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.