Livestock Sectors in the Economies of Eastern Europe and the Former Soviet Union: Transition from Plan to Market and the Road Ahead. By Britta Bjornlund, Nancy Cochrane (Report coordinator), Mildred Haley, Roger Hoskin, Olga Liefert, Philip Paarlberg (Purdue University), Market and Trade Economics Division, Economic Research Service, U.S. Department of Agriculture. Agricultural Economic Report No. 798.

Abstract

This report examines the restructuring of the livestock sectors in five countries: Russia, Ukraine, Poland, Hungary, and Romania. All five countries experienced a decline in both animal inventories and meat output during the early years of transition away from a centrally planned economy. ERS, in cooperation with Purdue University, developed five general equilibrium models depicting the economies of each nation. The models were used to evaluate capital investment at different stages of production; the rise in land prices that would result from a better functioning land market; reduced marketing costs; increased availability of credit; and, the creation of off-farm employment to draw labor out of agriculture. The study identifies potential trade and investment opportunities, but emphasizes that this potential depends on the successful implementation of institutional and policy reforms.

Keywords: livestock sector, Eastern Europe, centrally planned economy, cattle, dairy, beef, pork, poultry, hogs, property rights, trade, investment, reform.

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Executive Summary

This study is a comparative analysis of the restructuring of the livestock sectors in five of the transition economies of Eastern Europe and the Former Soviet Union: Russia, Ukraine, Poland, Hungary, and Romania.

Ten years after the end of Communism, Poland and Hungary had emerged as the most successful reformers of the five countries. But even in these countries, barriers remain that prevent the full restructuring of their livestock sectors. These barriers are much more serious in the other three countries.

Using general equilibrium models, we examine the potential effect of removing these barriers.

All five countries experienced a sharp decline in both animal inventories and meat output during the early years of the transition. These declines were in response to multiple economic shocks in both demand and supply. Producers were hit simultaneously by the reduction or elimination of government subsidies and sharp rises in feed prices. At the same time, demand for livestock products fell as real income declined.

There has been considerable divergence in the experience of these five countries since the early years of the transition. Animal numbers and meat output began to flatten out in Russia in 2000, but are still declining in Ukraine. In Poland and Hungary, the downward trend in cattle numbers has flattened out, and hog and poultry sectors are beginning to grow. Poultry output in Poland has rebounded significantly. The Romanian livestock sector saw a brief period of stability in the mid-1990s, but this was the result of heavy government support for the sector, and inventories and production resumed their downward trend after subsidies were withdrawn in 1997.

A number of factors accounted for the relative success of Poland and Hungary in restructuring their livestock sectors. These include the initial conditions—both countries had had a strong entrepreneurial tradition before the Communist period, and both had active private sectors throughout the Communist period. Both countries also moved more quickly to liberalize markets and privatize state property, in this way creating a friendlier environment for foreign investment. Russia, Ukraine, and Romania, in contrast, were much slower to privatize state farms and processing plants, and their governments continued to protect weak firms through soft credit and high border protection. In addition, weak market infrastructure and poor contract enforcement created a high-risk business environment, which raised the transaction costs of processing and distributing agricultural output.

However, unfinished business remains even in Poland and Hungary. Property rights are not fully defined, and land markets remain underdeveloped. There are large numbers of subsistence producers in both countries who do not participate in the market and whose productivity is low. But they are reluctant to leave the farms because of a lack of employment alternatives. Farmers interested in expanding are hindered by a lack of short- and long-term credit. Many very small processing enterprises do not meet European Union (EU) standards and will have to go out of business once these countries join the EU. Few of these plant owners have access to the capital to upgrade their facilities.

To simulate a market environment in the absence of these barriers, USDA's Economic Research Service (ERS), in cooperation with Purdue University, built five general equilibrium models depicting the economies of each country in the study. The models explicitly incorporate primary factor markets, as well as nonagricultural sectors. Livestock/poultry production and processing sectors are disaggregated, thus capturing key relationships along the entire marketing chain, from farmgate to retail outlet. Three of the country models also separate the subsistence from the commercial, or state, sectors. An important feature of these models is that they include nontraded feed crops as inputs to the animal production sectors. Inclusion of these crops is critical to the adjustment possibilities, and an analysis of animal agriculture without considering forages as a feed input biases the results. Using grains and meal as proxies for feed costs is inappropriate for cattle/dairy because that would understate the flexibility of the sector.

The models allow a simulation of the removal of identified price transmission barriers. The scenarios analyzed in this study are the following:

- capital investment at different stages of the production chain;

- rise in land prices that would result from a better functioning land market;
- reduced marketing costs;
- increased availability of credit;
- creation of off-farm employment to draw labor out of agriculture.

Country model simulations point to several general conclusions:

1. Location of investment within the marketing channel influences the magnitude of benefits to the sector. According to the model results, investment at the processing level brings greater benefits to the livestock sector than investment at the farm level.

2. Tradability and integration with the world market enhance the benefits of investment. Investment without integration tends to lead to a fall in output prices. The effect is to reduce the national benefit from the investment, in some cases to the point where there appears to be no net gain from the investment.

3. While improved functioning of the credit market is a small stimulus to agriculture, its major impact is to shift the production mix away from subsistence producers, toward commercial/state producers. Cost data do not suggest that credit costs are a major obstacle to agriculture.

4. Animal agriculture is the farm economy's shock absorber. During transition, it performed that role in each of the five countries in the study, by contracting more than the crop sector. The modeling results suggest it could expand faster than the crop sector in response to positive shocks. For example, scenarios simulating the effects of reduced farm marketing costs show that animal agriculture benefits in two ways: by raising the animal price and lowering the feed costs. Crops only benefit from the rise in crop prices.

5. Model results suggest that growth outside of agriculture is necessary to pull labor out of agriculture and that this is a slow process. To move even small amounts of labor out of agriculture requires large investments in nonagricultural sectors, because of the large amount of excess labor in transition economies.

6. The model results suggest that it may not be peasant agriculture that releases labor despite its high labor cost share. This is because economic expansion affects other prices, particularly those for nontraded goods and services (goods and services produced and consumed only within the domestic economy). Commercial and state agriculture tend to use these inputs, and are harmed by both the wage rise and the rising prices of nontraded inputs. Depending on the cost shares, commercial or state agriculture may release labor more quickly than the peasant farms.

In conclusion, the study points out potential opportunities for trade and investment, but emphasizes that realization of this potential depends critically on the successful implementation of institutional and policy reforms. Successful reform could lead to significant increases in livestock production and exports, which in turn may lead to increases in demand for grain and feed imports. Moreover, the livestock sectors and processing, in particular, can offer potentially high returns to foreign investors. However, such positive developments are by no means guaranteed. The reform process could very well remain stalled in many of these countries, with the result that their livestock sectors might remain indefinitely in a state of low-level equilibrium.

Livestock Sectors in the Economies of Eastern Europe and the Former Soviet Union

Transition from Plan to Market and the Road Ahead

Britta Bjornlund, Nancy Cochrane (Report coordinator),
Mildred Haley, Roger Hoskin, Olga Liefert, and Philip Paarlberg

Introduction

During the years since the collapse of Communism in Eastern Europe and the advent of the Newly Independent States (NIS), much attention has been focused on the livestock sectors of these countries. The early years of the transition were marked by drastic declines in livestock inventories and meat output. The consequence to the United States has been a decline in exports of grain and oilseed products to the region, but an increase in exports of meat and other animal products.

In the early 1990s, experts on the region were projecting a rapid turnaround and eventual expansion of the livestock sectors. These forecasts have proven far too optimistic. The declines were deeper and more protracted than expected. Ten years later, livestock numbers are just beginning to stabilize in Russia and some of the East European countries. Inventories of all species continue their decline in Ukraine and Romania.

Clearly, the restructuring process has been slower and more difficult than was anticipated a decade ago. It is precisely for this reason that many of the earliest projections published by experts on the transition economies have not proven true. The institutions essential for fully functioning private markets remain undeveloped in many of the countries. Lingering problems include lagging privatization, excessive government intervention in the production and marketing of livestock products, and the lack of such fundamental institutional market requirements as an enforceable commercial code (including the sanctity of contracts), clearly defined property rights, land markets, a system of rural credit, and market information.

However, removal of market bottlenecks alone is unlikely to return livestock inventories to pre-transition levels. During the Communist period, state subsidies held consumption and production of animal products at artificially high levels. On the demand side, present consumer incomes, and those forecast for the medium to long term, are insufficient to support consumption of animal products at pre-transition levels. On the supply side, animal products produced in the transition economies will compete, with difficulty, in both domestic and international markets, with products of low-cost producers like North America and Western Europe. Removal of these bottlenecks will enable markets to function and prices to allocate resources to their most efficient uses. That will not automatically lead to an expansion of the livestock sector if a country's comparative advantage lies elsewhere.

The study focuses on five countries—Poland, Hungary, Romania, Ukraine, and Russia. This particular set of countries was chosen to represent the range of progress made by the former Communist economies toward market-based economies. Poland and Hungary represent countries that have progressed rapidly in their transition. In contrast, Romania, Russia, and Ukraine are among those that continue to struggle through transition to market economies.

In the first part of this study, we argue that for each country, reform has progressed to the point where prices do function to allocate resources in livestock/poultry markets to varying degrees. We point out the different ways that producers and consumers have altered their behavior in response to changes in relative prices. However, significant barriers to price transmission remain. These barriers include underdeveloped land, labor, and capital markets, and a lack of institutions essential to support a free market.

Of the five countries under consideration, Poland and Hungary have emerged as relative success stories. Poultry

in particular has rebounded, and both countries have regained their former positions as net meat exporters. To some extent their success is due to different starting conditions—both countries had a strong entrepreneurial tradition even during the Communist period, and both had significant private sectors. But also, these two countries have been able to attract impressive amounts of foreign direct investment (FDI), which has helped bring processing plants up to Western standards. A final important factor is these countries' preparations for EU accession. Both are expected to join the EU in the next 5 or 6 years, and they are under strong pressure to upgrade their livestock industries to meet strict EU standards. Imminent EU membership also makes these countries more attractive to investors.

In the other three countries, and to some extent in Poland and Hungary as well, incomplete reform has led to a fracturing of production and processing into very small, mainly subsistence units and large, quasi-state-owned enterprises, with an absence of medium-sized units. Small producers lack the financial resources and the institutional support they need to expand; loss-making former state enterprises continue to tie up resources that could be used more efficiently elsewhere. These same barriers inhibit foreign investment, which has been key to the success in Hungary and Poland.

In the second half of the study, we present the results of a model developed to simulate a market environment in the absence of these barriers. The scenarios analyzed in this study are the following:

- increased availability of credit;
- capital investment at different stages of the production chain;
- reduced marketing costs;
- rise in land prices that would result from a better functioning land market;
- creation of off-farm employment to draw labor out of agriculture.

Model results suggest that the removal of these barriers can, to varying extents, promote growth and development of animal product markets in transition economies. However, this report emphasizes that the realization of this potential depends critically on successful implementation of institutional and policy reforms. If reform is completed, the region, with its rich resource endowments, extensive land bases, and relatively low population densities, will be an obvious site for modern, integrated animal products production systems. Potential for such development is even more promising in Poland and Hungary, which are preparing to join the EU. Growth of animal product production in the region also carries a potential for growth in import demand for oilseeds and protein meals. Such positive developments are by no means guaranteed, however. The reform process could very well remain stalled in many of these countries, with the result that their livestock sectors might remain indefinitely in a state of low-level equilibrium.

I. Reform Shocks to the Livestock Sector

The transition from central planning to a free market brought severe shocks to the livestock sectors of the transition economies. Demand-side shocks included rising consumer prices and falling real income that came with price and trade liberalization. On the supply side, producers faced falling output prices and sharply rising prices for feed and other inputs. Producers also had to adapt to fundamental changes in the markets for land, labor, and capital that came about with the transition.

A major restructuring and downsizing of production and consumption were accompanied by changes in the volume and patterns of trade. Since reform began, with a few notable exceptions, both livestock inventories and production in Poland, Hungary, Romania, Russia, and Ukraine have dropped by about half (tables I-1 and I-2). Though the countries in question did not have uniform agricultural systems, the main reform-induced shocks to the livestock sector have been similar, affecting both the demand and supply sides of the market.

Demand-Side Shocks

The main shock on the demand side is the reduction in consumer income and purchasing power brought on by economic reform. First, reform increased both unemployment and underemployment. At the start of 1999, unemployment in all five countries in question was above 10 percent (in 1990, unemployment figures varied between 0.4 percent in Romania and 6.3 percent in Poland). Also, many workers had become substantially underemployed, in that their jobs require them to work only a small fraction of any given week, with a corresponding drop in pay.

Consumer income also dropped because price liberalization, the lead policy of economic reform, caused prices to rise more than wages and salaries, thereby decreasing consumers' real income and lowering their purchasing power. In the pre-reform period, consumption of most foodstuffs, livestock products in particular but many other consumer goods as well, was heavily subsidized, with consumer prices often far below the real cost of production. Price liberalization eliminated most of these consumer subsidies, causing a jump in consumer prices to reflect full production costs. Within 4-5 years after the beginning of economic reform, per capita real income had decreased significantly in all five countries: from 20-25 percent in Poland and Hungary to about 40 percent in Russia.

Demand for meat and other livestock goods is fairly sensitive to changes in income (income elastic), while demand for staple products, such as bread and potatoes, is not. Since 1990, per capita consumption of livestock products has dropped significantly, with the sharpest declines, about 40 percent, in Russia and Ukraine.

Among the meats, consumption of poultry initially fell much less than that of beef and pork, and then leveled off or even increased (in Poland and Hungary). The principal reason is that poultry became cheaper than the other meats. In Poland and Hungary, poultry meat was cheaper than red meat at the beginning of the transition. In Russia, producer and consumer subsidies were higher for beef and pork than for poultry at the beginning of the transition, so that prices for beef and pork rose more after the removal of the subsidies. Poultry prices also remained low as a result of large imports of inexpensive frozen poultry legs. In 1990, the consumer price of a kilogram of poultry in Russia was 40 percent higher than for beef and pork. By 1997, a kilogram of poultry cost consumers 26 percent less than a kilogram of pork, and about the same as a kilogram of beef.

Supply-Side Shocks: Changing Terms of Trade

The main supply-side shocks have been changes in relatives prices faced by producers—output prices compared with input prices, as well as relative prices between inputs. The two policies most responsible for these relative price changes have been price liberalization and integration into the world economy.

Price liberalization, which was accompanied by policies eliminating or reducing subsidies to producers, worsened producers' terms of trade—that is, the prices producers had to pay for inputs rose by a greater percentage than the prices they received for their output. For example, from 1991 to 1996, farmgate prices for all meats in Russia rose by only about 25 percent as much as prices for mixed feed. The shock of deteriorating terms of trade for livestock producers has been a major reason for the sector's output decline (Macours and Swinnen, 1997, see table I-3).

The second supply-side shock for the livestock sector was the transition economies' integration into the world economy. Although the degree of integration varies by country and by livestock commodity, in general these economies have become sufficiently integrated and free-trading that domestic output must compete with imports, and world prices largely determine domestic prices. For all five countries in question and for most livestock commodities, integration and the growth of trade has resulted in an increase in imports and a decline in exports. The rapid surge of imports suggests that, before trade was opened up, the real costs of production were above world prices.

By the mid-1990s, Poland and Hungary had managed to reverse the flow of imports. During 1992 and 1993, both became large net importers of all meats. However, both are now net exporters of pork, and Hungary is a net exporter of beef and poultry as well. Russia, however, continued to be a major importer of meat, with imports supplying more than half of all domestic consumption of poultry (mainly from the United States) and 20-25 percent of beef and pork (mainly from the EU). These imports dropped substantially after the ruble devaluation of August 1998, but Russia remains a net meat importer.

Table I-1—Livestock inventories during the transition

	1987-89 average	1991-93 average	1994-96 average	2000	1991-93	1994-96 average	2000 average
	1,000 head				*Percent decline from 1987-89 average*		
Russia							
Cattle	59,867	54,649	43,968	27,516	-9	-27	-54
Cows	21,033	20,455	18,554	12,933	-3	-12	-39
Hogs	39,733	35,073	25,349	18.270	-12	-36	-54
Sheep, goats	63,267	54,939	35,417	18,270	-13	-44	-78
Poultry	638,667	626,733	492,867	356,000	-2	-23	-44
Ukraine							
Cattle	26,105	23,603	19,596	10,641	-10	-25	-59
Cows	8,628	8,233	7,809	5,428	-5	-9	-37
Hogs	19,641	17,814	14,129	10,042	-9	-28	-49
Sheep, goats	9,308	7,828	5,513	1,914	-16	-41	-79
Poultry	251,100	234,600	168,367	125,900	-7	-33	-50
Hungary							
Cattle	1,693	1,383	946	857	-18	-44	-49
Cows	612	532	429	399	-13	-30	-37
Hogs	8,410	6,452	4,796	5,335	-23	-43	-37
Poultry	64,666	42,871	36,106	29,385	-34	-44	-55
Poland							
Cattle	10,348	8,216	7,194	6,039	-21	-30	-41
Cows	4,884	4,393	3,682	3,296	-10	-25	-33
Hogs	19,532	20,508	18,968	18,224	5	-3	-7
Poultry	62,841	58,477	52,896	54,250	-7	-16	-14
Romania							
Cattle	6,941	4,473	3,553	3,060	-36	-49	-56
Cows	2,244	1,405	1,085	930	-37	-52	-59
Hogs	14,762	10,936	8,316	6,650	-26	-44	-55
Poultry	126,729	105,045	78,511	69,143	-17	-38	-45

Sources: USDA; Statistical Yearbooks, U.N. Food and Agriculture Organization.

Table I-2—Livestock output during the transition

	1987-89 average	1991-93 average	1994-96 average	2000	1991-93 average	1994-96 average	2000
	1,000 head				*Percent change from 1987-89 average*		
Russia							
Beef	4,132	3,660	2,868	2,126	-11	-31	-49
Pork	3,387	2,802	1,891	1,250	-17	-44	-63
Poultry meat	1,773	1,485	872	705	-16	-51	-60
Milk	54,385	48,549	39,079	31,855	-11	-28	-41
Eggs	48,538	43,358	34,393	34,150	-11	-29	-30
Ukraine							
Beef	2,004	1,638	1,220	803	-18	-39	-60
Pork	1,547	1,205	837	675	-22	-46	-56
Poultry meat	703	505	239	200	-28	-66	-72
Milk	24,077	19,966	17,101	12,562	-17	-29	-48
Eggs	17,497	13,492	9,434	8,818	-23	-46	-50
Hungary							
Beef	118	114	68	57	-3	-42	-52
Pork	1,043	667	461	463	-36	-56	-56
Poultry meat	452	316	351	370	-30	-22	-18
Milk	2,924	2,336	1,998	2,125	-20	-32	-27
Eggs	4,514	4,315	3,542	3,236	-4	-22	-28
Poland							
Beef	782	622	400	330	-20	-49	-58
Pork	1,820	1,852	1,541	1,610	2	-15	-12
Poultry meat	347	319	374	580	-8	8	67
Milk	15,763	13,405	11,644	12,530	-15	-26	-21
Eggs	8,129	6,083	6,400	7,600	-25	-21	-7
Romania							
Beef	227	272	163	173	20	-28	-24
Pork	780	505	470	280	-35	-40	-64
Poultry meat	387	210	158	63	-46	-59	-84
Milk	4,242	4,441	5,529	5,535	5	30	30
Eggs	7,750	6,037	4,050	4,500	-22	-48	-42

Sources: USDA and country statistical yearbooks.

Table I-3—Input and output price changes for the Russian livestock sector

	1991	1992	1993	1994	1995	1996	1997
				Percent change			
Input prices							
All ag. inputs	93	1523	969	321	222	64	18
Mixed feed	113	1690	760	271	160	104	7
Output prices							
All farm products	63	845	712	204	235	44	9
Livestock products	60	520	940	220	260	34	18
All meats[1]	55	460	1163	186	219	37	24
Cattle	48	380	1069	164	238	34	21
Hogs	51	624	1245	201	225	34	28
Poultry	69	718	1342	210	192	42	26
Milk	36	594	756	234	366	24	18
Eggs	16	735	973	316	202	47	9

[1]Without subsidies.
Sources: Sel'skoe khoz. Rossii; Tseny v Rossii, 1995; Ministry of Agriculture, Russia; Goskomstat Rossii.

Intensifying Factors: A Look at Capital, Land, and Labor

Underdeveloped or nonexistent capital, land, and labor markets continue to exacerbate the reform-induced shocks experienced in the livestock sector. Capital markets were so removed from the needs and functioning of a socialist centrally planned economy that the move to a market-driven economy has required that the very concept of capital markets be developed from scratch. These markets remain nearly nonexistent. Land and labor, two key inputs, have very low relative prices, especially compared with material inputs and capital. Whereas these low prices themselves do not constitute harmful shocks to the livestock sector, they do reflect the dramatic rise in the relative prices of material inputs and capital, and, in many cases, the low quality of much of the agricultural land and labor inherited from the pre-reform period.

Capital Markets. The notion of capital markets, in which commercial entities function as financial intermediaries between savers and investors, had no place in the functioning of a Socialist centrally planned economy. In fact, a defining feature of socialism is that capital is not a morally legitimate commercial input deserving of a return, since only labor—either current labor or past labor embodied in physical inputs—can add value to output. This is one of the reasons why capital markets, especially in more isolated and less reform-influenced rural areas, have been so underdeveloped.

In the pre-reform period, state-owned production enterprises (not only in agriculture but economy-wide) received most of their inputs, including capital investment, directly from state allocations. Even today, in many regions, rural capital markets either do not exist, or the amount of funds available for lending is so small that the cost of borrowed capital is very high. The relentless downsizing of agriculture, and of the livestock sector in particular, aggravates the problem, as it advertises agriculture as an unpromising sector to lend to. Hence, reform has resulted in a drastic decline of capital investment in agriculture.

Land. In the view of pre-reform central planners, land, like capital, did not contribute to the value of output. It therefore was not priced and was not included in the cost-based valuation of output. To the extent that economic reform in the transition economies has created markets and prices for land, land is relatively inexpensive, a result that makes sense from the point of view of relative factor endowments. During the Socialist period, planners felt that land should be used in production to the maximum. Agriculture was therefore pushed onto marginal land, some of which would probably not be farmed in a profit-driven market system. The generally low current price of land in transition economies also reflects, to some degree, the low quality of much of the land.

The land reform process in transition economies has also resulted in land and plot holders' being given either land or the right to continue working on currently held land (see Box I-1). Even during the Socialist period, households in Poland owned and worked their land. In Hungary and Romania, the land restitution process provided virtually free land to millions of households. In Russia and Ukraine, households on the former state and collective farms continue to independently farm small subsidiary plots. In all of these countries, farming households pay no taxes on the land they work.

Although land is inexpensive, acquiring additional land is extremely difficult. Underdeveloped or nonexistent land markets in most countries make the commercial acquisition of land almost impossible. The result is that large numbers of animals are kept on very small plots of land. Only cattle are directly affected by the small size of land holding, since they need land for grazing. But the small size of plots has had a strong impact on the way feed crops are grown, so pigs and poultry have also been affected, although indirectly. Well-functioning land markets are therefore another institutional market requirement for the development of a prosperous livestock industry in the transition countries, and this issue will be taken up in more detail in later chapters.

Labor. In terms of labor, during the Socialist period, sufficient mobility existed among industrial and urban workers such that Western specialists on these economies believed that fairly well-functioning markets existed for such labor, generating prices for labor that reflected the value workers added to production (see Bergson, 1961, and CIA, 1962). However, in Russia, Ukraine, and Romania, markets did not exist for agricultural labor, and state planners did not move labor among farms. Private farmers did not exist, and workers on state and collective farms were in essence deprived of the right to leave their farms. In Poland and Hungary, there was some movement of labor out of agriculture before 1989, but options for agricultural workers were severely limited. The most serious obstacles were housing shortages in urban areas and requirements for official permits to transfer to the larger cities.

Although agricultural labor markets did not exist during the socialist period, farmworkers did receive money wages. The price of farm labor as reflected by these wages shows that the labor was fairly inexpensive. Wages for agricultural workers were below those of industrial workers (though the gap narrowed a bit in the 1970s and 1980s). Another indicator is that the share of agricultural workers in the total labor force in these countries was greater than the sector's share in GDP. One reason for the low price or value of labor is its low quality. State and collective farms provided all the social-welfare needs of their workers, and the labor force was tilted toward both the unskilled and elderly. Some of the farmworkers counted in official state statistics on the agricultural labor force should probably not have been included, since they contributed little to production.

Low wages in the cities for low skilled labor, shortages, and state control of housing provide disincentives to move. Proximity to the land and food supplies is an incentive to stay. Consequently, there is a large rural labor force that is under-employed.

The relatively low cost of agricultural labor has been carried over into the reform period. Given the reform-induced growth of urban unemployment, many workers value the greater relative security of life and work on the farm. Although agriculture can play a strong role in the

Box I-1—Land Reform in the Transition Economies

In all five countries under consideration, the transition has meant the widespread redistribution of land and a redefinition of property rights. The process had proceeded at a different pace in the different countries, and each has chosen a different way to distribute land. Many of the countries opted for restitution of land to former owners or their heirs based on historic boundaries. Laws in Russia and Ukraine called for the distribution of land among collective workers and pensioners in more or less equal shares. Restitution was not an alternative in the Newly Independent States, since the farmers never owned land. The table below summarizes land reform undertaken since transition began in the study countries.

In Romania and Hungary, private landownership was legalized shortly after the demise of Communism. In 1991, Romania passed a land reform law restoring land to the pre-Communist owners. However, even now, many new owners lack permanent title, and land sales remained severely restricted until 1998. In Hungary, land was restored to former owners by means of a voucher system. Land sales there are legal and there is an active land rental market. Land may not be owned by foreigners or corporations, but only by individuals. In Poland, collectivization was never as complete as in other countries. Many small farms remained in private hands.

In Russia and Ukraine, while about 60 percent of the land is officially in private hands, the percentage actually farmed by households is much smaller than in the other three countries (see table). Most of the land that is individually farmed in Russia and Ukraine is in household or garden plots. Remaining private land is usually leased back to the newly privatized cooperative or collective farm.

While all five countries have seen the emergence of a small number of large private farms, it remains true that most private farms tend to be small and are often little more than household plots. The number of people on the land far exceeds the numbers in Western countries. For example, the Polish government estimates that employment on private farms is about 36 workers per hectare, and in parts of Poland this number rises to more than 100 persons per hectare. In contrast, the EU average is about 5.6 persons per hectare. In 1997, the Romanian government estimated the average sized private farm was about 3 hectares, and furthermore estimated that 7 to 10 hectares was needed to be competitive.

Land Privatization in the CEEC and the NIS

Country	Restitution of historic boundaries	Private ownership	Use rights transferable	Percentage of land cultivated by private households in 1996
Poland	No, land already in private hands before 1990.	Yes	Yes	82
Hungary	No, vouchers			54
Romania	Yes	Yes	Yes	67
Russia	No	Yes*	Yes*	11
Ukraine	No	Yes*	Yes*	17

* Legally, land is privately owned and transferable in Russia and Ukraine, but in actual practice most individuals find it difficult to exercise these rights.
Source: OECD, 1999

social safety net, the continued large relative size of the agricultural labor force in these countries and low wages for farmworkers keeps farm incomes low. Farm incomes will grow only if labor productivity increases, which requires two developments. One is effective reform within agriculture that motivates the changes necessary to raise productivity: these changes are not technological only, but extend to the entire system of production (management, organization, and worker incentives). The other is economy-wide reform that increases real wages and employment opportunities outside of agriculture, so that surplus labor created by productivity growth within agriculture can find sufficiently attractive employment opportunities elsewhere to leave the farm.

II. Response at Primary Production Level

In addition to shifts in relative prices of inputs and outputs, transition brought dramatic changes in farm structure. Producers responded by reducing livestock inventories, and production plummeted. The transition also resulted in a fracturing of production between large-scale former state and cooperative farms and tiny private subsistence farms. Many of the large-scale units are still majority state-owned; their management is largely unchanged, and they remain dependent on state subsidies. Private producers, in the meantime face serious obstacles in their efforts to expand into commercially viable units. The livestock sectors are still largely characterized by the "missing middle."

Producers were hit simultaneously by two sets of shocks: the drastic shifts in relative prices of inputs and outputs described in Chapter I and the shifts in farm structure that came with privatization and land reform. The initial response in all five countries was a dramatic liquidation of inventories. However, the rates of decline varied. In general, the declines were greater in Russia and Ukraine than in Poland, Hungary, or Romania; declines were greater in the state sector than the private; and there were variations across livestock species. Cattle inventories declined more than those of other species in the three East European countries, while poultry and hogs were hit harder in Russia and Ukraine. To a large extent, these differences are attributable to differences in initial conditions.

Two to three years into the transition, livestock production throughout the region was divided between large-scale, restructured cooperative and state farms and very small private farms, often less than a hectare in size. A typical private farm would own one cow, two pigs, and a small flock of chickens and produce mainly for home consumption. But all countries were characterized to varying extent by a "missing middle." Medium-sized units producing principally for the market were slow to develop. In more recent years, Poland and Hungary have seen a growing number of such enterprises. There has been some increase in the number and average size of private, commercially oriented farms in Romania, Russia, and Ukraine as well. But these continue to face formidable obstacles. True private farms in Russia, for example, as late as 1999, accounted for only 3 percent of total crop production and barely 2 percent of livestock production in that country.

Structure of Production Under Communism

During the Communist period, most livestock production occurred on large state-owned, collective, or cooperative farms.[1] Central planners in the former Soviet Union, and to a slightly lesser extent in Romania, stressed regional independence such that each administrative district was expected to maintain self-sufficiency in livestock production. Because the farm's location was not necessarily located close to feed sources and had other economic dif-

[1] All the countries covered in this study made a distiction between state-owned farms, whose assets belonged to the state, and farms that were in theory under collective ownership of the members. In Russia, Ukraine, and other countries of the former Soviet Union, these were known as collective farms. In Romania and Hungary they were called cooperatives. Poland only distinguished between state and private (or individual) farms. Polish cooperatives were mainly involved in marketing and input supply rather than primary agricultural production.

ficulties, most survived solely on government credits that were rarely repaid. State loans allowed the farm to purchase inputs at controlled prices and to sell the production through the official procurement agencies, again at fixed prices. Debts were rarely repaid. Usually, loans were forgiven or payment delayed indefinitely.

One of the main problems with meat production in the study countries was that planners generally emphasized livestock production in large capital-intensive production units but did not allocate sufficient resources for field crop production to provide feed. As a consequence, livestock were never fed optimal rations. Feeds were often imported, and the availability of feed depended on the availability of foreign exchange. The resulting inefficiencies led to high production costs. As a result, in order to achieve their goals of ensuring an inexpensive food supply, planners were forced to provide generous subsidies to both producers and consumers.

Many state farms included dairies, meat processing facilities, and even bakeries on their premises. These were primarily intended to produce food items for workers and pensioners living on or near the collective. In addition, farmers delivered products to a specific processing facility nearby. These facilities then manufactured items for the oblast or region. In this way, the agro-food complex was highly integrated. Farms and processors had no choices as to where to deliver their goods or sources of raw materials.

As an adjunct to the large production enterprises, farmworkers were allocated small subsidiary plots. Even in Communist times, individuals used these plots to both grow fresh produce and to raise livestock. In 1990, for example, nearly a quarter of the livestock products in the Soviet Union was produced on these subsidiary plots. In contrast, most land in Poland was never collectivized and most livestock production occurred on small privately owned farms.

Changes in Farm Structure

Prior to 1990, collective farming dominated the farming structure in all study countries except Poland (table II-1). By 1998, not only had state farming declined in all study countries, but the size of the newly privatized corporate farms had also declined.

Early in the transition state, cooperative and collective farms, more so in the Central European nations than in the former Soviet republics, were privatized, restructured, or liquidated. Most farms were converted to various types of shareholding companies. Farm privatization plans varied by country and met with different results.

In Poland, the Agricultural Property Agency (APA), created in 1992, took over the management of state farms and has been trying to sell off the assets. The APA is currently leasing a large portion of its assets to various private entrepreneurs, but there have been few buyers.

In Hungary, state and cooperative farms were transformed into various types of commercial companies. Some are now true, member-owned cooperatives. Others are commercial share-holding companies. All are private and all operate on a hard budget constraint. Many of the new companies have a substantial share of foreign ownership. In the restructuring process, several of the farms were significantly downsized. Some were split among different buyers; in many cases, less profitable lines of production were shut down (see boxes II-1, II-2).

Table II-1—Distribution of farm land by organizational type

Country	Farm type						
	Collective/co-op		State		New private/corporate	Households	
	Pre-1990	1998	Pre-1990	1998	1998	Pre-1990	1998
	Percent						
Poland	4	3	19	7	8	77	82
Romania	59	12	29	21	n.a.	12	67
Hungary	80	28	14	4	14	6	54
Ukraine	n.a.	n.a.	n.a.	n.a.	n.a.	7	17
Russia	n.a.	n.a.	n.a.	n.a.	n.a.	2	11

n.a.=not available
Source: OECD.

In Russia and Ukraine, the former state farms have all been reorganized in some fashion, with shares distributed among the farmworkers and pensioners. However, many of these farms continue to operate with few changes in terms of management, production, or resource allocation. And while the workers on the farm are, in principle, joint owners of the enterprise, a true market for selling shares of the assets and land has begun to develop only recently. This situation is rapidly changing: Ukraine only recently passed a land code, although Russia has yet to pass its own. Furthermore, most shareholders have little incentive to sell their share in a farm, as exiting the former collective would mean relinquishing their rights to farm subsidiary plots. Leasing of shares or land is more common. Farms are beginning to experiment with leasing operations and in doing so have begun to function more like private enterprises. While these farms do not show up in Ukraine's statistics as "private" farms, the profit motive between farmer and farmland is clearly apparent (see Box II-3).

In Romania, large cooperatives were liquidated early and land restituted to its former owners. However, most state-owned farms continued to exist and to benefit from subsidies not available to private farms. As of 1997, 34 percent of the hogs and 19 percent of poultry numbers were still raised on these state farms. The state livestock complexes were huge, vertically integrated enterprises. Some of them had as many as 800,000 hogs. They typically engage in every stage of the production chain: farrow to finish, slaughtering, processing, and even retailing. Many of these farms are located in the prime grain-growing regions and produce their own feed as well. They own their own trucks, maintain their own equipment repair shops, and so forth. The rationale given by the managers is that it is just too difficult to arrange for a steady flow of services and raw materials from other suppliers, and this high degree of integration was the response to the bottlenecks in the marketing and distribution system. These enterprises have been transformed into commercial stockholding companies and are supposed to be privatized, but most are still majority state-owned, and the privatization process has proceeded very slowly (see Box II-4).

In Hungary, Poland, and Romania, the collective and state farms have shrunk while household plots have become larger, although the change in household plot size is insignificant (table II-2). In the Russia and Ukraine, data are less complete but the size of collective farm enterprises has declined (table II-3). Still, they remain large by any standard.

Box II-1—Downsizing a Cooperative: Ber-ker-bet Poultry Farm, Hungary[2]

This was previously a cooperative employing 5,000 workers, which included a breeding farm, a hatchery, a processing plant, and a feed mill. Immediately after the beginning of the transition, the cooperative was transformed into a joint stock company, but shortly went bankrupt. The three current managers bought all the shares. They sold the hatchery, processing plant, and feed mill, then converted the breeding farm to a broiler farm because it required less capital. The farm now employs 45 workers.

[2]In 1997-98, the authors traveled extensively through the countries included in this study to collect data and information to support this research. As part of that travel, all five authors visited a number of farms and processing plants. Throughout this report we present case studies summarizing our observations from these visits. We have selected these case studies to illustrate the important points made in the text.

Box II-2—A State Farm in Svaros, Hungary

This is one of the few state farms left in Hungary, located in the southeast, near the Romanian border. It has 4,000 hectares, 3,200 of which are planted to grain, 400 is pasture, and the remainder is rented out. The primary enterprises are grain production and cattle—it has 620 dairy cattle. The farm also owns a rice factory, which processes imported rice.

The farm has downsized considerably during the transition. It used to farm 13,000 hectares. Its labor force has dropped from 1,500 employees to 200. But not all the former employees ended up on the unemployment rolls. The farm sold a slaughterhouse, a machinery station, and a construction unit, and many of the former employees went with these new companies.

Of the current employees, 90 work in crop production, 65-70 work in the rice factory, and 37 work with the cattle.

The manager seemed unsure just why this farm continued in state ownership. He thought that the state was interested in keeping some breeding farms in order to make sure the genetics remained pure. The farm receives no special subsidies and is expected to make a profit. However, the manager is not entirely free to make all business decisions. Five years earlier, when cattle were particularly unprofitable, private farms slaughtered their cattle, but he was prohibited from reducing his herds. The state also limits the salary he can pay his employees, and he is not free to fire some employees and raise the pay of those remaining. He said he could operate the farm with 60 employees.

Box II-3—Restructuring the Collectives in Ukraine: A Success Story

While the management of most of Ukraine's restructured collectives remains unchanged, there are notable exceptions. In July 1998, we visited one of these, Agro, located about an hour from Kiev. This farm produced milk, meat, wheat, barley, and corn. It had about 800 hectares of land, about 200 of which were used to produce feed for 200 milking cows and 60 bulls. The rest of the grain was marketed to the local privatized grain mill.

The director had previously served as the chairman of a collective farm. When the collective was transferred to joint-stock ownership, the land and asset shares were transferred from the collective to the individuals on the farm. The current and former workers each owned a share of the land but no one had title to a specific plot. Partly due to this, most such farms continued to operate as before, maintaining the same number of workers, the same output, etc. The director of Agro, however, decided to make some significant changes. He took advantage of new leasing laws and worked out a plan to rent the land from the 217 workers and pensioners who now "owned" the farm. He made a deal with the shareholders, workers, and pensioners to lease their land in exchange for a percentage of the harvest. He outlined his plan to change operations and downsize staff, and to run the farm as a private or profit-seeking entity. He then rehired about 60 of the former collective workers to work on his farm. He paid them in cash, or, on occasion, in grain.

Since May of 1997, the director had leased and farmed these 800 hectares of land. He had rented the land for a period of 15 years, but he renegotiated the terms of the agreement each year. In 1998, his leasing price for 800 hectares of lands (some of which he presumably owns himself) was about 100 tons of grain. He estimated that his total grain harvest would be about 3,000 tons of wheat, barley, and corn.

The farm raised cattle for both meat and milk. At the time of our visit, the farm owned about 200 milking cows and 60 bulls and planned on expanding this production. The farm sold the milk to a nearby state-owned processing plant. There was a great advantage to selling to the state-owned plant due to recent decree whereby producers who sold their meat and milk products to state-owned plants were not required to pay the value-added tax (VAT). According to this decree, the processor was then required to send 20 percent of the realized profits back to the producer. In the case of Agro, the processing plant paid for the milk in-kind by returning processed milk, cheese, and sour cream on a give-and-take contract. As for meat production, the cattle were slaughtered on the farm and the fresh meat was sold to various companies in and around Kiev. The farm was selling about 400 kilos of meat per week to the state-owned company.

The manager reported that his operations were in fact making some minimal profits. But the farm had been operating only since May 1997, and yields had already increased significantly, giving hope that profits would continue to improve. Milk yields per cow in 1998 were 3,500 liters, double the 1997 yield.

The manager seemed to have the freedom to make and implement his own decisions. He maintained that the shareholders had not restricted him in any way. In addition, he reported that the local authorities did not interfere in his operations, he did not receive assistance of any kind, and they did not attempt to dictate what he should produce or where it should be marketed. In fact, he seemed to enjoy a considerable amount of freedom in his marketing of grain. He marketed about 75 percent of his grain crop, using the rest for feed. He sold directly to a nearby private grain mill. An entrepreneurial Ukrainian, who also sold timber and steel piping, had recently built this grain mill, visible from the Agro property. The mill, which seemed to be making a significant profit, could process up to 70 tons of grain per day into flour and kasha. These two entrepreneurs, producer and processor, both engaged in profit-maximizing agribusinesses, could prove healthy examples for others in Ukrainian agriculture.

Credit: Britta Bjornlund.

Box II-4—State Hog Farm in Peris, Romania: An Extreme Case of Vertical Integration

This farm, which we visited in November 1998, was a fully integrated state farm with an annual output of $25 million per year. The enterprise included 100,000 hogs, 2 breeding farms, a slaughterhouse with a capacity of 130,000 pigs per year, or 3,000 per week, a feed mill, and a research institute. At the time of our visit, the farm did not produce any crops.

The enterprise also owned a fleet of trucks, supplied all its own transport, and provided maintenance for all vehicles and equipment; it even maintained local roads. The managers believed this was necessary because they could not rely on a stable supply of such services from outside. There were few independent providers of these services, and high interest rates were a formidable obstacle to the start-up and survival of such companies.

The entire staff was 900 employees, of which 320 worked directly with the hogs, and 150 in the slaughterhouse. The remainder were employed in ancillary services not related to the main enterprises of the farm. In Western countries, and even in neighboring Hungary, farms would not employ these workers.

The farm bought all feed components, importing soymeal and fishmeal directly from Brazil and Argentina, and buying grain locally through intermediaries—it was too much trouble to buy directly from hundreds of small producers. The intermediaries were (usually) foreign companies, which provided pesticides to farmers in exchange for grain. The firm bought the entire year's grain supply immediately at harvest and received $800,000 in short-term credit at an annual interest rate of 64 percent to do this.

The managers planned to rent some land for grain production, thus completing the vertical integration process. The rent would be 5 to 6 percent of the production potential. But they would also have to purchase equipment to grow the grain, and opted to postpone that investment for the time being.

We asked about any plans for privatization, which the managers believed was unlikely. They said the total value of the enterprise was $16 million, and no investor was ready to put up that sort of cash. They could not conceive of splitting up the enterprise and allowing investors to buy just one part.

Table II-2—Average farm size by structure

Country	Farm type						
	Collective/co-op		State		New private/corporate	Households	
	Pre-1990	1998	Pre-1990	1998	1998	Pre-1990	1998
	hectares						
Poland	4,179	833	3,140	620	8	6.6	7.0
Romania	2,374	451	5,001	3,657	—	0.5	2.7
Hungary[1]	4,179	833	7,138	7,779	204	2.3	3.0

[1]Hungarian state farms grew larger, but comprised only 4% of total agriculture in 1998 compared with 14% in 1990.
Source: OECD.

Table II-3—Average size of collective farms in Russia and Ukraine

Year	1991/91	1995/96	Percent change
		hectares	
Russia	9,500	8,000	-16%
Ukraine	3,700	3,100	-16%

Source: World Bank.

Rise of Subsistence Agriculture

In all five countries, the transition was marked by a significant rise in the share of animals held in the private sector. In Romania, like Poland and Hungary, the private sector now holds the majority of animals. According to official Romanian statistics, the private sector share of hogs in Romania rose from 33 percent in 1991 to 86 percent in 1999. In 1998 and 1999, as cattle and hogs in the state sector fell precipitously, private sector cattle and hogs rose. In Ukraine, private farms held 58 percent of the hogs in 1998, but restructured state and collective farms still own over half the cattle and poultry. The private sector share in Russia has risen steadily, but private farms still account for less than half the animals. However, in both Russia and Ukraine, the private sector produces the majority of meat output.

To varying degrees, all five countries are still characterized by a large subsistence livestock sector. In Romania, most livestock is held on peasant farms averaging half a hectare in size. In Poland and Hungary, although modernization has proceeded further, about half of all pork is produced on plots for home consumption. Throughout the region, a typical private farm has at most two or three hogs and perhaps a cow and a few chickens. Production is primarily for subsistence purposes, and very little is marketed.

In Russia and Ukraine, most private agriculture is still in the form of the subsidiary plots belonging to the collectives, as opposed to true private farms. According to official statistics, individual, private farmers accounted for less than 2 percent of total meat output in 1999. The historical synergy between the state or collective farm and the plots has continued into the reform period. Under Communism, state farms got cheap (though unproductive) labor, providing in return a small but guaranteed income, social welfare support, and access to farm resources such as feed, energy, infrastructure, and transportation. Currently, although the farms now have private shareholders, and although input prices have risen, farmworkers continued to procure farm resources (feed in particular) for their own purposes.

Small farmers lack access to appropriate machinery.

This trend toward subsistence farming is a rational response to the changes in relative prices. These farms use large labor inputs and small capital outlays and are probably economically efficient in the current environment. In all five countries, there is a large rural labor force that has little incentive to relocate and is underemployed.

Declining Feeding Efficiency

The rise of labor-intensive subsistence farming was accompanied by a decline in feed efficiency. This was a direct result of a shift to lower cost feed ingredients. Farmers, no longer able to afford a balanced feed mix for animals, sharply reduced the use of costly mixed feeds, switching to less expensive feeds that are poorly balanced with proteins and other supplements. Hog producers switched from high-protein concentrated feed to lower quality feed, direct grain feeding, and greater use of potatoes and root crops. Cattle producers turned away from relatively expensive concentrated feed in favor of forage crops and pasture grazing. In all cases, this was a rational response to changing relative prices: producers were substituting low-cost labor for expensive high-quality feeds.

Feed conversion in the former Soviet Union never reached Western levels. But after the end of the Soviet period, feed conversion declined rapidly. Mixed feeds became too expensive and livestock were fed whatever was available. Feed-out times increased. For example in Russia and Ukraine in 1996, the feed-out time for a hog was nearly 18 months compared with less than a year in 1990.[3] In contrast, feed-out times in the United States are about 6 months. Changes in these finishing times reflect much of the change in the structure of livestock farming in Russia and Ukraine.

Producer Response Linked to Farm Structure and Pace of Reform

The farm restructuring process in the countries we studied was generally accompanied by a wholesale transfer of animals into private hands. The new owners lacked adequate

[3] Conversations with Russian researchers.

facilities to keep the animals and could not afford proper feed. The result was a widespread slaughter or export of live animals. In many cases, prized breeding animals were slaughtered. Animals that remained on large state-owned complexes usually did not fare any better. Heavily indebted or supported by soft government loans, these state complexes lacked the finances to maintain proper feed rations and have significantly reduced herds in response.

The response to the shocks varied across species and depended also on the structure of production before the transition. General observations by species are as follows:

Cattle numbers fell more than numbers for other species throughout Eastern Europe. Cattle numbers in Russia and Ukraine fell more slowly at first, but have continued to fall steadily through the transition (figure II-1 to II-3). Cattle in all these countries are raised primarily for dairy production, and beef is mainly a byproduct. East European cattle were severely affected by the collapse of the dairy industry. Dairy products were subsidized even more than meat, and there was a significant drop in consumer demand when those subsidies were removed.

On the other hand, the raising of cattle is less energy-intensive than for other species and allows for greater substitution of forage crops and pasture grazing for mixed feed. Russian and Ukrainian producers were able to make this sort of substitution. The result was that, early in the transition, declines in cattle numbers in Russia and Ukraine were not as great as they were in Poland, Hungary, and Romania. East European producers did not have as easy access to grazing land, and cattle numbers fell abruptly in all three countries. In Romania, most cattle were on cooperatives, which were liquidated in 1991, while hogs and poultry remained on state-owned complexes until 1997. Liquidation of Romanian cooperatives was accompanied by the massive redistribution of cattle to private producers, most of whom did not have sufficient land to keep the cattle. Polish farms are small and fragmented and not suited for grazing cattle.

Figure II-1—Cattle inventories during the transition to free markets

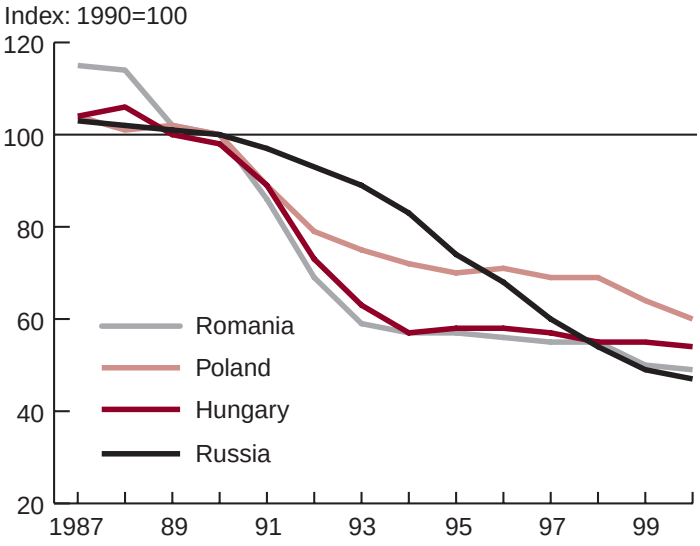


Figure II-2—Beef output during the transition to free markets

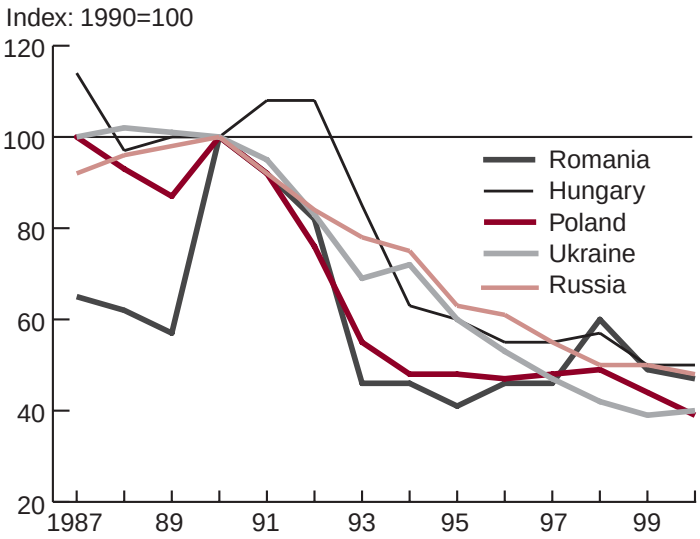
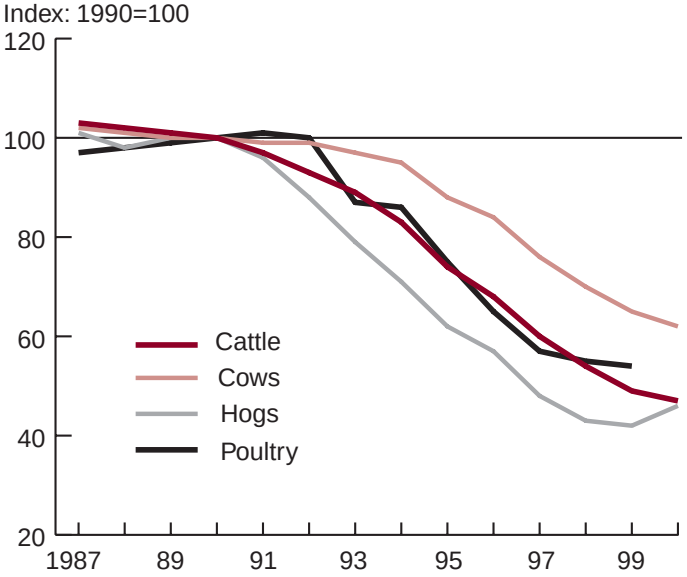


Figure II-3—Russia: Livestock inventories during the transition to free markets



Russia and Ukraine did not experience the liquidation of collective farms that occurred in many of the East European countries, so producers continued to have access to grazing land. However, in Poland, Hungary, and Romania, cattle numbers stabilized after 1994 or 1995, once the transfer of animals into the private sector was complete. In contrast, inventories in Russia continued to decline through early 2000, and Ukraine's cattle numbers were still declining as of January 2001. Russian and Ukrainian cattle breeders may have benefited during the early transition from better access to grazing land, but, the negative impacts of delayed reform ultimately outweighed this benefit.

Poultry declined significantly in Russia, Ukraine, and Romania (figure II-4). Poultry are more dependent on high-quality protein feed—corn and soymeal—and suffered more from the deterioration in feed quality. These countries also found it difficult to compete with low-cost chicken legs from the United States.

Poultry fared better in Poland and Hungary than in the other countries. The declines were much less, and, after 1993, poultry output began to grow in both countries, particularly in Poland. Several factors account for the growth of poultry output in Poland and Hungary. Consumers began to substitute lower priced poultry meat for beef, and producers were able to respond quickly to that shift in demand. In addition, a large share of poultry production was private in both countries before the transition. The technology is easily transferable across borders, and the short growing cycle also encourages investment. Moreover, there was also a well-established tradition of contracting between processing plants and producers, whereby processors provided baby chicks and feed against delivery of finished birds. In both countries, contracting relationships tended to break down during the early years of the transition, as a result of restructuring in the processing industry. But these relationships were quickly reestablished, and poultry output began to grow again as a result.

Poultry in Romania, Russia, and Ukraine tended to be concentrated in large state-owned complexes, which were heavily subsidized under Communism and had great difficulty adjusting to the new conditions.

Trends in **hog** numbers varied considerably across the region and seem to be linked to changes in farm structure (figures II-5 and II-6). Poland, where 75 percent of the hogs were on private farms, has been subject to a clearly de-fined hog cycle since 1970, and this pattern did not change after 1989. Hog numbers continue to rise or fall in response to grain prices. Elsewhere, inventories dropped sharply in the early years of the transition. In recent years, hog numbers have begun to stabilize in Hungary and Russia, while hog numbers in Romania and Ukraine continue their decline.

Hogs in Russia, Ukraine, and Romania were concentrated on very large state-owned complexes, some of them with up to 500,000 hogs. These operations were heavily dependent on concentrated feeds based on imported protein meal. They were also heavily subsidized and tended to employ large amounts of both labor and capital. In addition, the complexes in Russia and Ukraine generally did not have the land on which to grow their own feed,

Figure II-4—Poultry output during the transition to free markets

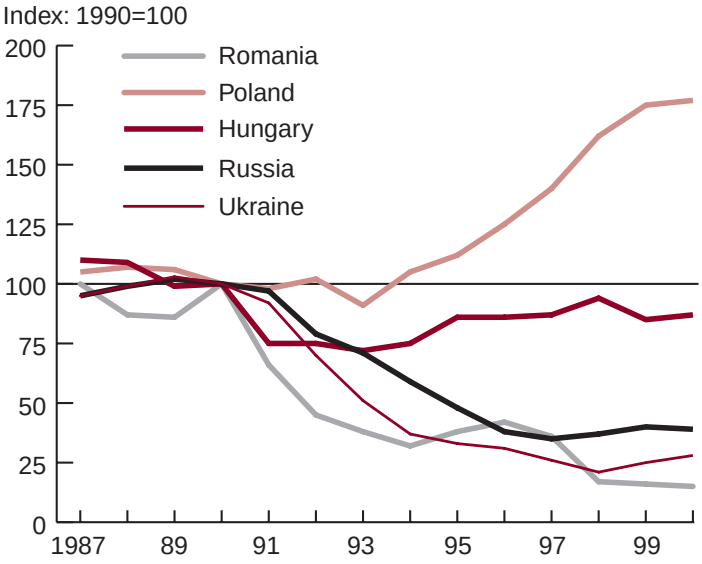


Figure II-5—Hog inventories during the transition to free markets

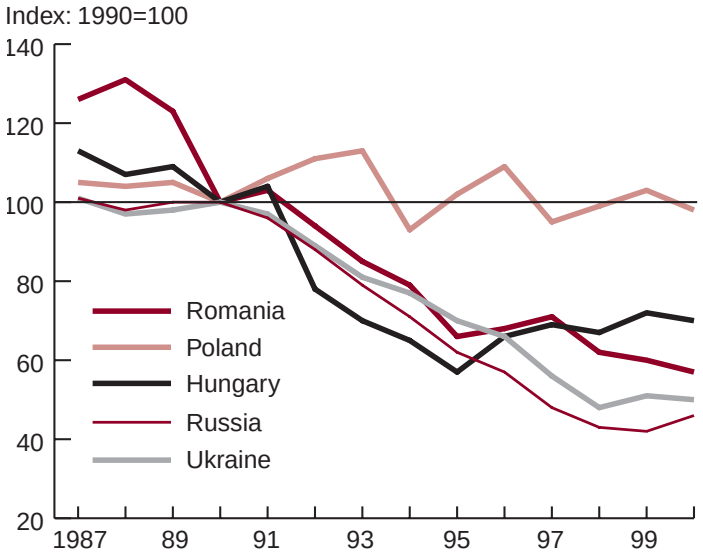
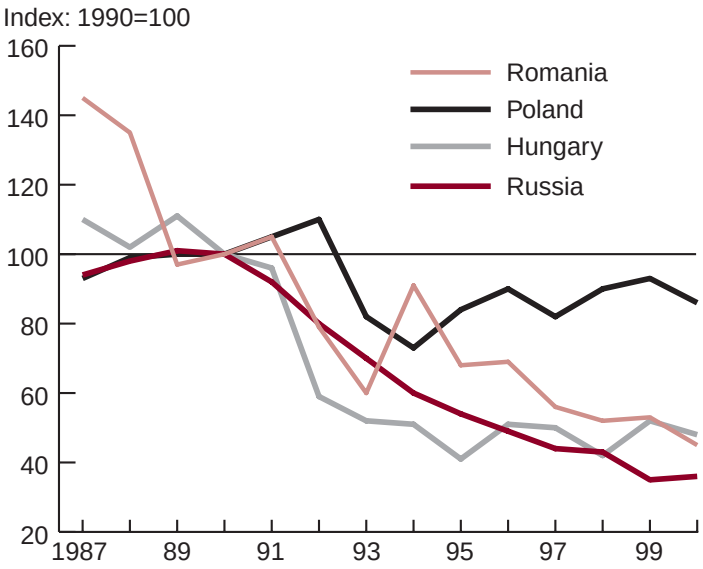


Figure II-6—Pork output during the transition to free markets



and many were inappropriately located in areas far from feed and energy supplies. With the transition, prices of feed, energy and other inputs rose, while output prices and subsidies fell. The complexes responded by slaughtering animals; many animals simply starved to death.

The Rise of Commercial Farming

The principal challenge facing all five countries is the relative absence of medium-sized commercially oriented farms. Subsistence farms are generally too small to be commercially viable, and most of the large-scale restructured collective farms remain inefficient and are kept afloat by a variety of government subsidies. But the emergence of medium-sized private farms producing for the market has been slow throughout the region. There has been some progress in Poland and Hungary, but private producers wishing to expand their operations in Romania, Russia, and Ukraine face a formidable array of institutional obstacles and a generally unfriendly policy environment.

In Poland and Hungary, there has emerged a significant class of commercially oriented private producers who recognize the importance of meeting the quality standards of foreign markets. In both countries, there are a significant number of producers who still produce mainly for their own consumption. But even in Poland, where the average farm size in 1999 was still just 8 hectares (up from 7 in 1990), there is a growing number of producers with 50 or more animals who produce mainly for the market. In Hungary, around half the animals belong to corporate farms, many of them with foreign ownership.

Poland and Hungary have both implemented policies deliberately designed to encourage the development of more commercially oriented livestock production. Both governments have extensive systems of subsidized credit. Many of the Polish producers we talked to had received credit through the Agency for Restructuring and Modernization with interest rates as low as 3 percent, compared with commercial interest rates of 50 percent or higher. The Hungarian Government has also provided a substantial amount of investment assistance.

Both governments have also designed their intervention programs to encourage higher quality output. These measures are motivated by pressures to conform to EU quality standards in preparation for eventual accession (see Box III-1 on page 24 for more details). Poland's Agricultural Market Agency (AMA) carries out intervention purchasing of hogs, but plants authorized to purchase on behalf of the AMA must be licensed to export and must meet EU standards. Furthermore, all carcasses that are purchased must meet the top three grades within the EU grading system. Hungary has a system of target prices and pays a premium to producers to make up for differences between the target and market prices. However, only commercial producers producing export-quality products are eligible for support.

There are a small and slowly growing number of private commercial producers in Romania. A study conducted by ACDI/VOCA of hog producers in Romania compared costs of production for small-, medium-, and large-scale producers and concluded that the medium-sized producers could be very efficient (Grant and Geber, 1997). The smallest producers, while showing a profit, probably did not suitably account for opportunity costs of their labor. The largest producers were clearly inefficient. Many of the medium-sized producers in Romania received startup capital through the World Bank and initially did well. However, their situation has become more difficult with the accelerating inflation and deteriorating macroeconomic environment that has characterized Romania since early 1998. They have difficulty accessing working capital, and their markets have shrunk with the declining income of the population. Moreover, marketing channels are still more oriented to handling production from the large state farms.

Some true private farms, producing for the market, are emerging in Russia and Ukraine. Ukraine passed a Law on Private Farmers in 1991, which allowed individuals wishing to start a new privately owned farm to receive 50 hectares of land from the state. There are currently only about 35,000 of this type of private farmer (see Box II-5).

The situation is somewhat better and is improving in Russia. In 1999, according to official statistics, Russia had 261,000 true private farms, and their average size had increased to 55 hectares from 43 hectares in 1995.

But even in Russia private farms accounted for only 7 percent of all agricultural land in 1999 and owned barely 2 percent of cattle and hog inventories. Overall, the share of private farms with livestock output in both Russia and Ukraine has remained small throughout the reform period, and the private sector continues to be dominated by household plots. Private farmers compete with plotholders at a major disadvantage. They must obtain credit to start up their operations and purchase animals, and they find it virtually impossible to obtain commercial credit. Private farmers, unlike plotholders, must pay full price for inputs such as feed and energy. Private farmers also lack access to veterinary and other services, and are on their own when looking for markets.

Polish and Hungarian Producers Begin to Specialize; Others Hedge Risk Through Diversification

The emerging commercial producers in Poland and Hungary are becoming more specialized. In the early days of the transition, a typical Polish farmer would produce a bit of everything, seeking self-sufficiency above all else. But in recent years a growing number of Polish producers have chosen to specialize in commodities that yield the greatest added value. The transformation of the state and cooperative farms in Hungary also led to greater specialization.

But many East European farms, whether large or small, private or state-owned, in Poland, as well as Romania, have more enterprises on them than does a typical American farm. U.S. farms tend to be much more specialized. For example, corn-soybean farms in the Midwestern United States will have at most one livestock enterprise on them, usually hogs. In North Dakota, if a farm has a livestock enterprise it is usually cattle feeding. Livestock production, with the exception of dairy production, is regionally specialized in the United States.

In Eastern Europe, farms usually have both multiple crop and livestock enterprises. Even the smallest subsidiary plot will produce several different crops and vegetables and will often have both hogs and a cow. The large state farms also will often have a dairy, hog, and sheep enterprise as well as two or three crop enterprises. As reform proceeds, some specialization will occur because some

Box II-5—Private Farming in Ukraine: Overcoming the Odds

We visited a private dairy farm in Ukraine in July 1998, which has been successful despite the obstacles described. The owner was formerly a livestock specialist at the Agricultural Institute in Kiev. In 1994, he decided to take advantage of recent laws and registered to receive his plot of 50 hectares. In addition, he now rents 50 adjacent hectares and farms 100 hectares in total.

He began his operations with 30,000 grivnas, which he took in credit and pays off yearly at a rate of 45 percent. He told us that he now has one year remaining on the rest of the loan, at a rate of 82 percent.

He began the farm producing grain and corn, but in 1997 he began to introduce livestock. He purchased 25 milking cows and had plans to purchase another 25. In the warm months, he allowed them to graze on 12 hectares of pasture and 15 hectares of hay fields. In the winter, they were kept in a pen where he fed them hay, concentrated feed, and silage. The cows would produce milk for up to 5 years and he planned to replace up to 40 percent of the herd using sperm purchased from Canada.

He sent the milk to the local joint-stock dairy plant on a daily basis. Most of the milk was made into butter. He reported that he received cash payments immediately for nearly all of the milk that he sold. He sold about 30 liters per day, four days a week. Because he did not have any refrigeration capacity, he had to transport the milk himself at the end of each day to the local plant.

His farm consisted of himself, his wife, and three hired workers. In addition to milk and grain, they also produced honey and fruits.

The farmer and his wife seemed to be enjoying the life that private farming gives them. They laughed at the collective farmers who had given up the rural life in order to seek office jobs in the city, while they have done just the opposite. They enjoyed working the land for their livelihood.

But there were many challenges to private farming. The owner complained of frequent visits by government officials to inspect his operations and accounting books, a constant drain on his energy, time, and efficiency. Although his operating costs included taxes on land, transport, and salaries, he offered that he would happily pay higher taxes (a VAT, for example) if he would be left to farm without interference from government officials.

regions of these countries are more suitable for some crops than others. Some land is suitable only for forage and will support cattle.

But there are some sound economic reasons to retain multiple enterprises. Multiple enterprises spread risk, make better use of on-farm labor, and provide for rotations that include pasture, thus reducing the need for expensive fertilizers and pesticides. Also, livestock waste can be recycled and crop waste can be grazed—all economizing strategies in an environment of limited capital (see Box II-6).

Institutional Barriers Perpetuate the Problem of the "Missing Middle"

While there are many obstacles to reform in the five countries, two major ones are apparent. First, land reform remains problematic. As already mentioned, the lack of transparent and enforceable property rights limit any investment in land. These institutional barriers also limit incentives to preserve or maintain the land using best farming practices that would limit erosion and environmental damage.

Box II-6—Multiple Enterprise Farming in Romania

The farm, located on the outskirts of Bucharest, which we visited in March 1998, was a former cooperative farm purchased at auction in 1991. At the time of our visit, it had been organized as a producer's association with four shareholders, three of whom were active in the farm's daily operation. We spoke with the general director and one of the four shareholders.

The farm consisted of 1,600 hectares located in three different counties. There were 100 employees who resided on the farm and remained from its days as a cooperative. The farm consisted of multiple enterprises, growing both livestock and cash field crops.

Field crops included wheat, barley, corn, soybeans, oats, and forages. Barley and wheat were the most important in terms of area sown. Previously, the farm had sold its field crops to local farmers in informal markets and to state procurement agencies. The managers now preferred to concentrate their acreage on feed crops, since raising field crops for cash had become unprofitable.

Livestock enterprises included dairy, beef, sheep, and hogs. The farm had about 100 hogs, down from about 500 two years ago, 300 head of cattle, and 200 sheep. The cattle were dual-purpose dairy-beef cattle and about 200 were being milked. The others were young bulls that were being finished for beef slaughter. The cow's milk was mostly sold to a nearby private dairy. Sheep milk was processed into white (feta) cheese on the farm and sold through farmers' markets. The farm also maintained a small slaughterhouse and a sausage plant.

The director explained that the farm engaged in multiple enterprises as a hedge against risk as well as a way to make maximum use of available labor. However, it seemed unlikely that any of the enterprises were operating anywhere near minimum long-run average costs. While multiple enterprises can be a hedge against risk, management poses some unique problems. For example, the director stated that crop farming was unprofitable both absolutely and compared with livestock farming. Yet, the farm's internal pricing practices tended to confuse resource allocation. Grain was "priced" out of the field and stored. Later, over the course of the year as the grain was fed to livestock, it was "priced" to the livestock enterprise at its original "out-of-the-field" price rather than current market prices, which would have been higher. This practice understated the value of the feed when fed, overstated the profitability of the livestock enterprise and assumed no return to storage. Correct internal pricing is an important indicator of which enterprises are profitable and would help guide farm investment to the points of highest potential return.

The level of enterprise integration is unusual by Western standards. The on-farm manufacture of cheese from sheep milk, and the small hog slaughter and sausage-making enterprise represent a high level of vertical integration and are suggestive of U.S. farming practices earlier in the century when there was more on-farm manufacture of food items, usually for home consumption.

The two most serious problems cited by the director were low prices for farm goods and difficulty in raising capital. The major sources of capital were internal savings, which were negligible, and bank credit, which was not only expensive, but difficult to obtain.

One probable reason why banks were reluctant to lend to the farm was that the director did not seem to know which, if any, of his enterprises was profitable. However, the director did state that if he had additional funds, he would spend them first on improved livestock genetics and planting seeds, then on improving the diet of his livestock, especially dairy cows.

The second is lack of short-term working capital. Longer term investment is sorely needed in all transition economies, but if short-term capital is unavailable, longer-term investment certainly will be as well. Agriculture is tied to biological processes—seeds are sown, livestock are born and fattened. Yet, until the product is ready for market, producers must finance all expenses attendant to production, including family living expenses. Farms carry work-in-progress inventory. Once harvested, grain must be stored until needed, and animal carcasses are stored until final dress and sale. The lack of working capital is a major barrier to adopting more efficient methods of production.

Government credits on concessionary terms do not meet this need. Credit given without the expectation of repayment does not require the firm to be economically efficient. The constraint of allocative efficiency is absent. The results are large farms that are bankrupt by any Western standard, yet continue to function, and small household plots that produce but cannot expand because of inability to obtain credit in any form. The result is the "missing middle"—an absence of medium-sized farms that are both technically and economically efficient.

An injection of capital investment, either foreign or domestic, could bring down the price of capital and stimulate expansion of small farms and a shift to more capital-intensive production practices. At present, however, agriculture is not seen as a particularly attractive investment by either foreign or domestic investors, and investors are further discouraged by the government practice, especially in Ukraine and Russia, of providing capital in the form of loans at less than market rates. Capital thus remains scarce, and the resulting high price for capital favors labor- and land-intensive farming. Until the relative prices of inputs change, the technology of food production is unlikely to change substantially.

III. Downstream Sector

The transition brought some dramatic changes to the meat processing industries. The giant state-owned monopoly processors that characterized the Communist period could not compete in a free market. These were successfully privatized in Hungary, but the other four countries have had difficulties finding interested buyers. All five countries have seen the startup of a large number of new private processing firms that pose formidable competition for the remaining state-owned giants. Many of these private firms are very small; some operate out of a stall in a marketplace. Poland and Hungary have seen the emergence of medium-sized, specialized firms capable of meeting EU standards. But meat processing in Romania, Russia, and Ukraine continues to be characterized by the "missing middle."

Whereas there was considerable diversity in farm structure among the five countries at the beginning of the transition, the structure of the downstream industries was quite similar in each country. Under central planning, decisions concerning purchasing, processing, and marketing of animal products was in the hands of state-owned monopoly enterprises. In some countries, there was a single state enterprise—Animex in Poland, for example—which controlled the entire meat processing and distribution system. This enterprise had regional branches, but all decisions were made in the center. In contrast to Poland, Romania's meat processing industry was characterized by a small number of discrete, vertically integrated livestock complexes. Hog and poultry complexes engaged in all stages of animal product production, from live animal breeding to meat retailing. A single hog complex in Romania typically processed close to a million hogs a year.

After the liberalization of prices and trade in the early 1990s, it became clear very quickly that the products produced in state-owned slaughter/processing facilities were not competitive in a market environment. Many facilities were technologically outdated—Communist era investment had been aimed at heavy industry, and few resources were allocated to the food industry. Central planners in the capital decided the location of slaughter/processing facilities. Frequently, the outcome was that slaughter/processing facilities were located far from the primary animal producers. Moreover, as production and consumption subsidies were removed, it also became clear that the scale of most state-owned facilities exceeded market demands. To summarize then, the slaughter/processing industries in each country at the beginning of the transition, were largely characterized by a suboptimally located set of facilities, suddenly too large to accommodate the new market environment.

The industries in each country differed significantly, however, in their responses to the collapse of central planning. Hungary, and to some extent Poland, has had some success in transforming state-owned enterprises into modern, profitable Western-style plants. An important factor contributing to the success of this transformation process was the effort of the governments of Poland and Hungary to create policy environments conducive to free enterprise.

In contrast, majority state-owned facilities continue to operate in Romania, Russia, and Ukraine. Such facilities typically operate at a fraction of their original capacity and many continue to stay afloat only through soft credit from government instituions that is rarely repaid. In these three countries, there has been little development of alternative, private marketing channels. Consequently, a major share of meat, poultry, and dairy production is marketed in direct transactions between producers and consumers in farmers' markets.

In hindsight, it is clear that the governments of Poland and Hungary initiated and completed a series of discrete steps that together facilitated the transformation of the downstream sector, from a centrally planned industry to a set of privately owned and operated companies. In Russia, Romania, and Ukraine, the transformation process has been initiated, but not as yet completed.

Privatization of State-Owned Purchasing and Processing Enterprises

As a first step, each government passed legislation intended to privatize state-owned enterprises. Governments differed significantly, however, in terms of procedures and implementation of privatization legislation. Most privatization legislation called for the transformation of state enterprises into joint stock companies, followed by the sale of equity shares to investors. In Romania, Russia, and Ukraine, however, the state continues to exert control over many enterprises through ownership of the majority of shares.

Hungary has nearly completed the process of privatizing its state-owned slaughter/processing enterprises. As a chief means of facilitating privatization, the Hungarian Government successfully marketed equity shares to foreign investors. The result is that nearly half of the livestock/poultry slaughter and processing industry is currently foreign-owned. Another key element of the Hungarian Government's privatization effort was acceptance of the notion that (financially) weaker units of large enterprises could be separated from stronger units. Weaker units were allowed to go out of business, enabling stronger units to be sold at higher prices than if accompanied by the weak units in a "package" sale. Hungary's efforts to privatize the slaughter/processing industry were accompanied by a significant reduction in the labor force, however. Because of Hungary's aggressive efforts, the meat-processing sector in that country is nearly 100 percent privatized.

Privatized meat plant in Hungary.

Privatization efforts in the other four countries have not yet achieved Hungary's level of success. Privatization has progressed very slowly in Romania, Russia, and Ukraine. Poland has made more progress, but 40 percent of the meat processing capacity remained in state hands at the end of 1999.[4] As in Hungary, the governments of Romania, Russia, Ukraine, and Poland initiated privatization efforts through the issuance of equity shares for sale to the public. But demand has been slack, and these governments continue to own the majority of shares in many slaughter and processing enterprises.

Several factors have limited private investor demand. Often the privatization ministries insist on minimum share prices which investors consider to be too high given the condition of the firms. The Romanian Government, in direct contrast to Hungary, was very reluctant to allow stronger units of an enterprise to be sold individually. In Russia and Ukraine, investors prefer starting up new enterprises over buying into existing state enterprises. Potential investors are put off by the high indebtedness of the firms and potential difficulties in downsizing the labor force.

Thus, 10 years after the beginning of the transition, many of these state-owned enterprises continue to operate in the three slower reforming nations. They are generally inefficient, incurring high costs because of outdated technology. Most operate well under capacity—some in Russia operate only at 25 percent of capacity—which raises per unit production costs still higher. Facing competitive world prices, they are unable to raise prices to cover their costs. Instead they rely heavily on government support and seek to maintain profits by cutting production to a point where variable costs are covered. In addition, they attempt to use whatever market power they have to limit producer prices. In the early years of the transition, these firms held considerable market power, but, in recent years and even in the less reformed countries, this market power has been eroded by competition from new private firms.

[4] Conversation with Polish experts.

Disintegration of Vertically Coordinated Marketing Chains

A high degree of vertical coordination characterized the meat processing industry under Communism. Many state-owned conglomerates were vertically integrated, engaged in every stage of production, from live animal production to processing to retailing. In all five countries, state enterprises also tended to contract with private producers. The state enterprise typically provided young animals and feed. The slaughter-ready animal was delivered at a negotiated price.

The transition to a large extent was characterized by a reversal of this trend. The Polish Government deliberately broke up the state-controlled marketing chains and split the state-owned enterprises into smaller units. Contracting agreements often broke down as a consequence, and most producer-growers pursued alternative marketing channels. Governments in Russia, Romania, and Ukraine attempted to retain a vertically coordinated system of animal product production, but their efforts have been largely unsuccessful. In response to delayed payments or no payment at all, producers have virtually ceased selling live animals to the state processing enterprises, seeking out various alternative private marketing channels.

The disintegration of established marketing relationships was much less pronounced in Hungary. Evan as former state enterprises were split into smaller units, the system of producer delivery contracts remained intact. Poultry processors, in particular, maintained their former links with private producers.

Producers Seek Alternative Marketing Channels

For a short time after the transition began, most livestock/poultry producers in the five countries continued to deliver slaughter animals to state slaughter/processing facilities. For reasons set out in Chapter 1 and above, prices paid to producers by state enterprises declined persistently, inducing most producers to search out alternative marketing channels. The chief alternative was often home processing (i.e., butchering, milk processing, etc.) with direct product marketing to consumers in open-air markets. This alternative reduced marketing risk, and allowed producers to capture value-added through processing.

Specialization

In the next stage of development of alternate marketing channels, the more enterprising producers/direct marketers begin to specialize, either narrowing their range of products or focusing on just one stage in the marketing chain. The open-air meat stalls slowly disappear, as their operators have been able to accumulate capital sufficient to

Open-air markets still play a vital role in retail food marketing.

move their operation into an indoor shop and purchase equipment. This slow process of developing new marketing alternatives to replace the former state-controlled channels can be observed to some extent in each of the five countries. Development of new marketing channels via specialization and capital accumulation provides evidence that market prices are diverting resources away from "old" marketing channels.

In Poland, as early as 1991, the sale of fresh meat moved from stalls in open-air markets to enclosed retail shops. This development can also be observed in Romania. But in Russia and Ukraine, would-be entrepreneurs still face

Box III-1—Poland, Hungary Influenced by Preparations for EU Accession

Developments in the hog and poultry sectors of Poland and Hungary are increasingly shaped by their preparations for EU accession. As the transition moves forward, and other Central and Eastern European countries prepare for accession, changes currently underway in Poland and Hungary will likely be duplicated.

The defining challenge of EU accession for the livestock/poultry production and processing sectors in Poland and Hungary is the prospect of direct competition with European producers and processors. The poultry, beef, and pork industries are in different states of readiness for accession. Both the production and processing ends of the poultry industry are well positioned for accession because of its strong historic orientation to the EU. Most large poultry processing facilities in Poland and Hungary meet EU phytosanitary and health standards, and are certified for export to the EU. Because the Polish and Hungarian poultry industries are each characterized by a high degree of vertical coordination, processors contract with producers to either purchase hatching eggs directly from the EU, or from breeding flocks sourced from European genetics.

In preparation for EU accession, both Poland and Hungary have adopted the EU's EUROP standard for grading beef and pork. The EUROP standard is a set of quality grades, beginning with the "E" grade at the high end of the quality spectrum, and the "P" quality grade at the opposite end of the scale. Because of higher consumer prices associated with higher quality grades, slaughter facilities compensate producers for higher quality animals. While the EUROP standard has limited relevance for the cattle and beef industry, as beef is largely a residual product of the dairy industry and is therefore rarely graded for quality, adoption of the EU standard is currently driving change in the Polish and Hungarian pork sectors.

Adoption of the EUROP grading standard became mandatory for large slaughter facilities in 1996 in Hungary and 1997 in Poland. Consequently, well-managed operations are currently paying premiums to hog producers for uniform, high-quality animals (i.e., those with less backfat, and higher lean yield). Producers, in turn, are incorporating new genetics into breeding herds in order to capture quality premiums. This dynamic will likely characterize transition hog and pork sectors for the next several years. Clearly, slaughter facilities whose managers are able to secure the financial capital necessary to upgrade slaughter and processing technology to meet the EUROP standard, and to pay premiums for quality hogs, will be among those most likely to survive. Producers who, in turn, are able to secure the financial capital necessary to improve breeding herd genetics and lower production costs have the greatest probability to grow and prosper.

To summarize, preparation for EU accession as a driver of change in the livestock/poultry production and processing sectors of transition economies has several implications: First, adoption of the EUROP meat grading standard suggests an increase in demand for financial capital in order to remain competitive within an expanded EU. Second, as consumer incomes continue to increase, demand for higher meat quality will likely follow. Together, these factors imply a greater degree of future vertical coordination in the meat industry. The livestock/poultry production and processing sectors of transition economies will thus likely be characterized by larger and fewer operations, each with good access to financial capital, to maintain a base of current technology for low-cost production of high-quality meat products.

EU welfare regulations prohibit tethering of cattle.

formidable obstacles. The principal obstacles include a lack of capital, ill-defined property rights, absence of contract enforcement, and an undeveloped market infrastructure. Moreover, small private firms in Russia and Ukraine must compete with state firms that still benefit from soft credit not available to private entrepreneurs.

As a result of this process, Poland, Hungary, and Romania have seen a dramatic increase in small slaughtering and processing plants. There were approximately 7,000 slaughterhouses in Poland in 1999, compared with a few hundred in 1990. In Romania, there were 93 slaughter/processors certified by the Ministry of Agriculture, but more than 1,000 other small plants still waiting for official certification; there were virtually none in 1990 (Grant and Gerber, 1997). Indeed, many new slaughter operations are little more than single-room operations; a Romanian expert described some new enterprises as little more than a "rope for hanging." The future for such operations is doubtful, particularly in Poland and Hungary, which are likely to accede to the EU membership in the coming decade and will be subject to the very strict EU sanitary standards. Many newer, more specialized processing operations in Poland and Hungary are expected to thrive as members of the European Union (see Box III-1).

The survival outlook for small, private slaughter/processors in Romania is more problematic. Most animal products currently found in retail markets are products of the large state-owned enterprises, or partially privatized enterprises. Private slaughter and processing facilities in Romania are very small. They typically depend on state farms for slaughter animal supplies and compete at a disadvantage with the same state farms on the retail market. The state farms have long-established ties with the major retail shops, and some maintain their own shops. It is difficult for a new, small-scale processor to break into this network (see Box III-2).

In Russia and Ukraine, privately owned slaughter/processing or dairy processing facilities account for just 5 percent of annual supplies of processed meat products. High transportation and search costs for slaughter animals appear to be the major problems faced by new slaughter facility managers. Poor roads and irregular delivery of slaughter animals from large numbers of small producers combine to increase production costs. A key problem for private processors is the high cost of refrigerated storage, which reduces the quantity of carcasses that can be purchased and stored for later processing. In Russia and Ukraine, it appears that privatization and development of alternative marketing channels have not advanced to the point where entrepreneurs have accumulated sufficient capital to take such elemental steps as leasing shops or investing in refrigeration. Currently, most successful specialized entrepreneurs in Russia and Ukraine continue to operate in open-air farmers' markets (see Box III-3).

Box III-2—Fighting the Odds in Romania: A Private Sausage Plant, Visited in 1998

This was a private meat processing plant founded in 1992, in what had been a bakery. The plant did not slaughter animals, but bought carcasses from the state farm in Peris described on page 13 and processed them into ham, sausage, and baloney. The plant sold 95 percent of its output to retail shops, aiming at higher income consumers; its largest customer was the German-owned hypermarket Metrou in Bucharest.

The plant was facing considerable difficulties because of the depressed pork market, and was working at less than half its capacity. Demand for pork meat had dropped substantially when prices were liberalized in 1997, and the plant was facing sharply higher prices for raw materials. Fresh carcasses accounted for 70 percent of its production costs. The only supplier was the state farm in Peris, and its prices had gone up 50 percent in the previous 6 months. The peasant market could not ensure reliable supplies. The plant was in a very disadvantageous position relative to that of the farm in Peris. The state farm had much easier access to credit, and, being the only reliable supplier of live hogs, it had all the market power.

Increasing Concentration and Reintegration

After animal processing becomes more specialized, developing private animal products industries appear to enter a consolidation period, where the industry often becomes

Raising broilers under contract.

Credit: Milton Madison.

more concentrated. The very smallest slaughter/processing operations go out of business, or merge with others. Larger, more successful plants gradually expand, and begin to account for significant percentages of national production.

The trend toward greater concentration in the livestock/poultry slaughter/processing industry is most pronounced in Hungary. In 1998, 24 of Hungary's 700 slaughterhouses produced 60-65 percent of total meat output, and three large companies controlled most poultry processing. The same trend is accelerating in Poland, particularly in the poultry sector: There are 500-600 poultry plants, but 28 account for 65 percent of birds slaughtered. The larger poultry processing operations have organized into groups. In 1999, four such processor groups were accounting for

Box III-3—Adam Smith's Pin Factory: The Principle Revisited at a Ukrainian Meat Market

The story of the pin factory in "Wealth of Nations" was used by Adam Smith to illustrate the basic economic principle of increased productivity of labor through specialization. We were able to see this process demonstrated at an open-air market in Kiev in the summer of 1998. This was a market for a multitude of food items—fresh vegetables, fruits (both imported and domestically produced), some fresh dairy products, household items, and fresh meat. The local municipal government operated the market, and stalls or booths were offered supposedly on a first-come, first-served basis to sellers. Local officials provided supervision and some inspection services for fresh meat items and overnight refrigeration—for a fee—for unsold meat.

We interviewed one butcher at this market. He and his wife had been operating this enterprise since 1995. They both had previously worked at a cooperative farm, where the man had been responsible for preparation and feeding of livestock. In a previous assignment, he had worked in the farm's meat processing shop, where he learned to dress hogs and cattle. Like most cooperative farmworkers, by 1995 he had received only sporadic payment of cash wages; by 1998 he had not received any cash wages in nearly 2 years. He still maintained a small plot on the farm of about 1.5 hectares, on which he lived and was currently raising five hogs as well as vegetables and a little wheat.

In 1995, he began cutting up his own hogs and delivering them to the Kiev market. He claimed to have earned about $150 from his first sale, compared with his monthly salary of 50 grivna (about $30 at the time.) After this initial success, he began looking for live animals to purchase, slaughter, and sell in the Kiev market. He was able to purchase live animals from plot owners like himself on a cash-and-carry basis. He would purchase the animal, take it into the woods, and slaughter it during the night. He transported the meat to Kiev, where he and his wife would set up a booth and sell it. This labor intensive and physically demanding activity was repeated no more than twice weekly, sometimes less depending on availability of animals and fatigue. Until early spring of 1998, he claimed profits of about $100 per animal. Ideally, he sold all the meat in one day. If not, the remainder was stored in the municipal refrigerator and removed the next day for sale. Since the meat was not refrigerated up until storage, it would perish quickly and would have to be discarded.

Some observations: First, this market was completely independent of government regulation. There is no state involvement in the pricing or terms of sale of the animals or meat. The municipality does operate the market, but entry is easy and relatively open to any bona fide marketer. The butcher we interviewed claimed that this type of market has captured virtually all of the fresh meat processing and marketing in Kiev. The privatized processing plants sold only processed meats—that is, smoked meat, pre-packaged hams, and casing meats.

Also, this was a "hot meat" system. This means that the meat was not refrigerated at any point in the processing chain. The characteristics of a hot meat system are that the time from slaughter to consumption is short, usually never more than a day or two at the most. Consequently, distances from farm to table are short and there is virtually no inventory in the system. This system is common in countries and areas where refrigeration or electricity is not available. However, electricity supplies were not the problem in Ukraine. The country has an electrical grid, and most Kievites have at least a small refrigerator. Thus, it seems that the reasons for the existence of this system were economic, not technical. Since the technical infrastructure already exists for a more modern meat processing system, this informal market will likely disappear when the terms of trade between farmers, consumers, and processors no longer make this activity profitable.

The processor assumes all risks associated with both purchase and sales; he has no recourse if he purchases a diseased animal. Likewise, losses due to leftovers were the processors' losses exclusively. While the larger, formerly state-owned factories complained of nonpayments, all sales at these private markets were made for cash. Thus, it appears that there

an increasing percentage of birds slaughtered annually in Poland.[5]

Many of the larger slaughter/livestock facilities in Poland and Hungary are former state enterprises. These operations have undergone considerable modernization, and some are licensed for export. Some are recently constructed plants, built in the early 1990s, but nearly all such operations have a significant share of foreign ownership (see Box III-4).

By the end of the 1990s, about a dozen large-scale privately owned packing plants had emerged in Russia.

[5] This information was obtained through extensive interviews with meat processing experts in Poland and Hungary.

is adequate monetary liquidity in the system. The state and formerly state-owned firms are by Western definitions bankrupt, but there is no formal liquidation or business exit procedure.

This alternative marketing system is rapidly changing. According to the butcher, his profits had deteriorated over the last year and especially in the last few months. This was likely because there were more people doing what he was doing. The large processors had raised prices for live animals, and prices at the live market had also risen. Another major change was the emergence of rural live animal markets. Initially, our processor would drive about the countryside looking for an animal to purchase. Lately, he had been able to purchase animals at the rural market. At this market, the closest of which is about 30 kilometers from Kiev, farmers (usually small plot holders) can sell animals for cash. There are some professional marketers who acquire a small number of animals to sell at this market, usually to people like the butcher, who process them into meat for the urban market. The gathering of animals, usually in small numbers, at a sales point is an example of specialization of activity.

A second development was the emergence of "families." These were groups of people, usually related, who engaged in meat processing with greater specialization than was possible for a single-person operation. One or two members would purchase animals from farmers, usually private plot holders or sometimes from the private co-ops. Numbers purchased were small and were paid for by cash. Other members specialized in slaughter. They operated in a garage, shack, or even outdoors, and the process was labor intensive. Finally, another member or two would staff the booth, selling the product. Several advantages accrue to this operation. First, unlike the single-person operation, the family can operate a booth 6 or 7 days a week, not just 2. The family thus realizes a greater volume of sales. The family can also make sure that they have not only the best location, but also the same location in the market. This makes it easier to establish a repeat business clientele. Asked if he had any regular customers, our interviewee mentioned only one person who would seek him out. A constant presence in the market permits quicker adjustment to changes in consumer preferences as well as prices.

It seemed that the market responded rapidly to consumer preferences. For example, processors in the market had, within the last 6 months, begun packaging purchases in plastic bags like the ones in U.S. supermarkets. Some of the larger merchants were able to offer these bags as gratuities to customers and soon everyone was doing it. In addition, customers definitely preferred 400- to 600-pound hogs, rather than the 250-pound "lean" hog desired in the United States and Western Europe. Hog fat was selling briskly at about $5 a pound in this market, and many of the tables were covered with bacon fat.

There was also specialization by livestock type. Our interviewee slaughtered only cattle and no longer hogs. There were several reasons for this, all rooted in market economics. First, hogs take longer to dress, despite their smaller size. With cattle, the hides are stripped and immediately sold to a broker, who exports them to Western Europe, usually Italy. With hogs, the hair has to be singed off with a blowtorch without burning or scorching the skin. Customers preferred cuts, especially back and belly fat, with the skin still intact. The singeing was a time-consuming activity requiring considerable skill. Hogs were also considered somewhat riskier to handle. Pork would go out of condition faster than beef, and consequently the losses from unsold meat were greater.

The butcher complained that his profits had been eroding steadily for about a year because of increased competition both at the retail booth and for procurement of live animals. In other words, processor margins were declining and efficiencies of operation, such as the specialization of family operations, were being passed on to consumers. Asked what he would do if this enterprise should fail, our interviewee would not speculate. But he did allow that he had six hogs on his plot, and that he expected to sell some of them.

These operations together accounted for about 30 percent of processed meat production. The plants are fully privatized, with 100 percent of their shares distributed among shareholders. Meat products are distributed mainly in large metropolitan areas (Moscow, St. Petersburg, Omsk, etc.). Metropolitan governments, which number among the large shareholders of the companies, assisted the private meat production operations by providing initial financing. Individuals hold the majority of outstanding shares. The private meat production companies have invested in new technology and operate at well above 50-percent capacity. They have steadily expanded their networks of warehouses and retail outlets throughout their product distribution areas. Typically, these plants are engaged in both importing and exporting (prior to the ruble depreciation in August 1998, the companies imported up to 90 percent of meat they processed; that proportion has presumably declined since then.)

The emergence of large, fully privatized meat processing facilities has not yet been observed in Ukraine, where privatization efforts lag behind those underway in Russia. In Ukraine, about 70 percent of all meat is processed at 25 very large, formerly state-owned facilities. These have all be transformed into shareholding companies, but the state still owns the majority of the shares, and the management is largely unchanged. These facilities reportedly operate at between 15 and 25 percent of available capacity.

Many of the larger companies in Hungary and Poland are now becoming more integrated; more and more buy their animals on contract with producers. In Poland, Romania, and Hungary, the processing firms tend to integrate backwards into production. The purpose is to insure more reliable supplies of animals of a uniform quality. Processors in Poland are beginning to rebuild the system of producer contracts that existed before 1989, in order to assure a

Box III-4—Farm Food, a Meat Processing Plant in Eastern Poland: An Example of Vertical Coordination and Increasing Concentration

Farm Food, which we visited in November 1998, produced fresh and processed beef and pork. It had been founded 5 years earlier by a former government Minister. He used his own capital and a loan from the Export-Import Bank of the United States. Since then, some Germans have bought a 25-percent share, and a Swedish group bought 15 percent. The company had also purchased existing plants in two other cities and established its own hog and cattle breeding farms in southern Poland.

The firm purchased 50 percent of its animals from nearby farms and the rest from larger units in neighboring regions. It supplied the genetic material to those farms in an effort to raise the quality of meat. The company used marketing contracts to purchase 70 percent of its hogs.

The plant processed 700-800 animals daily, producing 40 tons of sausage, 10 tons of variety meat sausage, 25 tons of smoked products, and 3 tons of fresh meat. The main plant's manager had a definite preference for processed products and hoped eventually to shift all of the plant's production to value-added processed meat products.

The main market was Warsaw, which took 48 percent of the output; the firm also sold in Gdansk, Szczecin, and Poznan.

The firm also exported to Russia. Before the Russian financial crisis of August 1998, Farm Food's main plant produced 100,000 tons of sausage a month for the Russian market. Immediately after the onset of the ruble depreciation, the Russian market all but disappeared. However, the manager said that exports had recently resumed. Farm Food had developed a new line of lower quality sausage to reach this market. It imported deboned turkey from the U.S. for use in this sausage.

The plant manager, when asked about possible impacts of a nationwide increase in wages, said that he did not think labor costs would be affected. Under the current economic conditions, the plant used quite a bit of hand labor and found it more profitable to invest in new plants rather than automated equipment. He had clearly made a decision to stay with more labor-intensive technologies for the time being, but if wages were to rise, he suggested that he would make every effort to substitute technology in place of labor.

Farm Food also owned two breeding farms—one for hogs and one for cattle. The breeding farms supplied genetic material to larger hog growers (cooperators), and young animals to the smaller growers. In this way, the firm had been able to raise the carcass quality. In 1993, for example, average lean yield for hogs slaughtered at Farm Foods was 42 percent. By 1998, the lean yield had increased to 49 percent.

The biggest challenge remains distribution, and any additional investment would go to improving the marketing and distribution system.

In November 1999, as evidence of the growing trend toward greater concentration, Farm Food announced a merger with three other major meat processors. Together these will constitute the country's largest meat producer with 20-percent share of the domestic retail market.

Box III-5—Ber-ker-bet Poultry Farm, Hungary: A Case of Contract Farming

This farm raised birds under contract to a nearby slaughterhouse/processor, which had provided credit to start the business and continued to provide the chicks and the feed. The farm covered the remaining costs. The slaughterhouse belonged to one of the two largest poultry processing companies, which together accounted for 90 percent of commercial poultry slaughter in Hungary. The company processed 50 million birds per year at eight separate plants. The farm had a 3-year contract with the slaughterhouse, which was renegotiated every 6 months. The manager stated that 80 percent of Hungarian poultry is produced under such contracts.

The manager had plans to build his own feed mill with a capacity of 10 tons per hour. He believed this was necessary to ensure uniform feed quality. Hungarian feed mills were allowed a considerable margin of error in the protein content, since most did not have the equipment to measure it more precisely. As a result, the manager was never exactly sure what was in the feed that he used, which resulted in some loss of productivity. The farm planned to finance the construction with assistance from a government program that established a fund of 8 billion forints for building or reconstruction of such facilities. Forty percent of the cost, up to 40 million forints, would be covered by the state under this program.

timely supply of uniform animals. The poultry sector in Hungary and Poland exhibits the greatest degree of vertical coordination. Virtually all birds processed by the large slaughter/processors are grown under contract. In Hungary, the slaughter/processor provides baby chicks and feed to the grower. The grower delivers the finished bird at a price specified in the contract. In Poland, growers procure feed and chicks on their own, but most have marketing contracts with processors. The pork sectors in Hungary and Poland are less integrated (see Box III-5).

IV. What Are the Keys to Successful Restructuring?

It is evident that Poland and Hungary have gone further in the restructuring process than the other three countries analyzed in this study. Some of the reasons include differing historical traditions, a friendlier policy environment, and greater foreign investment. However, the process is not complete even in these two countries. We still observe in all five countries the absence of some fundamental institutional market requirements. Underdeveloped markets for land, labor, and capital hinder the free movement of these factors to their most efficient uses and slow down the restructuring process.

The restructuring of the livestock production and processing sectors has proceeded the furthest in Poland and Hungary, and has been slower in the other three countries analyzed here. At various points in the preceding sections, we have alluded to some of the institutional and policy bottlenecks that have slowed down the process. These include the lagging pace of privatization, excessive government intervention in the production and marketing of livestock products, and the lack of such fundamental institutional market requirements as an enforceable commercial code, land markets, a system of rural credit, and market information. These deficiencies are particularly evident in Romania, Russia, and Ukraine, but some unfinished business remains in Poland and Hungary as well.

What Accounts for the Success of Poland and Hungary?

Several key factors explain the relative success of Hungary and Poland in the restructuring of their slaughter/processing and distribution sectors. Some of these factors will be analyzed in detail in later sections of this report. Briefly, key factors for transition success are:

Initial conditions. Both Poland and Hungary have a long and rich history of cultural, legal, and entrepreneurial traditions. Traditions of wealth creation, respect for laws, and recognition of private property rights had evolved over centuries, and they were easier to resurrect after the relatively short-lived Communist system collapsed. Moreover, both countries maintained a significant private sector and an active religious system throughout the Communist period. Polish and Hungarian citizens were also freer to travel to Western countries than were citizens of the USSR and Romania. In the other countries, activities of the private sector were much more circumscribed.

Privatization procedures. There is no doubt that privatization is key to providing the necessary environment for economic growth to take place. Privatization efforts have been most successful in countries where governments have exhibited maximum flexibility in negotiating the terms of sales of state assets. State firms that were privatized quickly in Hungary are doing well. Semi-privatized firms, where the state still holds majority ownership, are not growing as quickly as privatized firms. The majority-state-owned firms that remain in Poland are among the weaker firms in that country. The Polish meat industry as a whole is moving forward because the majority of the industry is privately owned.

Policy environment. Government policies can either encourage or inhibit the development of an industry. Poland and Hungary moved aggressively to liberalize prices and trade, forcing firms to compete in a free market or go out of business. Other governments continued to protect weak firms through soft credit, high border protection, and other measures. Policy in Poland and Hungary is also heavily oriented toward preparing for EU accession.

Foreign investment. The development of a modern animal products industry that can compete in global markets requires large quantities of investment capital. Where this investment has occurred, the principal source of capital has been foreign. Foreign investors are attracted to countries whose governments have created a stable policy and institutional environment.

But Unfinished Business Remains

Even the more advanced transition economies are characterized by a "missing middle." Even in Poland and Hungary, both production and slaughter/processing are nearly evenly divided between large modern firms and very small firms. At the farm level in Poland, even the commercial producers are still small—they may have 10 hectares and 20 pigs instead of 2 hectares and one pig. Hungary's farm sector is also split almost evenly between large-scale former cooperatives and small, mainly subsistence, farms. Nearly half of Poland's meat output and 40 percent of Hungary's comes from small plants, many of which do not meet export standards and operate in the "gray" (semi-legal) economy. There are very few medium-sized plants in either country and almost none in Russia, Ukraine, or Romania.

Small-scale entrepreneurs throughout the region encounter a number of institutional obstacles to expansion. Entrepreneurs themselves identify the absence of reasonably priced credit as their biggest obstacle. But there are others, including poor market infrastructure, absence of land markets, labor immobility, and a generally high-risk business environment. Most of all, the development of a modern, competitive livestock sector requires huge amounts of capital. Domestic and foreign investors alike will be reluctant to invest in these industries as long as such obstacles are in place.

Much of the reform process involves restructuring government institutions so that they better serve the needs of private producers. A major impediment to the complete restructuring of the region's livestock sectors is the lack of the institutional infrastructure needed to support the development of markets. The necessary institutions include clearly defined property rights, bankruptcy procedures, enforcement of contracts, a credit system, and market infrastructure. These institutions are better developed in Poland and Hungary than in the other countries, but are not fully developed even there. The lack of such institutions greatly inhibits the free movement of factors of production and slows the transition from a sector dominated by subsistence farming to a truly commercial livestock sector. Even where relative prices might favor expansion of a given species, producers are often unable to respond to those signals because of a lack of institutional support.

As stated in the introduction, early expectations of a quick turnaround in the livestock sectors and consequent rise in demand for imported feeds in the transition economies have not been borne out. The restructuring process proved to be much more difficult than anticipated, and Russia, Ukraine, and Romania have a long way to go before the transition process is completed.

But it does not automatically follow that if these bottlenecks are removed and the reform process is completed, the result will be an expansion of these countries' livestock sectors. Removal of these bottlenecks will enable markets to function and prices to allocate resources to their most efficient uses. That will not automatically lead to an expansion of the livestock sector if the country's comparative advantage lies elsewhere.

In the remaining sections of this report, we present results from a simulation model developed in cooperation with Purdue University in an attempt to analyze the impacts of those bottlenecks. We will analyze in further detail some of the institutional bottlenecks listed above, and we attempt to quantify the impacts of these bottlenecks and to project the changes in livestock production and trade that could come about with the removal of these obstacles.

V. Modeling Livestock/Poultry Production and Processing in Transition Economies

The Economic Research Service cooperated with Purdue University to develop a set of simulation models that provides a quantitative framework to assist in analyzing livestock/poultry producer and processor responses to alternative reform scenarios in five transition economies: Poland, Hungary, Romania, Russia, and Ukraine. The modeling framework incorporates characteristics of both general and partial equilibrium models. The models for Romania, Russia, and Ukraine also separate livestock/poultry production and processing into subsistence and commercial components. The models are used to simulate the disappearance of bottlenecks in factor markets, as well as price liberalization and reductions in marketing costs.

Introduction and Background

The Economic Research Service cooperated with Purdue University to develop a set of models to provide a consistent framework for analysis of questions that are unique to the production and processing of animal products in transition economies. The modeling framework relies on economic theory, country data, and qualitative country information to quantify the responses of livestock/poultry production and processing sectors in selected countries to exogenous price and policy shocks that accompany the transition process.

The transition economies of Poland, Hungary, Romania, Russia, and Ukraine are cast in a Ricardo-Viner Specific Factor trade model framework.[6] The empirical application of the Specific Factor model results in a set of theoretically consistent country models that include characteristics of both general and partial equilibrium models. The models depict both agricultural and nonagricultural sectors. Primary factor markets—land, labor, and capital—are included, with linkages between sectors and aggregate resource constraints explicitly recognized. The agricultural sector is disaggregated into livestock/poultry and crop production. Crops provide feed for livestock/poultry production. Animals are traded, retained in breeding herds, or slaughtered and processed into consumer goods. Processed consumer goods (meat and dairy products) are retailed domestically or exported.

[6] This class of trade models assumes that trade results when factor prices differ between regions; factor prices are based on factor endowments and productivity. One of the primary factors is assumed to be fixed, and specific to the production of a specified good (in these models that factor is capital). Other primary factors can be mobile across sectors or international borders. For further discussion see Paarlberg (1994), Sanyal and Jones (1982), and Jones, (1981).

The modeling framework allows simulation of exogenous changes in policies, resource endowments, factor prices, etc. The consequences of alternative market structures can be examined by imposing alternative closure and clearing rules. This approach is taken because transition economies' limited market experience precludes a demand/supply model based on time series data. Data consistent with a mathematical programming approach are available and were used in developing the country models. Nevertheless, data were often missing and qualitative judgments based on country expertise were required.

A comparison of scenario results with a base-year model solution allows calculation of the following:

- changes in equilibrium quantities of livestock and poultry production (cattle, hogs, poultry, and milk), and processing (beef, pork, poultry meat, and dairy products), and animal products consumption;
- changes in net trade position for live animals, meats (beef, pork, poultry), and dairy products;
- changes in factor intensities within livestock production and processing industries, and between meat production and nonagricultural sectors.

Thus, for a given market scenario, model results indicate whether production of a given species (cattle, hog, poultry, dairy) is growing or declining, and whether the species under production is being processed or traded live. Changes in factor intensities of livestock/poultry production and processing will provide insight into whether or not, for example, hog production is more, or less, labor or capital intensive. Decreases in the feed-to-animal ratio for

hog production would suggest increasing efficiencies in hog production. Changes in capital stocks accumulation show redirection of investment, both within the meat production sector (between agricultural and nonagricultural sectors of a given country), and between the given country and the rest of the world.

The transition process itself imposes limitations on the set of country models. The models are based on neoclassical assumptions of rational, perfectly competitive, maximizing agents. While many of the unique characteristics of the sectors are incorporated into the models, some important features are omitted. The models ignore or imperfectly reflect many critical institutional failures presently hindering the transition process, and so may overstate the ability of agents to respond to changing conditions. The models assume representative agents when there is clearly great heterogeneity. Given such limitations, the models serve as a complement to country expertise.

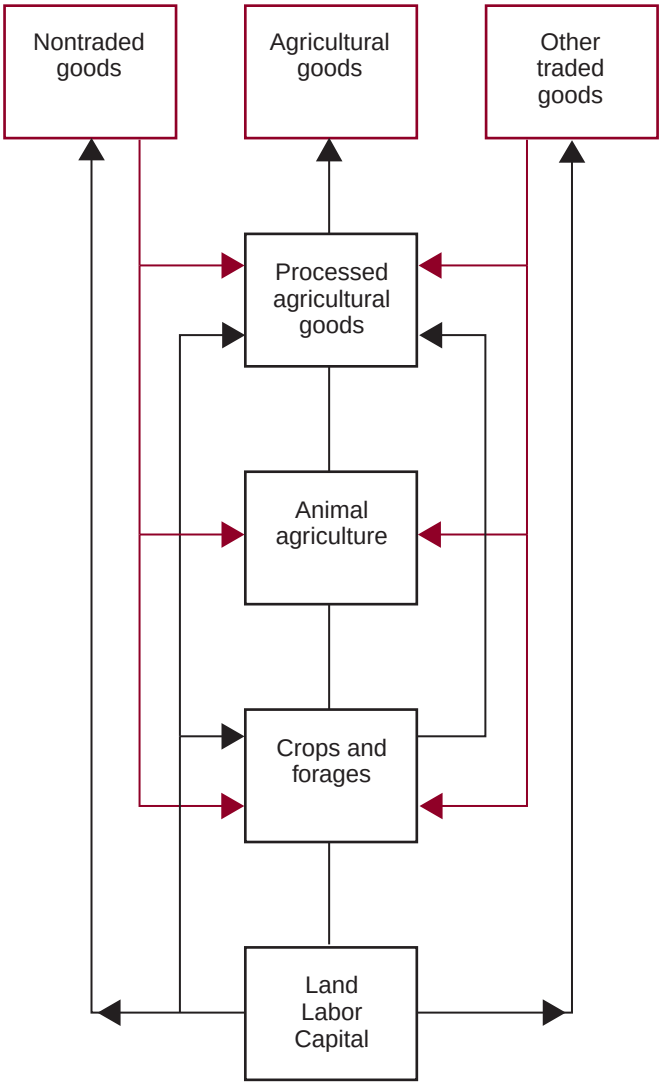
Model Overview and Sector Linkages

The models use the structure of trade models presented in Jones (1981) and Sanyal and Jones (1982). (A detailed mathematical form appears in Appendix: Model Structure and Data Sources, page 72). All transition nations are assumed to be unable to affect world prices of traded goods. This assumption allows the research to focus on national model development instead of devoting resources to modeling the world market. The cost of this assumption is that world market price effects are ignored. Primary factors of production consist of labor, land, and sector-specific capital. Pure final goods are beef, pork, poultry meat, fluid milk, butter, cheese, and sugar. Goods used only in the production of other goods (pure intermediates) are oilseeds and meal, cattle, hogs, poultry, sugarbeets, roughage, pasture, and farm milk. The remaining goods are used both as intermediates and as final goods. These include grains, potatoes, roots/pulses, and a composite nonagricultural good.

Composite nonagricultural goods are further disaggregated into a composite traded good and a composite nontraded good. The composite traded good includes all nonagricultural goods used to produce or process agricultural goods, which are able to be transported across international borders. Included in the composite traded good are such inputs as fertilizer, pesticides, herbicides, petroleum goods, etc. The nontraded composite good includes such items as bank credit, veterinary services, storage, transportation, electricity, etc., which by their nature are unable to be transported across international borders.

Figure V-1 provides an overview of the country model framework. Primary factors are combined with nonagricultural goods to produce crops, roughage, and pasture. These inputs together provide the feed necessary to produce livestock and poultry for slaughter or trade. The feed allocation by livestock type is allocated using animal budgets and information from in-country livestock experts. Animal production relies on feeds as well as labor, nonagricultural goods, and sector-specific capital. After adjusting for trade and breeding inventories, animals are slaughtered or provide farm milk. Farm milk is processed into a price-determined combination of fluid

Figure V-1—Schematic view of model structure



(retail) milk, butter, or cheese, using labor, capital, and nonagricultural goods. Slaughtered livestock and poultry become final goods—beef, pork, poultry meat.

Production of each crop relies on land, labor, capital, and nonagricultural goods. Roughage, pasture, and oilseeds are produced solely for feed use. Sugarbeets are either fed to livestock or sold to sugar processors. Grains, potatoes, and roots/pulses are used both as a feed and as a final good. Two crops—roughage and pasture—are always treated as nontraded agricultural goods. Sugarbeets, potatoes, and roots/pulses can be traded or not, depending on specific country practices. In Romania, Ukraine, and Russia all these crops are assumed not to be traded. In Poland and Hungary, only sugarbeets are modeled as nontraded crops.

Pasture and roughage are assumed to be consumed only by cattle. Oilseeds are converted to meal based on observed crushing yields and allocated to the various livestock types based on observed feeding practices. Similar feed ration allocations are used for the other feed ingredients.

In the livestock/poultry sectors, beginning inventories for cattle, swine, and poultry are taken from USDA's PS&D database. Cattle herd data show cattle "in milk" with the remaining cattle assumed for beef production. Poultry inventories are divided into layers and birds for meat. Slaughter is determined from the processing sector based on the output price for meat compared with the costs of production, including the price of the live animal. Final inventories are set using the ratio between the output for the animal and a weighted average of feed prices. Death rates are exogenous. When animals are traded, trade is the residual, with livestock prices linked to exogenous world market prices via policy interventions. Where animals are not traded or trade is set exogenously, the domestic animal price adjusts to clear the market. Live animals are not traded in the models for Romania, Russia, and Ukraine. Swine and birds are not traded in the models for Poland and Hungary, but cattle are traded. In all cases, meat is traded so meat prices are linked to the exogenous world price with trade quantities adjusting. This pattern is the opposite of the structure illustrated in the Sanyal and Jones (1982) model.

Milk produced at the farm goes into one of three outlets: milk for drinking, butter, or cheese. Milk is always assumed to be nontraded, while butter and cheese can be traded. The structure of the model allows for rates of return to differ between each dairy processing activity. Rates of return to fluid milk, butter, and cheese processing capital are thus important factors in output determination.

Meat production activities are more direct than dairy processing. Slaughtered cattle become beef, slaughtered hogs become pork, and poultry is transformed into poultry meat, all using labor, nonagricultural goods (traded and nontraded), and sector-specific capital.

Russian, Ukrainian, and Romanian agriculture is disaggregated into subsistence and commercial sectors because of between-sector differences in farming practices. Disaggregated data were obtained for Romanian agriculture. For the Russia and Ukraine models, because of data constraints, the private and state sectors were used as proxies for the subsistence and commercial sectors. Little precision is lost in such a data substitution, as most private sector output in Russia and Ukraine is the product of subsistence farms. Poland and Hungary also have various sized units ranging from subsistence farming to state farming, but in each case one structure tends to dominate. That is not the case in the other countries.

Technical Aspects of the Modeling Framework

The data needed to construct the production side of the model include the unit cost shares for the factors in each sector, per unit factor uses, and elasticities of substitution. In an ideal case, these data would be industry- and country-specific, but since not all the necessary data are available, some assumptions are necessary.

Country model results are largely driven by a predetermined set of unit cost shares for each output: crops, livestock, poultry, and processed products. Unit cost shares represent percentages (i.e., "shares") of total factor costs (i.e., costs of land, labor, capital, and nonagricultural goods), necessary to produce one ton of output. Some general patterns appear in the constructed unit cost share values:

- Because of low labor productivity, the labor cost shares are generally above those reported for Western nations despite the low wage.

- Subsistence agriculture shows higher labor cost shares than commercial agriculture. For example, subsistence grain production in Romania has a labor cost share of 24 percent versus 13 percent in commercial production.

- Crops have higher labor cost shares than animals for meat, for which the labor costs range from 1 to 14 percent.

- Labor cost shares in commercial processing are relatively low, for example, 7-15 percent in Romania. Usually one or more intermediates dominate the cost. In meat production, the dominant intermediate is the animal, with cost shares of 60-70 percent. In animal production, feed is the dominant cost share, ranging from 39 percent for peasant cattle to 94 percent for peasant swine.

- The cost shares of the "other traded good" component of the composite nonagricultural good (broken into "other traded good" and nontraded good) in livestock production are low. Again, there is a difference between commercial and subsistence agriculture, where subsistence agriculture makes limited use of nonagricultural inputs. The cost share of the other traded good component in crop production ranges from 30 to 75 percent because of the heavy use of chemicals, fertilizer, and purchased seed. Except for dairy products, the cost shares of the other traded good component in other sectors is 15 percent or less.

- A similar pattern is exhibited by the cost shares for the nontraded component of the composite nonagricultural input, but the magnitudes are smaller—10-20 percent for crops and less than 10 percent for other products.

Further details of unit cost share construction, together with assumptions that support construction of retail demand elasticities and elasticities of substitution, are described in the Appendix.

Overview of Scenarios

Chapters I-IV identified and described institutional and factor market barriers that currently hinder resource reallocation in transition economies. The five scenarios described below address unique transitional questions presented by livestock/poultry production and processing. The scenarios are each designed to simulate the impacts that could result from the elimination of factor market bottlenecks, price liberalization, and lower marketing costs.

Partial liberalization. Despite significant steps taken by most transition economies to liberalize prices and trade, various types of price supports, investment subsidies, and trade barriers remained in effect during the base period of the model. Russia and Ukraine directed significant subsidies to restructured state and cooperative farms, and continued to impose a variety of price and administrative trade controls. Romania maintained controls on consumer prices of bread and dairy products and producer prices of most grains and livestock products, and granted significant input and credit subsidies to producers. Poland and Hungary, after fully liberalizing their economies in the early 1990s, introduced a number of measures to protect producers' incomes in 1993. Income support measures took the form of minimum prices, high import tariffs, export subsidies, and credit subsidies.

Partial removal of government support was modeled for Romania. Romania is an obvious target for analysis, as the Romanian government removed many of the subsidies in 1997 and is unlikely to restore them to previous levels.

Reduced impediments to capital flows. One of the most urgent problems identified by producers in the transition economies is a lack of capital. There are two dimensions to this problem: one relates to a lack of financial capital and the other relates to capital as a stock. Capital stocks describe physical and human resources that generate flows of productive services. Financial capital is a collective term, used to identify a set of funds, often obtained through such instruments as bank loans, equity sales, bond issues, etc. Financial capital is typically converted into new stocks of physical capital. This scenario looks at both types of capital.

The first set of scenarios examine the impact of more readily available bank credit. Many producers and processors cite the lack of credit as the most serious obstacle to expansion. The cost of credit remains high, and banks are often unwilling to lend to agriculture at any price because of risk levels that are perceived to be unacceptably high. We tested this scenario for Romania and Russia. The results were similar for both countries, and we will present the results for Romania here.

In the second set of scenarios we ask the question: if financial capital were to become more readily available, where can it be invested to bring the greatest returns? There is already considerable interest among international agribusiness in investing in the livestock sectors of the transition economies. As these countries remove the institutional obstacles described in Chapter I, this interest will increase. Foreign investors are particularly interested in Poland and Hungary for two reasons: increased Polish and Hungarian access to EU markets, and the high probability of Polish and Hungarian accession to the EU.

After a decision is made to invest in the livestock/poultry sector, the issue of investment location within the market-

ing chain must be addressed; that is, at what level in the marketing chain are the returns to investment the highest. Scenarios depicted below use the Poland model to compare investment returns between hog production and pork processing.

Similar investment scenarios are simulated with the Russia model. Particular attention is focused on the poultry sector because of the significant level of recent Russian poultry imports, and in recognition of the ease with which poultry production and processing technology can be transported across international borders.

Reduced marketing costs. Marketing margins, particularly in the early transition period, were extremely wide. As described in Chapter III, the price difference between the farm level and the retail level is increased when costs of moving animal products through the marketing chain are increased by factors such as poor transportation and communications, uneven quality, poor market information, and high risk. Economists hypothesize that once these infrastructural shortcomings are overcome, the margins will decline. The result will be higher prices received by the producer and lower prices charged to the consumer.

This hypothesis is tested for Russia, Ukraine, and Romania. In all three countries, there remain several impediments to the efficient marketing and distribution of agricultural products. These impediments are generally less serious for Poland and Hungary.

Higher land prices. Land prices are generally low in the transition economies. In part, this is the result of a poorly functioning land market, but land prices are also influenced by the general low profitability of agriculture. Because land is cheap relative to other inputs, production in the transition economies tends to be extensive and yields are low. Land prices in all transition economies will likely rise as agriculture becomes more attractive to investors. This scenario is of greater interest for Poland and Hungary because of their imminent accession to the EU. One of the requirements of EU membership will be that all EU citizens will be able to buy land in Hungary or Poland, and the result will be upward pressure on land prices.

Lower employment in agricultural production. One agricultural growth dynamic frequently cited in the literature describes a process where labor is drawn off small family farm operations by more remunerative nonagricultural employment opportunities. Off-farm movement of labor begins a process whereby the agricultural labor population declines, average farm size increases, and farm productivity increases as returns to scale are realized. Our hypothesis was that this process would lead to increased profitability in a structurally altered agricultural sector supporting a reduced labor base.

We tested this scenario for Russia, Romania and Poland. All three countries have seen a rise in the share of agricultural labor in their total labor force since the beginning of the transition. Ukraine is in a situation similar to Russia, but Ukrainian employment data were not accurate enough to run this scenario. This scenario was not considered relevant for Hungary because of the significant decline in its agricultural labor force.

VI. Scenario 1—Romania: What Is the Impact of Partial Removal of Subsidies?

As a first step in modeling alternative reform scenarios for Romania, we simulated the partial removal of the extensive array of subsidies that were in place during the 1994-96 base period. The results of this scenario were used as a base for the scenarios that follow. These subsidies were removed in 1997, and it is unlikely that they will be restored in full during the projection period. The results of the partial price liberalization scenario show deep declines in pork, poultry, and dairy output but a slight rise in beef output. There is also a pronounced increase in the share of the subsistence sector in agricultural output. These results are consistent with developments that have actually taken place since 1997.

The base period data used for construction of the computer model contains consumer subsidies, producer subsidies, and herd subsidies to large livestock enterprises. Beginning in 1997, the Romanian Government began to dismantle this intervention. Consumer subsidies were removed and producer and investment subsidies sharply reduced. There have been pressures to restore these subsidies, but it is unlikely that the Government will restore them in full. Thus, before accurate analysis of other issues can be done, the model results must be adjusted to reflect the policy reforms undertaken. That new partial liberalization solution forms the base for the subsequent analysis.

The shocks applied in this scenario are summarized in table VI-1:

The general impact of these changes is to reduce output of the formerly subsidized sectors, leading to an overall decline in agricultural output. Since agriculture accounts for 19 percent of GDP and 28 percent of the labor force in Romania, these declines have a profound effect on national income and employment. These effects are compounded because the reduced agricultural output leads to declines in demand and prices for nontraded inputs. National income is further reduced because of the increase in unemployment and the reduction in land rent that comes with the decline in crop output. The combined impact of these factors is a 12 percent decline in GDP and expenditures and an increase in unemployment from 9.6 percent to 16 percent.

Pork, Poultry, Dairy Output Fall, Beef Rises

In the meat industries, output of pork and poultry meat fall, while output of beef rises (table VI-2). Profitability of pork, poultry meat, dairy products, and milk, as measured by payments to physical and human capital, fall with effects transmitted downward to animal sectors. Herd subsidy reductions are harmful to the agroindustrial

Table VI-1—Romania: Summary of shocks

Policy	Shock
Consumer subsidies on pork and poultry meat (20 percent of producer price), milk (50 percent) and bread (20 percent)	Removed
Herd subsidies: 70 percent interest subsidy for purchase of breeding stock and equipment or construction or expansion of livestock facilities; restricted to large scale producers	Cut by 50 percent
Producer subsidy for milk	Removed
Producer subsidy for poultry (subsidy for purchase of feed and other inputs)	Cut by 60 percent
Producer subsidy for grain (subsidy for purchase of seed and fertilizer)	Cut by 75 percent

Table VI-2—Romania: Impact of partial price liberalization on meat sector

	Beef	Pork	Poultry
		Percent change	
Output	6	-11	-37
Food	-2	-18	-16
		Imports (1,000 tons)	
Base value	0	-40,000	27,000
Scenario	-14,000	-66,000	55,000

Table VI-3—Romania: Impact of partial price liberalization on the dairy sector

	Fluid milk	Butter	Cheese	Raw milk
		Percent change		
Output	-35	-14	-15	-39
Food	-35	-13	-15	n.a.
		Output of Processed goods		
Fluid	n.a.	n.a.	n.a.	-42
Butter	n.a.	n.a.	n.a.	-18
Cheese	n.a.	n.a.	n.a.	-20
Feed	n.a.	n.a.	n.a.	-35

Table VI-4—Romania: Impact of partial price liberalization on animal sectors

	Cattle	Swine	Birds
		Percent change	
Births	4	-14	-79
Slaughter	7	-16	-73
Ending inventories	1	0	-4

complexes, not to peasant farmers. Cattle are mostly raised by subsistence farmers. There were no retail subsidies for beef in the base scenario, so there is a relative price change at the retail level that favors beef consumption. Pork and poultry were more evenly split between the commercial and subsistence sectors, and retail consumption of both was subsidized. The retail price rises for pork and poultry meat reinforce the effects of falling national income and cause significant declines in consumption. For beef, the retail price is unchanged and this dampens the impact of falling national income. Thus, beef consumption falls little. With the exception of birds, peasant households expand animal agriculture while agroindustrial complexes reduce animal agriculture. There are significant rises in net exports of beef and pork; in the case of pork, demand declines more than output. The drop in poultry meat production exceeds the fall in consumption, with the result that poultry meat imports double.

Because dairy products are modeled as nontraded, falling income, rising consumer prices, and reduced production subsidies cuts demand and production (table VI-3). Fluid milk production shows the largest decline, falling by 35 percent, but butter and cheese output also fall. In turn, demand for raw milk at the farm level falls, and production of raw milk falls 39 percent.

Reduced meat and dairy production puts pressure on the animal sectors, with the exception of cattle for beef (table VI-4). Poultry and swine numbers fall sharply, since the reduction of producer subsidies results in a lower price to producers and a higher price to processors. The calf crop, however, rises slightly, as peasant farmers expand to meet the increased demand for cattle slaughter.

Producers Switch to Nongrain Feeding

Adjustment in animals forces changes in feeding (table VI-5). Grain use is lower for all animal types as grain is more expensive. Meal use is lower for cattle and birds, but greater for swine. One reason for these shifts is that the reduced grain subsidy causes its price to rise relative to other feeds, so that other feeds replace grain. Milk in feed is also priced higher due to the subsidy removal. Cattle breeders substitute silage and forage for grain, milk, and meal, with a resulting loss in total feed efficiency. In the swine sector, increased use of meal, potatoes, roots, and legumes replace the more expensive grain. Again there is a loss in feed efficiency.

The changes in final and derived demand bring adjustments in crop production (table VI-6). Land rent falls from $85 per hectare to $75 per hectare, as area shifts to accommodate the lower grain price. Area moves out of grain production into other crops, and grain output shrinks by 9 percent. Lower land rent and relatively higher costs for purchased inputs leads to a more land-extensive grain production, causing a 3 percent drop in grain yields. Net grain exports rise slightly, despite the lower output, as a result of sharply reduced feed demand.

Commercial Producers Hit Harder

Because herd subsidies were restricted to large producers, the bulk of the adjustment was in commercial production (table VI-7). Milk production falls for both commercial and subsistence producers, but commercial producers suffer far more—output by commercial producers falls by 76 percent. The calf crop expands, but all of that expansion is in the subsistence sector. Peasant calving expands 5 percent while the calf crop in the agroindustrial complexes fall 1 percent. The changes in the pig crop show an even more pronounced shift towards subsistence agriculture.

Grain production also shifts towards subsistence agriculture, as the fall in output in the subsistence sector is less severe. The shares of subsistence production for silage and forage rise as production of those two crops increase.

Table VI-5—Romania: Impact of partial price liberalization on feeding

Type of feed	Cattle	Swine	Birds
	Percent change		
Grain	-14	-8	-40
Meal	-4	14	-20
Milk	-35	n.a.	n.a.
Silage	6	n.a.	n.a.
Forage	5	n.a.	n.a.
Roots/Legumes	n.a.	11	n.a.
Sugarbeets	-3	n.a.	n.a.
Potatoes	n.a.	14	n.a.

Table VI-6—Romania: Impact of partial price liberalization on crop output

	Sugarbeets	Potatoes	Grain	Roots and legumes
		Percent change		
Output	6	5	-9	9
Food	n.a.	-3	-6	1
Feed	-3	14	-12	12
Process	9.03	n.a.	n.a.	n.a.
Imports	n.a.	0	6	0
	Silage	Forage	Oilseeds	Meals
Output	6	5	12	n.a.
Food	n.a.	n.a.	0	n.a.
Feed	6	5	0	6
Imports	n.a.	n.a.	n.a.	-9

Table VI-7—Romania: Impact of partial price liberalization on agricultural output by farm type

	Subsistence	Commercial
	Percent change	
Milk output	-1	-76
Cattle births	5	-1
Swine births	13	-51
Birds births	-59	-34
Egg output	-34	-63
Sugarbeet output	2	19
Potato output	2	9
Grain output	-4	-11
Oilseed output	5	16
Roots/legume output	4	17
Silage output	6	5
Forage	6	3

Conclusions

These results are generally consistent with actual developments in Romania since 1997. On the macroeconomic level, real income fell 3 years in a row beginning in 1997, finally starting to rise in 2000. Unemployment was at 8 percent in 1996, and by 1998 was in the double digits. Hog and poultry numbers have fallen, with most of the decline occurring in the former state complexes. The fall in poultry meat output was particularly severe. Grain yields and output have also fallen. Contrary to model results, the cattle/beef sector in aggregate has not expanded, and cattle numbers have continued to decline. But beef output has remained nearly constant since 1997, and it can still be said that the reform favored beef at the expense of pork, poultry meat, and milk. The model results show that pattern.

The declines in swine and poultry output will likely continue in the short term. But, under pressure from the World Bank, the Romanian Government is accelerating the process of privatizing state livestock complexes. A number of smaller poultry complexes have already been privatized. Privatization of some of the largest complexes—one of which had 834,000 hogs in April 1999— is now under way. The state Ownership Fund is attempting to find strategic investors interested in purchasing the assets of these farms. If these efforts are successful, the result may be a revitalization of the sector. In the investment scenarios that follow, we try to quantify the possible impact of such investment.

VII: Scenario 2—What Are the Benefits of Lowering the Barriers to Capital Flows?

The transition presented animal producers and meat processors with the common problem of surviving in a market economy with an outdated capital stock. Ten years into the transition, binding constraints on financial capital supplies remain a significant bottleneck. The most important sources of financial capital to livestock/poultry producers and processors in more reformed countries include foreign investors and retained earnings. The effects of lower credit costs are evaluated using the Romania model. Differential investment returns are evaluated between producer and processor levels of the marketing chain, using the Poland and Russia models.

Introduction and Background

The term "capital" is used in several ways in the economics literature. Two such uses relate to capital as a stock, and financial capital. Capital stocks describe physical and human resources that generate flows of productive services. Financial capital is a collective term, used to identify a set of funds, often obtained through such instruments as bank loans, equity sales, bond issues, etc. Financial capital is typically converted into new stocks of physical capital. Both categories of capital are relevant to a discussion of capital as a bottleneck in livestock/poultry production and processing sectors in transition economies.

The transition immediately confronted the animal production and meat-processing sectors with a common problem: how to survive in a market economy with a outdated stock of capital (both human and productive), established years previously by central planners. To address this problem, most production and processing operations initially attempted to upgrade their capital stock, whether in the form of breeding stock or new machinery. As a result, sector demand for capital of both categories—physical and financial—increased. A consequence of the sector's increased capital demand was the realization by producers and processors that the supply of financial capital was (and remains) severely constrained.

In terms of capital as a stock, animal production and meat processing industries began the transition with a stock of capital set in place by central planners. Production operations were often very large-scale, and suboptimally located with respect to feed supplies, processing facilities, and population centers. Moreover, planners' directives rather than consumers' tastes and preferences dictated the variety and quality of meat products produced under central planning.

On the processing side, characteristics of the capital stocks at the outset of transition had much in common with those on the animal production side: large-scale slaughter and processing facilities, sometimes coordinated with large-scale production complexes, but often suboptimally located with respect to transportation and population centers. Moreover, although meat processing technology tended to be current at the time of plant construction, the technology rarely received necessary maintenance or periodic upgrading. Consequently, the average stock of meat processing capital began the transition in a seriously deteriorated state.

Underdeveloped Financial Markets

By U.S. standards, financial capital markets in transition economies remain underdeveloped. Supplies of financial capital available to livestock/poultry producers and processors derive primarily from three sources: credit, retained earnings, and foreign direct investment (FDI).

Credit. Financial capital in the form of credit is provided primarily by governments and by banks. Governments in Poland and Hungary have established subsidized credit programs for livestock/poultry producers and meat processors. Applicants for subsidized credit must meet pre-determined program criteria before the subsidy is provided. In Romania, Ukraine, and Russia, governments extend open-ended credits to banks, which function as conduits to state-owned livestock/meat operations. The resulting debt is rarely serviced or repaid by either the bank or the recip-

ient agricultural operation. Indeed, it has been argued that the practice of open-ended extension of credits to agricultural banks serves only to accelerate inflation, and to perpetuate production and processing operations that would (and should) otherwise go out of business (Sedik, 1996.)

Banks are also a major source of financial capital, particularly in Poland and Hungary. The Polish and Hungarian macroeconomies have stabilized as the transition has proceeded. Real lending rates have become less volatile in Hungary and Poland and are declining to levels closer to those found in developed economies, such as Germany and the United States (IMF, International Financial Statitics). Despite relatively moderate interest rates, however, significant barriers to bank credit exist for livestock/poultry producers and processors. Important barriers include:

- low agricultural returns;
- high risk levels associated with animal agriculture;
- absence of traditions of agricultural lending by commercial banks;
- legal questions surrounding the use of agricultural land as collateral for bank loans.

Since borrowed financial capital is a "given" for the agricultural sectors in both the United States and the EU, it is reasonable to conclude that the high cost of credit in transition economies severely limits the possibilities for expansion and upgrading by livestock/poultry producers and meat processors. Limited access to credit effectively locks producers and processors into their current capital stock.

Retained Earnings and Foreign Direct Investment

The competitive nature of the market for bank loans in Poland and Hungary necessitated the development of alternate sources of financial capital by producers and processors. Two important sources of financial capital in Poland and Hungary are retained earnings and FDI. The use of retained earnings appears to be the chief means employed by small producers and processors to expand capital stocks. Clearly, reliance on retained earnings as a primary source of financial capital implies relatively slow rates of capital accumulation and growth.

FDI as a source of financial capital appears to be more prevalent among larger, well-managed production and processing operations. Northern Europe and the United States are major sources of FDI in Poland and Hungary. Aggregate FDI in both Poland and Hungary has averaged about $2 billion per year since the beginning of the transition. In the first half of 1998, 11 percent of FDI in Hungary was directed toward the food component of the economy: 1 percent to agriculture, and 10 percent to food processing (Hungarian Central Statistics Office.)

The current structure of financial capital markets in transition economies is likely an important determinant of the current structure of livestock/poultry production and processing. In its current state of development, financial capital markets are accessible to relatively large, ongoing enterprises, such as privatized processing facilities. There are currently few sources of financial capital for startup commercial livestock/poultry production or meat processing enterprises beyond retained earnings. The limited set of financial capital sources tends to "freeze" the current bimodal industry structure in place, suggesting that medium-sized commercial production and processing enterprises will remain "missing" for at least the medium term.

Implications of Developed Capital Markets and Increased Supplies of Financial Capital: Simulation Results

Implicit in the foregoing discussion is the assumption that as the transition progresses, development of factor markets will proceed, and, in particular, constraints on the availability of financial capital will become less binding on animal production/meat processing sectors. The set of models developed for Romania, Poland, and Russia allows simulation of the removal of bottlenecks that presently impede financial capital flows. These simulations provide useful insight into the likely impact of increased financial capital on the sectors.

Two sets of investment scenarios are detailed below. First, the Romanian model is used to simulate increased availability of credit that will likely follow further development of financial capital markets. This simulation tests the effects of lower credit costs. Next, given that most FDI has been channeled toward the processing end of the meat industry, the Poland and the Russia models are used to test the hypothesis that investment in processing brings higher returns than investment at the farm level.

Reduced Credit Costs in Romania

Informal interviews with Romanian livestock/poultry producers suggest that credit costs are a major impediment to agricultural investment. Accordingly, the simulation below shows possible Romanian livestock/poultry producer and meat processor responses to lower credit costs. The reduction of credit costs is simulated by a 20 percent reduction in the price of the nontraded input. In this scenario it is assumed that all producers, not only agricultural producers, benefit from the lower credit costs.

Credit cost reductions targeted at the entire productive sector of the Romanian economy generated the results summarized in table VII-1. The simulation results indicate that commercial producers and processors benefit from lower credit costs to a greater degree than subsistence operations. The reason is that commercial operations make greater use of lower-cost credit services and purchased inputs.

The increased output by commercial producers puts upward pressure on land rents and the prices of nontraded feeds. For commercial operations, the benefits from lower credit costs more than compensate for the price rises of other inputs. In contrast, subsistence operations tend to use fewer of the services whose prices have declined. Small subsistence operations are therefore more vulnerable to higher land rents and feed costs. Yields in the subsistence sector are often lower than commercial sector yields, and the result is that land accounts for a higher share of subsistence sector costs. Moreover, reduced credit costs induce large production increases by commercial hog operators, forcing domestic hog prices down. Lower prices mean lower returns and production for subsistence producers.

The shift between the commercial and subsistence sectors is reversed in the case of poultry. Both subsistence and commercial poultry producers benefit from reduced credit costs more than any other sector, but subsistence producers expand output more than commercial ones. Total births rise 7 percent, with a 9-percent rise in the subsistence sector and just a 6-percent rise in the commercial sector. The reason is that subsistence poultry producers are much heavier users of nontraded goods than subsistence swine or cattle producers because they buy chicks from state poultry enterprises. The cost share of nontraded goods for subsistence poultry growers is nearly 12 percent, while it is near zero for subsistence swine and cattle.

The crop sector is affected by the rise in land rents, but this has a greater negative impact on subsistence producers since land comprises a higher share of their production costs (table VII-2.) For commercial crop producers, the rise in land rents is offset by the reduction in credit costs, and commercial output of grain and oilseeds rises. Area planted by commercial farms declines slightly, but yields rise, resulting in an 8-percent increase in grain output and a 1-percent rise in oilseed output. In contrast, grain output by subsistence producers falls 4 percent, and oilseed output falls by 3 percent. On net, grain output rises nearly 5 percent.

While grain output rises, consumption remains constant. The decline in the cost of credit leads livestock producers

Table VII-1—Romania: Reduction in cost of bank credit, all producers

	Cattle production	Beef processing	Hog production	Pork processing	Broiler production	Broiler processing	Farm milk production	Butter production	Cheese production
				percent changes from '94-'96 base					
Consumer price	1	0[1]	-2	0[1]	-1	0[1]	-1	-1	-1
Producer price	1	0[1]	-2	0[1]	-1	0[1]	-1	-1	-1
Returns to capital: subsistence	2	-3	-20	9	60	-23	-3	-2	1
Returns to capital: commercial	15	5	16	22	12	169	34	25	9
Births[2]/output: subsistence	0	-1	-9	2	16	4	-1	0	0
Births[2]/output: commercial	0	1	47	4	7	9	19	6	2
Exports	n.a.[3]	-23	n.a.[3]	9	n.a.[3]	-7	n.a.[3]	n.a.[3]	34

[1]Price change equals zero, because good is traded
[2]Births are applicable to production; output is applicable to processing
[3]Not applicable: cattle, hogs, birds, milk, and butter assumed to be nontraded goods

Table VII-2—Romania: Effect of reduction of credit costs on crop output and utilization

	Sugarbeets	Potatoes	Grain	Oilseeds	Silage
			percent change from '94-'96 base		
Consumer price	3	-3	0[1]	0[1]	1
Producer price	3	-3	0[1]	0[1]	1
Rent-Land	9	9	9	9	9
Area	4	-2	2	-1	-2
Commercial	22	-1	6	-1	-2
Subsistence	0	-4	-5	-4	-2
Output	7	-1	5	0	0
Commercial	25	0	8	1	-1
Subsistence	2	-2	-5	-3	-1
Food	n.a.[2]	2	0	0	n.a.[2]
Feed	-3	-3	0	0	0
Process	11	n.a.[2]	n.a.[2]	n.a.[3]	n.a.[2]
Exports	n.a.[4]	n.a.[4]	79	n.a.[4]	n.a.[4]

[1]Price change equals zero, because good is traded
[2]Not applicable because the good is not used in this way
[3]Not applicable because the model does not calculate this value
[4]Not applicable because the good is nontraded

to substitute other inputs for feed, and the income effect of the shock is not sufficient to affect food demand. The result is that grain exports nearly double.

Are Investment Returns Higher at the Production Level or at the Processing Level of the Marketing Chain?

The credit cost reduction scenario in the Romania model projects ahead to a time when livestock/poultry producers and meat processors will have comparatively easier access to credit. A relevant area of current inquiry is identification of the level in the marketing chain where investment will generate the largest capital returns. The scenarios set out below focus on identification of location(s) in the marketing chain for capital investment. Whether to augment capital stocks at the farm level, the processing stage, or at the point of retail sale is a relevant issue presently, and will likely continue in importance as the transition concludes.

Most foreign direct investment in transition livestock and poultry sectors has been targeted at the processing end of the marketing chain. Such investment patterns raise several issues:

- Are there differential returns between investment in animal products processing and livestock/poultry production?
- What are the differential effects of targeted subsector investment; that is, what happens when investment is targeted at the commercial sector alone, as private investment tends to be, or, when investment is targeted at the peasant sector alone, as is the practice of international lending institutions?

A set of investment location scenarios is set out below, for the hog/pork sector in Poland, and for the poultry sector in Russia.

Investment in hog production and pork processing in Poland. Using the Poland model to simulate six investment scenarios shows that the same investment quantity can have different effects, depending on (1) the level of the marketing chain where the investment injection occurs, and, (2) assumptions regarding the tradability of the processed good (which in this case, is pork). In the first set of three scenarios, we invoke the "small country"[7] assumption for Poland, and assume that pork is a traded good, while live hogs are assumed to be nontraded. Investment shocks of ten percent are imposed on the model in three ways. In the first scenario (Scenario 1), the investment occurs at the producer level. In the second (Scenario 2), the investment is imposed at the processor level, and in the third (Scenario 3), investment occurs simultaneously at the producer and the processor level.

In the second set of three scenarios, the same investment shocks are imposed as in the first scenario set, but pork is

[7]The small country assumption focuses on the potential of a country's trade patterns to affect international market prices. Because Poland's livestock/poultry production and processing sector accounts for a relatively small percentage of world animal products volume, it is assumed that Poland's production, processing, and trade decisions have no effect on international market prices.

assumed to be a nontraded good. When pork is nontraded, domestic market prices adjust to balance domestic demand and supply. Net trade remains constant.

The results of Scenario 1 (table VII-3) show the effects of a ten percent increase in the capital stock of Polish hog producers. As a result of the capital stock increase, the rate of return on hog production-specific capital is 29 percent lower than in the base period solution. That is, with a greater supply of capital, the per unit return is lower. With an enhanced capital base however, more hogs can be produced profitably at the given market price. The model results show a 4-percent increase in hog production, which causes a 3-percent reduction the equilibrium market price for hogs, as prices must adjust to clear the internal market. Lower hog prices increase the quantity of slaughter hogs demanded by processors by 5 percent. Ending inventories decline by less than one percent, as a result of lower returns to capital in the form of breeding stock.

Processors benefit from the enhanced capital base of the hog production sector, and pork production increases by 5 percent. Because pork is a traded good by assumption, the Polish price remains the same and the world pork price does not change. The result is a 174-percent increase in Polish exports.

In Scenario 2, where the 10-percent capital stock increase occurred at the at the processing level of the marketing chain, both the processing sector as well as the hog production sector appear to benefit from the investment, to a greater extent than under Scenario 1. Hog producers are unambiguously better off when investment takes place at the processing level due to the expansion in derived demand: capital returns increase by 15 percent, and ending stocks increase slightly, reflecting gilt retention for augmentation of the breeding herd. Increased demand for hogs from the capital-enhanced processing sector increases the equilibrium hog price by 2 percent; in response, the pig crop increases by 7 percent. On the processing side, slaughter increases by 8 percent. As pork is a traded good, the domestic Polish market price remains constant, and the increase in output is exported. Exports increase by more than 350 percent.

Investment at the processing sector thus results in larger gains/smaller declines in both the processing and the production sector, in comparison to the results that were observed when investment occurred at the production level of the marketing chain (Scenario 1). Processing sector investment generates larger gains or smaller declines in capital returns for both processors and hog producers and larger increases in pig crops, slaughter, pork output, and exports. Moreover, when investment occurs at the processing level, hog prices increase, as opposed to the decrease that was observed under the production sector investment scenario.

In Scenario 3, where investment occurs at both the production and processing levels of the marketing chain,

Table VII-3—Poland hog/pork sector investment scenarios

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6
Increase in capital stock (percent)	10	10	10	10	10	10
Level of investment	Production	Processing	Production and processing	Production	Processing	Production and processing
Hogs traded	No	No	No	No	No	No
Pork traded	Yes	Yes	Yes	No	No	No
	percent changes from '94-'96 base					
Processing sector						
Price	0[1]	0[1]	0[1]	-2	-5	-7
Capital returns	12	-6	6	1	-30	-29
Slaughter	4	8	12	2	1	3
Output	5	8	12	1	2	4
Exports	174	356	529	n.a.[2]	n.a.[2]	n.a.[2]
Production sector						
Price	-3	2	-2	-4	0	-4
Capital returns	-29	15	-14	-35	2	-33
Pig crop	4	7	11	1	1	2
Ending inventory	-1	0	0	0	0	0

[1]Price change equals zero, because good is traded
[2]Not applicable because good is nontraded.

model results are similar to Scenario 1, where the processing sector appears to benefit unambiguously, while hog producer effects are mixed. Investment in the production sector drives the results in this scenario. The investment-enhanced production base allows more hogs to be produced at a given output price, leading to an 11-percent increase in the pig crop, a greater increase than observed in either Scenario 1 or 2 since the inflow of investment is greater. The large increase in the pig crop forces hog prices lower and increases the quantity of hogs demanded by the processing sector for slaughter. In the processing sector, slaughter, output, and exports all increase by larger percentages than those observed under Scenarios 1 and 2. Returns to capital fall in the production sector, but by less than what resulted from investment in the production sector alone (Scenario 1). Despite an enhanced capital base, returns in the processing sector rise, unlike the decline in returns that resulted from investment in the processing sector alone (Scenario 2).

In the second set of three scenarios, the final good—pork—is assumed to be nontraded. That is, the domestic price of Polish pork adjusts to equalize the supply and demand for pork, independent of international markets. Pork nontradability could result from a sudden outbreak of animal disease, for example, or allegations of unsafe processing practices. Table VII-3 summarizes the results of the second set of three investment scenarios: first, investment in the production sector (Scenario 4); second, investment in the processing sector (Scenario 5), and last, investment in both sectors simultaneously (Scenario 6), all under the assumption of final good nontradability.

The changes demonstrate, by counterexample, the beneficial effects of linkage to the world market. When pork is a nontraded good, positive responses to investment are lower in magnitude, compared with responses generated by models that assume that Polish pork is traded. This occurs because as the investment expands pork output, the price of pork falls to clear the market.

The nontradability assumption also appears to amplify declines in capital returns responses and to diminish positive effects when compared with results generated by models incorporating pork as a traded good. Under Scenarios 2 and 3, changes in capital returns on the processing side are 4 to 5 times greater under the nontraded assumption. On the production side, capital returns changes are more negative in Scenarios 4 and 6, and less positive in Scenario 5, relative to identical investment scenarios where pork is a traded good.

This version of the model has important implications for all the transition countries. Even though the model assumes that meat products—beef, pork and poultry—are fully tradable, the reality is that with the possible exception of Hungary, meat is not fully tradable in any of the countries considered in this study. Even in Poland, export markets are limited by uneven quality and disease problems. For example, because Poland vaccinates for foot-and-mouth disease, export markets for fresh pork are severely restricted. Tradability is further hindered by the various bottlenecks we have identified. Because of these bottlenecks, world prices are not fully transmitted to producers. The results of this scenario suggest that all these countries will become much more attractive to investors once integration with world markets is complete.

Investment in poultry production and poultry processing in Russia. As the transition has unfolded in Russia, imported poultry meat has become a major source of protein for Russian consumers, particularly between 1993 and August 1998. The volume of poultry meat imports and the relative ease of transferring poultry production and processing technology across international borders suggest a high potential for investment in the domestic poultry sector. The scenarios detailed below consider three types of investment in the poultry and poultry meat industries. Scenario 1 assumes a 10-percent increase in the capital stock of the poultry processing industry. In Scenario 2 investment increases the capital stock of state poultry production enterprises (farms) by 10 percent. In Scenario 3, there is a 10-percent increase in the capital stock of subsistence poultry production enterprises. Results are summarized in table VII-4.

Investment in commercial poultry meat processing. In Scenario 1, poultry meat prices are assumed to be linked to the world market. That is, poultry meat is a traded good, whose domestic price equals the world price. Because the domestic poultry meat price remains constant, domestic consumption does not change, and the production effects of added investment appear on the trade side.

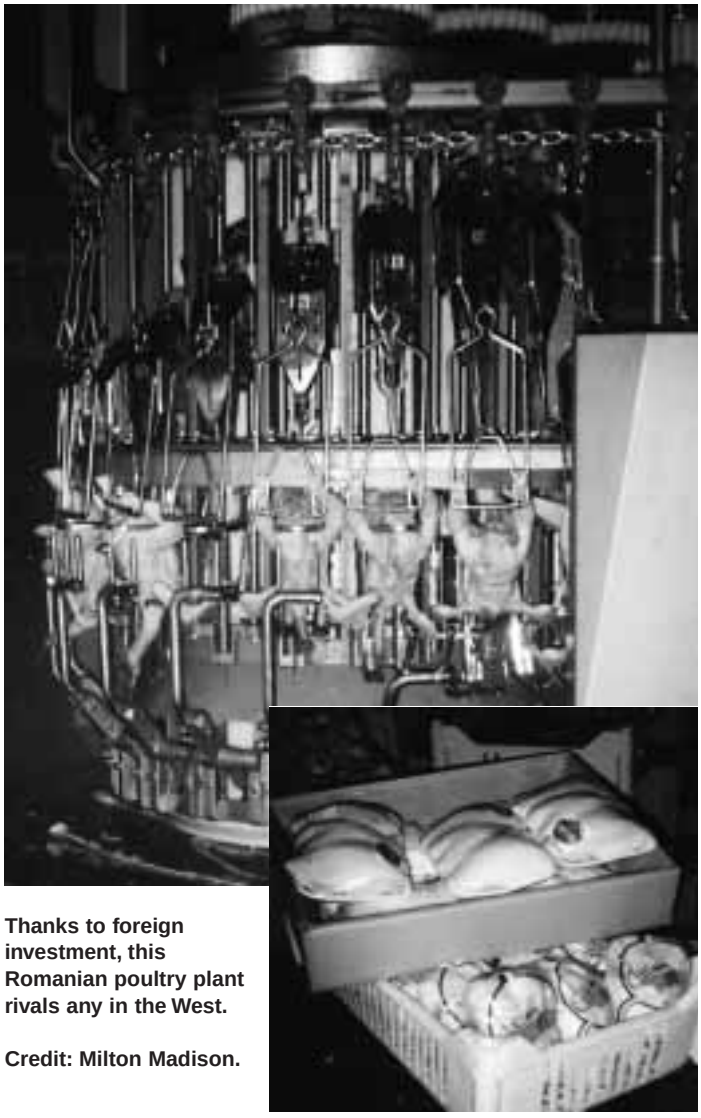
The result is a 4-percent increase in poultry meat production and a 5-percent decline in imports. Lower processing costs lead to an increase in derived demand for slaughter poultry and a small increase in the farm price of birds. Higher profits stimulate an expansion in poultry production to meet increased processor demand. Total poultry numbers rise 3 percent, and more birds are held as ending inventory, as long-run profitability of bird production increases.

The expansion of poultry inventories triggers a 3-percent increase in feed demand for grain and oilseed meal. Some of the increased grain use by poultry diverts feed from other animals, causing cattle and swine numbers to fall slightly. Most of the additional grain demand is met by increased imports, which rise 3 percent. The increased demand for oilseed meal is met through a 3-percent decline in oilseed and meal exports, in meal equivalent.

Investment in commercial poultry production enterprises. An alternative to targeting investment at the processing level of the poultry marketing chain is to invest in farm level poultry production. Such investment can take place at either commercial enterprises or subsistence farms. The results which follow consider a 10 percent increase in the capital stock of commercial poultry production facilities (Scenario 2).

The increased capital in commercial bird production generates a 2-percent increase in poultry meat output, while poultry meat imports fall 2 percent. On a per dollar of investment basis, the poultry meat output increase is more costly to obtain if the investment occurs at the farm level. A $1 million investment in the commercial poultry processing industry results in 9,000 tons of added poultry meat output. Each $1 million invested in commercial poultry production generates 6,000 tons of additional poultry meat.

Investment at the farm level leads to an increase in poultry meat output because increased poultry numbers drive down the cost of birds to processors. However, compared



Thanks to foreign investment, this Romanian poultry plant rivals any in the West.

Credit: Milton Madison.

Table VII-4—Russia: Investment in poultry sector: 10-percent increase in capital stock

	Scenario 1	Scenario 2	Scenario 3
Level of investment	Processing	Production	Production
Sector	Commercial	Commercial	Subsistence
		percent changes from '94-'96 base	
Poultry meat			
Price	0[1]	0[1]	0[1]
Production			
Commercial	8	3	2
Subsistence	-1	2	1
Total	5	2	1
Exports	5	-2	-1
Poultry			
Price	1	-1	0
Output			
Commercial	7	5	-6
Subsistence	1	-1	15
Total	5	3	2
Slaughter	5	3	1

[1]Price change equals zero, because good is traded

with Scenario 1, in which investment occurs at the processing level of the marketing chain, investment at the farm level yields a smaller expansion of bird numbers and a lower price to bird producers. Each $1 million invested at the processing level expands bird numbers by almost 7 million birds, compared with 4 million birds when the same investment is made in the commercial poultry production facilities.

As in the Scenario 1, investment in commercial bird enterprises increases feed demand for oilseed meal and grain. A 1-percent reduction in oilseed and meal exports (in meal equivalents) satisfies the added derived demand for meal. The increased feed demand for grain appears as a 1-percent increase in grain imports.

Investment in subsistence poultry production farms. Investment in subsistence bird farms (Scenario 3) yields responses that are similar to those described for the commercial investment scenario, but the magnitudes of the changes are smaller. Poultry meat output rises just 1 percent under this scenario, and imports fall by 1 percent. The 2-percent increase in poultry numbers lowers the processor price of birds by less than 1 percent.

Scenario results show that investment in commercial poultry production facilities yield larger increases than investment in the subsistence farms. Each $1 million invested in commercial bird production facilities generates an additional 6,000 tons of poultry meat, and 4 million additional birds, than the same investment in subsistence facilities. The same investment in subsistence poultry production farms yields 600 tons of poultry meat and 434,000 birds.

Key Implications From the Investment Scenarios

- Lower credit costs will not immediately benefit all producers and all processors. Rather, those operations that have utilized credit in the past will likely benefit first. Smaller operations will initially face a learning curve, with its associated transaction costs.

- Investment targeted at the processing level brings greater benefits to both processors and producers than when investment is targeted at the producer level.

- Tradability of the final good (pork in the examples above) enhances capital returns to both processors and producers. Returns are lower when trade in the final goods is prevented.

- Investment in commercial poultry production and processing enterprises in Russia appear to generate greater capital returns and larger output changes than comparable investment in subsistence enterprises.

VIII. Scenario 3—Can the Reduction of Marketing Costs Boost Livestock Output?

Marketing costs are important factors in determining prices received by producers for live animals, and prices paid by retail consumers for finished animal products. The transition process has reduced marketing costs, but institutional and policy impediments continue to characterize livestock/poultry marketing chains in some transition economies. Country models for Romania, Russia, and Ukraine were used to simulate the elimination of marketing chain bottlenecks. Model results suggest a reduction in marketing costs can have significant positive impacts on output and net exports. In general these impacts are greater that those obtained through a reduction in credit costs.

Introduction and Background

Marketing costs are important factors in determining the prices that producers receive for live animals, and that consumers pay for finished animal products in retail markets. Several institutional and policy impediments continue to characterize livestock markets in the five countries, leading to marketing costs that are typically higher than comparable costs in more developed market economies. These impediments include poor market infrastructure, underdeveloped institutional market requirements (see Chapter I), segmented markets, underdeveloped market information systems, low investment, lagging privatization efforts, and a high-risk business environment. All of these factors together constitute another "bottleneck" to fully functioning livestock markets, which hinders increased profitability of animal agriculture in transition economies. We hypothesize that marketing costs will decline with continued economic growth and development in transition economies. Following a brief discussion of marketing margins and hypothesized responses to price liberalization, simulation results from the marketing cost reduction scenarios costs will be discussed.

Marketing Margins: Definition and Use

Economists use the term "marketing margin" to summarize the aggregated costs of moving agricultural goods forward along successive levels of the farm-to-retail marketing chain. For animal products, a farm-to-retail marketing margin is computed by the price difference between what the farmer receives for the live animal and what the consumer pays for a finished meat product. Marketing margins thus include the costs of converting a live animal or farm milk to a retail product: costs of assembly, cutting, processing, packaging, transport, and distribution are captured in a farm-to-retail margin. Observing marketing margins over time provides insight into the distribution of consumers' food dollars among producers, processors, and retailers. Further, marketing margins indicate how retail prices respond to changes in farm prices and consumer demand. Marketing margins alone are not indicators of farm, processor, or retail profitability. Thus, a marketing margin is never "too wide," or "too narrow."

Over the past three decades in the U.S., for example, marketing margins for meat products, when adjusted for inflation, have either remained constant or have declined slightly (Nelson and Duewer, 1997). Factors that cause marketing margins to decrease include industry adoption of new technology, improved transportation and infrastructure, lower labor costs, and lower business/financial risk.

Prior to the transition period, governments in the five countries set and controlled marketing margins. Typically, margins were not permitted to deviate beyond a specified percentage of acquisition costs. For example, a meat processor could sell products to a wholesaler at a price that reflected only the purchase price of live animals plus a fixed percent of the acquisition price. Under central planning, this "cost-plus" pricing method often characterized prices along all levels of the marketing chain.

Marketing Margins in Transition Economies

In the early years of the transition, marketing costs in the five countries increased dramatically in response to mar-

ket reforms and liberalized prices. Margins increased as retail consumers paid more for animal products while animal producers received lower prices. At that time economists hypothesized that as transition economies adjusted to market forces, new lower price equilibria would be achieved and marketing margins would decline.

Price series for livestock/poultry and animal products are available for some Polish, Hungarian, Romanian, and Russian markets. Approximate marketing margins computed from the price data tend to support the adjustment hypothesis: that an explosive initial response to liberalized prices and margins would be followed by decline, and subsequent stabilization. Marketing margins for meat in Poland, and for meat and eggs in Russia, most directly reflect this dynamic (figures VIII-1 and VIII-2). Margins computed for meat products in Hungary, however, do not show a clear response to the collapse of central planning (figure VIII-3). This may be because prices were partially liberalized even before the end of the Communist period. Romania demonstrates an altogether different set of margin dynamics (figure VIII-4). Unlike Poland, Hungary, and Russia, Romanian margins continued to widen from the early 1990s, through 1997. The likely reason is that the first post-communist government maintained controls on margins, which were finally abolished in 1997.

It is difficult to forecast the dynamics of marketing margins in transition economies because markets simultaneously generate forces that both increase and decrease marketing costs. Supply-side factors will likely decrease marketing margins, while demand-related factors tend to increase marketing costs. Supply-related factors that will likely cause marketing margins for animal products to decline include industry investment in technology, upgraded country infrastructure, and the development of coordinated relationships between producers, processors, and financial institutions.

On the other hand, marketing margins for all food products typically increase with economic growth and development because consumer demand for marketing and processing services increases as income increases. Consumer income growth is associated with increased demand for higher quality meats, as well as for more highly prepared, processed, and packaged animal products. The transition process includes both factors that cause marketing margins to decline (listed previously) and income-related factors that cause margins to increase. The net effect on marketing margins for animal products therefore, is indeterminate, and will depend on the relative strength of the respective factors over time.

Supply-Side Factors Still Keep Margins High

The modeling scenarios described below focus only on the supply-related factors that tend to hold margins above those observed in more developed countries. Chapter 1 sets out a general description of institutional bottlenecks that continue to inhibit market development in transition economies. Supply-side factors that continue to keep marketing margins high in Romania, Russia, and Ukraine are described in more detail below.

Market infrastructure. Market infrastructure includes transportation, storage, handling, processing and retail networks, and communications. Deficiencies in market infrastructure have been described previously (see Chapters III and IV).

In Poland and Hungary there has been considerable investment in the physical infrastructure since the beginning of the transition. Highways have been upgraded, public transportation has improved, and telephone communications are more reliable. The movement of goods in Romania, Russia, and Ukraine, however, continues to be handicapped by poor transportation networks and outdated transport and handling equipment. It is often necessary for meat products to travel great distances to consumption centers by rail and/or truck. Because the road and rail systems are not extensive and are often in a deteriorated condition, transportation and handling costs in Romania, Russia, and Ukraine are high. It is estimated that Russian transportation costs from farmgate to consumer are 20-40 percent of the costs of production.[8]

Market information. Market information systems—broadly disseminated reports of commodity market prices—are a key element in a system whose chief purpose is to move goods from surplus to deficit regions at minimum cost. In Hungary and Poland, market information systems are more developed than systems in Romania, Russia, and Ukraine. Although nascent price information systems exist, the absence of regularly scheduled, widely available market price information in Romania, Russia, and Ukraine continues to hinder livestock/poultry producers and processors. Small producers in particular are affected by lack of access to low-cost market information, while large producers appear to have developed their own information sources. Clearly, publicly available and low-cost market price information would contribute to a

[8] As a point of reference, in the U.S, transportation accounted for 4.1 percent of the estimated value-added in the food marketing system in 1993 (Gallo, ERS/USDA).

leveling of the playing field and allow small producers to compete more equally in meat and livestock/poultry markets.

Segmented markets. Private sector participants in livestock/poultry and meat markets in Romania, Russia, and Ukraine continue to be handicapped by what is sometimes termed segmentation of markets. Under central planning, production, processing, distribution, and marketing operations were managed in isolation of one another. Moreover, these components of the marketing chain were often located at great physical distances from one another. The state controlled the movement of products through the marketing chain, as well as among different regions and across international borders. Because of the high degree of commitment to central planning by the governments of Romania and the former Soviet Union, producers and processors in Romania, Russia, and Ukraine currently face comparatively greater challenges in developing price-driven marketing relationships to coordinate delivery of meat products to consumers.

In transition economies today, livestock/poultry production takes place largely on small subsistence-level farms,

Figure VIII-1—Poland: Approximate share of marketing costs in retail prices of beef and pork

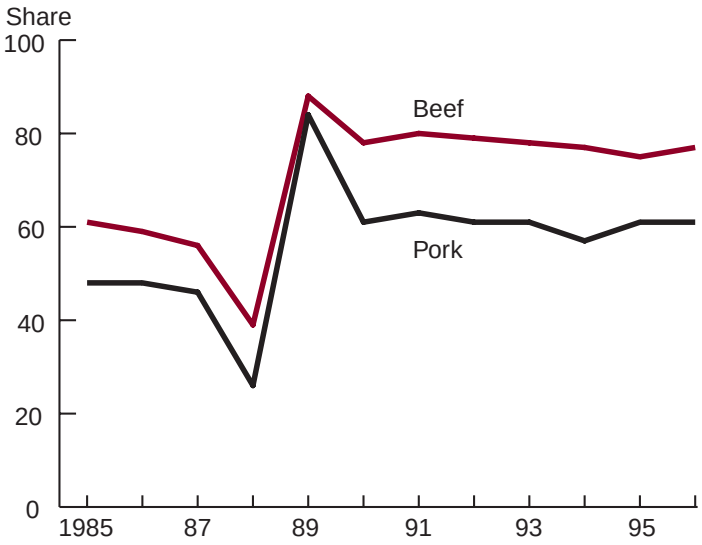


Figure VIII-2—Russia: Approximate share of processing and marketing costs in retail price for beef, pork, and eggs

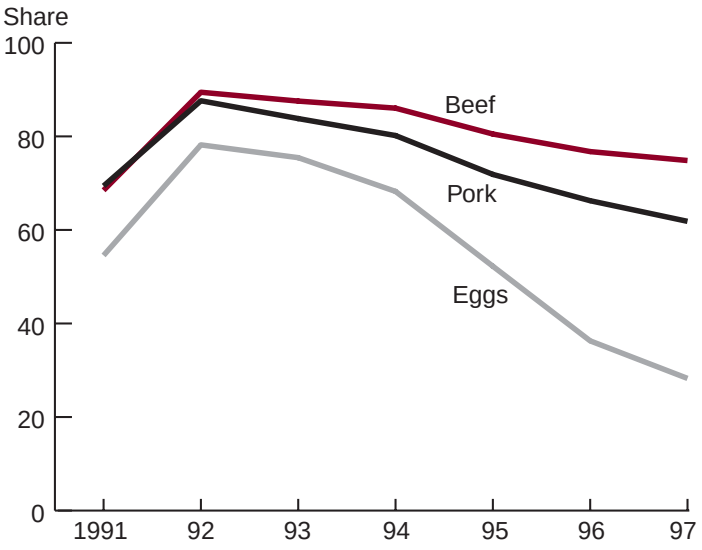


Figure VIII-3—Hungary: Approximate share of marketing costs in retail prices of meat

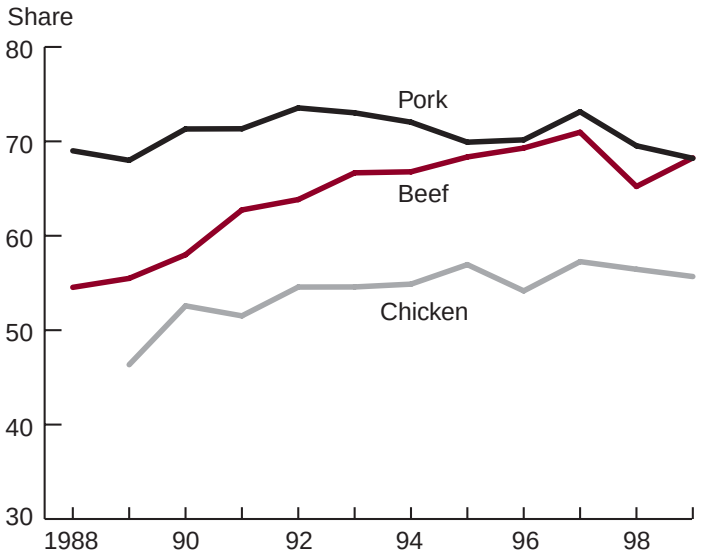
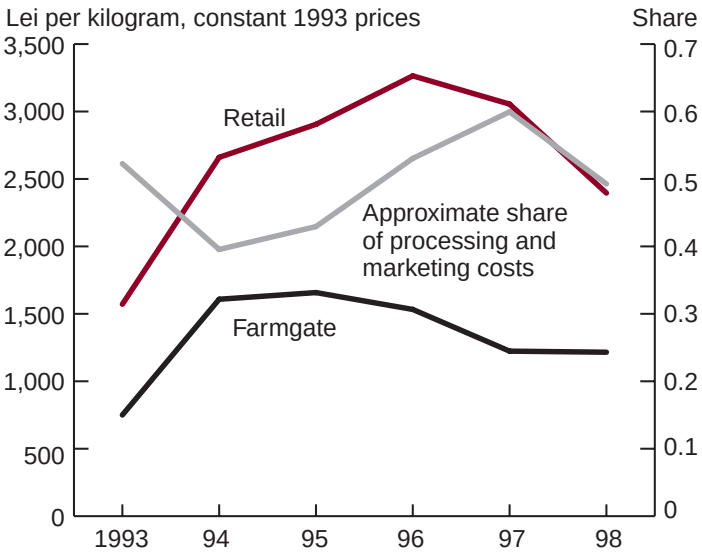


Figure VIII-4—Romanian pork prices, farmgate and retail



or household plots. However, marketing structures inherited from central planning are geared toward servicing large cooperatives and state farms. Emerging private producers are increasingly bypassing marketing channels held over from central planning, marketing products directly to consumers (see Chapter III.) But unit costs of direct marketing are high. Because production is small-scale and dispersed, costs associated with marketing significant volumes of animal products are extremely high. Meat marketing may include direct cattle sales through agents who travel from farm to farm. The added costs of collecting meat from a number of small private meat slaughterers, maintaining quality control, finding adequate storage, and organizing the sale of the product contribute to large price spreads, and keep marketing margins high.

High-risk environment. The costs associated with operating in a high-risk business environment also contribute to high marketing margins. Studies by Wei and Orban support this hypothesis (see Box VIII-1). Anecdotal evidence suggests that risk factors continue to come into play for other animal product markets as well. Small producers and processors appear to minimize marketing risk by choosing to deal with suppliers, etc, who are known to them, rather than seeking out low-cost service providers who may be unknown to them. This practice may also contribute to wide marketing margins (see Box VIII-1).

Lagging privatization. Chapters I-III document advances made by the governments of Hungary and Poland in privatizing formerly state-owned assets. Privatization efforts in Romania, Russia, and Ukraine are ongoing, but progress continues to lag. The state continues to play a significant role in processing and marketing livestock/poultry products, through partial ownership and/or control of formally state-owned assets. The continued state presence in livestock/poultry production, processing, and marketing more than likely has a negative impact on private operations. Anecdotal evidence indicates that operations either partially or wholly owned by the state continue to receive subsidies, thus disadvantaging private enterprises. In addition, state dominance of marking channels limits the marketing options of private producers. State ownership of grain storage and feed mills also appears to raise production costs for livestock/poultry producers.

As market-based economies continue to develop in the transition economies, the costs of marketing agricultural products will decrease. Costs will decline as private and governmental investment increases, new technologies are adopted, and domestic marketing chains become more closely coordinated. Model simulations of lower marketing costs using the Romania, Ukraine, and Russia models indicate that the livestock/poultry producers and processors, as well as consumers, all benefit.

Model Results

Country models for Romania, Russia, and Ukraine were used to analyze the effects of the disappearance of bottlenecks associated with marketing agricultural products. By assumption, marketing margins in each of the country models declined by 20 percent for all commodities. Prices for outputs rise while prices for inputs fall.

Lower marketing margins generated similar outcomes in the Romania, Russia, and Ukraine models. Results suggest that lower marketing costs cause output of all agricultural and processed goods to increase (except oilseeds in Russia and Ukraine), with livestock products benefiting more than crops. Furthermore, the positive impacts under this scenario are significantly greater than the benefits observed under the reduced credit cost scenario. In part this occurs because lower marketing costs benefit both commercial and subsistence producers. The reduction in marketing costs is also reflected in higher output prices and lower input prices, whereas the reduced credit cost only affects the cost structure.

Livestock producers receive higher prices for their animals, milk, and eggs and pay lower prices for feed. These reinforcing price changes raise returns to capital from the low levels of the base scenarios and encourage producers

Many farmers find direct marketing to be their only viable outlet.

Credit: Milton Madison.

to expand animal numbers and to increase the production of farm milk. In each of the three countries, lowered margins generate increased animal production (Table VIII-1) Calf crops increased by less than hogs and poultry because cattle are less dependent on grain and oilmeal, whose prices fall, and more dependent on roughage and pasture, which are relatively more expensive in the scenario outcome.

Increased animal numbers put an upward pressure on feed supplies. In the Russia model, feed use of grain increases by 13.8 percent. Feed demand for meal increases by 11.8 percent. In addition, demand for nontraded feeds—pasture grass, hay, etc.—is higher, and their prices rise.

Lower marketing costs and higher output prices lead to an expansion in area planted to grain, potato, root and pulse, and sugarbeets. This expanion causes the rental price of land to rise. Producers substitute other inputs for the more expensive land, and yields rise as a result. The increase in land rental rates limits expansion in the crop sector, and oilseed output declines in Russia and Ukraine. Because oilseeds are traded, their prices are fixed by international markets, and the increased feed demand is met through imports and does not lead to higher oilseed prices. Since oilseed yields are low, the cost share for land is relatively high. Ukraine and Russia reduce production of oilseeds due to rising land rents, and lower returns to the crop cause oilseed area and output to fall. Feed grain production in Russia and Ukraine increases slightly because a

Table VIII-1—Impact of marketing cost reduction on live animals births

	Ukraine	Russia	Romania
		Percent increase	
Pig	18	26	9
Bird	15	22	16
Cattle	9	11	1

Box VIII-1—Theoretical Work on Marketing Margins

Theoretical work on processor margins for agricultural commodities has centered on the work of Gardner (1975) and Hein (1980). Gardner's approach is based on a one-output, two-input model involving retail food, farm product, and a conglomerate marketing service. Gardner concluded that changes in farm-retail spread are functions of changes in any market and in the relationship between any two markets. Furthermore, he concludes that a markup pricing rule could not depict the farm-retail price spread.

Hein argued that in markets where inventory was important and the time period for adjustment was short, the fixed markup rule would indeed apply. These two models remain the basic framework, where Gardner's model explains long-run behavior and Hein's model short-run behavior. Additional studies have focused on relaxing the pure competition assumption both Gardner and Hein make, or introducing a risk variable into the mix.

Both Wei (1995) and Orban and Toth (1998) have empirically tested models based on the Hein concept but with the introduction of risk variables similar to Brorsen, et al., (1985). Orban and Toth use a margin calculated as the difference between farmgate and retail pork prices. Wei includes two margins: farmgate-wholesale and wholesale-retail. Wei modeled the Polish pork sector while Orban and Toth modeled the Hungarian pork sector.

The independent variables include a real wage variable, an energy price index variable, a government intervention variable, and a marketing risk variable. The Consumer Price Index with a fixed base was used to measure macroeconomic risk. Wei's model featured two equations, with the marketing margin from farmgate to wholesale being one dependent variable and the marketing margin from wholesale to retail being the other. Orban used only one margin, but employed a mixed ARIMA model with structural variables. In both models, the independent variables were wages, energy, government intervention, and macroeconomic risk.

Both Wei and Orban found the risk variable to be highly significant in both Poland and Hungary. The wage variable had the expected sign in both cases but was statistically insignificant. Orban and Toth found the energy price index to be significant in Hungary, while Wei found energy not to be a significant variable in Poland. As expected, government intervention was significant in both countries.

What both these studies suggest is that risk and uncertainty are major contributors to high marketing margins in both countries. Wei was explicit in pointing out that the Polish processing sector was highly competitive with many private and formerly state-owned processors competing for customers. Wei dismissed the common argument of monopoly power in the processing sector. What was surprising was that energy costs were not a strong contributor to margins in Poland, yet were significant in Hungary. High energy costs were another often-cited cause for high marketing margins. Labor costs were not considered important determinants of marketing margins in either country.

smaller percentage of feed grain production costs are attributable to land, which permit the substitution of lower cost inputs in place of land. As with oilseeds, the link to the world price means that the rise in derived demand is met via trade changes.

In each country model, animal products output increases under the lower marketing cost scenario. Falling marketing costs and increased supplies cause prices of animals and raw milk to fall, thus benefiting meat and dairy processors. Output of pork, beef (with the exception of Romania, see below), poultry, and eggs all increase (table VIII-2). Fluid milk, butter, and cheese production also increase slightly.

Animal products output in Romania follows a different pattern from Russia and Ukraine. While pork and poultry meat output expands by 8.2 percent and 11.5 percent, respectively, Romanian beef output remains largely unchanged. The limited production response by cattle producers in Romania may be attributable to the structure of cattle ownership. Most of the cattle in Romania are held by subsistence farmers, who tend to feed roughage and pasture whose price remained constant in the marketing cost reduction scenario. Consequently, they do not benefit as much from lower grain prices as commercial producers. In contrast, in Russia and Ukraine, the majority of cattle are held on commercial farms, where labor and purchased inputs account for a higher proportion of total costs. Because cattle production in Romania is less responsive to lower marketing costs than production in Russia and Ukraine, the 20 percent marketing cost reduction causes a smaller rise in the Romanian calf crop and smaller increases in beef production.

The major impact of reducing marketing margins is seen in changes in trade. In Russia, meat imports fall considerably: beef by 28 percent, pork by 89 percent, and poultry by 16.7 percent. Likewise in Romania, poultry imports fall by 16 percent, and pork exports increase by 45 percent. Ukraine receives a significant boost to its export markets, becoming a net exporter of beef, pork, and poultry (table VIII-3).

Unlike trade in meat products, net exports of feed crops declined, due partly to the increased demand for feed. Grain imports rise by 180 percent in Russia, while oilseed and meal exports fall by over 68 percent. Lower marketing costs caused Ukraine to move from the position of a net exporter of grains to a net importer. Imports of oilseed meal also increase by almost 40 percent, due only in part to increased feed demand. The increase is also a reflection of the rise in land rents. The increased cost of land divert grain and oilseed production slightly in favor of sugarbeets, potatoes, roots and legumes, roughage, and pasture.

Although both subsistence and commercial agriculture benefit from reduced farm marketing costs in Russia and Ukraine, there are some small but notable shifts among types of enterprises.

As in the Romanian beef sector, subsistence farms in Russia and Ukraine make less use of grains and oilseeds as feed. Thus, subsistence enterprises in Russia and Ukraine also demonstrate less response to changes in marketing costs than commercial enterprises.

In general, subsistence farmers rely more on labor and less on purchased inputs than commercial producers. As a result, subsistence producers are less flexible and less responsive to changes in the prices of purchased feeds. The principal exception is swine, a pattern similar to Romania. Reduced marketing costs allow the pig crop in the subsistence sector to increase by 46 percent in Russia and by 27 percent in Ukraine, compared with 16 and 11 percent in the commercial sector. Feed crops—grain and potatoes—comprise a much larger share (over 90 percent) of the cost of raising pigs in the subsistence sector than in the commercial sector, where the cost share of feed is over 60 percent.

Table VIII-2—Impact of marketing cost reduction on meat output

	Ukraine	Russia	Romania
	Percent increase		
Pork	24	17	8
Poultry	11	17	12
Beef	6	7	0

Table VIII-3—Impact of marketing cost reduction on imports

	Ukraine		Russia		Romania	
	Base	New	Base	New	Base	New
			1,000 tons			
Pork	1	-178	440	146	-66	-96
Poultry	1	-30	822	684	55.3	46.2
Beef	-148	-223	596	427	-14.1	-12.3

Summary: Key Results From Lower Marketing Costs in Russia, Ukraine, and Romania

- The reduced marketing margin scenario produced similar results in the Russia, Ukraine, and Romania models. The reduction in marketing costs caused the output of most agricultural products to increase, with a greater expansion in livestock products than in crop output. Livestock/poultry production increased, and the processor price of animals and raw milk declined. The output of processed meat and milk products also increased. Thus, as marketing margins decline in transition economies, animal products production is likely to increase.

- A key result of the marketing cost scenarios was the large positive effect on net trade. Romania, Russia, and Ukraine reduced animal product imports, or increased exports. In some cases, the country moved from a net importer of a given product to a net exporter. The crop sector, on the other hand, moved in the opposite direction, as net exports decreased. Net exports declined because feed demand increases frequently exceeded domestic crop expansion. Thus, lower marketing costs in transition economies could bring about higher exports of high-value animal products, and greater imports of bulk feed inputs.

- Another important scenario result was that both subsistence and commercial agriculture tended to benefit from the reduced farm marketing costs, but not uniformly. In general, the subsistence sector is less responsive to reduced farm marketing costs because it tends to rely more heavily on labor and less on purchased feeds and other inputs. The result was a small shift of agricultural labor from the subsistence to the commercial sector.

IX: Scenario 4—How Will Better Functioning Land Markets Affect Animal Agriculture?

The lack of fully functioning land markets is to some extent an obstacle to restructuring in the countries under consideration in this study. The lack of full transferability prevents land from moving to its most efficient uses and tends to perpetuate the fragmented farm structure. In this chapter, we present a model scenario for Hungary. We assume that a functioning land market will cause land to be taken out of agricultural production and impose a reduction of the land base on the model. The result is higher land prices, which lead to higher prices for nontraded feeds. Cattle, which depend more than other species on nontraded feeds, are negatively affected—there is a significant decline in cattle births and exports of live cattle.

The transition process has led to a situation where land generally has a very low value. At the same time, the lack of functioning land markets makes it difficult for producers to acquire additional land. This leads to a situation in which marginal land remains in production instead of moving to more efficient uses. In addition, users who have virtually free use of land but no permanent rights to it have little incentive to take care of their land, leading to production practices that can further degrade the land. In this section we lay out some of the economic consequences of this situation and present a scenario of rising land prices for Hungary.

Land Reform Confers Property Rights

Land ownership rights are part of the larger category of property rights that include the following characteristics:

Exclusivity. Owners have exclusive right to the use and disposition of their property. Owners may use the land in whatever manner deemed most useful: they may either use the land themselves or assign that use to specific persons, excluding use by all others. This is in contrast to a situation of common grazing rights—a common land tenure feature in many countries and even in the United States—where grazing is permitted on public lands, for a fee.

Inheritability. Inheritance laws, or their lack, influence land structures by affecting farmers' decisions about final disposition of their land. Countries with laws that limit inheritance often have relatively fragmented land ownership patterns.

Transferability. This refers to the right to allocate land by sale, lease, or rent to whomever one wishes. In transition economies, the ability to allocate land to others is limited. Especially in Russia and Ukraine, allocating land to other than the collective or cooperative of which one is a member is not a practical alternative. Lack of transferability also contributes to fragmented land ownership patterns.

Enforcement. To be meaningful, property rights must not only be clearly spelled out in law, but must be enforced both in fact and in perception by economic agents. In transition economies, this criterion is seldom met.

Land rights accrue to both owners and users of land. Frequently, the two are not the same agents. Land rights are defined by government policy and governments may restrict rights by limiting the degree of exclusivity, inheritability or transferability. In the United States, for example, exclusivity is limited by local zoning laws placing limits on land use. In the transition economies, limits on foreign and corporate ownership, taxes, and restrictions on sales and inheritances affect the property ownership and use rights conferred with land reform.

Enforcement remains a major problem in transition countries. Especially in the NIS countries, difficulty and delay in registration, titling, determining boundaries, and settling disputes all add to the uncertainty of buying and investing in land. Also, there is a lack of trust in government, especially in Russia, where the rules governing land ownership result from presidential decrees rather than statutes. If owners feel that land may be appropriated or that change in government could change the status of their property rights, the effect is to undermine land rights and any incentive to own or improve land.

Proper stewardship of the land depends on an "interested" owner with a financial stake in the care, maintenance, and use of the land. That person may be the farmer or a landlord, but absent a financial stakeholder, land will in all likelihood be abused. A reform program that gives ownership rights to citizens is expected to remedy the major shortcoming of collective ownership, which was that no one had a financial stake in maintenance, investment, or stewardship of land.

The Land Market in Transition Economies

Officially, land use rights are transferable in all five countries, either through sale or lease. Actual sales in transition economies are rare. Some evidence suggests that in many transition economies land turnover is about 1 percent a year. The rate of transactions in Hungary is higher, about 2.5 percent a year. These estimates compare to EU countries where the rate of land sales, though variable, average about 7 percent a year.

In the Russia and Ukraine, sales are even more rare. Some error of definition may exist because people buy and sell dachas and the associated land, but these are not considered land sales. Sales occur in those regions that have enabling legislation on the books, but as yet there is no national land code. NIS data separate completely private transactions from those to which the state is a party. The data for Poland, Hungary, and Romania do not make that distinction. At any rate, land transactions are still uncommon in the transition world. The reasons include limitations on transferability rights, absence of secure property rights, and lack of financing. Note, also, that in some places the state may still be giving away land. Small subsistence farmers may still be acquiring neighboring plots through informal arrangements. Apart from sales, leasing appears to be the dominant form of land transaction in these economies. In Hungary, as much as 70 percent of all agricultural land is leased. In Poland it is about 20 percent.

While data for the NIS is scant, World Bank surveys suggest that about one third of the land is leased in Ukraine. Belenkiy and Wegran (1997) conducted a survey in Russia, which indicated that land leasing from local administrations accounted for more than 99 percent of land turnover in the 1993-1995 period. Actual land purchases were less than one percent. The study showed that among the small amounts purchased, most land is used for small-scale agriculture and collective gardening, i.e., dacha plots.

Land Tenure and Economic Efficiency

Land tenure affects farmers' basic operational decisions. If land tenure is uncertain—that is if right of exclusivity, transferability and inheritability are weak or uncertain—a farmer will have no incentive to invest in land or land enhancement and maintainance (e.g., best farming practices) activity.

In fact, it probably makes little difference whether the owner and the user are one in the same or two different persons as long as landowner and tenant rights are transparent and enforceable. Someone, either the landlord or the owner/farmer, must have a vested interest in maintaining and husbanding the land resource for the long term.

Changes in land tenure systems can affect economic efficiency and the allocation of resources in agricultural production. In the pre-transition period, land like all other inputs was procured. Land was not a remunerated input. Like other inputs, especially fertilizers and chemicals, land was overused. In the post-reform period, given the weakly enforced systems of land rights, land in all likelihood remains an unremunerated, or at least underremunerated, input. If land remains an underremunerated input, investment in land and land-enhancing activities remains below what it would be if land prices reflected their value as an economic input.

Land Rights, Farm Organization, and Economic Efficiency

Efficiency can be considered two ways: technical or economic efficiency. Technical efficiency in which a farm unit maximizes output with respect to a given set of inputs and the technology of combining them. That is, the firm operates in a technically efficient manner given the selected technology among a set of possible technologies. Either a large, highly mechanized farm or a small, labor-intensive farm can be technically efficient if it uses its respective resources in a manner such that there are no redundant inputs. Economic efficiency adds to technical efficiency the constraint that inputs should be combined, not only so that none are redundant, but also so that the technology selected should be profit-maximizing, which given that the firm is a price taker, means the firm is cost-minimizing.

Absent a land tenure in which land is remunerated as an economic input, land will be used as if its price is zero, which implies overuse. Extensive overuse implies farming

on land that would not be farmed if the land were priced according to its opportunity cost value, e.g., farming highly erodible lands. Intensive use implies maximizing output in the short run without regard to long-term maintenance of the resource, e.g., overgrazing.

Modeling the Impact of Rising Land Prices in Hungary

One modeling scenario is included that directly affects land use. It was assumed that liberalization of land ownership laws in Hungary would result in land being bid out of agriculture. The view of some Hungarian agricultural economists is that some land is of such low productivity that it should not be cultivated.[9] In all likelihood it would move to uses such as grassland or forest. Hence, the supply of land for agricultural use would decline. The scenario assumed the land would completely exit agriculture. If it returned to grassland, it could be grazed. However, the energy value of the feed obtained as pasture would be less than that obtained from grain production. This possibility was not modeled here.

The effect on livestock is secondary because land enters livestock production primarily through land necessary to produce feed. Because of the zero cost shares associated with land in producing and processing livestock, poultry, and raw milk, the decreased agricultural land base affects livestock sectors in the model largely through acreage reductions in three nontraded feed inputs: sugarbeets, silage, and forage. These nongrain feed inputs are significant components of cattle feed, comprising 4, 31, and 10 percent of the cost of cattle production, respectively. Acreage reductions for sugarbeets (18 percent), silage (31 percent), and forage (21 percent) lead to domestic price increases of 3, 2, and 14 percent, respectively. Since these items are most closely associated with cattle feeding, the principal impact on the livestock sector is a 16 percent reduction in cattle births. Higher feeding costs reduce milk output slightly. In general, however, the domestic processing end of the cattle industry is not greatly affected. Instead, exports of live cattle fall by 13 percent (table IX-1).

[9] Authors' discussions with Hungarian Ministry of Agriculture officials.

Table IX-1—Hungary: Impact of agricultural land base reduction on animals and animal products

	Pork/hogs	Beef/cattle	Birds/ poultry meat	Milk
	Percent change from 1994-96 base			
Processing sector				
Cost share: land	0	0	0	0
Price	0[1]	0[1]	0[1]	1
Capital returns	-0.4	-0.2	-0.3	1
Slaughter	0	0	0	0
Output	0	0	0	0
Exports	16	-2	-2	n.a.
Production sector				
Cost share: land	0	0	0	0
Price	1	0[1]	0	2
Capital returns	0	-16	0	0
Births/output	0	-13	0	-1
Ending inventory	0	0	0	0
Exports	n.a.	-13	n.a.	n.a.

[1]Price change is zero because the good is traded.
n.a.= not applicable because the good is nontraded.

Pork and poultry rely more on traded feeds, the prices of which are unchanged. Consequently, a reduction in the land base has almost no impact on either the live animals or the processed output of these species.

Apart from land responses, the value of land is linked with labor demand and wages. The movement of labor out of agriculture in response to rising wages in other sectors could also have a secondary impact on land markets. Higher wages in the nonagricultural sector would begin to bid labor out of agriculture, but the increase in the land-to-labor ratio would boost labor productivity and farm income. This would create a demand for additional land and would be the impetus for farm consolidation that so far has been absent in the transition economies. Rising land values would make land ownership a more profitable enterprise for both farmer/owners and landlords. These effects are not directly modeled because they are secondary effects of initial shocks to the system. But the longer run response would suggest that changes in the agricultural labor markets would lead to higher farm incomes and land consolidation. What is still absent is a modern financial system that would provide liquidity to the sector for long-term investment as well as fewer restraints on land ownership and sale.

X: Scenario 5—Can Growth in Nonagricultural Sectors Stimulate the Exit of Labor From Agriculture?

It has been noted previously in this report that agriculture in the transition economies tends to be very labor-intensive. The large numbers of workers employed in agriculture can be a barrier to land consolidation and hold back productivity growth in the sector. In this scenario, we look at the impacts of a reduction in the number of workers employed in agriculture. We do this by simulating an injection of capital into the nonagricultural sectors. This investment stimulates higher output in these sectors, which in turn increases the demand for labor and forces wages up. The results, however, suggest that this process will be very slow. It takes a very large amount of investment to force wages up enough to significantly reduce unemployment. Furthermore, without simultaneous investment in agriculture, the impact in most cases is to reduce output.

A large share of livestock, poultry, and feed production in Poland, Romania, Russia, and Ukraine (close to 50 percent in many cases) is produced by very small operations producing principally for self-consumption. In Poland and Romania, the large share of land occupied by such subsistence farmers is regarded as a major obstacle to complete restructuring. The European Commission regards Poland's farm structure as a serious obstacle to EU membership: the cost of providing income support to 2 million small farmers is considered prohibitive. In countries such as Poland, Romania, and to some extent Hungary, the consolidation of land holdings which is necessary for these agricultural sectors to compete in a global economy is hindered by the reluctance of these subsistence farmers to give up their land.

The labor problem in Russia and Ukraine is slightly different from that of the East European countries. The majority of agricultural land in these countries is still farmed by large-scale units, so the need for consolidation of holdings is not such an issue. The problem in Russia and Ukraine is that both the commercial and subsistence sectors are burdened with excess labor, which seriously slows productivity growth.

The movement of labor off the farms is a crucial step in the restructuring of the entire agricultural sector. This is not simply a problem for livestock and poultry production; it is a rural development problem and a problem of overall economic growth. As long as this large portion of the population has no alternative but to stay on their land, this land will not move to alternative uses that might bring a higher return. Alternative use may mean transfer to larger-scale production units or movement out of agriculture altogether.

For farm consolidation to occur on a significant scale, the following needs to happen:

1) Land values increase to the point where small producers can sell their land and receive sufficient returns to compensate them for lost agricultural productive capacity and provide them with an adequate income stream if they give up agriculture. This will happen as agriculture overall becomes more profitable (i.e., more efficient.)

2) The older farmers gradually die off. Their heirs will be less likely to continue to cultivate the land, opting instead to lease or sell it.

3) Employment and wages in other sectors rise to the point that large numbers of small farmers decide the opportunity cost of maintaining their small livestock operations is too high.

Throughout the region, a number of obstacles are retarding the generation of new employment and the movement of labor out of agriculture. These include housing shortages in urban areas, poor public transportation in rural areas, and high payroll taxes. Another problem is that rural workers, many of whom are older, do not have the skills demanded by employers in the cities.

We used the country models to test the hypothesis that a key to farm consolidation and expansion of large-scale agriculture is the generation of alternative off-farm employment. Rising wages in other sectors can be expected to draw many small producers off the farm towards nonagricultural employment. Off-farm movement of labor begins a process whereby the agricultural labor population declines, average farm size increases, and farm productivity increases as economies of scale are realized. Increased profitability frequently follows, in a structurally altered agricultural sector supporting a reduced labor base.

We modeled this scenario by increasing the capital base of the nonagricultural sectors, both traded and nontraded. Investment in the traded, nonagricultural sector might include the construction of an automobile or tractor factory. Investment in the nontraded goods sector might include investment in transportation, communications, or storage facilities. The investment results in increased nonagricultural output. As output expands, these sectors first draw on unemployed labor with agricultural labor use unchanged. Once unemployment falls to a frictional rate, the wage rises and labor begins to flow out of agriculture. The effect of these shocks is an expansion of employment in the nonagricultural sectors experiencing the investment through the release of labor from agricultural sectors. In addition, investment in the nonagricultural sector will likely bring improvements to housing and transportation systems and thus facilitate the mobility of labor (see Box X-1).

This scenario was tested for Romania, Russia, and Poland. The general pattern of results was similar for Romania and Russia: output of nonagricultural products rises, while production of most farm commodities and processed agricultural goods falls. Food demand rises as a result of higher wages, with the result that exports are generally lower and imports higher. The output declines are sufficient to turn Romania into a small net grain importer. The clear conclusion is that in the current situation of incomplete reform, a major factor that allows the agricultural sectors to remain afloat is the low cost of labor.

Box X-1—How Does the Model Treat Employment and Wages?

In the neoclassical economic theory on which most computer models are based, the labor market clears through a flexible wage. The wage is determined by the intersection of the demand for labor and the supply of labor. Labor moves among sectors to eliminate any wage differences.

This model includes structural features based on observations of labor markets in transition economies. One observation is that these nations have high and persistent unemployment. Also, wages tend to be sticky and do not fall in the face of unemployment.

Consequently, the labor market in this model clears either through changes in unemployment or changes in the wage, as in Brecher (1974). As long as unemployment is above a frictional rate of 5-6 percent, changes in unemployment clear the labor market, and the wage rate is exogenous. Each sector determines labor use based on that wage. The difference between the sum of those demands and the labor available is unemployment. Once unemployment falls to the frictional rate, the labor market is cleared by changes in the wage, which adjusts to maintain the frictional unemployment rate.

Poland demonstrated a different reaction for two reasons. First, there was enough slack in Poland's labor market that the investment resulted in a very small wage increase. Second, the investment led to substantial drop in the price of nontraded goods (see box X-2 for explanation of that dynamic.) As a result, in Poland, livestock output tends to rise as the economy expands. But the increased meat output does not keep pace with rising demand, and Poland also becomes a net importer of meat.

Russia and Romania: Higher Wages Lead to a Fall in Livestock Output

For each country, investment in the other traded and nontraded goods sectors was increased by 15 percent. This increase amounted to $30 billion for Russia, and about $3 billion for Romania (table X-1). In both countries, the investment brings significant increases in output in both sectors. The result is a rise in the price of nontraded goods—12 and 15 percent respectively. The price of nontraded goods rises because the investment is an increased external inflow and boosts expenditure. That investment is

targeted to nonagricultural goods, both traded and nontraded, which have large income elasticities. Prices for traded goods do not change by assumption. The expenditure effects from larger capital payments, greater employment, and higher wages generate large demand effects on nontraded goods which bid their prices higher.

The expansion in the nonagricultural sectors nearly eliminates unemployment, leading to significant wage increases. The wage increases bring corresponding increases in consumption, particularly of meat (table X-2). Consumption of other foods rises as well, but to a lesser degree than the meats.

Meat production falls. However, meat production declines in both countries, as nonagricultural wage increases draw labor off the farms, leaving fewer production resources in the agricultural sector (tables X-2 and X-3). The declines are greater in the case of Russia; they are less dramatic for Romania because wage increases are less in that country (table X-4). In both Romania and Russia, output of beef declines less than that of other meats. Cattle have a more flexible diet, and beef is linked to the dairy sector, which also benefits from a rise in consumer demand. The reduced meat output is reflected in declining animal births (tables X-5 and X-6).

Net meat imports rise. There are significant changes in net meat trade under this scenario. Due to falling output and rising consumption, imports rise while exports fall. The most dramatic changes are in Russia, where imports of beef triple to reach 1.8 million tons and poultry imports rise by a third to 1.2 million tons. The large trade changes are related to the size of the inflow required to tighten the Russian labor market and raise the wage—$30 billion. Romania becomes a much larger importer of poultry, with imports rising by 52 percent. Romania's pork exports decline to almost zero, and the country switches from a small exporter of beef to a small importer.

Dairy output rises. The dairy sectors show a different pattern. Because dairy products are modeled as nontraded, the expansion in food demand for milk, butter, and cheese

Table X-1—Impact of growth in nonagricultural sectors: Overview

Indicator	Russia	Romania	Poland
	Billion dollars		
Level of investment	29.8	2.9	9.5
	Percent change		
Output of other traded goods	13	14	25
Output of nontraded goods	25	19	21
Change in price	12	14.6	-24
Wage increase	16	10	0.5

Table X-2—Romania: Impact of growth in nonagricultural sectors on meat and dairy processing

	Beef	Pork	Poultry	Fluid milk	Butter	Cheese
	Percent change					
Prices						
Consumer	0	0	0	6	7	10
Producer	0	0	0	6	7	10
Output	-3	-5	-9	3	10	9
Food	11	11	13	3	9	9
Imports	-175	-88	52	0	0	0

Table X-3—Russia: Impact of growth in nonagricultural sectors on meat processing

	Beef	Pork	Poultry
	Percent change		
Output	-12	-15	-13
Food	25	15	18
Imports	204	144	52

Table X-4—Romania: Impact of growth in nonagricultural sectors on live animals

	Cattle	Swine	Birds
	Percent change		
Price			
Consumer	0	2	1
Producer	0	2	1
Births	-2	-5	-11
Slaughter	-2	-6	-10

Table X-5—Russia: Impact of growth in nonagricultural sectors on births and slaughter

	Cattle	Swine	Birds
	Percent change		
Price			
Consumer	1	1	2
Producer	1	1	2
Births	-19	-27	-18
Slaughter	-17	-31	-16

bids the prices higher and output expands to satisfy the increased demand. In Russia, production of dairy products rises by an average of 15 percent. Romania sees slightly smaller increases. Increases in the consumer demand for dairy products raise the farm price of milk. The higher price shifts milk use from feeding to dairy processing and encourages more milk production. Rising farm milk production, coupled with the output decline in the beef industry, triggers a shift of the cattle industry towards dairying and away from beef. The model results suggest cows are held in milk production longer with the investment in nonagricultural sectors.

Feed demand falls. Reduced animal numbers lead to a decline in the demand for feed (table X-6). However, there is some substitution of feeds for the more expensive labor and nonagricultural inputs, so that total feed use declines less than meat output. The magnitudes of change vary between the two countries, but the patterns are similar. There is some substitution from nontraded feeds such as potatoes, roots and legumes, roughage, and pasture to grain and oilseed meal. Since the prices of grains and meal are tied to the world market, they do not change. In contrast, the nontraded feeds become relatively more expensive as labor becomes more expensive and as food demand grows. The adjustments in feed demand are greatest in the poultry sector. Feed use for birds is limited to grain and meal, and use of both feeds by poultry falls 8.4 in Russia and by a similar magnitude in Romania.

In Russia, feed use by swine declines sharply as well, and there is a shift in the composition of feed in favor of grain and meal. In Russia, meal use by swine falls 8 percent and grain use by 11 percent, while feeding of roots and legumes, and potatoes falls by 16 and 20 percent, respectively. However, changes in swine rations are almost negligible in Romania: there is a small rise in feed use of meal, while potato feeding declines by 2 percent.

The adjustments in cattle feeding differ from those in the swine and poultry sectors because of the rise in dairy output and the greater flexibility inherent in cattle feeding. As a result, total demand for feed by cattle remains nearly constant. In response to higher prices of nontraded feeds, there is a small decrease in the feeding of roughage and pasture, and a larger decrease in milk feeding. There are small increases in use of grain and meal fed to cattle.

Adjustments in the crop sector are mixed. Adjustments in the crop sector reflect the interaction of several forces (tables X-7 and X-8). One is the influence of the input price changes on subsistence versus commercial enterprises. The wage increase has a greater impact on the output of relatively labor intensive crops. These tend to be

Table X-6—Romania and Russia: Impact of growth in nonagricultural sectors on feeding

	Romania			Russia		
	Cattle	Swine	Birds	Cattle	Swine	Birds
	Percent change					
Grain	0	0	-9	1	-11	-8
Meal	1	1	-6	1	-8	-8
Milk	-10	n.a.	n.a.	-9	n.a.	n.a.
Silage	-1	n.a.	n.a.	-2	n.a.	n.a.
Forage	-1	n.a.	n.a.	-1	n.a.	n.a.
Root	n.a.	-1	n.a.	0	-16	n.a.
Sugarbeets	4	n.a.	n.a.	n.a.	n.a.	n.a.
Potato	n.a.	-2	n.a.	n.a.	-20	n.a.

n.a.= not applicable because the component is not fed to that specific animal.

Table X-8—Romania: Impact of growth in nonagricultural sectors on crop supply and use

	Sugarbeets	Potatoes	Grain	Meal	Oilseeds	Silage
	Percent change					
Rent-Land	-12	-12	-12	n.a.	-12	-12
Area	-3	4	-2	n.a.	3	1
Output	-7	1	-6	n.a.	1	-1
Food	n.a.	4.25	3.25	n.a.	n.a.	n.a.
Feed	4	-2	0	0	0	-1
Process	-11	n.a.	n.a.	n.a.	n.a.	n.a.
Imports	0	0	104	0	0	0

n.a.= not applicable.

Table X-7—Russia: Impact of growth in nonagricultural sectors on crops

	Sugarbeets	Potatoes	Grains	Roots & legumes	Roughage	Pasture	Oilseeds	Meal
				Percent change				
Output	-2	0	-2	-2	-2	-1	1	n.a.
Food	n.a.	7	11	2	n.a.	n.a.	0	n.a.
Feed	n.a.	-20	-8	-10	-2	-1	0	-7
Processing	-2	0	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Imports	0	0	57	0	0	0	0	-35

n.a.=not applicable

crops produced on the subsistence farms, particularly sugarbeets, potatoes, and grains. In contrast, an increase in the price of the nontraded good hurts commodities which make intensive use of that good as an input. These commodities are produced largely by state enterprises. Furthermore, the rising costs of crop production causes producers to cut output, and the output decline puts downward pressure on the shadow rent for land, which drops 5.8 percent. Crops, which are relatively heavy users of land, obtained an offsetting benefit. Finally, there is some substitution from traded crops to nontraded ones. The prices of nontraded crops—that is, sugarbeets, potatoes, roots and pulses, roughage, and pasture—can adjust and rise to offset some of the rising input costs. In contrast, grain and oilseed prices are fixed.

As a result of these offsetting pressures, net changes in crop output are much smaller than those in the livestock sectors. Russia sees small declines in all crops except oilseeds as labor exits agriculture. With its low yield base, Russian oilseed production is land-intensive but not very labor-intensive or intensive in the use of nontraded goods.

In Romania, grain is affected more than in the other countries because of a dramatic decline in commercial production. Commercial producers in Romania are hit hard by the rise in the price of nontraded goods, with the result that commercial grain output falls by 8 percent, while subsistence output rose by 1 percent. The shifts between commercial and subsistence sectors will be discussed in fuller detail in the next section.

Net grain imports rise; oilseed imports decline. These results have important implications for net grain and oilseed trade. Impacts on grain trade are large: food demand, especially for grain, rises due to higher incomes, and production either falls or does not expand. The result is a general trend towards reduced exports or increased imports. Romania switches from a net exporter of 954,000 tons to a net importer of 34,000 tons; Russia's grain imports rise from 2.7 million to 4.2 million tons.

For the oilseed complex, in contrast, there is a rise in net exports for Russia and a fall in imports for Romania. Russia's oilseed and meal exports, expressed in soymeal equivalent, rise from 368,000 tons to nearly 500,000. There is a slight decline in Romania's meal imports, due to falling demand and higher domestic sunflower production.

Exit of labor from agriculture is small. Table X-9 shows the shifts in the labor force that result from the investment

Table X-9—Labor force changes resulting from growth in nonagricultural sectors

	Russia			Romania		
Sector	Subsistence	Commercial	Total	Subsistence	Commercial	Total
			Percent change			
Total Ag.	-4	-1	-3	-5	-8	-6
Other Traded	n.a.	n.a.	8	n.a.	n.a.	11
Nontraded	n.a.	n.a.	12	n.a.	n.a.	22
Beef	-10	-22	-12	-5	-6	-5
Pork	-10	-36	-11	-8	-9	-8
Poultry	-16	-19	-16	-16	-12	-14
Fluid Milk	4	19	8	0	3	1
Butter	7	17	11	-31	13	7
Cheese	14	17	16	7	11	9
Sugar	n.a.	-6	-6	n.a.	-14	-5
Eggs	-13	-7	-13	-11	-41	-34
Raw Milk	-1	16	7	-2	10	-1
Cattle	-5	-12	-11	-4	n.a.	-4
Swine	-27	-13	-15	-1	-11	-4
Birds	-5	-19	-9	-14	-14	-14
Sugarbeets	-17	-9	-9	-9	-34	-13
Potatoes	-4	-5	-4	0	-1	0
Roots/Legumes	-8	-9	-9	-2	-4	-2
Grain	-12	-9	-10	-2	-24	-14
Oilseeds	-5	-4	-4	1	-3	-1
Roughage	-31	4	-19	-16	-9	-9
Pasture	-19	0	-5	-7	-1	-5

n.a.=not available.

shock. There are large increases in employment in nonagricultural sectors. There are declines in agricultural labor, but these declines are not large. Within the agricultural sector changes in labor use mirror the output changes described above. Most agricultural sectors release labor to the nonagricultural sectors. The principal exception is the dairy sector, where expansion in output brings significant increases in the use of labor.

Labor exits not only from subsistence agriculture. Because subsistence agriculture is a heavier user of labor than commercial agriculture, the wage increase might be expected to cause greater labor release from subsistence agriculture than from commercial production. This pattern holds true for Russia, but in Romania there is a greater exit of labor from the commercial sector than from subsistence agriculture. The shift of labor between the subsistence and commercial sectors depends on differences in the use of nontraded inputs and the degree of the price rise for the nontraded inputs.

In both Romania and Russia the significant rises in the price of the nontraded good place an added burden on those industries which make intensive use of that input—commercial farming. In the case of Romania, for example, the commercial sector employment drops by 8 percent because of that sector's heavy reliance on nontraded inputs.

The changes in output mix between subsistence and commercial agriculture reflect those for labor, although the magnitudes differ, since enterprises adjust input use. While the wage rise might be expected to shift output away from subsistence agriculture, that is not always the case because of changes in the land rent and the price of the nontraded input. In Russia, swine, milk, sugarbeets, potatoes, oilseeds, roughage, and pasture production shifts away from subsistence agriculture (tables X-10 through X-12). Cattle, birds, roots and legumes production shifts towards subsistence production. In Romania, swine, grain, sugarbeets, and oilseeds shifts into the subsistence sector, while output of cattle, poultry, silage, and pasture moves from subsistence to commercial farms (tables X-13 through X-15). In all cases, the shifts are determined by the relative weight of the nontraded good in the cost structure.

Poland

The same scenario was modeled for Poland with 25-percent increases in the base quantities of capital in the nonagricultural sector. The results for Poland differ in some significant ways from those described above for Russia and Romania. The effect is to raise output of most agricultural goods, while the other two countries experience a significant contraction of their agricultural sectors as labor exits agriculture.

There are two key differences that underlie these results. One is that the combined impact of the shifts in demand

Table X-10—Russia: Impact of growth in nonagricultural sectors on animal births and slaughter by sector

	Cattle	Swine	Birds
		Percent change	
Births total	-16	-21	-15
Commercial	-21	-13	-23
Subsistence	-3	-38	-1
Total slaughter	-14	-23	-14

Table X-11—Russia: Impact of growth in nonagricultural sectors on meat processing and egg production by sector

	Beef	Pork	Poultry	Eggs
		Percent change		
Total	-12	-15	-13	-5
Subsistence	-5	-5	-11	-9
Commercial	-17	-32	-14	-3

Table X-12—Russia: Impact of growth in nonagricultural sectors on crop output by sector

	Sugarbeets	Potatoes	Grains	Oilseeds	Roots and Legumes	Roughage	Pasture
				Percent change			
Area	0	2	0	3	0	2	2
Subsistence	-4	2	-2	2	1	-11	-5
Commercial	0	2	0	3	0	6	4
Output	-2	0	-2	1	-2	-2	-1
Subsistence	-8	0	-4	1	-1	-19	-10
Commercial	2	0	-1	1	-2	5	3

Table X-13—Romania: Impact of growth in nonagricultural sectors on meat and dairy processing

	Beef	Pork	Poultry
	Percent change		
Total output	-3	-5	-9
Subsistence	-2	-5	-11
Commercial	-3	-6	-7

Table X-14—Romania: Impact of growth in nonagricultural sectors on live animals

	Cattle	Swine	Birds
	Percent change		
Births	-2	-5	-11
Subsistence	-3	0	-23
Commercial	0	-24	-6

Table X-15—Romania: Impact of growth in nonagricultural sectors on crop output by sector

	S. Beets	Potatoes	Grain	Oilseeds	Roots and Legumes	Silage	Forage
				Percent change			
Output	-7	1	-6	1	0	-1	-1
Subsistence	-3	1	1	3	0	-10	-3
Commercial	-19	1	-8	0	-1	6	1

and supply of nontraded goods is to lower their prices by 24 percent. At the same time, it appears that there is enough slack in the Polish labor market that the 25-percent investment in nonagriculture does not tighten the labor market enough to force a significant rise in wages. A wage rise of just 0.5 percent was sufficient to clear the labor market. As a result, agricultural producers face lower costs on net, since the small rise in wages is more than offset by the cut in the price of nontraded inputs (see Box X-2).

Poland becomes a net meat importer despite higher pork and poultry output. Because of the decline in the price of the nontraded good, output of beef, pork, and poultry all rise (table X-16). Even so, the principal outcome of the investment shock is the effective transformation of Poland into a net importer of meat and poultry.

Box X-2—The Dynamics of the Nontraded Good Sector

The impact of investment in nonagricultural goods on the price of the nontraded good differs significantly across countries. The reason is that the price change for the nontraded good is a result of the interaction of four conflicting shifts in its demand and supply. The investment in the nontraded good output causes an outward shift in its supply schedule, while the increase in the wage brings about an inward shift. On the demand side, the rise in national expenditure shifts the demand curve outward, as consumer demand rises. At the same time, demand for the nontraded good as an intermediate input falls as the rise in the wage reduces output in other sectors. Every agricultural and agricultural processing sector, except the expanding dairy sectors, uses fewer nontraded inputs. This inward shift offsets part of the expenditure-induced outward shift of the final demand.

Table X-16—Poland: Impacts of growth in nonagricultural sectors

	Pork/hogs	Beef/cattle	Birds/poultry meat	Milk	Butter	Cheese
			Percent change			
Processing						
Price	0	0	0	12	0	0
Capital returns	10	11	16	56	-35	6
Slaughter	3	3	5	n.a.	n.a.	n.a.
Output	3	3	4	13	-11	1
Exports*	+34 to -55	+3 to -37	+34 to -55	n.a.	+10 to -21	-75
Live animals						
Price	0	0	0	6	n.a.	n.a.
Capital returns	6	-4	18	15	n.a.	n.a.
Births/output	3	-8	5	3	n.a.	n.a.
Exports	Nontraded	+328 to -30	n.a.	n.a.	n.a.	n.a.

*Exports are reported as percent changes, except where the scenario changed Poland's status from net exporter (+) to net importer (-). In this case, outcomes are reported in 1,000 metric ton quantities.
n.a.=not applicable.

Higher investment and wages increase national expenditure by 4 percent. Higher consumer incomes, together with relatively large income elasticities, translate into increased demand for meat and dairy products. Despite output increases at the farm level in the hog and bird sectors, the scenario outcome leaves Poland importing 55,000 tons of pork, 37,000 tons of beef, and 55,000 tons of poultry meat, whereas the country was a net exporter of all three products in the base period.

Cattle numbers decline. Whereas rising consumer demand brings production increases in the hog and poultry sector, the effect on the cattle sector is the opposite. In that sector, the reduction in the prices of nontraded goods fails to compensate for the increased forage and silage prices. Even though the prices of nontraded goods decline by 24 percent, these goods constitute just 10 percent of the per unit cost of cattle production. Silage and forage prices both increase 6 percent; together these constitute almost half of the cost of cattle production.

Land rent rises, leading to area declines. The principal dynamic behind developments in the crop sector is an investment-induced increase in the demand for land which, in turn, increases land rent by 18 percent and increases the costs of producing land-intensive crops. Consequently, area declines for all crops except roots and legumes. Reduced acreage appears to be the key factor behind higher forage and silage prices. As can be seen from table X-17, returns are lower for commodities whose land cost shares are relatively higher than cost shares of nontraded goods. In the cases of grains, oilseeds, silage and forage, lower nontraded goods prices fail to compensate for higher land costs, thus reducing capital returns. This dynamic is amplified in the cases of nontraded crops: silage and forage. Increases in capital returns to roots and legumes appear to be the consequence of a large nontraded good cost share, relative to land.

Table X-17—Poland: Impacts of growth in nonagricultural sectors on capital returns to land

	Change in capital returns	Unit cost share: land	Unit cost share: nontraded goods
		Percent change	
Sugarbeets	14	14	15
Potatoes	10	16	19
Roots, Legumes	22	3	22
Grains	-17	28	10
Oilseeds	-6	19	9
Silage	-10	42	1
Forage	-12	44	1

Grain imports increase. Under this scenario Poland becomes a significantly larger importer of grain. Grain output remains largely unchanged, while both food and feed demand expand. As a result, net grain imports rise from 1.8 million tons in the base period to 5.3 million tons.

Conclusions

The model results suggest that nonagricultural investment might be one way to draw labor out of agriculture, but this labor migration will be slow. With the possible exception of Hungary, there is still a large amount of underemployed agricultural labor in the transition economies. For this reason, large investment in nonagricultural sectors was required to move even small amounts of labor out of agriculture. For Russia the required investment inflow is $29.8 billion dollars, for Romania $2.9 billion, and for Ukraine $2.6 billion. More modest inflows of investment in nonagricultural sectors will lower unemployment, but not tighten the labor market enough to put upward pressure on wages and pull labor out of agriculture.

It also appears that the exit of labor from agriculture by itself is not sufficient to stimulate growth in the livestock sector. In three of the countries analyzed, meat output declines, and agriculture's share in the economy shrinks. In Romania and Russia, the declines are magnified by a rise in the price of nontraded goods, which compounds the wage shock. In Ukraine, the profitability of meat processing is so low that the single shock of a wage increase is sufficient to bring huge declines in output. In all three less-reformed countries, the livestock sector is hit much harder than the crop sector.

The results for Russia, Ukraine, and Romania may appear to contradict the development experiences of North America, Western Europe, and parts of Asia. In those economies, the expanding nonagricultural economy pulled labor out of agriculture without generally lowering agricultural output.

Yet the model results described above are consistent with the development experiences of other nations. Economies in which the exit of labor from agriculture did not bring about output declines experienced two additional forces that were not included in these scenarios. One is that there has usually been an expansion of the capital stock in agriculture as well as in the nonagricultural sectors. Had capi-

tal flowed into agricultural sectors, outputs would not have fallen. Second, laborsaving technical change has accommodated the labor release. The model allows factor proportion changes in response to movements in factor prices, but not technical change. In this study we wanted to isolate a single shock in order to be able to determine cause and effect in the model. In this case the intention was to measure the rate at which labor flows out of agriculture as a result of growth outside agriculture, and the magnitude of the investment required to stimulate that outflow. For this reason, in these scenarios, the capital stock in agriculture and the technology were held constant.

If these additional shocks were included in the scenario, the fundamental story described by the model results above would not change because agriculture as a share of national output and employment would still shrink. The magnitudes of the changes would differ from those reported, and livestock output might not shrink in absolute terms, but the essential features remain intact. If the capital stock in the nonagricultural sectors expands at a rate faster than that of agriculture, the composition of national output will shift in favor of nonagricultural goods. It is that shift which pulls labor out of agriculture through higher wages. Loss of labor and higher wages creates an incentive for agricultural producers and processors to adopt laborsaving technologies to keep agricultural output from falling. This is the experience in much of the developed world, and the models suggest that the same story is valid for the transition countries. Historical experience and the model results also suggest that it is a very long-term process, which requires large inflows of investment.

But the scenario modeled for this study is a plausible outcome for the transition economies. In the 10 years since the fall of communism, the agricultural sectors have not attracted the investment that has gone to other sectors. Investors remain quite wary of investing in agriculture, particularly primary production. Without some fundamental institutional reform, investors could continue to shun agriculture. Without such an injection of capital, producers will be unable to introduce technological change. In such a pessimistic case, the outflow of labor could well bring about an absolute contraction of the agricultural sector.

Some Caveats

These results must be interpreted with some caution. Because of the way that this scenario was simulated, adjustments occur not only in the market wage, but also in the price of nontraded goods. Nontraded goods constitute a significant share of the cost of some agricultural and processed products, and changes in their prices can have large impacts on output. The response of producers to the prices of nontraded goods tends to obscure the isolated effect of the rise in wages. The fact that Ukrainian producers respond differently from their Russian counterparts does not reflect fundamental differences in the two countries' labor markets, but is the result of differences in their baskets of nontraded goods. A detailed analysis of the nontraded goods sectors of these countries is beyond the scope of this study.

Another issue is the accuracy of employment statistics in the transition economies. According to the model results, Poland has considerably more slack in its labor market than the other countries. The result is that a very small wage increase is sufficient to clear the labor market after the expansion of the nontraded goods sector, and the small rise in the cost of labor faced by producers is more than offset by the drop in the prices of nontraded goods. In the Ukrainian and Russian models, wage increases of 6 and 16 percent, respectively, are needed to clear the market. Wage rises of these magnitudes can be expected to have negative impacts on production.

Most experts agree that official unemployment statistics in Russia and Ukraine are seriously underestimated. The official unemployment rate in Russia is 10 percent; in Ukraine it was 0.7 percent in the base period used for the model, rising to 4 percent by January 1999. For the Ukrainian model, we used an estimate of 8 percent provided by experts in the country. These numbers are based on those who register with official employment centers, and true unemployment is almost certainly considerably higher than these estimates. It is clear from visits to farms in these countries that there is a substantial amount of hidden unemployment in the agricultural sectors. Many workers still officially employed on state farms haven't been paid in months and are not contributing anything close to full-time work in agriculture.

Thus, it seems likely that the Russian and Ukrainian labor markets are at least as slack as Poland's. If that is the case, it will take an even larger investment to draw significant amounts of labor out of agriculture.

In sum, this scenario does not suggest a very optimistic forecast for economies in transition. Based on these results it appears that until the rest of the economy is growing strongly, agriculture will remain a low-income, labor-intensive sector.

XI: Conclusions

Throughout this analysis, it has been clear that of the five countries examined in this study, Poland and Hungary are rapidly emerging as relative success stories. Pork production has stabilized and appears to be on a slight upward trend, and the poultry sectors are growing in both countries. Both countries, after a brief surge in meat imports in the early years of the transition, are now net exporters. Moreover, as a result of pressures associated with EU accession, there have been significant improvements in the overall quality of meat output. In these countries, only the cattle/beef sectors continue to decline.

The adjustment has been much slower in Russia, Ukraine, and Romania. In Russia, producers have finally begun to respond to the ruble devaluation of August 1998, but this response is only now becoming evident. The downward trends in Russian livestock inventories finally slowed in 1999, and in 2001 there are indications of a slight degree of recovery at the farm level. This is in contrast to Ukraine and Romania, where the livestock sectors continue their stagnation or decline. There are still few signs of the turnaround that analysts expected at the beginning of the decade. These countries continue to import meat despite their production potential, and the imports of feed grains and soymeal once eagerly anticipated by Western agribusiness still haven't materialized.

All five countries, including the three slower reformers, have implemented wide-ranging policies of price and trade liberalization. Domestic price controls have been almost completely eliminated, and all five countries permit relatively free flow of imports and exports. But producers in the slower reformers have yet to realize benefits of such trade liberalization. Even in Poland and Hungary there remain institutional bottlenecks that hinder the flow of market signals to producers.

A large part of this report examined the impact of some of the institutional bottlenecks. Key among these are:

- Incomplete privatization: majority state-owned enterprises tend to be less responsive to market signals, primarily because soft credit provided by governments shield them from any hard budget constraint.

- High-risk business environment: this risk results from inadequate market information and a lack of contract enforcement, and is the key contributing factor to the high costs of marketing and distribution of agricultural products.

- Underdeveloped capital markets: capital needed for technological improvements and expansion of enterprises is difficult to obtain or prohibitively expensive.

- Lack of a land market and poorly defined property rights: these conditions make it more difficult for land to move to its most efficient uses.

- Barriers to labor mobility: agricultural enterprises are burdened with excess labor, which reduces productivity.

These problems endure to some extent in all five countries but are more serious in Romania, Russia, and Ukraine than in Hungary or Poland.

In the second half of this report, we presented the results of a model we built in an attempt to measure the impacts of the removal of these institutional bottlenecks. We tested the following scenarios:

- Partial price liberalization in Romania;

- Removal of bottlenecks in capital markets and the benefits to be derived from different types of investment;

- Reduction of marketing and distribution costs that might result from a better developed market infrastructure;

- Better functioning land markets;

- Removal of barriers to labor mobility.

From these model scenarios we can draw the following general conclusions:

Successful Reform Does Not Necessarily Mean a "Recovery" of the Livestock Sector

In these scenarios we have attempted to measure the potential impact of the removal of some of the most serious barriers to fully functioning markets. Our results suggest that successful reform can bring significant benefits to both producers and consumers. Lower marketing costs and more readily available capital can improve profitabil-

ity for producers and bring higher incomes or lower meat prices to consumers. Several of the scenarios suggest a potential for higher meat exports or lower imports for the transition economies. But output increases are generally rather modest—3 to 17 percent. Output declines between 1990 and the base period used in the model (1994-96) were often 40 to 50 percent, and none of the scenarios bring output even close to pre-1990 levels.

These results confirm our assertion that success cannot be measured in terms of output indicators alone. Rather, they suggest that during the Communist era, livestock output was much higher than optimal, artificially supported through a vast array of subsidies and price and trade controls. Successful reform can bring benefits to both producers and consumers of livestock products, but may not bring the "recovery" in inventories and output that some policymakers are striving for.

The Livestock Sector Is the Farm Economy's Shock Absorber

The livestock sector responds far more than the crop sector to both positive and negative stimuli. This was observed during the early years of the transition, when the livestock sectors of all five countries contracted more than the crop sectors. The results of the partial liberalization scenario for Romania also demonstrated the same conclusion. In that scenario subsidies were removed in both the crop and livestock sectors, but livestock output declined far more than crop production. This phenomenon lies behind the increasing grain exports and falling imports that have been observed in the transition economies.

On the other hand, model results suggest that the livestock sector can expand faster than the crop sector in response to positive shocks. This pattern was observed in both the credit and the reduced marketing cost scenarios. Reduced credit costs gave a boost to the livestock sector, while crop output changed very little. In the crop sector, the benefit of lower cost credit was generally offset by higher land rents. Both crops and livestock benefited from reduction of marketing costs. However, livestock producers benefited in two ways: once through higher prices for the live animals, and again through lower feed costs. Crop producers benefited in only one way, since they typically do not use agricultural products as inputs.

The corollary to this conclusion is that once the livestock sectors begin to expand, much of the resulting increase in feed demand will be met through higher imports or reduced exports. In some scenarios, a portion of the increased feed demand was met through higher domestic production, but domestic output increases were not sufficient to meet the increase in feed demand.

The High Cost of Credit Is Not as Serious an Impediment as High Marketing Costs

Improved functioning of rural credit markets brings a small benefit to agriculture, but the principal effect is to shift production away from subsistence producers towards commercial producers. Because subsistence producers make little use of credit, they do not benefit from the lower costs. Furthermore, they are adversely affected by higher land rents and lower prices for live animals. For commercial producers, the positive impacts derived from cheaper credit are less than those that come with a reduction of marketing costs. The reason is that lower marketing costs lead to a reduction in feed costs and simultaneously an increase in the output price, whereas lower credit costs do not have such an impact on feed costs or the output price. The insensitivity of the results to changes in credit costs also reflects the situation that, in the base period, the use of credit was limited. As credit costs fall and more credit is used, the impacts of credit cost changes could increase.

Investment in Meat Processing Brings Greater Returns Than Farm-Level Investment

A new injection of capital at either the farm or the processing level can bring significant benefits. Meat output increases, producers realize greater profitability, and there is either an increase in exports or a decrease in imports. Expansion of the livestock sector leads to increased feed demand, and can mean stronger markets for exporters of grain and oilseeds.

However, scenarios tested for both Russia and Poland suggest that investment returns are far greater if the investment is directed to the processing industry rather than farm level production. Investment at the farm level means that more animals can be produced at any given price, but the resulting expansion of inventories puts downward pressure on livestock prices. Investment in processing enterprises increases processors' demand for live animals, which leads to a higher price for producers, which in turn stimulates even greater increases in meat output.

Tradability Matters

The investment scenarios also suggest that the returns to investment are greater if the final good is fully tradable on international markets. If the final output is not fully tradable, the expansion of output induced by the investment simply brings about lower domestic prices.

This is an important consideration because none of the countries under consideration, with the possible exception of Hungary, have reached the point where their domestic livestock sectors are fully integrated into world markets. Even in Poland, export markets are limited because of uneven quality and disease problems. Less than half of Poland's pork is produced in plants that are licensed for exports, and because Poland still vaccinates for foot-and-mouth disease, export markets for fresh pork are limited. The same problems apply to Russia, Ukraine, and Romania, but in those countries tradability is further hampered by downstream bottlenecks that prevent the full transmission of price signals from the world market to producers. In Russia the interregional trade barriers also reduce integration into the world market.

Model results suggest that there is a potential for greater foreign direct investment in these countries if their livestock sectors do eventually become fully integrated into world markets. Once Poland and Hungary join the EU, their livestock sectors will almost by definition become more integrated, and these countries will almost certainly become more attractive to investors. But in the other countries, this is almost a vicious circle. Investment is needed to overcome the institutional barriers to full integration into the world market, but the investment will come only when the governments take steps to create a business environment that facilitates the transmission of world market signals.

Removal of Bottlenecks Brings Greater Benefits to Commercial Producers Than to Subsistence Producers

One generalization that emerges from scenarios 2 and 3 (Chapters VI and VII) is that commercial producers and processors derive greater benefits from the removal of institutional bottlenecks than does the subsistence sector. In the case of reduced credit costs, output from subsistence producers actually declines because, as commercial producers expand, resources shared by subsistence producers become more expensive. With a reduction in marketing costs, the gains are significantly greater for commercial producers; in many cases there is almost no change in subsistence output. An injection of capital investment also brings greater benefits to commercial producers. The net impact of all three shocks is to increase the share of commercial producers and processors in the total output of the sector. As output shifted from the subsistence to commercial sector, there was a small movement of labor in the same direction.

The Process of Drawing Excess Labor Out of Agriculture Will Be Slow

Four of the countries under consideration—Hungary is the exception—continue to be burdened with a large amount of excess labor in agriculture which cannot move easily to other sectors. We hypothesized that investment in the nonagricultural sectors would generate an increased demand for labor, push up wages, and draw labor out of agriculture. However, model results suggest that large amounts of investment in nonagricultural sectors will be needed to pull even small numbers of workers out of agriculture. The reason is the large amount of excess labor. Furthermore, without simultaneous investment in agriculture, the principal result of reducing the labor employed in agriculture will be a decline in output.

Model results further suggest that it may not be only the subsistence sector that releases labor under this scenario. The reason is that investment in nonagricultural sectors can affect the prices of nonagricultural inputs. Commercial producers are heavier users of these inputs than subsistence producers, so the wage increase can be compounded by rising prices for other inputs. Depending on the cost shares, the result is sometimes that commercial output contracts more than subsistence output, causing the commercial sector to release more labor.

What About the Future?

Model results suggest that institutional reform can bring significant benefits to the livestock sectors of the transition economies. Each of the scenarios was modeled in isolation, but in reality these shocks will probably not occur in isolation. Reduction of the downstream bottlenecks will not only reduce marketing and distribution costs, but will create a more favorable business environment that will attract additional investment. The result could therefore be an even greater stimulus to the livestock sector than the scenarios suggest. If agriculture becomes more attractive for investors, there could be simultaneous investment in

both agricultural and nonagricultural sectors, which could eventually lead to an exit of labor from agriculture.

But the key question is whether and when these reforms will take place. Hungary and Poland have made significant progress in the reform process. There has already been a large amount of foreign investment in the livestock sectors of these countries, and, as EU accession draws nearer, the rate of investment will probably accelerate. Moreover, the EU will not admit these two countries until most of the remaining institutional shortcomings are overcome, and this provides a strong incentive to speed up and complete the reform process.

But the other three countries have much further to go. With their rich resource endowments, these countries certainly have the potential to develop modern, competitive livestock sectors, a hypothesis confirmed by our model results. Should these countries move in that direction, the result could well be the surge in demand for imported feed ingredients that Western agribusiness has been waiting for. But the needed reforms have come slowly, and may never be complete. In that case these economies could remain indefinitely in their current state of low-level equilibrium.

Because of such uncertainty, this report cannot give definitive answers to policymakers, agribusiness, and others interested in the agricultural economies of the transition economies. The future depends on political as well as economic developments. But we have identified some of the most important variables that will determine developments in the livestock sectors in the transition economies over the next decade. Readers are urged to monitor the reform process as it continues to unfold and watch for signs of the needed institutional changes.

Capital investment, whether domestic or foreign, is key to any positive developments in the livestock economies of these countries. An important conclusion of our work is that this investment will bring maximum returns if these countries are fully integrated into world markets. That is, if market signals from the world market are fully transmitted to producers. While markets in all the transition economies have opened up and are functioning, the institutional barriers summarized at the beginning of this section to varying degrees continue to hinder the full transmission of these price signals.

Appendix: Model Structure and Data Sources

Model Structure. The model used in this report incorporates the commodity detail of partial equilibrium models while recognizing the aggregate resource constraints that are the focus of general equilibrium models. Because time series data for transition countries are insufficient for the estimation of relationships, the model uses a mathematical programming approach.

In the empirical model, goods and factors are one of four types. Pure final goods are those goods only consumed by consumers. These include: beef, pork, poultry meat, eggs, sugar, butter, cheese, and retail milk. Other goods are used as both a final good and as an intermediate good: potatoes, grain, roots and pulses, the composite other traded good, and the composite nontraded good. Goods that are classified as pure intermediates are: farm milk, cattle, swine, birds, oilseeds, sugarbeets, silage, and forage. Finally, there are the pure factors of production: labor, land, and sector-specific capital.

The model adopts a Ricardo-Viner structure common in trade models (Jones, 1981; Sanyal and Jones, 1982; Paarlberg, 1994). Each country is treated as facing given world prices for tradable goods. Goods are produced by perfectly competitive firms using constant returns to scale technologies. Each industry uses multiple factors of production in variable proportions. Primary factors—land, labor, and capital—are in fixed supply and nontraded. Labor is used by all sectors with an institutionally set wage since these nations had considerable unemployment in the 1994-1996 base period. Thus, the labor market behaves like that described by Brecher (1974). Land is mobile within crop production but is not used in animal agriculture or in agricultural processing. Capital is industry-specific and takes a putty-clay form. Investment in previous periods determines the capital available for production in the current period. The other type of factor consists of intermediates that may or may not be traded (Sanyal and Jones, 1982; Paarlberg, 1995).

Under these assumptions, industries earn zero profits. Let W be a vector of primary factor prices and P_c be a vector of demand prices. Producer prices are given by a vector P_p. The per unit use of primary factors is described by the matrix $A(W, P_c)$. The per unit use of intermediates is described by the matrix $Z(W, P_c)$. Under the constant returns to scale assumption, the per unit factor demands depend on only factor prices. Note that intermediate factor use is also a function of factor prices, so this model allows factor substitution. Thus, the zero profit conditions are:

$$(1)\ A(W, P_c)*W+Z(W, P_c)*P_c = P_p.$$

Nontraded factor markets clear via price, except for labor. Demand for factors is derived from the production activities, denoted by the vector Q. The fixed supplies of these factors are given by the resource endowments (the vector R). This is described by:

$$(2)\ A^T(W, P_c)*Q = R.$$

Goods markets need to clear. There are two sources of demand, as a final good and as an intermediate. Final demand is captured in a demand system. Let C be the vector of final consumption and E be a scalar representing national expenditure. The demand system is:

$$(3)\ C = C(P_c, E).$$

Derived demands are given by $Z(W, P_c)$ *Q which is the per unit use multiplied by the output. The final identity states that demand less output equals imports (M). For nontraded, goods the elements of M are zero:

$$(4)\ M = I* C(P_c, E) +(Z(W, P_c) -I)*Q,$$

where I is an identity matrix.

All goods have price linkages that determine the price for consumption as the producer price less domestic subsidies (S):

$$(5)\ P_c = P_p - S.$$

The elements of the vector S for taxed goods have a negative sign. When there are no taxes or domestic subsidies, the element of S is zero and the producer and consumer price match. Traded goods have additional price linkages that relate the producer price to the world price plus a border intervention. For traded good i these price linkages are:

$$(6)\ P_{pi} = P_{wi} + t_i,$$

where P_{wi} is the world price for good i and t_i is the border intervention for the good. Tariffs represent a positive intervention for imported commodities. Export subsidies also have a positive t_i for exported goods.

The final variable to determine is expenditure on goods (E). Expenditure is defined as the value of returns to primary factors plus net revenues from border intervention plus borrowing from overseas, less savings. Revenue earned in production is allocated ultimately to primary factors W*R. Revenue earned on border interventions is given by t*M, where t is the vector of import tariffs or export subsidies. In the case of an export subsidy on good i, $M_i < 0$, so a loss is incurred. Net borrowing (F) is the negative of the balance of trade. To find expenditure on goods in the current period deferred spending—savings (SV)—must be removed. Thus, expenditure is:

(7) E = W*R + t*M + F - SV.

To determine the impact of changes the system is differentiated and the percent changes are applied to the 1994-1996 base.

Supply Use, Prices. Most of the supply use and price data used are from USDA/Foreign Agriculture Service (USDA/FAS) attaché reports supplemented by national yearbooks. Quantity data for potatoes and pulses that are not normally covered in USDA/FAS reports are from FAO *Production Yearbook and Trade Yearbook,* or national statistical sources. The majority of price data come from USDA/FAS attaché reports. Those reports generally provide sufficient data on prices for grains, oilseeds, sugarbeets, sugar, livestock, and livestock products. Prices for the other commodities are from various sources including national statistics as well as individuals in the country. Three models separate the national supply and use data into peasant/private sectors and commercial/state sectors. The separation of production and consumption relies on using data on farm numbers and average size by type, on crop and animal production allocation, and national per capita consumption to determine household nonmarket use and peasant production (see AEI, 1998 for Romanian dairy information). Once the peasant/private quantity flows are calculated they are subtracted from the national data to determine the commercial/state sector values.

Unit cost shares. Unit cost shares are a critical data input. Sources of cost share information include industry contacts, research institutions, and ministries of agriculture. Unit cost shares for agricultural commodities in commercial Romanian production, except for dairy products, come from budgets developed in the Ministry of Agriculture supplemented by AEI (1996a). Cost shares for hog and poultry production in Romania also use information provided by Luca (1998) and Grant and Gerber (1997). The dairy product cost shares are from a private dairy processor. Cost shares for peasant agriculture are based on survey results (AEI, 1996b). Hungarian cost shares are based on AKII (1997) and Kertesz (1997). For Ukraine and Russia, state sector cost shares are calculated from the World Bank report on Ukraine, with grain and meal shares reflecting information on feed composition from Raskhod. Polish information comes from the agriculture ministry. Another method of deriving cost shares is to use the supply use data from USDA/FAS to calculate unit cost shares for intermediate inputs. In most cases similar results are obtained.

The unit cost shares for physical and human capital are calculated as residuals, and the industry allocation of capital is determined from the cost share. Capital in this formulation consists of physical capital plus the return to management (accounting profits).

The major difference between crops and other production activities concerns the input land. For crops, land is a major input with a payment (rent). Since many of the nations in the study have either a poorly functioning or nonexistent land market, the interpretation of the payment to land in the models must be clarified. The zero profit conditions used to model output behavior are dual conditions to the problem of maximizing national output given the resource (factor) constraints. Consequently, the factor prices are the marginal value of one more unit of the input—shadow prices. The absence of a land market (which is the case in Ukraine) does not imply that the return to land equals zero. That would only occur if land does not represent a binding constraint to national output. If land represents a constraint to expanding output, whether there is or is not a functioning land market, the land has an implicit value and its shadow price is positive. The market rental rate for land may be zero in that case, but the shadow price will be positive and will change as output prices change. Since the shadow return to land is assumed to be common to all crops, the cost shares are calculated using the base yields. The result is that low yields contribute to high cost shares for land, despite the low rent. Intensive crops, like potatoes and sugarbeets, show low land cost shares—2 to 16 percent. Extensive crops, like grain and oil-seeds, show large unit cost allocated to land—30 to 40 percent.

The residual cost share is the allocation to physical and human capital, and indicates profitability of each commodity. Usually subsistence agriculture is more "profitable" than commercial agriculture in that subsistence agriculture has a higher residual. Within animal agriculture, milk and beef production consistently show higher residuals than swine and birds because the feed cost shares are lower. Beyond these broad generalizations, it is difficult to find a pattern to the capital cost shares.

Retail demand elasticities. The retail demand for the model is built using a complete set of elasticities to determine the changes in retail consumption. For Romania, Russia, and Ukraine the elasticities are obtained from ERS estimates.

For Poland and Hungary, the demand elasticities were obtained using a Stone-Geary utility function. Implementation of this system uses food consumption data for each good in the base period, 1994-1996. Most of the numbers come from USDA/FAS. Data for potatoes and roots/pulses come from various sources, including the Food and Agriculture Organization and national statistical yearbooks, and retail consumption is derived from production and trade data along with per capita household consumption estimates. The retail consumption of the nontraded good and the other traded good are obtained when the economy is balanced.

Elasticities of substitution. The model requires values for the elasticities of substitution. Many general equilibrium models assume a nested constant elasticity of substitution production function system with the per unit use of intermediate inputs fixed—a Leontief production function where the elasticities of substitution are zero. This model does not assume the elasticities of substitution are zero, but they need to be low or the processing sector exhibits overly elastic behavior. Given the lack of time series data, estimation of the elasticities is not possible. The approach is to set a pattern where none of the inputs substitute very well, but labor and capital substitute for the bulk commodity better than the other traded and nontraded goods. Accordingly, the elasticities of substitution for labor and capital are set at 0.3 and those for other traded and nontraded goods are set at 0.1. The elasticities of substitution among feed ingredients are found using a pseudodata technique with compound feed rations as described by McKinzie, Paarlberg, and Huerta (1986). These tend to be around 1. Land substitutes for capital in crop production at an elasticity of substitution of 0.3.

Closure. The markets for the other traded good, for the nontraded good, and the macroeconomic accounts are used to close the circular flow of the economy. Closure requires that payments to factors balance, that all goods markets clear via factor price or quantity adjustments, and that external accounts be cleared. This closure starts with the agricultural and agricultural products markets, then moves to the nontraded market, and finally the market for other traded goods.

Gross Domestic Product (GDP) measures the value of all goods and services produced and is the sum of returns to primary factors (IMF). Once the GDP is set, the factor markets are cleared using other national accounts data. The factor use in agriculture and processed agricultural goods is determined. Those figures are subtracted from data on the total labor force and arable area. The nontraded good is assumed not to use land, and labor use is found from employment by sector data. Consequently, the use of labor and land by the other traded good are residuals. Clearing for the capital market is more involved as data for payments to capital are not available. The GDP is reduced by the total wage and land payments, leaving a residual for capital. That value is reduced by the payments to all other sectors to find the value of capital in the other traded good sector.

The national accounts give the output shares by sector, including that devoted to nontraded goods production (CIA a,b; National Trade Data Bank a,b; Trade Mission of Ukraine; U.S. Department of Commerce; U.S. Department of State). This allows calculating the output value and quantity of nontraded goods. Subtracting the value of nontraded goods produced and the value of agricultural and processed agricultural goods produced from GDP gives the value of the other traded good.

Next, the expenditure and external balances are set so that the entire economy is in domestic and external balance. The national accounts give the current account balance at world market prices and the opposite flow is treated as the balance on the capital account. The supply and use data give the trade balance for the agricultural goods. Combined, these figures determine the external balance for the other traded goods, which is added to the value of production to find the value of consumption. National total expenditure is the sum of payments to primary factors, tariff revenues less export subsidy costs, and overseas borrowing (the capital account balance). The level of expenditure on goods and services in the base period is calculated by subtracting the average level of national savings (deferred spending) from total expenditure.

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