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Changes in Agricultural Markets in Transition Economies. By William Liefert, Market and Trade Economics Division, Economic Research Service, and Johan Swinnen, Katholieke Universiteit Leuven. Agricultural Economic Report No. 806.

Abstract

Economic reform in the transition economies of the former Soviet bloc has transformed the volume and mix of these economies' agricultural production, consumption, and trade. Output drops in most countries have ranged from 25 to 50 percent. The livestock sector has been hit particularly hard, all but eliminating U.S. grain exports to the region. This report concludes that the output decline has been an inevitable part of market reform and that the main goal of agricultural policy in the transition economies should not be to return output to pre-reform levels but to increase the productivity of input use. Although reform has created a food security problem in some countries, the cause of the problem is not insufficient food supplies, but rather inadequate access to food by segments of the population and regions within countries.

Keywords: Russia, Ukraine, former Soviet Union, Central and Eastern European countries, transition economies, agricultural production, livestock sector, food consumption, trade, policy reform, productivity.

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Summary

Economic reform in the transition economies of Central and Eastern Europe and the Newly Independent States (NIS) of the former USSR has transformed the volume and mix of these countries' agricultural production, consumption, and trade. The main development has been the drop in output, ranging in most countries from 25 to 50 percent, the livestock sector being hit particularly hard.

The fall in agricultural production, along with the accompanying decline in food consumption, affects U.S. agricultural and policy interests vis-à-vis the transition economies in three areas: policy-advising/technical assistance, food security and aid, and agricultural trade. A conceptual framework based on supply and demand analysis is used to examine how reform has changed agricultural production, consumption, and trade in the transition economies, with an emphasis on explaining the decline in output. Conclusions are then drawn concerning the above areas of U.S. policy interest. Key findings include:

The drop in agricultural production has been an inevitable part of market reform. Most government officials and agricultural interests in the transition region argue that the downsizing of agriculture during reform has had a devastating effect on the region. They contend that the main goal of government policy and Western technical assistance in agriculture should be to revive production. Western press accounts also tend to assess the reform-driven drop in output in negative terms. This report shows that large direct and indirect subsidies in the pre-reform period helped to maintain artificially high levels of production and consumption. Reduction of the subsidies inevitably reduced these bloated volumes.

The absence of a decline in output in a country more likely reflects failure to reform, rather than reform success. The countries that have experienced the lowest declines in agricultural output, such as Uzbekistan and Turkmenistan, have also been the least reformist.

The food security problem in transition economies is not inadequate availability of food supplies, but insufficient access to food by segments of the population and regions within countries. Before reform, the transition economies had high per capita levels of consumption of most foodstuffs, compared even with wealthy Western countries. Although consumption of high-value livestock products has fallen during reform, consumption of staple foods, such as bread and potatoes, has remained steady or even increased. This shows that overall food supplies have been adequate. Food insecurity has increased because the growth in poverty during transition has expanded the size of the population that cannot afford a healthy diet, and because impediments to the internal flow of foodstuffs within certain countries have prevented deficit-producing regions from obtaining food supplies.

The main goal of agricultural reform should not be to increase output but rather to raise productivity and reduce production costs. By lowering production costs, productivity growth will make domestic output more price competitive on the world market. Productivity growth not only raises a country's productive capacity, but also provides flexibility as to how the country uses the increased capacity. In many transition economies, productivity growth in agriculture will benefit the economy most not by expanding the output of agricultural goods, but rather by allowing

resources to be shifted to producing other goods that either are more desired by consumers or are more competitive on the world market.

The loss of the former USSR as a large market for U.S. animal feed is a permanent consequence of reform. The contraction of the region's livestock sector has eliminated the need for large imports of feed grain, soybeans, and soybean meal from the United States and other Western countries. On the other hand, the NIS region has become a big importer of meat, particularly poultry from the United States. The shift from importing animal feed to maintain a large livestock sector to importing meat and other livestock products is consistent with the region's comparative advantage in agricultural goods—that is, the region produces livestock goods at a relatively higher cost than it produces animal feed.

Changes in Agricultural Markets in Transition Economies

William Liefert and Johan Swinnen

Introduction

The Central and Eastern European countries (CEECs) and Newly Independent States (NIS) of the former USSR began major market-oriented reform of their economies in the late 1980s and early 1990s.[1] Economic reform has transformed the structure and volume of these countries' agricultural production, consumption, and trade. The dominant development throughout the region is that output has fallen. By the late 1990s, in every transition economy agricultural production was below pre-reform levels, the drop in most countries being in the range of 25 to 50 percent. The contraction has been particularly strong in the livestock sector, with animal herds and livestock production down by about half.

Most agricultural interests in the transition economies view the contraction of agriculture in general, and the livestock sector in particular, as a catastrophe, and argue that reviving output should be a top priority of government policy. Most Western press accounts of transition agriculture during the last decade have painted the reform-driven decline in production in negative terms, using it as an indicator of the many troubles plaguing the sector. The fall in food consumption that has accompanied the drop in output has raised concerns over food security, particularly in Russia and other NIS countries.

Because the severe decline in output has been the key "fact" concerning agriculture's experience during the transition period, and has evoked so much concern, understanding why output has fallen is crucial in determining the nature of the problems facing the sector and the appropriate policy response. In particular, it is essential that the agricultural establishments in the transition economies and Western bodies providing policy advice and technical assistance (national governments, international organizations, private voluntary organizations) agree on the explanations of the main reform developments (or facts), particularly the contraction of output. Also, Western forecasting studies underestimated the extent to which agricultural output would fall during the transition period. Understanding why the underprediction occurred can help identify problems that were unanticipated or underappreciated at the start of reform and may therefore deserve more attention.

Some publications during the 1990s monitored the contraction of agriculture in the transition economies, examples being the annual reports on transition agriculture by the Organization for Economic Cooperation and Development (OECD) and Economic Research Service (ERS).[2] These studies appropriately explain the contraction as the natural consequence of policies and market responses that are necessary pieces of the reform process. The analysis, however, is in rather general terms. Jackson and Swinnen (1995) and Macours and Swinnen (2000a) more explicitly examine the causes of agricultural output decline, with Macours and Swinnen quantitatively measuring the contribution of various factors to the CEECs' drop in production in the first half of the 1990s. This ERS study is the first to develop and use a conceptual framework based on supply and demand analysis to analyze how market reform has changed agricultural production, consumption, and trade, with an emphasis on output contraction.

This study has four key objectives: (1) to explain how and why the transition has changed the structure of agricultural production, consumption, and trade; (2) to identify why Western forecasting studies underestimated the production decline; (3) to examine the consequences of commodity restructuring for food security; and (4) to examine output versus productivity growth as competing performance indicators of agricultural reform.

[1] The reforming CEECs include Poland, Hungary, Czech Republic, Slovak Republic, Bulgaria, Romania, Estonia, Latvia, Lithuania, Slovenia, Albania, Croatia, Macedonia, and Bosnia. The NIS include Russia, Ukraine, Belarus, Moldova, Georgia, Armenia, Azerbaijan, Kazakstan, Kyrgyzstan, Uzbekistan, Turkmenistan, and Tajikistan.

[2] The latest publications of each are OECD (2001) and ERS (1998).

Main Elements of Agricultural Reform in Transition Economies

Reform of the agricultural and food systems of the transition economies has involved four main elements: (1) market liberalization, (2) farm restructuring, (3) reform of upstream and downstream operations, and (4) the creation of supporting market infrastructure. *Market liberalization* involves removing government controls over the allocation of resources and output, thereby allowing the market to become the main means of allocation. It includes the key reform policies of liberalizing prices and trade and eliminating subsidies to agricultural producers and consumers. By changing prices, incomes, and other key monetary values that influence the market decisions of producers and consumers, market liberalization has substantially altered the volume and mix of countries' agricultural production, consumption, and trade. Liberalization and its effects thereby mainly address the question of *what* goods are produced and consumed in the agricultural economy. Market liberalization also links the macroeconomy to agriculture. Macro developments, such as inflation and movement in the exchange rate, affect the key variables (prices, consumer income) that drive agricultural markets.

Farm restructuring changes the nature or system of production at the level of the actual producer. It involves how farms are owned, organized, and managed—that is, *how* goods are produced. Key policies of farm restructuring are privatization and land reform, which directly affect incentives for using labor and other resource inputs.

The difference between market liberalization and farm restructuring in terms of their effect on output and consumption is as follows. Market liberalization changes the mix of goods produced, as well as how goods are distributed, in a way that better satisfies consumers' desires for goods. Farm restructuring entails changes by producers that could increase productivity. This would allow more output to be produced from a given amount of input, which would increase the total quantity of goods available for consumption.

Market liberalization and farm restructuring are interrelated, in that market liberalization can help motivate farm restructuring. The desire to increase profit, or fighting just to stay in business, can spur producers to reduce costs by changing their system of production. The pressures from market competition are the key to the relationship between the two elements of reform. Market liberalization by itself, however, will not inevitably lead to farm restructuring—producers must still make the actual changes in how they produce.

Reform of upstream and downstream operations (upstream activities involve the supplying of agricultural inputs, while downstream activities involve storage, transportation, processing, and distribution) would turn the previously state-run enterprises and systems responsible for these matters into market-oriented and competitive enterprises. Such reform could improve the productivity and performance not only of the suppliers of upstream and downstream goods and services, but also of the farms they serve.

The creation of supporting market infrastructure entails establishing the institutions and services, whether commercially or publicly provided, that a well-functioning, market-oriented agricultural economy needs. This infrastructure includes systems of agricultural banking and finance, market information, and commercial law that can clarify and protect property, enforce contracts, and resolve disputes. Development of market infrastructure and the transformation of upstream and downstream operations are closely related, and, in some respects, hard to separate. For example, in many isolated regions of countries, the collapse of the planned economy has deprived farms (especially small ones) of any channels for obtaining inputs, or for selling, storing, or processing output. In other words, upstream and downstream linkages, as well as the market infrastructure (such as market information) that could allow farms to find new linkages, are completely lacking.

The four elements of agricultural reform identified in this report are roughly comparable to the taxonomy of reform elements for transition agriculture by the World Bank (Csaki and Nash, 2000): (1) price and market liberalization, (2) land reform and privatization, (3) privatization and reform of agroprocessing and input supply enterprises, (4) rural finance, and (5) institutional reforms. Market liberalization corresponds to WB element #1, farm restructuring to WB element #2, reform of upstream and downstream operations to WB element #3, and market infrastructure to WB elements #4 and #5.

The World Bank report not only identifies the main elements of agricultural reform, but also grades the agricultural reform effort in all transition economies with respect to its five reform elements. Unlike the World Bank study, the focus of this ERS report is not on determining which transition economies have performed better in agricultural reform, and why they have done better. Rather, this report focuses on identifying the agricultural reform experiences and problems that have been most common to all transition economies.

Nonetheless, it should be kept in mind that the reform experience and progress of countries have differed. The CEECs (including the Baltic States) have generally reformed faster and more successfully than their NIS counterparts. In the World Bank grading system, out of a maximum total score of 10, Hungary (8.8) and the Czech Republic (8.6) lead all countries, followed by Estonia, Latvia, Slovenia, and Poland. Russia and Ukraine receive scores of 5.6 and 5.4. The lowest scores go to Turkmenistan (2.0), Uzbekistan (2.0), and Belarus (1.8). (The differing reform progress of countries, particularly as reflected by productivity growth, is discussed later in this ERS report.) The problems of transition agriculture examined in this report therefore hold more strongly for the NIS countries than for the CEECs.

How Reform Has Changed Agricultural Production, Consumption, and Trade

Since reform began in the late 1980s and early 1990s, agriculture in most transition economies has experienced major commodity restructuring—that is, major changes in the commodity mix and volume of agricultural production, consumption, and trade. The main feature of the restructuring has been a substantial drop in agricultural production, especially in the livestock sector (table 1).[3,4] The data in the table are based on countries' official production numbers, which exaggerate the decline in output. In the pre-reform period, farms often overstated their production to look better with respect to output target performance. In the transition period, farms have an incentive to understate production to avoid taxes and buttress their arguments for more state support. The difficulty of measuring the growing output by private farmers and the informal sector increases the likelihood of undercounting transition production. Yet, even if not wholly accurate, the official numbers clearly show a large decline in output. The downsizing of the agricultural sector has also coincided with a major drop in consumption of livestock products (table 2).[5]

The drop in agricultural production has been part of an economy-wide decline in output (table 1). In most transition economies, industry has also contracted substantially (especially heavy industry), and gross domestic product (GDP) is also down in most. As with agriculture, the decline in output in industry and in GDP as indicated by the table is overstated. For largely the same reasons given for agriculture, the official output numbers for industry on which the table figures are based exaggerate the drop. The GDP figures are probably more downwardly biased than those for agriculture and industry. The fastest growing sectors in GDP involve services (everything from hair styling to legal work), which either did not exist during the socialist period or were severely underrepresented in official macroeconomic accounts. Because growth in services is hard to measure, these sectors are underrepresented in countries' GDP accounts.

[3] The exceptions are Uzbekistan and Turkmenistan, whose experiences are examined later in this report.

[4] For data on agricultural production and trade, as well as analysis of key issues involving specific countries' agriculture, see the briefing rooms on Hungary, Poland, Russia, and Ukraine at the ERS Web site www.ers.usda.gov

[5] A recent ERS study (Cochrane, 2002) focuses on how reform in the transition economies has restructured the livestock sector. The report examines how reform has reduced the production and consumption of livestock products, as well as generated institutional change within the sector, as illustrated by a number of case studies. The report also uses a simulation model to forecast how various reform and policy developments, such as reducing subsidies to agriculture and creating land markets, would affect livestock production, consumption, and trade.

Table 1—Agricultural and industrial production and GDP all fall

	Index of change in production				
Countries	Grain	Meat	Agriculture	Industry	GDP
Hungary	88	65	72	112	98
Czech Republic[1]	87	73	72	86	91
Poland	99	98	92	108	122
Romania	93	76	97	68	75
Bulgaria	68	50	59	50	68
Russia	61	48	60	50	61
Ukraine	61	41	51	39	39
Kazakstan	46	45	47	44	51
Belarus	73	57	58	96	71
Uzbekistan	246	108	99	72	97
Turkmenistan	335	126	118	45	90

Note: The indices give average annual output for 1997-99 relative to average annual output for 1986-90, with 1986-90 = 100. For example, the index of 72 for agriculture for Hungary means that total agricultural output in Hungary for 1997-99 equaled 72 percent of output for 1986-90. All changes are in volume (or real) terms.

[1] For grain and meat, the indices cover the Czeck and Slovak Republics combined.

Source: USDA, OECD, and PlanEcon.

Table 2—Per capita consumption of foodstuffs

Foodstuff	Poland	Hungary	Romania	Russia	Ukraine	United States	Germany	Great Britain	Japan
					1990				
					Kilograms				
Meat	73	101	74	75	68	113	96	72	38
Milk (excluding butter)	230	178	99	184[1]	184[1]	256	224	227	65
Cereals	145	148	173	164[1]	164[1]	109	94	93	133
Potatoes	144	58	59	106	131	55	81	105	25

Foodstuff	Poland	Hungary	Romania	Russia	Ukraine	United States	Germany	Great Britain	Japan
					1997				
					Kilograms				
Meat	66	84	50	48	32	117	83	73	42
Milk (excluding butter)	204	156	179	145	156	254	236	234	68
Cereals	157	113	205	156	160	116	83	95	118
Potatoes	136	66	82	125	126	62	79	113	26

[1] Figure for entire USSR.

Source: FAO.

The main reason agricultural and industrial output and GDP have fallen in most transition economies is that consumers' desires for goods have replaced planners' preferences as the dominant force in determining what goods are produced, consumed, and traded. The contraction and commodity restructuring of transition agriculture has therefore been an inevitable part of market reform. To examine the downsizing of agriculture, one must first explore certain features of the pre-reform agricultural economy.

The Pre-Reform Agriculture and Food Economy

In the late 1960s, the leadership of the USSR decided to increase production of livestock goods, a policy the Eastern European countries of the Soviet bloc generally followed. Consequently, from 1970 to 1990, livestock herds and output in these countries grew by 40-60 percent (for example, 63 percent in the USSR, 43 percent in Poland, and 57 percent in Hungary). The rise in feed requirements caused by the growing herds stimulated the crop sector. In the late 1980s, the average annual output of feed grain in the USSR and Poland was up by about half compared with output in the late 1960s, and in Hungary the rise was about one-quarter. The feed requirements of the USSR were so great that the country also became a substantial importer of grain, soybeans, and soybean meal, much of it from the United States (table 3).

By 1990, per capita consumption of livestock products and foodstuffs in general in transition economies compared favorably with levels in many OECD nations (table 2). Because per capita GDP in the USSR and Eastern Europe was at most only half the OECD average, these countries were producing and consuming high-cost livestock products at a much higher volume than one would expect based on the countries' real income. This "achievement" came at a price, as large state subsidies, to both producers and consumers, were necessary to maintain the high levels of production and consumption. For example, by 1990 direct budget subsidies to the agriculture and food economy were about 10 percent of GDP in the USSR and between 5 and 10 percent of GDP in most Eastern European countries. The bulk of the subsidies went to the livestock sector.

Supply and demand analysis can be used to show how market reform has changed agricultural production, consumption, and trade in transition agriculture, with special emphasis on the contraction of the livestock sector. Figure 1 identifies the "market" for a typical agricultural good in a transition economy before reform. S^1 is the supply curve and D^1 is the

Table 3—Agricultural imports by the former USSR change dramatically

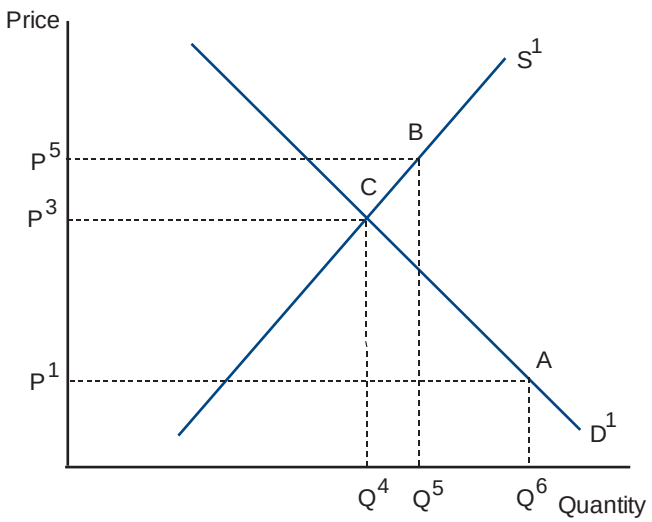
Commodity	1986-90	1995-98
	Thousand tons	
Total imports		
Grain	33,140	2,150
Soybeans and soybean meal[1]	4,500	850
Meat	868	1,970
Imports from United States		
Grain	13,700	660
Soybeans and soybean meal[1]	1,720	160
Meat	30	1,200

Note: Figures give average annual values over the period. Imports for 1995-98 are from countries beyond the region of the former USSR.

[1]In soybean equivalent.

Source: USDA.

Figure 1
Price liberalization within a single market



Note: Identification of price (P) and quantity (Q) values:

P^1 is the pre-reform consumer price.

P^3 is the producer and consumer price after price liberalization within this market alone.

P^5 is the pre-reform producer price.

Q^4 is the quantity of production and consumption after price liberalization within this market alone.

Q^5 is the pre-reform quantity of production.

Q^6 is the pre-reform quantity demanded by consumers.

Source: ERS.

demand curve. The state set prices for both producers and consumers. Producers receive a price of P^5, which motivates them to produce Q^5.[6] The consumer price is P^1, such that consumers wish to buy Q^6. However, consumers must settle for the actual level of production Q^5.

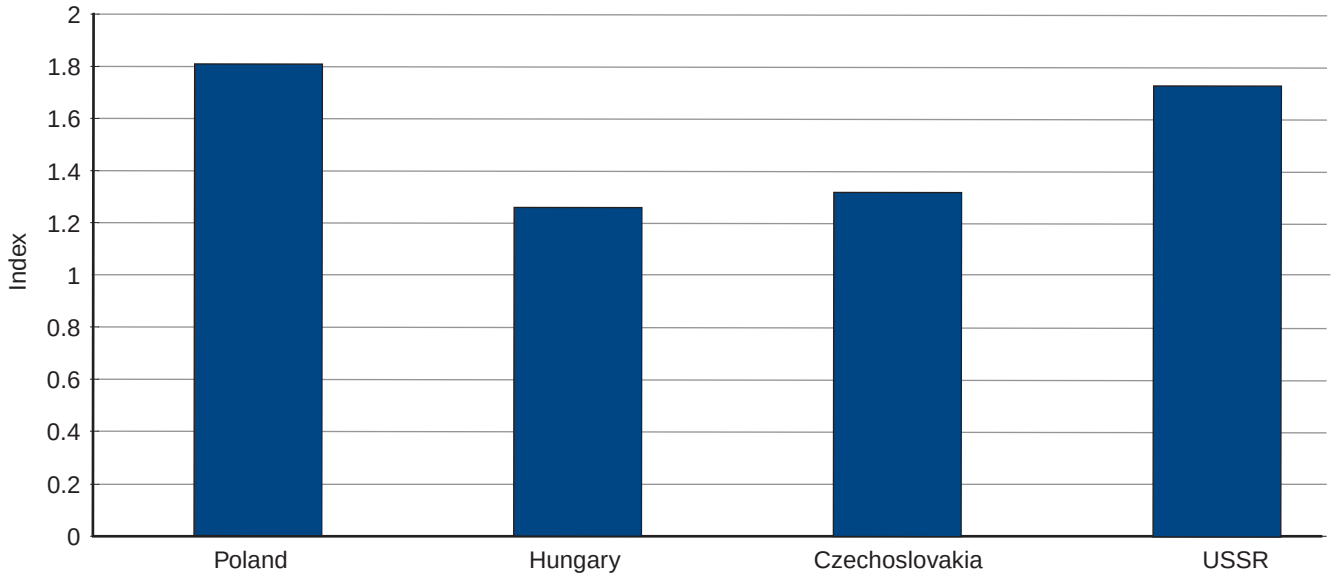
In the transition economies, pre-reform producer prices for agricultural goods typically exceeded consumer prices. Thus, the producer price P^5 in figure 1 is greater than the consumer price P^1. Figure 2 gives the ratio of pre-reform producer prices to consumer prices for agricultural goods for various transition economies.[7] Government budget subsidies were necessary to cover the gap, with the difference between producer and consumer prices indicating how large the subsidies had to be. For example, the ratio of producer to consumer prices in Poland in 1986 was about 1.8; that is, budget subsidies alone to the agriculture and food economy equaled about 80 percent of all consumer expenditure on agricultural goods.

Another feature of the pre-reform food economy in transition economies was that consumer prices for foodstuffs were set so low that output could not satisfy the demand generated by the prices. In figure 1, this effect results in a market shortage of the good, or excess demand, equal to Q^5Q^6. In the pre-reform period, long lines of shoppers and food stores with empty shelves were commonly interpreted in both the Soviet bloc countries and the West as signs of major food shortages. Low state-set consumer prices that overly stimulated demand, however, were the main cause of these "market" shortages, rather than inade-

[6] One can argue that in most pre-reform countries of the Soviet bloc, markets did not really exist for agricultural goods on the supply side, which means a market supply curve did not exist. Producers did not freely determine their output in response to prices. Rather, they were given an output target, which they sold to the state at the state-determined price. With respect to figure 1, Q^5 would be the economy-wide output target for the good in question. The pre-reform supply curve is therefore really the economy-wide marginal cost of production curve for the good. P^5 identifies the per unit full cost of producing the last units of output needed to reach the total output level of Q^5.

[7] The producer prices used in figure 2 are in fact full *producer incentive prices*. They equal the actual monetary prices producers received plus budget subsidies per unit of output. The incentive price of P^5 gives the full "price" that producers in a market economy must receive to produce Q^5 of output.

Figure 2
Ratios of producer to consumer prices for agricultural goods in 1986



Source: Computed from ERS (1994).

quate supplies of foodstuffs in any material sense (as the inter-country comparison of consumption in table 2 shows).

Price Liberalization

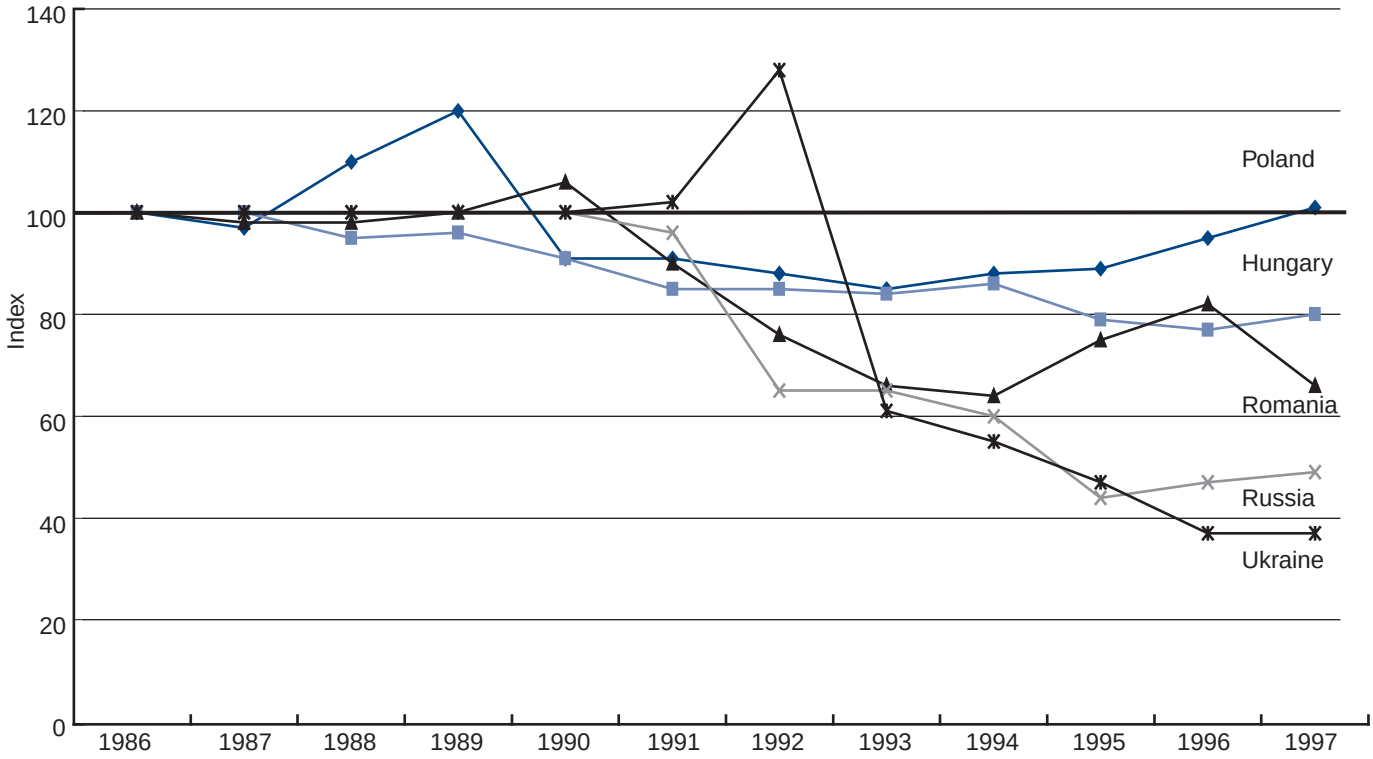
The lead policy of economic reform in the transition economies was price liberalization, which involved the corollary policy of reducing or eliminating state budget subsidies needed to maintain gaps between prices paid to producers and prices charged to consumers. In figure 1, the immediate effect of freeing prices and eliminating budget subsidies for the good in question is that both the producer and consumer price move to P^3. (S^1, the marginal cost of production curve, now becomes the market supply curve.) Production and consumption fall from Q^5 to the market clearing level of Q^4.

The drop in output from Q^5 to Q^4 measures the effect of reform on production from liberalizing the market for only this particular good. However, price liberalization had two other major effects on markets for agricultural products. The freeing of prices led to high economy-wide inflation, in most countries in the hundreds (and in some cases thousands) of percent annually in the early reform years. The massive inflation substantially reduced consumers' real income and, correspondingly, purchasing power, as prices economy-wide rose by a greater percentage than wages and salaries (fig. 3). The decline was particularly severe in Russia and Ukraine, where real incomes fell during the 1990s by half or more. The decrease reflects not only the drop in pay for workers who kept their jobs, but also the rise in unemployment during the transition period.

The fall in real income reduced demand for foodstuffs, represented in figure 4 by the shift left in the demand curve from D^1 to D^2 (figure 4 reproduces and adds to figure 1). The drop in demand decreases both production and consumption from Q^4 to Q^3. The degree to which demand falls for a particular foodstuff depends on how sensitive demand is to changes in income (the income elasticity of demand). Among foodstuffs, demand for livestock products is relatively sensitive to changes in income (*income elastic*), such that declining income in the transition economies particularly hurt the livestock sector. The downsizing of the livestock sector also lowered demand for animal feed (feed grains and oilseeds), and thereby hurt those markets. This effect, rather than the drop in human demand for grain and oilseed products because of falling real income, accounted for most of the reform-driven shift to the left in the demand curves for these crops.

For certain foods, such as bread and potatoes, demand can rise rather than fall when income decreases (*inferior goods*). In figure 4, this would shift the demand curve right. During the transition, consumption of cereals and potatoes in some countries has risen, suggesting that for these countries the products might in fact be inferior goods (table 2).

Figure 3
Consumers' real income falls



Note: For Poland, Hungary, and Romania, figure begins in 1986, with 1986 = 100. For Russia and Ukraine, figure begins in 1990, with 1990 = 100.

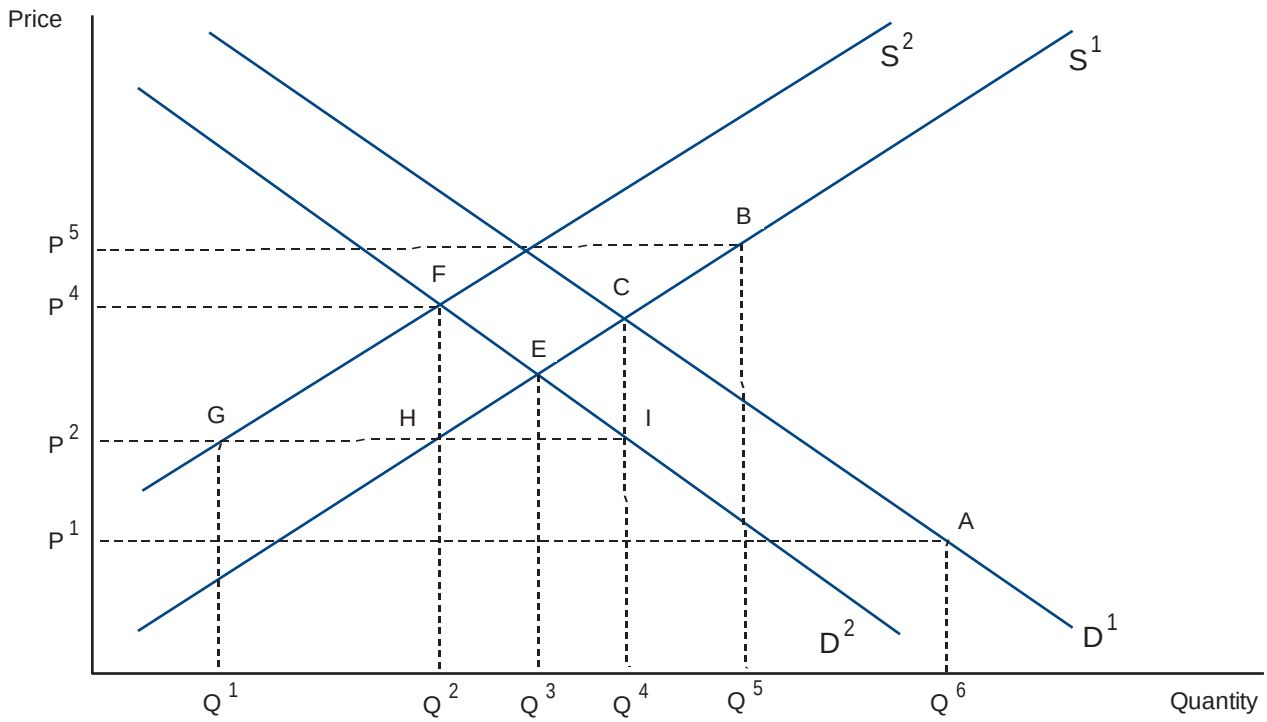
Source: PlanEcon.

In addition to this demand-side effect, price liberalization also affected the supply side of the market by raising the real prices for agricultural inputs. In the inflation that followed price liberalization, prices for agricultural inputs rose by a much greater percentage than prices for agricultural output. This effect increased the real prices producers had to pay for inputs, or in other words, worsened *producers' terms of trade* (fig. 5). In most CEECs, such as Poland, Hungary, and Romania, agricultural producers' terms of trade have dropped by 30-60 percent, while in Russia and Ukraine they have deteriorated by about 75 percent. In 1992, Russian wheat producers on average had to sell 0.3 tons of output to purchase 1 ton of nitrogen fertilizer. In 1997, they had to sell 1.4 tons of wheat to buy the same amount of input (Russian Federation, 1998).

The rise in input prices increases producers' per unit costs of production. This effect is represented in figure 4 by the leftward shift in the supply curve from S^1 to S^2. The shift in supply cuts production and consumption further to Q^2. (To avoid cluttering figure 4, Q^2 is used to represent two different quantities—the level of production and consumption after economy-wide price liberalization referred to in this paragraph, associated with point F, *and* the quantity of production after price and trade liberalization within this market alone, associated with point H, which is discussed later. These two quantities would usually be different.) The drop in output occurs because higher real prices for inputs result in reduced use in production. For example, from 1990 to 1997, Russian fertilizer use per hectare fell 80 percent, from 88 to 16 kilograms (Russian Federation, 2000).

Price liberalization could result in input prices rising relative to output prices for two reasons. The first is that in the pre-reform period, prices for inputs were set lower relative to their production cost than were prices for output. When prices were then freed, prices for inputs had to rise more than prices for output to reach the value of the real cost of production. Such

Figure 4
Price and trade liberalization



Note: Identification of price (P) and quantity (Q) values:

P^1 is the pre-reform consumer price.

P^2 is the producer and consumer price after price and trade liberalization.

P^4 is the producer and consumer price after economy-wide price liberalization.

P^5 is the pre-reform producer price.

Q^1 is the quantity of production after price and trade liberalization.

Q^2 is the quantity of production and consumption after economy-wide price liberalization; it also is the quantity of production after price and trade liberalization within this market alone. Q^2 is used to represent two different values simply to avoid cluttering the figure.

Q^3 is the quantity of production and consumption after both price liberalization within this market alone and the drop in consumer demand from declining real income following economy-wide price liberalization.

Q^4 is the quantity of production and consumption after price liberalization within this market alone; it also is the quantity of consumption after price and trade liberalization. Q^4 is used to represent two different values simply to avoid cluttering the figure.

Q^5 is the pre-reform quantity of production.

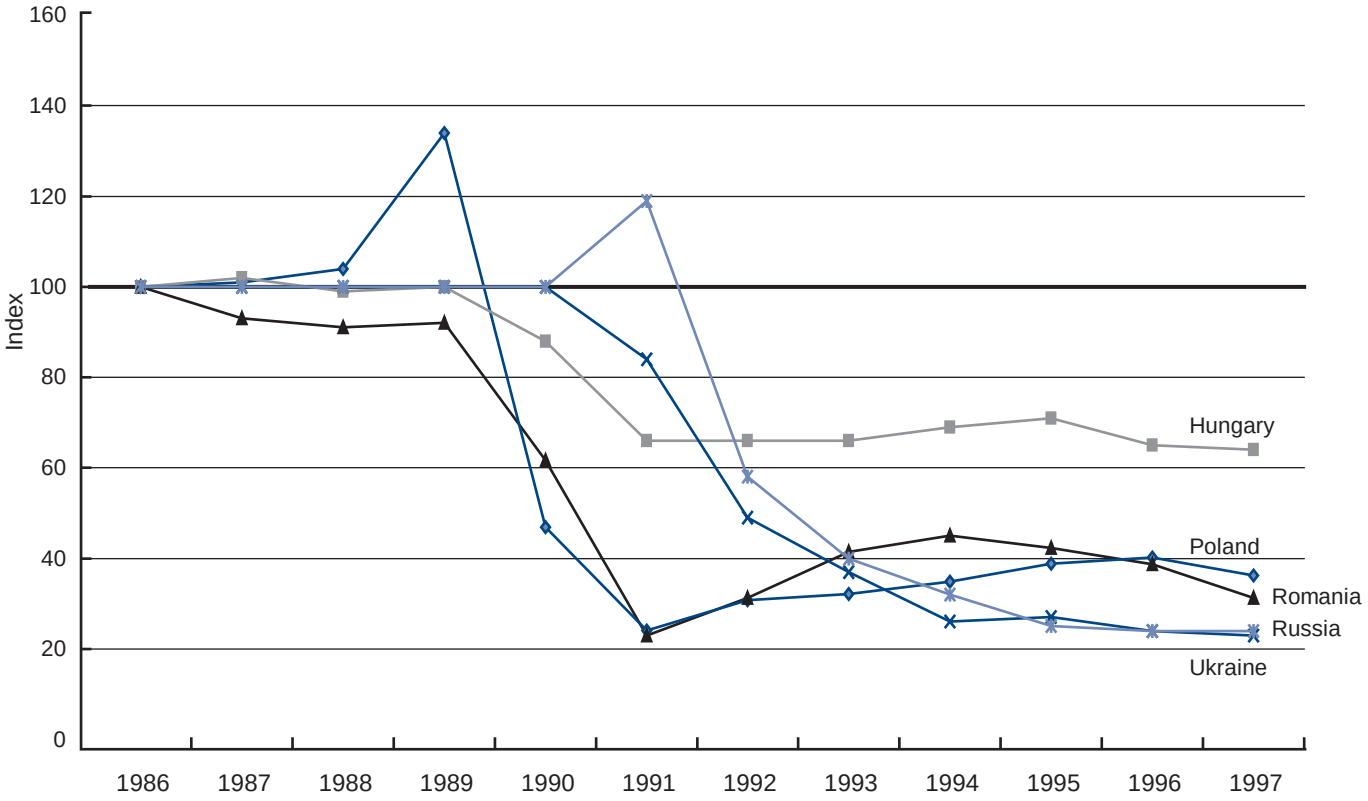
Q^6 is the pre-reform quantity demanded by consumers.

Source: ERS.

price-setting behavior means that in the pre-reform period, producers were subsidized not only through direct budget subsidies, but also indirectly through the price system.

The second possible reason input prices could rise relative to output prices involves not only market liberalization but also the market structure for suppliers of agricultural inputs. In the pre-reform period, farms were typically dependent for the supply of any particular input on just a few, and perhaps only one, large state distributor(s). During the early reform years, markets in most transition economies were liberalized and the input distributors privatized without the latter being broken up into smaller competing units. During the transition period, farms have accused the large suppliers of using their monopoly-type market power inherited from the old system to charge higher prices than would be possible if a number of smaller competitive suppliers existed, prices that exceed the input producers' costs of

Figure 5
Agricultural producers' terms of trade deteriorate



Note: The index values identify the change in the prices agricultural producers received for their output relative to the change in the prices producers paid for inputs. For Poland, Hungary, and Romania, the figure begins in 1986, with 1986 = 100. For Russia and Ukraine, the figure begins in 1990, with 1990 = 100.

Source: OECD.

production. Higher input prices raise farms' production costs. In figure 4, such pricing behavior would contribute to the leftward shift in the supply curve from S^1 to S^2.

Although common to most transition economies, this problem is hard to gauge. In most NIS countries, such as Russia and Ukraine, local authorities continue to help the large former state and collective farms obtain inputs, often at below-market prices, in return for the farms' willingness to sell the authorities a certain amount of output at agreed-upon prices. Because the prices of both inputs and output exchanged in these deals often deviate from existing "market" prices, it is difficult to determine whether farms are on net gaining or losing from the arrangement. Given that NIS regional governments have been paternalistic toward farms in their jurisdictions, fearing that defunct farms would create unemployment and possibly food security problems, they have probably not used their power over farms much to the latters' disadvantage.

Because the relationship between farms and local governments in Central and Eastern Europe is weaker than in NIS countries, CEEC farms might be more vulnerable to input suppliers with market power. However, evidence indicates that processors in CEECs do not have strong market power, with food processing being even less concentrated than in Western Europe. For example, the top four flour processors in the Czech Republic, Hungary, Poland, and Romania have less market power than their counterparts in France, Germany, or the United Kingdom (Gorton et al., 2000).

It therefore appears that most of the worsening in agricultural producers' terms of trade during transition resulted not from the abuse of market power by input suppliers, but rather from correction of the price-cost disparity for goods in the pre-reform period. If so, the worsening of producers' terms of trade with price liberalization is evidence of the degree to which the pre-reform price system helped subsidize agricultural production.

Trade Liberalization

The second major reform policy that affected commodity restructuring in agriculture was trade liberalization. Assume in figure 4 that the world price for the good in question is P^2, compared with the domestic price after price liberalization but before trade liberalization of P^4. If the country allows free trade in the good and internal markets are functioning well, the world price will determine the domestic price. The domestic price will therefore drop to P^2. Production will fall from Q^2 to Q^1, consumption will rise from Q^2 to Q^4, and the country will import Q^1Q^4 of the good. (In figure 4, Q^4 is used to represent the quantity of consumption after price and trade liberalization, associated with point I, as well as the quantity of production and consumption after price liberalization within this market alone, associated with point C. These two quantities would usually be different, but again are made equal simply to avoid cluttering the figure.)

When transition economies liberalized trade, world market prices for agricultural goods were typically below rather than above domestic prices (the empirical evidence is discussed later in the section that examines why forecasting studies underestimated the output drop during transition). Setting domestic producer prices above world trade prices was the third way by which the pre-reform system subsidized agriculture. For certain countries and goods, though, world prices were above domestic prices. This means that with trade liberalization, domestic prices rose to world levels, and pre-reform production was taxed rather than subsidized relative to the world market. One could easily use figure 4 to show that in this case the (isolated) effect of trade liberalization would be increased production, decreased consumption, and increased exports of the good. Transition economies that currently are net exporters of agricultural commodities include Poland and Hungary with pork, Hungary and Romania with grain, and Uzbekistan and Turkmenistan with cotton.

The pre-reform scenario depicted in figure 1 assumes that the country is not trading any of the good in question. However, the pre-reform transition economies did engage in agricultural trade. Most of their agricultural exports went to other states within the Soviet bloc, particularly Russia. (For the countries of the former USSR, these "exports" were part of inter-republic flows.) Examples include exports of meat by Hungary, Romania, Ukraine and Kazakstan; grain by Hungary, Ukraine, and Kazakstan; sugar by Ukraine; and cotton by Uzbekistan and Turkmenistan.

The pre-reform trade in agriculture was not market-driven but rather was an integral part of countries' economic planning. As a result, the collapse of the Soviet bloc and central planning abruptly reduced the commodity flows. Because these exports were generally lower in quality than corresponding output sold on the world market, alternative foreign markets could not necessarily be found. The loss of markets within the former Soviet bloc reinforced the drop in demand from falling domestic consumer income. This effect caused the demand curve for such products to shift even further to the left.[8] Over time, some CEECs have expanded their agricultural exports to the European Union. For certain CEECs, such as Poland and Hungary, this export growth has more than compensated for the loss of export markets in other transition economies. By the late 1990s, their total agricultural exports in value terms exceeded pre-reform levels.[9]

The USSR was also a major agricultural importer of products from outside the Soviet bloc (with most of the imports again going to Russia). The main imports included feed grain, soybeans, and soybean meal, needed to feed the growing livestock herds.[10] The reform-driven contraction of the livestock sector has severely reduced these imports (table 3). Instead of importing feed to support their expensively maintained livestock herds, the countries of the former USSR (again mainly Russia) are importing meat and other livestock products directly. From the second half of the 1980s to the period 1995-98, average annual meat imports by the countries of the former USSR rose by about 125 percent.[11]

[8] In the pre-reform scenario depicted in figure 1, exports would result in a new demand curve, called D^3, which lay to the right of, and parallel to, D^1. The horizontal distance between the two demand curves would equal the level of exports. Loss of this trade would shift the operative demand curve from D^3 to D^1.

[9] For further discussion of the effects of reform on the agricultural trade of the CEECs, in particular their growing trade with the EU, see ERS (1993) and ERS (1999a).

[10] This point takes issue with the criticism often made of the former USSR that it could not even feed itself. Rather than allaying food shortages, the imports of animal feed were used to maintain artificially high levels of livestock production and consumption.

[11] The reason the data in table 3 stop at 1998 is that in 1999 and 2000 the United States and EU gave Russia substantial food aid. The official Russian foreign trade data do not distinguish between commercial imports and food aid, and separating out the two categories of inflows would be overly difficult.

The NIS region's switch from being a major importer of animal feed to a major importer of meat and other livestock products suggests that the region has a *comparative disadvantage* in the production of livestock products relative to animal feed; that is, the region produces meat and other livestock products at a higher cost than it produces animal feed, relative to world market prices. Liefert (1994) supports this conclusion. He finds that at the end of the Soviet period, the USSR had a comparative disadvantage in meat production compared with grain production. That agricultural trade during the Soviet period appears to have been inconsistent with comparative advantage shows the extent to which trade was driven by policy rather than economic rationality. Liefert (forthcoming) shows that in the late 1990s, Russia continued to have a comparative disadvantage in meat production compared with grain production.

In the pre-reform period, the United States was a major exporter of grain, soybeans, and soybean meal to the former USSR. In the wake of the changes in NIS agricultural trade, U.S. exports of all these products to the region have fallen substantially. However, the United States has moved from exporting almost no meat to the region in the pre-reform period to being a major meat exporter. The bulk of the exports are poultry, going mostly to Russia. In fact, during the second half of the 1990s, Russia took nearly half of all U.S. poultry exports. Because the changes in NIS agricultural trade are being driven by the economic fundamentals of comparative advantage, rather than any short-run "disruptions" of transition, the changes in the volume and structure of U.S. agricultural exports to the NIS region are not likely to be reversed in the foreseeable future.

Why Price and Trade Liberalization Reduced Agricultural Output

Price and trade liberalization substantially changed prices and incomes—the two main factors on which producers and consumers base their decisions to produce, buy, and sell goods. Changes in these variables in turn induced major changes in agricultural production, consumption, and trade. The decline in output, particularly in the livestock sector, was inevitable. Price liberalization caused output for a typical good to fall for three reasons—liberalization and elimination of budget subsidies within that market alone, the drop in consumer income, and the rise in inputs' real prices, with the last two effects occurring from economy-wide price liberalization. Trade liberalization added a fourth reason production could drop—world prices lying below domestic producer prices.

Another way to explain why economic reform has reduced agricultural output is to identify how the pre-reform system directly and indirectly subsidized agriculture, and how the elimination of these subsidies through price and trade liberalization caused production to drop. The three main types of subsidies were direct budget subsidies from the government, the domestic price system that kept prices for agricultural inputs low relative to producer output prices and the real costs of production, and the price and trade system that kept producer prices above world trade prices.

Certain "transition economies" have experienced no drop in aggregate agricultural output during the 1990s. In Uzbekistan, total production has not fallen, and in Turkmenistan, it has increased (table 1). However, the absence of a decline in output for such countries reflects failure to reform, rather than reform success. These countries have been the least reformist, not only in agriculture but economy-wide, with the state retaining strong control over agriculture. In fact, in the World Bank grading of agricultural reform progress among the transition economies, Uzbekistan and Turkmenistan (along with Belarus) are at the bottom of the list. However, major changes have occurred in these two countries' commodity composition of output. Their main agricultural policy since the Soviet Union broke up has been to move away from heavily pushing cotton production to producing more foodstuffs, in particular grain. This explains why in table 1 grain output in Uzbekistan and Turkmenistan during the 1990s more than doubled and tripled, respectively.

Because the decline in agricultural output (in most transition economies) has been a necessary consequence of market liberalization, the change in output is a misleading indicator of the success of agricultural reform. The degree to which output has fallen in individual countries is largely a measure of the extent to which in the pre-reform period agriculture was subsidized, planners' preferences for goods deviated from consumers' preferences, and the structure of countries' production and foreign trade differed from that based on comparative advantage.[12]

[12] Although examining why industrial output has also fallen during the transition period is beyond the scope of this report, the general reasons are the same as those given for agriculture. Planners' desires for goods dominated those of consumers, industrial production was subsidized (especially in heavy industry, such as metallurgy and chemicals), and production and trade were not driven by countries' comparative advantage vis-à-vis the world market. Thus, industry was also an overexpanded sector of the economy.

High Transaction Costs Resulting From Undeveloped Market Infrastructure

Liberalization policies hit agricultural markets fast and hard during the early reform years. A more protracted reason for the decline in agricultural output has been deficient market infrastructure, both physical and institutional. Poor infrastructure increases farms' costs and risks of producing and, in particular, selling output—that is, it raises the transaction costs of doing business. Although undeveloped physical and commercial infrastructure can also be a difficulty for industry, it is particularly problematic for agriculture, largely because of the perishability of foodstuffs.

Just as an increase in the cost of inputs shifts the producers' supply curve to the left, so also does an increase in transaction costs. In figure 4, high transaction costs would be represented by shifting the supply curve S^2 further to the left. With the world price of P^2 setting the domestic price, the leftward shift in supply would cause production to fall below Q^1.

All the transition economies inherited from the prereform period poor systems of physical infrastructure. Although storage capacity is inadequate, the main weakness is transportation, particularly the poor road system. In some countries, the cost of shipping agricultural commodities between regions exceeds producer prices. In addition, the deficient transportation and storage systems increase the risk of spoilage.

Transition economies also undertook reform without the benefit of established market infrastructure. The prereform planned system did not need, and therefore did not provide, the type of commercial and institutional infrastructure that a market-oriented agricultural economy requires. Producers and, especially, traders need a financial system that allows fast, affordable access to capital, a system for quick and inexpensive dissemination of market information (where can one buy and sell, and at what price?), and a strong system of commercial law that protects property and enforces contracts. The absence of this market infrastructure increases the risks and transaction costs of doing business.

An endemic problem in these economies that raises transaction costs is extortion and bribery, a consequence largely of the dysfunctional legal system. The problem is particularly serious for sellers of agricultural products. The easily identifiable and spoilable nature of their output makes them vulnerable to vandalism by extortionists or corrupt officials.

Producers must compete, especially vis-à-vis imports, with respect to all aspects of their operations—sales as well as primary production. High transaction costs, particularly in NIS countries, make it difficult for domestic producers in outlying regions to compete with food imports. The large agricultural imports of the Soviet period led to the creation of a relatively well-functioning and inexpensive system for moving imports from entry ports to high-consuming urban areas, such as Moscow and St. Petersburg (which itself is a port).

These transaction costs can be roughly measured by comparing producer prices for agricultural commodities within countries with world prices. Often, producer prices have been far below world trade prices, which under normal market conditions would result in the countries' exporting the products. However, the goods in question often were not exported, and in many cases countries imported the products. High transaction costs precluded export; that is, if transaction costs were added to the costs of production, the total cost would make the goods uncompetitive on the world market or with imports.

For example, in the first half of the 1990s, producer prices for all agricultural commodities in Russia were far below world prices, which were two to four times greater than Russian producer prices (Liefert et al., 1996). Yet, Russia was not a net exporter of any major agricultural goods, and for a number of products it was in fact a net importer.

The economic crisis that hit Russia in August 1998, and agriculture's response to it, provides further evidence of the harmful effect of high transaction costs on agriculture. As a result of the crisis, the ruble depreciated against Western currencies by as much as 80 percent. The depreciation substantially raised the domestic currency prices of imports, such that imports fell significantly. In 1999, agricultural imports dropped by about half. This hurt U.S. agricultural exports to Russia, especially of poultry, as well as exports by various transition economies to Russia, such as Polish pork.

By raising the price competitiveness of all domestic output vis-à-vis imports and the world market, the currency depreciation provided an excellent opportunity

Measuring the Causes of Output Decline

An empirical study by Macours and Swinnen (2000a) on the causes of agricultural output decline in transition economies strongly supports this ERS report's analysis of why agricultural production has fallen. This report argues that the drop in agricultural output has resulted mainly from the policies of market liberalization—price and trade liberalization and reduction of subsidies. According to Macours and Swinnen, market liberalization policies account for about three-quarters of the output decline in their study.

The Macours and Swinnen (M&S) study covers the output of five crops (wheat, corn, barley, sugar, and oilseeds) in eight CEECs during 1989-95. The eight countries are Albania, Bulgaria, Czech Republic, Hungary, Poland, Romania, Slovak Republic, and Slovenia.

The study econometrically measures the contribution of various reform policies and developments to the production drop (see table). *Uncertainty* hurts output because it motivates farmers to reduce input use. *Disruption* from farm restructuring lowers output because of temporary inefficiencies, such as upsetting contractual relations and poor initial allocations on farms of the key inputs of land, labor, and capital. *Individual farms* is the only variable in the study found to increase output, as the move from large collective farms to small individual ones improves the incentives to use labor and other inputs more productively.

The two explanatory variables in M&S that capture the output effects from market liberalization are *price changes* and *privatization*. *Price changes* covers changes in agricultural output prices relative to changes in input prices (that is, producers' terms of trade) that result from price and trade liberalization. Because the analysis of the drop in output as presented in this report using figures 1 and 4 focuses on how price and trade liberalization changes prices, the fall in output attributed to the variable *price changes* in M&S corresponds to most of the output decline as identified in this ERS report. M&S find that price changes account for 46 percent of the drop in output.

Causes of crop output decline

Variable	Contribution to net output change
	Percent
Weather	-10
Uncertainty	-12
Farm restructuring	+18
Disruption	-50
Individual farms	+68
Privatization	-39
Price changes	-46
Residual	-11
Total output change	-100

Source: Macours and Swinnen (2000a).

Privatization measures the share of privately owned land. The move to privatization can have two opposite effects on output. The positive effect is that like individual farming, privatization can improve incentives to use inputs more productively, thereby increasing production. The negative effect is that privatization imposes a "hard budget constraint," which means that farms must become self-financing rather than dependent on the state for various subsidies. The drop in subsidies reduces input use, which lowers output. M&S find that privatization is responsible for 39 percent of the net fall in production. This finding shows that the negative hard budget constraint impact on output from privatization heavily dominates the positive efficiency effect. However, M&S point out that privatization encourages underreporting of output by farms, both to reduce taxation and to strengthen farms' arguments that they need more state support. The likelihood of underreporting means that privatization might account for somewhat less than the 39 percent of the drop in production calculated by M&S.

As mentioned in the previous paragraph, privatization decreases output by reducing subsidies to farms. In figure 1, the pre-reform producer price P^5 is the producer incentive price, which equals the actual price received plus per unit subsidies. The negative

Continued on page 15

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effect on output because of privatization in M&S would be captured in figure 1 by the fall in production from Q^5 to Q^4. The examination of the fall in agricultural production in this ERS report therefore covers the output effects from both changes in prices and privatization as defined and measured by M&S. These two variables in the M&S study together explain 85 percent of the drop in output, though the number should be reduced somewhat because of the incentives for farms under privatization to switch from overreporting to underreporting output. Thus, the policies of market liberalization—liberalizing prices and trade and reducing subsidies—probably account for about three-quarters of the reform-driven drop in agricultural output in the M&S study.

The one major cause of agricultural output decline examined in this ERS report that M&S do not measure is high transaction costs resulting from undeveloped market infrastructure. The explanatory variable in M&S probably closest to this factor is *uncertainty*. In M&S, 11 percent of the output decline cannot be explained by the variables identified. This residual 11 percent could therefore capture the output decline from undeveloped market infrastructure.

to stimulate Russian agricultural production. However, it appears that agriculture has responded only mildly. Although total agricultural output in Russia increased in 1999 and 2000 by 3 and 5 percent, this was mainly because weather improved in these years compared with the terrible weather year of 1998 (which produced Russia's lowest grain harvest in decades). In 2000, total agricultural production was still 4 percent lower than in 1997 (admittedly a very good weather year).

The change in Russia's production of livestock goods is a better indicator of the response to ruble depreciation than the change in crop production, given that Russia imports more livestock products than crops (in value terms), and that livestock output is not as vulnerable to the weather. In 1999 livestock production declined 4 percent, while aggregate output in 2000 was unchanged. The 2000 performance, in fact, represents some progress, because it was the first year since reform began that livestock output did not fall. Other positive indicators in 2000 were the marginal improvement in farm profitability (the number of unprofitable farms fell from 54 to 48 percent), and the rise in output of agricultural inputs (Serova, 2001). This evidence supports the conclusion that the isolated effect of major ruble depreciation on agricultural output has been positive, though hardly robust.

Ruble depreciation should stimulate domestic production by raising the domestic ruble prices of agricultural goods that compete with imports. The actual modest output response suggests that transmission between changes in the exchange rate and changes in domestic agricultural prices is not strong. Osborne and Liefert (2001) calculate that transmission between changes in the exchange rate and retail food prices in Russia is fairly weak. The most likely reason for low price transmission is high transaction costs due to deficient physical and institutional infrastructure, which work to segment regional markets within the country from each other as well as isolate these regional markets from the world market.

Why Forecasting Studies Underestimated the Decline in Output

At the start of the transition period, some Western forecasting studies used models to predict how economic reform could change various countries' agricultural production, consumption, and trade. Liefert et al. (1993) and Tyers (1994) did so for the NIS region, and Cochrane (1990) for Poland. Rather than forecasting major drops in output, the studies generally projected nontrivial increases in grain output, and much smaller declines in meat production than actually occurred (table 4).

In fairness to these studies, it should be noted they were not necessarily predicting what would *actually* happen to the commodity structure of agriculture in the transition economies 5-10 years after reform began. Rather, their intention was to forecast changes based on the general premise (fleshed out with specific assumptions) that fairly ambitious reform would be pursued. Most of the transition economies, and especially those in the NIS region, have adopted agricultural reform programs less ambitious than those that would be consistent with the forecasters' assumptions. Reform has been particularly slow in the area of farm- and enterprise-level restructuring, the key to productivity growth. As a result, agricultural productivity growth in the transition economies has not achieved the levels assumed by the forecasters in their models.

Nonetheless, examining why the studies underestimated the decline in agricultural production during transition can help identify what can be learned about the problems and challenges of agricultural reform that were not sufficiently understood or anticipated at the start of reform. There are three main reasons why the studies underestimated the fall in agricultural output: (1) they underestimated the magnitude of total pre-reform support to agriculture; (2) they ignored or underrated the extent to which high transaction costs from deficient infrastructure would hurt agriculture; (3) and they assumed productivity in the agro-food economy would grow over the forecasting period by more than it in fact has.

Western estimates of agricultural subsidies in the pre-reform economies were based on the measure of support called producer support estimates (PSE).[13] The PSE for a good equals the difference between producers' "real," or incentive, price and the good's trade or border price (converted to domestic currency with a meaningful exchange rate). The producers' incentive price is the actual monetary price received for a good plus any per unit budget subsidies. The PSE is conventionally expressed as the gap between the producer incentive price and the trade price, divided by the producer incentive price. In figure 4, the pre-reform incentive price is P^5, while the world price is P^2. The PSE for the good equals $(P^5 - P^2)/P^5$.

PSEs measure the per unit transfer of income to producers from government policies that keep the producers' incentive price above the free trade price. PSEs capture two of the general types of subsidies for agriculture that existed in the pre-reform economies and were discussed before—budget subsidies and price

[13] PSEs are the most commonly used measure of support to agriculture not only for transition economies, but for all countries regardless of systemic considerations. PSEs originally were called *producer subsidy equivalents*. In 1999, the Agricultural Directorate of the OECD, which annually calculates PSEs for all member countries (as well as for some nonmember countries, including transition economies), changed its use of the phrase to *producer support estimates*. This is now the more commonly used term, though some researchers continue to use the original phrase.

Table 4—Forecasts of changes in agricultural production

	Grain		Meat	
Country	Forecast	Actual	Forecast	Actual
	Percent change			
USSR (Liefert et al.)	-5	-39	-10	-57
USSR (Tyers)	14	-39	-8	-57
Russia	14	-39	-10	-52
Ukraine	18	-39	-8	-59
Poland	14	-1	17	-2

Note: The figures in the *Forecast* column give the predicted change in output 5-10 years after reform is implemented. The figures in the *Actual* column give the actual change in average annual output between 1986-90 and 1997-99.

Source: Liefert et al. (1993); Tyers (1994); Cochrane (1990); USDA for actual changes.

support policies that kept domestic producer prices above world trade prices.

In figure 4, eliminating the subsidies captured by the PSEs causes the producer incentive price to drop from P^5 to P^2. The fall in price reduces output from Q^5 to Q^2. (As mentioned earlier, to avoid cluttering figure 4, Q^2 is used to identify not only this new quantity, associated with point H, but also the quantity of production and consumption after economy-wide price liberalization but before trade liberalization, associated with point F.) The greater the pre-reform PSE, the greater will be the decline in output from liberalization.

Table 5 presents pre-reform PSE estimates for various transition economies.[14] The high values indicate that liberalization would initially cause agricultural production to fall, as the forecasting studies anticipated. An examination of the various elements of the PSE values using the sources identified shows that the greater share of the PSEs came from border support rather than budget transfers. This finding supports the point made earlier in the study that pre-reform agricultural producer prices in transition economies generally lay above world trade prices.

Another type of pre-reform subsidy to agriculture was indirect support through the domestic price system, whereby the prices farms had to pay for inputs were set low relative to output prices and to the real costs of production. The PSE method for calculating support ignores this type of subsidy; thus, the PSEs computed for transition economies exclude this indirect support. With respect to figure 4, ignoring this subsidy means that output forecasts based on PSEs fail to account for the drop in production from Q^2 to Q^1. This output fall occurs because liberalization results in much larger rises in prices for agricultural inputs than for agricultural output, thereby worsening producers' terms of trade (fig. 5). The deterioration in the terms of trade is represented in figure 4 by the leftward shift in the supply curve from S^1 to S^2. Transition specialists in general failed to anticipate the extent to which price liberalization would worsen agricultural producers' terms of trade with their input suppliers. The magnitude of the deterioration in the terms of trade under reform reveals how strongly the forecasting studies underestimated liberalization's effect on output from neglecting this indirect type of subsidy.[15]

The second reason the studies underestimated the decline in agricultural output was that they underrated the extent to which high transaction costs from undeveloped market infrastructure would hurt transition agriculture. Wehrheim et al. (2000) argues that undeveloped institutions and infrastructure are the main problem facing the sector. The studies identified wholly ignored the issues of market infrastructure and associated transaction costs.

The third reason the studies underestimated the fall in output is that they assumed that productivity in the agro-food economy would grow more than it has once the transition began. Productivity growth would allow output to rise without a corresponding increase in inputs or even allow output to rise with total input use declining. Also, as the transition economies moved to freer trade, productivity growth, by reducing costs of

[14] The main reason for the differences between the ERS and OECD PSE calculations is that the OECD uses exchange rates that give higher values for the currencies of the countries being studied relative to Western currencies. These exchange rates give high domestic producer prices relative to world prices when domestic prices are converted from domestic currency values to U.S. dollar values.

Table 5—PSE estimates for pre-reform agriculture

Country	ERS	OECD
	Percent	
USSR	25	NA
Russia	NA	81
Poland	32	43
Hungary	12	46
Romania	NA	49

NA means not available.

Note: The figures are weighted averages of PSEs for individual commodities, where the PSE for a commodity equals the gap between the producer incentive price and the trade price, divided by the producer incentive price. The calculations cover various years between 1986 and 1990, depending on the country.

Source: ERS (1994), OECD (annual for 1996, 1999, 2000).

[15] Four reasons were identified earlier as to why market liberalization reduces output. The first three reasons followed from domestic price liberalization—the move to market equilibrium from liberalization within a single market, the drop in consumer income, and the rise in inputs' real prices—while the fourth reason was trade liberalization. The fall in output from removing support as measured by PSEs covers the effects from all of these events, except for the rise in inputs' real prices. This last effect is represented by the shift left in the supply curve, while the other three are represented by movement along the supply curve. Note also that once a country opens up to free trade, the drop in consumer income stops being a contributing cause of the decline in output. Once the world price determines the domestic price, it also determines the quantity of output produced. Although the leftward shift in the demand curve from falling income ceases to affect production, it does affect the levels of consumption and imports.

production, would make domestic output more competitive with products sold on the world market. In figure 4, productivity growth would shift the supply curve to the right, thereby increasing production.

The two productivity variables in the forecasting studies are crop yields and feeding efficiency in the livestock sector. Liefert et al. (1993) assumes that reform in the former USSR would increase crop yields 10-15 percent, and feeding efficiency in the livestock sector (output per unit of feed) 20-25 percent. Tyers' (1994) forecasts are based on the assumption that after the initial disruption of reform, agricultural productivity throughout the former USSR would revert to its trend rate of growth. Cochrane (1990) assumes productivity growth for Polish commodities of 10-30 percent (yields for crops and feeding efficiency for livestock products).

Contrary to the forecast assumptions that yields would rise, during the first 5 or so years of reform, they fell heavily in virtually all transition economies. In the second half of the 1990s, yields began to recover in the faster reforming CEECs, such as Hungary and Poland. In the NIS region, however, yields have not rebounded from the large drop. The change in feeding efficiency is less clear, as it varies by country and product, rising in some cases and falling in others. The data, however, do not support a conclusion of overall improvement.

Consumption and Food Security Concerns

The drop in agricultural production during reform has coincided with a fall in consumption of some foodstuffs (table 2). The Western media commonly cite the decline in agricultural output and consumption in Russia and other (mainly NIS) transition economies as evidence that transition has worsened food security. Although transition has created a food security problem in various countries, the cause of the problem is not the drop in agricultural output, nor is it more generally insufficient availability of food supplies. In some countries, such as Russia, consumption of livestock products has declined less than production. Trade liberalization has resulted in growing imports of livestock products and other foodstuffs that are costly to produce domestically (the drop in Russian imports following the 1998 economic crisis notwithstanding).

As mentioned earlier, before reform, the transition economies had high per capita levels of consumption of most foodstuffs, including meat and other high-value livestock products, compared with even rich OECD nations. The best evidence of the adequate availability of foodstuffs during transition is that, even with food supplies and consumption being relatively high in the pre-reform period, consumption of staple foods, such as cereals and potatoes, has remained steady or even risen. Consumption of high-value livestock products has fallen during transition. However, per capita GDP in the CEECs and USSR before reform was at most only half the OECD average. Consumption of "luxury" livestock products has therefore declined during transition to levels more consistent with countries' real income.

Reform has threatened food security in Russia and other transition economies because of problems involving *access* to food for segments of the population and certain regions within countries. As poverty increases because of inflation and rising unemployment, food becomes less affordable to a growing share of the population. Reports from Russia suggest that as much as 40 percent of the population might be living below the poverty level. In addition, within certain countries, such as Russia, Ukraine, and Uzbekistan, agricultural surplus-producing regions are restricting the outflow of foodstuffs. The most benign-possible reason for this behavior is that regional authorities wish to protect their own consumers by ensuring that local supplies are adequate. The most malign-possible reason is corruption, as officials might be exploiting the regional price differences created by these restrictions to earn easy profits. Whatever the cause, these controls can prevent food-deficit regions from obtaining needed supplies.

During the 1990s, the United States and EU gave food aid to a number of transition economies, including Albania, Armenia, Azerbaijan, Georgia, Kyrgyzstan, Moldova, Russia, and Tajikistan.[16] The biggest recipient in recent years has been Russia, which in 1998-2000 received over 3 million metric tons (mmt) of commodities from the United States, worth about $1.1 billion, and around 1.8 mmt from the EU, worth almost $0.5 billion. Some of the U.S. aid was distributed by private voluntary organizations to the poor and elderly, while most of the U.S. and EU aid was targeted to food-deficit regions.[17]

These distribution policies reflect the wisdom of targeting food aid to needy social groups and regions. Such distribution will not only have the strongest possible humanitarian effect, but also limit any potential harm to agricultural producers in the recipient countries. Funneling food aid to the poor, who have reduced purchasing power, and to food-deficit regions, where food prices are high, will minimize the harmful

[16] ERS has an ongoing research program that forecasts the food security needs of countries throughout the world. The transition economies included in the forecasting exercise are Armenia, Azerbaijan, Georgia, Kyrgyzstan, and Tajikistan (see ERS, 1999b). Key causes of food insecurity in these countries are political instability and economic uncertainty, such as repercussions from the economic crisis that hit Russia in August 1998 (which, among other effects, disrupted trade flows within the NIS region).

[17] One of the motivating factors in the large aid to Russia was worry about the potential effects on food availability of Russia's economic crisis of 1998. As discussed earlier in this report, the crisis substantially depreciated the Russian ruble against Western currencies. By raising the price of imported foodstuffs, the depreciation cut food imports in half. It has been a commonly held belief during the transition that Russia imports over half of its food. If true, the large drop in imports following ruble depreciation could by itself threaten food security. However, ERS has calculated that even before Russia's crisis, imports accounted for only about a fifth of the country's total food consumption. Poultry (mainly from the United States) was the only major foodstuff for which imports have been providing over half of domestic consumption. However, imports do account for over half of the food consumed in major cities such as Moscow and St. Petersburg. Extrapolating the experience of the big cities to the entire country might explain how the misconception developed concerning the importance of imports to total national food supplies (see Liefert and Liefert, 1999).

effect that food aid can have on agricultural producers by depressing prices.

One of the main effects of market reform in transition economies is the rise of consumer sovereignty; that is, the desires of consumers have replaced the preferences of planners as the dominant force in determining what goods (and quantities) are produced and consumed. The reform-driven drop in agricultural production and consumption is therefore part of the economy-wide reallocation of resources away from producing and consuming goods favored by planners and the political elite to goods favored by consumers. Although it might seem surprising to describe foodstuffs as goods more favored by planners than consumers, when the prices of goods began to reflect the full cost of their production, consumers switched from buying high-cost livestock products to other goods and services. Reform has, in fact, created entirely new goods and, in particular, services which consumers were starved of under the old regime and to which demand is turning during reform. Much of the worry in both the transition economies and West about the consequences of declining food production and consumption during reform has been based on the misconception that foodstuffs by their very nature must be goods more favored by consumers than planners, such that consumers must on net inevitably suffer if reform reduces consumption.

Output Versus Productivity Growth as Reform Performance Indicators

As argued earlier, during the initial years of agricultural reform, the growth of output was an inappropriate indicator of reform progress. Once the short- to medium-term negative output effects of market liberalization have subsided, would output become a valid indicator of reform success? We maintain that in the long run, as well as short run, output is an inappropriate performance indicator. Rather, growth in productivity—output per unit of input used in production—is the single best measure of reform progress. A way to argue this point is to examine how agricultural production could increase in the future in transition economies, and in particular how productivity growth and output are related.

Productivity Growth and Output

One way the transition economies could raise agricultural production is by adopting policies that reverse the market-driven contraction resulting from market liberalization. These policies might include higher budget subsidies to the agricultural sector, greater state control over prices (for both inputs and output), which would be set to agricultural producers' advantage, and more trade restrictions.[18] Such policies, though, would be wholly inconsistent with market reform. Any resulting rise in output would therefore be a measure not of the progress of reform but of its negation. Thus, the main reason output is a flawed indicator of reform progress in agriculture is that one could not easily determine whether any growth was the result of effective market-consistent reform policies or anti-reform policies.

One might argue that production could be stimulated by higher GDP growth that raised consumer income, thereby boosting demand for foodstuffs. Higher demand for food would increase prices for producers, thereby motivating more output. Some high-level officials in transition economies have argued that demand-stimulating GDP growth is agriculture's best hope for an output rebound.

[18] Most transition economies have not wholly eliminated subsidies or state controls over prices and trade. Most, however, are closer to the free market and trade scenario depicted in figure 4 than to the pre-reform scenario in figure 1.

This argument holds, however, only for countries largely insulated from the world market. As mentioned earlier in this report, if a country is generally free-trading and its domestic market is well-integrated into the world market, world prices determine its domestic prices, independent of the level of domestic demand. If a country were a net importer of a certain foodstuff, an increase in domestic demand for the good from growing consumer income would be satisfied by additional imports, not additional domestic production. If a country were a net exporter of the good, higher consumer demand would reduce exports, leaving domestic output unchanged. This effect can be seen in figure 4, where we assume again that a country is facing world price P^2 for a good and importing Q^1Q^4. A shift to the right of the demand curve increases domestic consumption and imports, but not domestic production.

The main way to raise agricultural output consistent with a market-driven and free-trading economy would be through positive supply-side developments. Two such developments are possible: effective farm-level changes, of the type imagined by the forecasting studies examined earlier, that increase productivity; and more vigorous development of both commercial and public infrastructure and institutions that a market-driven agricultural economy needs.

Farm-level changes could spur productivity growth in three general ways. The first way would be simply to shed unproductive inputs, particularly labor. The agricultural labor force in virtually all transition economies is inefficiently large, as shown by the fact that agriculture's share in the total labor force is much higher than agriculture's share in GDP. In most countries, primary agriculture accounts for 15-30 percent of the total labor force (compared with only 2 percent in the United States and about 5 percent in the EU), while agriculture's share in GDP is about 10-20 percent.

This form of agricultural productivity growth—excess labor moving out of agriculture to new employment—expands output not in agriculture, but in the industries to which the labor moves. Unlike with the two other ways of increasing productivity that will be discussed, agriculture itself does not receive a production boost. Shedding excess labor has the advantage that productivity can rise in agriculture without necessarily having to change the nature and system of farm-level production. The transfer of labor to off-farm employment, however, requires reform developments outside

of agriculture, that is, the generation of new nonagricultural jobs. In the transition context, this would come from economy-wide liberalization, particularly in services, which quickly creates new employment opportunities. Macours and Swinnen (forthcoming) find that economy-wide liberalization is positively correlated with the growth of labor productivity in agriculture. Concern that discarded low-skilled labor might be unable to find new jobs has been a major obstacle to systemic reform in transition agriculture.[19]

The second way farm-level changes could raise productivity would be for less productive farms to rise to the productivity and efficiency level of the current top-performing farms in their country. This improvement in *technical efficiency* by farms moving closer to the production practices of their country's best farms is also achievable within a country's existing production technology. One way farms could increase usable output in this manner would be to reduce the tremendous waste of harvested output during the stages of storage, transportation, and processing, a systemic weakness inherited from the prereform period (Johnson, 1993). This would raise productivity and efficiency measured from the point of view of the entire agro-food economy.

The third way farm-level changes could increase productivity would be to adopt new technologies of production (*technological change*). The new "technology" could involve improvement not only in the technical means of production, but also in the way farms are organized, managed, and motivated. For example, Macours and Swinnen (forthcoming) find that the creation of *user rights* for farmland is positively correlated with growth in agricultural labor productivity (as well as with growth in output). User rights motivate productivity growth by providing farmers security of tenure in their land (if not strictly as owners, at least as users), thereby improving farmers' incentives to work efficiently and invest in their farms. Foreign direct investment could play a key role in transferring both superior technology and management practices to transition agriculture.

The other major supply-side development that could increase support would be to improve both the commercial and public institutional infrastructure that a market-driven agricultural economy requires. As discussed earlier in this report, major institutional needs include well-operating systems of market information, rural banking and finance, and commercial law. By lowering transaction costs, such infrastructural services would make domestic agricultural output more price competitive vis-à-vis the world market (which for many countries means competing with imports sold in their large cities). In figure 4, the drop in transaction costs would shift the supply curve to the right, stimulating output and improving the trade balance of the good in question.

Lerman (1999, 2000) finds that a correlation exists between GDP growth in transition economies and growth in agricultural output. GDP growth not only increases the quantity of agricultural inputs (including physical capital) available to farms, but also results in development of the agricultural services and commercial infrastructure that farms need to function and reduces operational and transaction costs. Thus, the success of economy-wide reform and growth appears to be a key factor in the prosperity and growth of agriculture.

Another simulation scenario in the ERS study on restructuring in the livestock sector (Cochrane, 2002) examines the effect on livestock herds and production from a decrease in transaction costs resulting from accelerated development of institutional market infrastructure. Institutional development is assumed to reduce transaction costs (represented in the study by *marketing margins*) by 20 percent in Russia, Ukraine, and Romania. The projected effect is substantial, as both herds and meat output rise 5-20 percent (depending on the country and type of meat).

It was mentioned earlier in the report that Western forecasting studies omitted the role of institutions and commercial infrastructure in predicting how reform might change the volume and mix of transition economies' agricultural production, consumption, and trade (perhaps because these elements are not easily quantifiable). Yet, Western aid has far from ignored the

[19] One of the simulation scenarios in the ERS study on restructuring in transition economies' livestock sector (Cochrane, 2002) examines the effect on employment, production, and trade from the movement of labor out of the sector to nonagricultural jobs. In the simulation, investment in nonagricultural sectors in Poland, Romania, and Russia is assumed to rise 15 percent, which by increasing wages draws labor from agriculture. As expected, output in the sectors receiving the investment rises while livestock production falls, which in turn increases imports of livestock goods. The main conclusion of the scenario is that in order for a significant amount of labor to be enticed to nonagricultural employment, wages must rise substantially.

importance of institutions and market infrastructure in the reform of transition agriculture. Much of the West's technical assistance effort vis-à-vis transition agriculture, as indicated by the efforts of the World Bank and European Bank for Reconstruction and Development, has focused on building such infrastructure.

Nonetheless, it seems fair to conclude that at the start of reform, Western specialists underrated how slow and difficult the creation of this infrastructure would be, as well as how crucial it is for the functioning of a market-based agricultural system. A recent World Bank report on poverty (World Bank, 2000) asserts that in formulating policies to combat poverty in developing and transition economies, as well as in helping devise social and economic policy in general, international aid organizations have paid insufficient attention to institutions.

The creation and effective operation of market-based institutions in the transition economies take time. Western technical assistance in this area should focus on education and training. While it is important that personnel in the transition economies master the technical administration of new institutions, it is equally important that public officials, as well as those whom the institutions should serve, understand why the institutions are important within the framework of a market system, and trust and respect them, particularly when their own interests conflict with maintaining the institutions' integrity. The ability of people to change their behavior in this way is a major constraint on the pace and effectiveness of reform.

The two main ways the transition economies can increase agricultural output compatible with market reform—effective farm-level changes and building of supporting institutional infrastructure—create that additional output by either raising productivity or lowering costs (both the primary costs of production and transaction costs). In fact, productivity growth and cost reduction are opposite sides of the same coin. Productivity growth allows a given level of output to be produced using fewer inputs than before, thereby lowering unit costs of production. Since productivity growth is the means to the end of market-compatible growth in output, it is a more primal performance indicator of reform success than output.

As mentioned earlier, productivity growth within an industry can result in transferring resources to produce more goods in other parts of the economy. In the transition economies, resources will move to those industries producing goods that consumers now wish to buy but were unavailable (or provided in insufficient quantity) under the planned economy. Many goods and, especially, services that have been common in the West were completely unavailable to consumers in the pre-reform period. Therefore, another reason productivity growth is superior to output growth as a performance indicator for a particular industry is that the effect of a rise in productivity might not be to increase output in that industry. Rather, its effect might be to allow resources to be shifted to producing other goods that are either more desired by domestic consumers (particularly as tastes change), or are more competitive on the world market. Productivity growth has the benefit of raising a country's production capacity while providing flexibility as to how the country uses the increased capacity.

Measuring Productivity Growth

The single best measure of productivity growth, not only for transition economies but for economies in general, is total factor productivity (TFP) growth. TFP growth for a good is an aggregate measure that captures the growth in productivity of all inputs used in production.[20]

Productivity growth can also be measured for each specific input used in production. However, the analysis of productivity growth for individual inputs must be handled with care, particularly with transition economies. During transition, the measured productivity of agricultural intermediate inputs, such as fertilizer, fuel, and machinery, has risen, in many cases substantially. On the other hand, the productivity of labor and land (as measured by yields) in general has dropped. The main reason for these developments is not that major changes have been made in the *system of production* that make intermediate inputs more productive and labor and land less so. Rather, the large increase in real prices for agricultural intermediate inputs following price liberalization has caused the use of these inputs by farms to fall to a greater degree than output. Measured productivity for these more scarcely used inputs has thereby increased. The amount of labor and land used in agriculture has also generally declined, but by less than intermediate inputs. The

[20] More specifically, TFP growth is the weighted average of growth in productivity of each individual input used in production, where the weight of each input equals its share in the total value of production.

larger relative drop in intermediate inputs has therefore reduced the average productivity of land and labor. Some countries, such as Hungary and the Czech Republic, are exceptions, in that their farms have managed to shed enough labor such that labor productivity has risen.

The fact that there is natural pressure within transition economies for the productivity of agricultural labor and land to drop (as just described) makes productivity growth for these two inputs relatively more acceptable as indicators of reform progress. Any positive growth in productivity of these inputs would come not from changes in the relative mix of the inputs used in production, but from an improvement in the way these inputs are used in production.

The main disadvantage of growth in productivity, as opposed to output, as a performance indicator is that productivity changes are more difficult to compute, especially in terms of data requirements. Although calculating productivity growth for individual inputs is fairly straightforward, and the required data are generally available, computing changes in TFP is much more challenging. The necessary data most difficult to obtain are the shares of each input in the total value of output. Because of the challenges involved, the research community has yet to provide anything close to a complete set of TFP calculations for transition agriculture.

Agricultural Productivity Performance Differs Among Transition Economies

In general, agricultural productivity growth in the transition economies during the 1990s was disappointing, particularly in light of the expectations many had at the beginning of reform. A detailed examination of why productivity growth was lower than expected, and why some countries have done better than others, is beyond the scope of this report. Only a brief discussion will be provided. Because of the challenges of computing agricultural productivity growth, especially that of TFP, the "hard" empirical evidence one can use in a productivity assessment is only fragmentary. The following discussion is based not only on this hard evidence, but also on more anecdotal information.

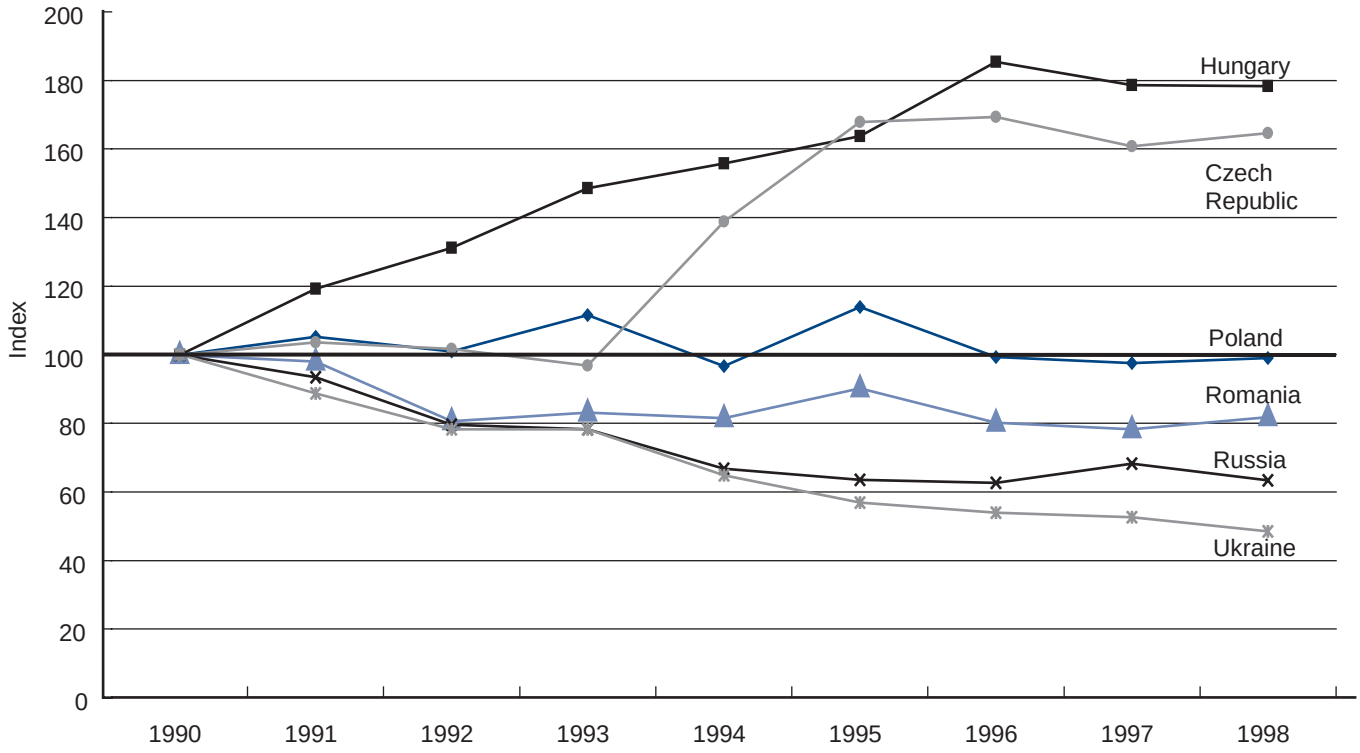
The best productivity performers appear to be Hungary and the Czech Republic. Macours and Swinnen (2000a) compute that during the first half of the 1990s, these countries had the best TFP performance in crop production among the CEECs. The superior performance, though, was strictly relative, because TFP grew over the 5-year period in the two countries by only 10-20 percent (total, not annual). Hungary and the Czech Republic, however, enjoyed a large increase in agricultural *labor productivity* during the 1990s, far above that of other transition economies (fig. 6).

As discussed earlier, the World Bank grades the agricultural reform effort in the 26 transition economies based on five elements: price and market liberalization, land reform and privatization, privatization and reform of agroprocessing and input supply enterprises, rural finance, and institutional reform (Csaki and Nash, 2000). Scores on these indicators should generally be correlated with productivity growth, and for some indicators, such as land reform and privatization, the correlation should be close.

Out of a maximum possible score of 10, Hungary and the Czech Republic receive the highest scores of 8.8 and 8.6, respectively. The large socialist-era farms in these two countries have turned into private, large-scale corporate enterprises. It appears that labor productivity has risen mainly because a major systemic restructuring of these farms induced them to shed substantial amounts of labor. This has been made possible by (relatively) successful economy-wide reform that generates jobs outside of agriculture (Macours and Swinnen, forthcoming) and helps finance and maintain an effective social welfare system that provides pensions and unemployment benefits for urban residents. High foreign direct investment (compared to other transition economies; OECD, 1999), in both agriculture and economy-wide, has also helped motivate this labor migration. Investment within agriculture facilitates labor-saving productivity growth, while investment in the rest of the economy creates new jobs outside of agriculture.

Productivity growth has been lower in the other CEECs, such as Poland, Bulgaria, and Romania. These countries also score lower than Hungary and the Czech Republic in the World Bank agricultural reform ranking. (The scores are 7.8 for Poland, 7.6 for Bulgaria, and 6.6 for Romania.) Some countries, such as Poland and the Baltic States, have implemented major farm-level reforms, such as creating land markets and full user rights in land. Certain of these countries, however, have also moved to a system of small private farms. (Poland already had small household farms at the beginning of reform.) Such a move can improve

Figure 6
Labor productivity in agriculture



Source: Computed from data from OECD and FAO.

incentives to work and invest. On the other hand, the small farms in these countries appear to suffer from diseconomies of scale, as well as underutilized labor. Small household farms absorb surplus labor from the rest of the economy. Labor is also drawn to household farms because they often function as a more effective social safety net than national welfare systems, which are less well organized and generous in these countries than in Hungary and the Czech Republic.

With so little land on these farms for each household to work, the productivity of labor suffers. Poland and Romania had low declines in aggregate agricultural production during the 1990s (less than 10 percent) relative to most other transition economies (table 1). The main reason is not better productivity performance but greater labor employment. During the 1990s, agriculture's share in Poland's labor force was 20 percent or more, while agriculture's share in Romania rose from 28 to 36 percent. Output levels were maintained at the expense of low labor productivity.

In affecting farm performance, the diseconomies of scale of small private farms can negate much of the benefit arising from strong incentives to work and invest. In fact, Lerman (2000) finds no conclusive evidence for the CEECs or NIS that farm size alone is correlated with productivity—neither large nor small farms are necessarily more productive than the other.[21]

The NIS countries generally have had the poorest productivity performance. Lerman et al. (2001) find that from 1992 to 1997, Russia had TFP growth of about 7 percent, and Ukraine, Kazakstan, and Belarus had TFP growth of only 2-3 percent. Not surprisingly, these countries also score low in the World Bank agricultural reform ranking. (Scores were 5.6 for Russia, 5.4 for Ukraine, and 1.8 for Belarus.) In most NIS countries, the former large state and collective farms continue to dominate production. Reform

[21] Mathijs and Swinnen (2001) find that in the former East Germany during the first half of the 1990s, medium-size partnership farms (about 400-500 hectares) were more efficient producers than either family farms or large former state and collective farms. Partnerships and family farms both had better technical efficiency than former state and collective farms, presumably because of superior incentives to use labor well, while partnerships enjoyed economies of scale compared with family farms.

Productivity Growth and Comparative Advantage in Agriculture

Just as productivity growth in a particular industry might not necessarily result in a rise in output in that industry, productivity growth might also affect trade differently than one might at first think. This point will be discussed specifically with respect to the grain trade of the NIS countries. Earlier in this report, it was explained that the fears of Western agribusiness that reform might turn the NIS region into a major grain exporter have not been realized. This is largely because reform has not generated the productivity increases that would result in large surplus production. However, even if reform succeeded in raising productivity in grain production, this effect might be insufficient to move the region toward grain exports.

During the last few years, the NIS region has been neither a big importer nor exporter of grain, the annual trade balance for the region being just a few million metric tons of either imports or exports. The *isolated effect* of productivity growth in grain would probably be to improve the trade balance in the product. Productivity growth would stimulate exports by reducing per unit costs of production, thereby making domestic output more price competitive vis-à-vis imports and the world market—in other words, productivity growth would improve a country's comparative advantage in the product.

Assume, though, that productivity grows uniformly throughout the region (for all inputs used to produce all goods), say by 50 percent. Because of the inverse relationship between productivity growth and costs of production, production costs for all goods would fall also by a uniform percentage. (Under standard assumptions, the per unit costs would drop by one-third.) Since comparative advantage depends on relative costs and prices, the region's structure of comparative advantage would not change. If the region were a relatively high-cost producer of a good before the uniform productivity increase, it would remain a relatively high-cost producer of the good, because per unit costs for all goods would change by the same percentage. This means that if the region were a net importer of a good (say grain) before the productivity growth, it would be economically profitable for the region to continue importing the good.

This point can be reconciled with figure 4. Assume again that both the world and domestic price equal P^2 and the country in question is importing Q^1Q^4. Economy-wide productivity growth would shift the supply curve for the good in question to the right. However, by lowering the production cost of all goods by a uniform percentage, the productivity rise should appreciate the country's currency (under standard assumptions by an amount equal to the productivity growth). The appreciation would lower the good's world price expressed in domestic currency, which means the domestic currency price P^2 would fall. The drop in price would increase domestic consumption and reduce domestic production. Thus, the country's import trade balance in the good might change little. Liefert (1994) examines the relationship between productivity growth and comparative advantage, particularly as applied to transition agriculture.

The following example further illustrates the relationship between productivity growth and comparative advantage. Ever since Great Britain repealed the Corn Laws in the middle of the 19th century, which opened the country up to free trade, it has been a major importer of agricultural goods. Over the past 150 years, Britain has had significant productivity growth in agriculture in absolute terms. However, because productivity growth has occurred throughout the economy, Britain remains a high-cost producer of agricultural goods relative to other goods it produces, and thereby continues to be a large agricultural importer.

If the NIS region currently does not have a comparative advantage in grain, as appears to be the case, it can develop a comparative advantage and thereby become a major exporter only if productivity growth in grain production exceeds that in most other sectors of the economy. The southern half of the European part of the NIS region has

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highly favorable natural conditions for agriculture, particularly grain production—excellent soil and climate and generally adequate (though inconsistent) precipitation. Once that region, which covers Ukraine and southern European Russia, adopts world-standard production technology, creates reasonably efficient systems of farm organization and management, and builds institutional infrastructure to service agriculture properly, it will most likely have a comparative advantage in production of grain and various other crops, such that it should be a major exporter. This effect would be consistent with the region's history of being a large grain exporter. However, agriculture has been one of the most conservative and anti-reform sectors in the NIS economies during the transition period and gives little indication of becoming significantly more progressive during the next 10-15 years. Thus, during at least this timeframe, the likelihood that agriculture will outperform the rest of the economy in productivity growth to become a major exporting sector appears dim.

of these large farms to date has been largely cosmetic. Farms in these countries have been required officially to privatize and reorganize, with many becoming joint-stock companies owned by their managers and workers or some form of cooperative. However, little has been done to change the farms' internal systems of organization, management, or incentives for workers.

Economy-wide reform has been slower in the NIS countries than in most of the CEECs, thereby limiting both the potential for farm labor to move to off-farm employment and the availability of capital investment for farms (capital replacing labor). Also, foreign direct investment in the agro-food sector, which could bring technology transfer, has been slight.

Conclusion

Economic reform in the transition economies has transformed the volume and mix of these countries' agricultural production, consumption, and trade. The main development has been a major drop in production—ranging in most countries from 25 to 50 percent for total agricultural output—with the livestock sector being hit particularly hard.

The contraction in both the production and consumption of foodstuffs is an inevitable part of market reform. The main reason for the drop is that consumers' desires for goods have replaced those of planners and the political leadership as the dominant force in determining what goods are produced and consumed. The policies that engineered the switch from planners' to consumers' preferences as the driving force of production and consumption were price and trade liberalization. These policies substantially reduced the array of subsidies to agriculture that maintained artificially high levels of output.

The main effect of the commodity restructuring of transition agriculture for U.S. agriculture is that the region of the former USSR ceased being a major market for grain and oilseeds (soybeans and soybean meal), and instead has become a large market for U.S. poultry (as well as for beef and pork, though not mainly from the United States). In fact, during the second half of the 1990s, nearly half of all U.S. poultry exports went to Russia. These trade changes indicate that the region has a comparative disadvantage in livestock products relative to crops—that is, the region produces livestock goods at a relatively higher cost than it produces animal feed and food crops.

The drop in food production and consumption has raised concerns about food security in certain countries, such as Russia and other NIS countries. The food security problem, however, is not the result of inadequate availability of food supplies. Before reform, the transition economies had high per capita levels of consumption of most foodstuffs, compared even to rich countries of the West. Although consumption of expensive livestock products has fallen, consumption of staple foods such as bread and potatoes has remained steady or even increased. Food insecurity has grown because of insufficient access to food by segments of the population and regions within countries. The growth in poverty has expanded the size of the population that cannot afford a healthy diet, while impediments to the internal flow of foodstuffs have prevented deficit-producing regions from obtaining food supplies.

That the fall in agricultural production has been a necessary part of market reform shows that output is a misleading indicator of reform progress. The absence of a decline in output for a country more likely reflects the failure to reform, rather than reform success. The transition economies that have experienced the lowest declines in agricultural output, such as Uzbekistan and Turkmenistan, have also been the least reformist.

A better performance indicator than output for transition agriculture is productivity growth. Productivity growth will raise income in the sector, as well as close the gap between agriculture's share in the labor force and its share in GDP. Also, the only way a country can increase agricultural output consistent with a market-driven, low-subsidy, and free-trading economy is to raise productivity, which by lowering production costs makes domestic output more price competitive on the world market. Productivity growth has the added benefit that the increase in productive capacity does not have to be wholly realized in the industry in which the productivity rise occurs. Rather, existing levels of output can be maintained in that industry while resources (such as labor) are shifted to producing other goods that either are more desired by consumers or are more competitive on the world market.

The restructuring of agricultural production, consumption, and trade during transition that results from market liberalization is the more "shortrun" side of agricultural reform (which nonetheless can run for quite a few years), as well as the side of reform that involves hardship for the sector. Agricultural productivity growth, and the systemic and policy changes that would motivate the growth, represents the longer term, more dynamic, and more optimistic side of reform, through which the sector could achieve prosperity. Productivity growth in the transition economies involves changing not just the material technology of production, but more importantly the nature and behavior of farms—that is, how they are organized, managed, and motivated (the system of incentives). A necessary supplement to these farm-level changes is creating the supporting commercial and public infrastructure and institutions that a market-driven agricultural system needs. Such infrastructure involves, for example, systems of credit, market information, and commercial law.

Whatever optimism existed in the West at the beginning of the transition period concerning agricultural reform in the transition economies was based on the belief that these countries had the potential (including the will) to make the farm-level changes and build the institutional infrastructure that would allow them to close the large agricultural productivity gap between themselves and OECD countries. Based on existing evidence, productivity growth to date in transition agriculture has generally been disappointing. The more progressive reformers in Central and Eastern Europe, such as Hungary and the Czech Republic, have done better than others. This conclusion is based on both (limited) empirical measures of productivity and the observed degree of policy and institutional change. The NIS countries (which exclude the Baltic States) have done poorly, with respect to both empirical results and observed policy and institutional changes.

Poland is an example of a country that in terms of overall economic reform has been a relatively fast and successful reformer, but suffers from a large agricultural workforce and a system of small household farms that cannot exploit economies of scale.

If the goal of agricultural reform in the transition economies is to create a profitable, market-driven agricultural economy with productivity levels and supporting infrastructure that allow it to compete effectively on the world market, the process in most countries is far from complete, with the degree of progress to date diminishing the farther one moves east. The agricultural sector in the transition economies has already endured a large part of the costs of economic reform. That most of the benefits that would come from effective reform still remain to be captured can be a basis for both frustration and optimism.

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