the NIS countries will continue to pursue less ambitious reform programs than the countries just mentioned, resulting in lower economy-wide productivity growth.

The most important set of variables for which assumptions must be made concerns productivity growth in agriculture. We assume that rather than continue to fall, agricultural productivity will rise over the projection period, though only modestly. The main reason we are not more optimistic is we believe that only slight progress will be made in the institutional reforms within NIS agriculture necessary to improve incentives to use resources more productively.

In most NIS countries, including Russia, Ukraine, and Kazakstan, the state and collective farm system inherited from the Soviet period continues to dominate agricultural production. Although output on private plots held by farm workers has generally grown, private farming has not taken off, in most countries accounting for less than 5 percent of arable land and total agricultural output. (The Caucasus countries of Georgia and Armenia and the Baltic states are exceptions.) In the early reform years, most former state and collective farms were officially reregistered as corporatized joint-stock companies. However, these large corporate farms have yet to be restructured

into viable, profitable businesses. Three quarters of them were unprofitable in 1996, up from two-thirds the year before, and 59 percent in 1994.

The former state and collective farms face two serious conundra that prevent them from improving the efficiency with which they operate: the lack of land markets and the lack of ownership reform. The absence of land markets has hurt NIS agriculture in 3 ways, affecting not only productivity performance but also the functioning of capital markets. First, without land markets, land is a (nearly) free good for managers. Thus, it is overused in farming, as cultivation is extended to low-yielding marginal land. Second, without land markets, land, which should be farms' primary asset, cannot function as collateral for loans to fund capital investment. Third, land is not only virtually free for farms, but also inalienable. Since farms do not risk losing their land, regardless of how unprofitable they might be, management can pursue objectives other than productivity-raising cost minimization or profit maximization (such as rent seeking or maintaining worker employment).

The structure of farm ownership also prevents the restructuring necessary for systemic improvements in productivity. The assets of the corporate farms belong collectively to their shareholders, composed of farm workers, retired employees and management. Decision rights on what crops to grow, hiring and firing, to whom to sell and from whom to buy are held by the shareholders and local political authorities. The provincial governor, the head of the provincial department of agriculture, and other political authorities have considerable capacity to influence farm decision-making through their control over local taxes, subsidies, inter-provincial trade permits, and their analogous influence with upstream and downstream suppliers and buyers.

The politicization of ownership rights on corporate farms has resulted in higher levels of farm employment than would be tolerated if farms were truly cost minimizers.[6] This labor retention can be seen in the continued losses of (and subsidies for) livestock production, when livestock prices are relatively stable. Though widely unprofitable, livestock production does not fall to an economically justifiable level on corporate farms, mainly because it is particularly labor-intensive. In contrast, crop production in Russia is generally profitable.

A similar situation exists for downstream livestock and crop processors, which were corporatized, along with other industrial enterprises in the NIS region, starting in 1992. However, by Russian and Ukrainian law, corporate farms hold 51 percent of the shares of downstream processors. Moreover, most processors were built on a much larger scale than can be accommodated by the current state of demand, and thus operate with quite high unit costs of production, such that many are chronic loss-makers. But local packing plants, feed mills, seed crushing facilities and sugar mills are seldom shut down, because of local authorities' concerns for provincial food self-sufficiency and employment.

The lack of land reform and ownership reform not only prevent the restructuring that is needed to make farms profitable; the failure to restructure or allow liquidation of farms

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[6] Blanchard and Aghion (1996); Boycko, Shleifer, and Vishny (1995), chs. 2-3; Boycko, Shleifer, and Vishny (1996).

and processors that are obviously inviable in a market economy calls into question the very enforceability of contracts with these enterprises. In the end, the lack of land markets and the ownership quagmire of NIS corporate farms and processors exclude them from the three avenues for accumulation of capital for investment purposes: own profits, joint ventures and bank loans. We believe that the general lack of capital under such conditions will prevent farms and processors from the investment needed for long term productivity improvements.

Despite our nonoptimistic views concerning NIS productivity growth during the projection period, we nonetheless assume some growth will occur (table 7). The aggregate grain yield (for all countries and all types of grain) is projected to increase from 1997 to 2005 by 12 percent. This figure results from an assumed average annual growth rate for wheat yield of about 2 percent (slight variations depending on the specific country), and average annual growth of yield for coarse grains of about 1 percent. Concerning productivity in the livestock sector, the grain/meat conversion coefficient aggregated across countries and meats is projected to fall from 1997 to 2005 by 16 percent. This results from the assumption that in 2005, the grain/meat conversion coefficient is 10 percent *higher (worse) than in 1990*, an improvement over 1996 when the coefficient was 31 percent higher (worse) than in 1990. (This assumption is specifically made for Russia; for Ukraine, performance lags that in Russia by one year; for the other NIS countries, performance lags Russia by two years.)

Agriculture in the NIS region has suffered from a chronically high degree of waste, during not only primary production, but even more so during the downstream activities of storage, transportation, and processing. The transportation and processing of foodstuffs was arguably the weakest part of the entire Soviet economy, such that total waste for certain agricultural commodities was reported to exceed 20 percent of production.[7] Some observers of NIS agriculture argue that if reform simply reduced waste, the NIS region could become a major exporter of grain and other agricultural products (see, for example, Johnson (1997)). The forecasting studies previously examined in this paper could be said to capture this effect in their assumptions about improvements in productivity by defining their supply functions to represent downstream output rather than just primary production.

In our model, we formally account for waste, assuming that over the projection period it equals 6.5 percent of product, from the farm to the processor. (We account for waste during primary production by using cleanweight harvest figures.) The reasons we do not assume better performance are generally the same as to why we do not assume higher productivity growth for primary agriculture: poor incentives to improve performance and poor prospects for investment.

Table 8 presents our predictions for changes in aggregate NIS agricultural production, consumption, and trade to 2005. The base year from which the model generates forecasts is calendar year 1998 for meats, and marketing year 1997/98 (July to June) for grains. The figures given for calendar years 1997 and 1998 and marketing years 1996/97 and 97/98 are therefore our estimates (not generated by the model) for

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[7] See OECD (1991), pp. 165-66.

production, consumption, and trade. Figure 1 presents our annual forecasts of the net trade balance for total meat, wheat, and coarse grains. The values through 1996 are the actual historical figures.

Production and consumption of both meat and grains increase moderately over the projection period, reflecting the modest assumptions concerning growth of agricultural productivity and consumer income. Production of meat grows a bit more than consumption, such that net meat imports fall by 9 percent, though still remaining by 2005 close to 2 million tons. However, imports of poultry, which have fueled the general rise in meat imports, are projected to increase 15 percent. Grain imports, on the other hand, are projected to fall, such that by 2005 the region's aggregate trade balance in grain is almost zero. The results indicate that continued imports of wheat are more likely than of coarse grains, as the region could become a small net exporter of the latter.

The projections strongly indicate that the major changes in the agricultural trade of the NIS region since reform will not be reversed (assuming no fundamental changes in trade policy). The region will continue to be a major importer of meat, with net imports in 2005 projected to be about double that in 1991, as the region's apparent comparative disadvantage in meat production continues. The region will also not return to the large grain imports of the Soviet period. Whether a net grain importer or exporter, the trade balance either way should not be substantial.

Table 9 compares pre-reform NIS production, consumption, and trade with our 2005 projections. Tables 8 and 9 together illustrate the strong J-curve effect (decline followed by upswing) that reform appears to have on production and consumption of agricultural goods. Although we project a rebound in both production and consumption of commodities, for each product projected production and consumption in 2005 is lower than the pre-reform level, in most cases substantially so. This demonstrates the extent to which the agricultural sector artificially expanded during the Soviet period to levels of production and consumption that cannot be maintained in a market economy where consumer preferences and relatively free trade, rather than planners' desires, determine what goods are produced.

Conclusion

Western studies done in the early 1990s generally predict that large-scale market-oriented reform in the NIS region would change it from being a major importer of grain to a major exporter. The studies differ more in their forecasts for the region's meat imports, some predicting an increase and some a decrease. Although the reform changes to date have substantially reduced NIS grain imports, they have not turned the region into an exporter. Also, since 1991 meat imports have roughly doubled, to over 2 million tons in 1996.

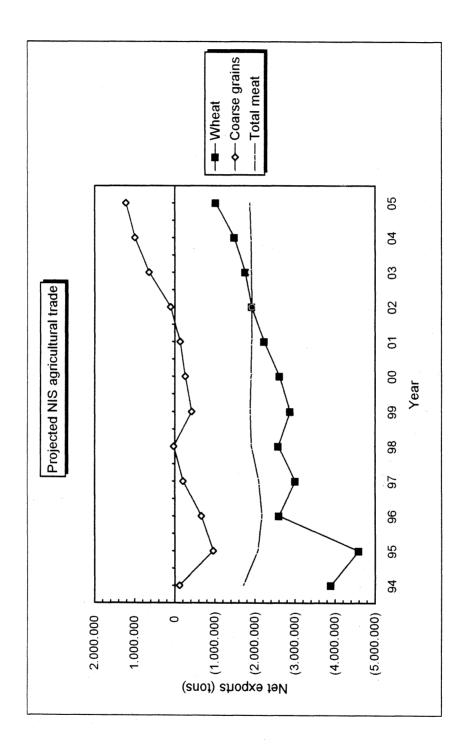Reform to date has substantially reduced NIS production and consumption of both grain and meat, drops much greater than these studies (based on their assumptions) forecast. On the demand side, the studies assume either too low, or no, decline in consumer income, while on the supply side they assume either positive, or no, productivity growth. Yet, NIS agricultural productivity from 1991 to 1996 generally fell.

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One must keep in mind, though, that these studies' forecasts are based on the general premise, supported by specific assumptions, that a larger-scale reform program is implemented than most of the NIS countries have yet enacted.

This paper's forecasts of changes in NIS agricultural production, consumption, and trade from the present to 2005 rest on the assumptions that both real GDP (reflecting economy-wide productivity growth) and productivity growth in agriculture within the region will grow modestly over the projection period. We forecast that in the aggregate the NIS region by 2005 will run close to a zero trade balance in grain, though it could be a small exporter of coarse grains. However, meat imports are forecast to remain substantial, falling a bit to about 1.8 million tons. Rather than importing feed to maintain an artificially large livestock sector as it did during the Soviet period, the region, based on apparent comparative (dis)advantage, should continue to import livestock products directly.

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Projected NIS agricultural trade

Legend:
- Wheat
- Coarse grains
- Total meat

X-axis: Year (94, 95, 96, 97, 98, 99, 00, 01, 02, 03, 04, 05)

Y-axis: Net exports (tons) — 2.000.000, 1.000.000, 0, (1.000.000), (2.000.000), (3.000.000), (4.000.000), (5.000.000)

Table 1--Estimates of producer subsidy and consumer subsidy equivalents for the USSR

Study	Liefert et al. (1993)		Koopman (1991)		Tyers (1994) [3]
Year	1986	1986	1989	1989	1990
Commodity	PSE [1]	CSE [2]	PSE [1]	CSE [2]	PSE [1]
Wheat	-31	66	-130	176	-59
Corn	56	-13	27	64	na
Other coarse grain	18	20	na	na	na
Total coarse grain	na	na	na	na	-37
Beef	32	82	10	118	10 [4]
Pork	20	21	-2	52	na
Poultry	46	-28	33	-7	10 [5]
[6] Total	21	32	1	77	na

Note: All figures are percentages.

na means not available.

[1] Total subsidies divided by producer revenue.

[2] Total subsidies divided by consumer expenditure.

[3] Calculated from information in Tyers (1994).

[4] Ruminant meat.

[5] Non-ruminant meat.

[6] Covers all commodities for which support was estimated, not just those reported in the table.

Sources: Liefert et al. (1993); Koopman (1991); Tyers (1994).

Table 2--Assumptions of agricultural liberalization studies for NIS region

Author	Liefert et al. (1993)	Koopman (1991)	Tyers (1994)	Actual History	ERS (1997)	History + ERS (1997)
Base year	CY86	CY89	CY90	MY90/91	MY97/98	MY90/91
End year	+5 years	+5 years	CY2000	MY97/98	MY2005	MY2005
Support implied by PSEs	Complete Elimination	No change	Complete Elimination	Partial Elimination	Partial Elimination	Partial Elimination
Support implied by CSEs	Complete Elimination	Complete Elimination	Complete Elimination	Complete Elimination	na	na
Agricultural terms of trade[1]						
--Agricultural commodities	na	na	na	1.434	na	na
--Agricultural inputs	na	na	na	7.082	na	na
Livestock productivity[2]	+20 to +25 percent	No change	+2 to +6 percent	-31 percent	+16 percent	-9 percent
Grain yield	+10 to +15 percent	No change	+ 8 percent	-15 percent	+12 percent	+1 percent
Real income	No change	-20 percent	-24 percent	-41 percent	+27 percent	-25 percent

[1] Change in prices in Russia, 1990-96 (1990=1).

[2] Negative of the percent change in grain/meat conversion ratio weighted by meat production.

Sources: Liefert et al. (1993); Koopman (1991); Tyers (1994); Russian Ministry of Agriculture and Food; Russian Goskomstat; Goskomstat CIS.

Table 3--Previous forecasts: Liefert et al. (1993): 1986-+5 years

	Production			Consumption			Net Exports		
Meat Crops	MY86/87 CY86	Five years hence	Percent change	MY86/87 CY86	Five years hence	Percent change	MY86/87 CY86	Five years hence	Percent change
	1,000 tons			*1,000 tons*			*1,000 tons*		
[1] Meat	16.500	14.794	(10)	17.258	18.377	6	(858)	(3.583)	318
Beef	7.700	6.741	(12)	8.028	6.543	(18)	(328)	198	cc
Pork	5.900	5.689	(4)	6.155	7.114	16	(255)	(1.425)	459
Poultry	2.900	2.364	(18)	3.075	4.720	53	(275)	(2.356)	757
Grain	198.219	187.859	(5)	226.019	188.682	(17)	(27.800)	(823)	(97)
Wheat	92.306	96.503	5	107.806	88.284	(18)	(15.500)	8.219	cc
Corn	12.479	11.128	(11)	20.479	19.833	(3)	(8.000)	(8.705)	9
Other coarse	93.434	80.228	(14)	97.734	80.565	(18)	(4.300)	(337)	(92)
Total coarse	105.913	91.356	(14)	118.213	100.398	(15)	(12.300)	(9.042)	(26)

Note: Parentheses denote negative percent change or net imports.
cc means cannot compute percent change, because two figures have different signs.

[1] Includes beef, pork, poultry.
Source: Liefert et al. (1993).

Table 4--Previous forecasts: Koopman (1991): 1989-+5 years

Meat Crops	Production			Consumption			Net Exports		
	MY89/90 CY89	Five years hence	Percent change	MY89/90 CY89	Five years hence	Percent change	MY89/90 CY89	Five years hence	Percent change
	1,000 tons			1,000 tons			1,000 tons		
[1]Meat	na	na	na	na	na	na	(543)	(1.126)	107
Beef	na	na	na	na	na	na	na	na	na
Pork	na	na	na	na	na	na	na	na	na
Poultry	na	na	na	na	na	na	na	na	na
Grain	na	na	na	na	na	na	(36.500)	33.376	cc
Wheat	na	na	na	na	na	na	(13.500)	32.458	cc
Corn	na	na	na	na	na	na	(18.100)	(16.296)	(10)
Other coarse	na	na	na	na	na	na	(4.900)	17.214	cc
Total coarse	na	na	na	na	na	na	(23.000)	918	cc

Note: Parentheses denote negative percent change or net imports.
cc means cannot compute percent change, because two figures have different signs.
[1] Includes beef, pork, poultry.

Source: Koopman (1991).

Table 5--Previous forecasts: Tyers (1994): 1990-2000

Meat Crops	Production			Consumption			Net Exports		
	MY90/91 CY90	MY00/01 CY2000	Percent change	MY90/91 CY90	MY00/01 CY2000	Percent change	MY90/91 CY90	MY00/01 CY2000	Percent change
	1,000 tons			*1,000 tons*			*1,000 tons*		
Meat	19.541	17.932	(8)	20.514	18.005	(12)	(973)	(73)	(93)
Ruminant	9.811	8.926	(9)	10.315	7.630	(26)	(504)	1.296	cc
Non-ruminant	9.730	9.006	(7)	10.198	10.374	2	(468)	(1.368)	192
Grain	203.006	230.719	14	225.955	189.668	(16)	(22.949)	41.051	cc
Wheat	100.597	116.299	16	112.761	89.263	(21)	(12.164)	27.036	cc
Corn	na	na	na	na	na	na	na	na	na
Other coarse	na	na	na	na	na	na	na	na	na
Total coarse	102.409	114.420	12	113.194	100.405	(11)	(10.785)	14.015	cc

Note: Parentheses denote negative percent change or net imports.
cc means cannot compute percent change, because two figures have different signs.
All figures exclude the Caucasus countries (Armenia, Azerbaijan, Georgia).

Source: Calculated from information in Tyers (1994).

Table 6--NIS region history: MY87/91-MY96

Meat Crops	Production			Consumption			Net Exports		
	MY87-91 CY91	MY96/97 CY97	Percent change	MY87-91 CY91	MY96/97 CY97	Percent change	MY87-91 CY91	MY96/97 CY97	Percent change
	1,000 tons			1,000 tons			1,000 tons		
¹Meat	18.237	9.664	(47)	19.226	11.835	(38)	(989)	(2.171)	120
Beef	8.250	4.954	(40)	8.931	5.425	(39)	(681)	(471)	(31)
Pork	5.979	2.932	(51)	6.182	3.507	(43)	(203)	(575)	183
Poultry	3.093	1.165	(62)	3.188	2.262	(29)	(95)	(1.097)	1.055
Grain	178.286	119.234	(33)	214.231	122.634	(43)	(35.945)	(3.400)	(91)
Wheat	83.442	64.326	(23)	101.041	66.921	(34)	(17.599)	(2.595)	(85)
Corn	13.140	4.535	(65)	26.105	5.060	(81)	(12.965)	(525)	(96)
Other coarse	81.704	50.373	(38)	87.085	50.653	(42)	(5.381)	(280)	(95)
Total coarse	94.844	54.908	(42)	113.190	55.713	(51)	(18.346)	(805)	(96)

Note: Parentheses denote negative percent change or net imports.

¹ Includes beef, pork, poultry, mutton, and goat meat.

Source: ERS, USDA.

Table 7--History and assumptions of ERS projections

	Income and productivity			Cumulative growth		
				MY87-91 to	MY97/98 to	MY87-91 to
	MY87-91 CY91	MY97/98 CY98	MY05/06 CY06	MY97/98	MY05/06	MY05/06
Income	*index*			*percent*		
Russia	100	62	78	(38)	26	(22)
Ukraine	100	47	58	(53)	24	(42)
Other NIS	100	59	78	(41)	32	(22)
Total NIS	100	59	75	(41)	27	(25)
Productivity						
Wheat yields	*tons/ha.*			*percent*		
Russia	1,7	1,5	1,7	(13)	10	(4)
Ukraine	3,6	2,7	3,0	(26)	14	(15)
Other NIS	1,1	1,1	1,3	3	16	20
Total NIS	2,1	1,7	1,9	(21)	13	(10)
Coarse grain yields	*tons/ha.*			*percent*		
Russia	1,5	1,4	1,5	(7)	9	1
Ukraine	2,9	2,5	2,9	(14)	13	(3)
Other NIS	1,6	1,5	1,6	(4)	6	1
Total NIS	1,8	1,7	1,9	(8)	11	3
Beef conversion	*kg. grain/kg. weight gain*			*percent*		
Russia	3,0	3,6	3,0	19	(15)	1
Ukraine	3,0	3,6	3,2	19	(11)	5
Other NIS	3,0	3,6	3,2	19	(9)	8
Total NIS	3,0	3,6	3,1	19	(12)	4
Pork conversion	*kg. grain/kg. weight gain*			*percent*		
Russia	6,1	9,4	7,0	54	(26)	15
Ukraine	6,1	9,4	7,6	54	(19)	25
Other NIS	6,1	9,4	7,9	54	(16)	30
Total NIS	6,1	9,4	7,4	54	(22)	21
Poultry conversion	*kg. grain/kg. weight gain*			*percent*		
Russia	3,2	3,9	3,3	21	(16)	2
Ukraine	3,2	3,9	3,4	21	(12)	7
Other NIS	3,2	3,9	3,5	21	(10)	9
Total NIS	3,2	3,9	3,3	21	(14)	4

Note: Parentheses denote negative percent change.

All total values in the table weighted by GDP or production in respective years.

Sources: ERS, USDA; Goskomstat Rossii, Raskhod kormov (1996).

Table 8--NIS region ERS projections: MY97-MY05

Meat Crops	Production			Consumption			Net Exports		
	MY97/98 CY98	MY05/06 CY06	Percent change	MY97/98 CY98	MY05/06 CY06	Percent change	MY97/98 CY98	MY05/06 CY06	Percent change
	1,000 tons			*1,000 tons*			*1,000 tons*		
[1]Meat	9.502	11.497	21	11.567	13.369	16	(2.065)	(1.871)	(9)
Beef	4.790	5.699	19	5.170	5.837	13	(380)	(138)	(64)
Pork	2.956	3.632	23	3.531	4.072	15	(575)	(440)	(23)
Poultry	1.215	1.519	25	2.320	2.794	20	(1.105)	(1.274)	15
Grain	140.270	151.501	8	141.666	151.518	7	(3.420)	(79)	(98)
Wheat	73.500	81.016	10	75.108	81.932	9	(3.000)	(1.016)	(66)
Corn	6.950	7.265	5	6.800	7.288	7	(500)	(28)	(94)
Other coarse	58.850	62.233	6	58.568	61.023	4	300	1.254	318
Total coarse	65.800	69.498	6	65.368	68.311	5	(200)	1.226	cc

Note: Parentheses denote negative percent change or net imports.

cc means cannot compute percent change, because two figures have different signs.

[1] Includes beef, pork, poultry, mutton, and goat meat.

Source: ERS, USDA.

Table 9--NIS region history combined with ERS projections: MY87/91-MY05

Meat Crops	Production			Consumption			Net Exports		
	MY87-91 CY91	MY05/06 CY06	Percent change	MY90/91 CY91	MY05/06 CY06	Percent change	MY90/91 CY91	MY05/06 CY06	Percent change
	1,000 tons			1,000 tons			1,000 tons		
[1]Meat	18.237	11.497	(37)	19.226	13.369	(30)	(989)	(1.871)	89
Beef	8.250	5.699	(31)	8.931	5.837	(35)	(681)	(138)	(80)
Pork	5.979	3.632	(39)	6.182	4.072	(34)	(203)	(440)	117
Poultry	3.093	1.519	(51)	3.188	2.794	(12)	(95)	(1.274)	1.241
Grain	178.286	151.501	(15)	213.598	151.518	(29)	(35.945)	(79)	(100)
Wheat	83.442	81.016	(3)	100.745	81.932	(19)	(17.599)	(1.016)	(94)
Corn	13.140	7.265	(45)	25.654	7.288	(72)	(12.965)	(28)	(100)
Other coarse	81.704	62.233	(24)	87.199	61.023	(30)	(5.381)	1.254	cc
Total coarse	94.844	69.498	(27)	112.853	68.311	(39)	(18.346)	1.226	cc

Note: Parentheses denote negative percent change or net imports.

[1] Includes beef, pork, poultry, mutton, and goat meat.

Source: ERS, USDA.