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Distributional Consequences of the Russian Price Liberalization*

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I. Introduction

The Russian price liberalization was implemented in January 1992 amid great controversy, and debates have continued with undiminished intensity. Despite the controversy, the Russian government had little choice but to go ahead. The attempt to retain fixed prices in an inflationary environment had brought the food economy nearly to a halt in autumn 1991; marketing fell sharply, inventories expanded, and barter increased. This created severe problems for an economy as dependent on internal trade in food as was the case in the USSR. There was a high likelihood of full-scale collapse, both of marketing and production in spring and summer 1992, had prices not been liberalized.

Ideally price liberalization would have been implemented in an environment with economic infrastructure conducive to competition, for example, private ownership, clear channels for the flow of information on markets, and well-developed transportation for new interregional flows. But none of this was in place in January 1992 because necessary measures were not taken immediately after the August coup, nor had they been taken by prior governments. The severity of pending collapse in the food sector, however, meant that the liberalization could not be postponed.

Foremost among many areas of concern regarding food price liberalization was the impact on the welfare and nutrition of the poor. This article focuses on the short-term distributional impact of liberalization

with alternative approaches to compensation. While the main objectives of the liberalization were to eliminate costly subsidies and revive trade and production of food, distributional concerns led to limits on price increases for some key consumer items and the approximate doubling of many wages and transfers. These steps were followed by further increases in nominal wages, pensions, and allowances. In this article we use numerical simulations to examine the distributional impact of wage and pension increases when prices are free to respond to higher nominal incomes.

The former system of controlled prices delivered implicit transfers to consumers who purchased food at subsidized prices. As argued below, richer consumers received a larger absolute subsidy because they purchased more of the subsidized products (especially meat) than did poorer consumers. Richer consumers also paid higher average prices for a given commodity, however, because they bought a larger proportion of total purchases in unsubsidized channels. One dimension of price liberalization is the fusion of marketing channels formerly separated by differing degrees of subsidy; as a unified price for a given product emerges, prices in the channels formerly most subsidized rise most, and prices in channels with the least subsidy in the past rise less.¹ Thus, for a given commodity, the average price that the poor pay will rise more than will the average price that the rich pay, and this differential distribution of price increase is not well captured in standard price indexes.

The mechanism that moves prices immediately after liberalization is thus different from a standard inflationary process. In the latter, the prices that all consumers pay move upward together, and the distributional impact depends on changes in wealth and expenditure by income group. In the former, the prices that the poor pay for a given commodity rise most. The mechanism for protecting the poor during subsidy removal may thus be different from mechanisms that work during inflation. Indexation of wages or transfers to movement in average food prices is particularly deficient, since the prices that the rich pay rise less than average and those of the poor rise more.

The distributional impact of subsidy removal strengthens the argument in favor of targeted assistance to the poor in the postliberalization period. Budgetary stringency mandates targeting, but even in the absence of a fiscal crisis, assistance should be targeted toward the poor, since for them prices rise most. The point remains relevant for Russia even after formal liberalization, as the process of subsidy removal at the local level continues. Other states of the former Soviet Union (besides the Baltics) had not, as of September 1992, begun to dismantle consumer food subsidies, and they will, in the near future, face the design of compensation programs.

As argued below, when compensation is not targeted toward the

poor, some combinations of liberalization and compensation reduce the welfare of the poor. Even in the worst case examined below, however, the poor fare better than under the alternative of no liberalization and attendant collapse of the food economy. Had the latter occurred, the poor would have been hardest hit, since in the environment of confusion, localized shortage, and skyrocketing prices associated with a deeper collapse their access would have been the worst. Six months after the liberalization, our empirical understanding of how the poor have fared is not good, but there is little evidence of widespread nutritional deficit.

II. Markets, Prices, and Income before the Price Liberalization

Discussion of the price liberalization has centered on implications for prices and income, but it is not always clear which measures of price and income change are most relevant for assessing changes in welfare. Before the liberalization, the average Russian citizen found it necessary to go to a number of retail outlets in an effort to obtain the desired total quantity of any given good, and prices in different outlets varied according to the degree of government subsidization. Thus a variety of prices existed for the same good and, summing over purchases, subsidies contributed substantially to total full income.² Accordingly, examining changes in money income can give only a limited picture of the distributional impact of the liberalization, and we will focus on income inclusive of the total value of subsidies. In this way we capture changes in purchasing power. We also cut through the multiplicity of markets and prices to focus on prices paid for marginal purchases only. As we show below, once inframarginal subsidies have been included in full income, consumer behavior is determined by the highest price that the consumer pays for a given good.³

Table 1 describes the main channels through which households made purchases, according to official statistics for 1988. The three

TABLE 1
SHARE OF TOTAL RETAIL SALES BY CHANNEL,
USSR, 1988 (Percentages)

State markets	71.3*
Cooperative markets	26.2
Kolkhoz ("free") markets	2.5

SOURCE.—International Monetary Fund, *A Study of the Soviet Economy* (Washington, D.C.: International Monetary Fund, 1991), chap. V.2, p. 32.

NOTE.—The data include all formal sales in indicated channels, both rural and urban, but exclude informal trade and self-supply.

* On their own, public catering establishments (included in state markets) account for 8.2% of total retail sales.

main channels for allocation are state markets, which are most heavily subsidized; the less subsidized cooperative markets; and kolkhoz (collective farm) markets, which are not directly subsidized at all. There are numerous channels within these three divisions.⁴ For example, much subsidized food is obtained at the workplace, either as subsidized meals (two-thirds to three-quarters of sales at the workplace) or through direct sales of food to be consumed at home. Because enterprises have been an important channel for the allocation of subsidized food, the preliberalization pricing system is commonly considered to have been regressive: needy households, seldom headed by employees of prosperous enterprises, have had limited access to subsidized food distributed through the workplace. The system was also biased in favor of urban people, since they bought a higher proportion of their food in the most heavily subsidized state stores.

Kolkhoz markets are characterized by little competition, although they are officially described as "free." Retailers are free to charge prices that equate supply with demand, but entry is limited. The analysis below is greatly simplified by the assumption that kolkhoz prices are equilibrium prices. In recent years these prices have been significantly higher than retail prices on state markets. For example, in 1988, kolkhoz market prices were roughly three to four times those of state market prices for a wide range of goods.⁵

While kolkhoz markets account for a small fraction of total sales, they are important for several commodities; for example, in 1988 they accounted for 34% of potato sales and 13% of vegetables (but only 3% of meat). Furthermore, purchases on kolkhoz markets are far more important for richer groups than for poorer. All the same, unpublished household survey data collected by Goskomstat (the Russian statistical bureau) show that households from all income groups make some purchases through kolkhoz markets for many commodities.

The demand for a given good can be shown graphically, as in figure 1, where subsidies are shown by the shaded areas and marginal purchases are made on the kolkhoz market. Note that, given the short-run horizon, we have assumed that supply curves are vertical but the demand curve is downward-sloping. The amounts of total demand satisfied by purchases on state, cooperative, and kolkhoz markets are given by Q^s , Q^c , and Q^k , with associated prices p^s , p^c , and p^k . Total demand is a function of the price on the kolkhoz market and full income, which consists of after-tax wage (or pension) income plus subsidies for purchases on state and cooperative markets [$y = w + Q^s(p^k - p^s) + Q^c(p^k - p^c)$]. The kolkhoz price is determined in equilibrium as the price that equates total supply and demand for the good.

If subsidies are eliminated with no compensatory augmentation of income, the demand curve will shift backward, reducing the equilib-

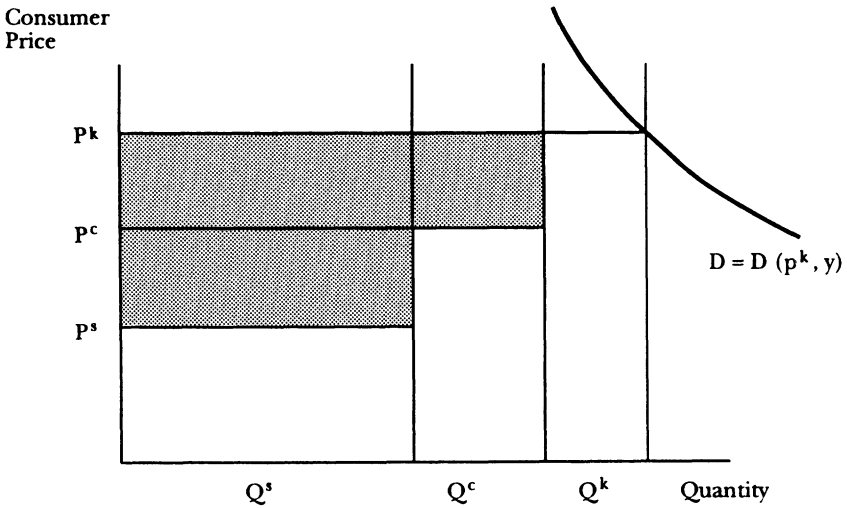


FIG. 1.—Consumer demand with subsidies under the old price structure

rium price on the kolkhoz market. Thus the price liberalization will lead to a decrease in the marginal price unless compensatory transfers are so large that they offset the income lost through the elimination of subsidies. However, the price liberalization will also lead to increases in most inframarginal prices—so the net impact on welfare of consumers will depend on the magnitudes of these two offsetting effects. Since poorer people, particularly in urban areas, purchase a small part of total consumption on kolkhoz markets and a large part on subsidized markets, they lose much more from the price liberalization than do richer groups. Richer groups may actually gain from the elimination of subsidies if they reap the benefits of wage increases but purchase relatively little on subsidized markets. This, and related results, can be seen in the analytic framework presented below. The impact of subsidy removal for the poor and rich developed below holds most strongly for urban consumers, since, on average, the rural poor purchase less on subsidized markets.

III. Simple Analytics of Price Liberalization

As above, we begin with the observation that a household’s demand for a given good is determined by kolkhoz prices and income inclusive of subsidies:

$$d_j = f(p, y_j), \tag{1}$$

where j indexes the household, and the superscript denoting kolkhoz markets has been dropped for expositional clarity. As above, we as-

sume that marginal purchases are made on kolkhoz markets. The demand function is assumed to follow textbook properties.

We focus on a single market with two representative groups, but in empirical work we consider interactions between markets and the role of other groups. Equation (1) can be log differentiated to yield a simple equation for the change in demand:

$$\hat{d}_j = \epsilon^p \hat{p} + \epsilon^y \hat{y}_j. \quad (2)$$

Here, ϵ^p is the price elasticity of demand and ϵ^y is the income elasticity; hats above variables reflect percentage changes.⁶ Given the elasticities, determining the change in consumption after a liberalization requires determining changes in full income (exogenous) and the price (endogenous). To determine the new equilibrium price we start with the change in aggregate demand ($D = d_1 + d_2$):

$$\hat{D} = (1 - \omega) \hat{d}_1 + \omega \hat{d}_2, \text{ where } \omega = d_2/D. \quad (3)$$

Substituting equation (2) into equation (3) gives

$$\hat{D} = \epsilon^p \hat{p} + \epsilon^y [(1 - \omega) \hat{y}_1 + \omega \hat{y}_2]. \quad (4)$$

When there is no change in supply, the price change is then

$$\hat{S} = \hat{D} = 0 \Rightarrow \hat{p} = -\frac{\epsilon^y}{\epsilon^p} [(1 - \omega) \hat{y}_1 + \omega \hat{y}_2]. \quad (5)$$

And substituting back into equation (2) gives the percentage of consumption change in group 1:

$$\hat{d}_1 = \epsilon^y \omega (\hat{y}_1 - \hat{y}_2). \quad (6)$$

In this simple setting, only changes in income affect changes in consumption, since equilibrium prices are determined themselves by income movements (see eq. [5]). Moreover, because supply is fixed in the short run, absolute changes in income matter relatively little in themselves. Rather, equation (6) shows that it is relative changes in income that matter absolutely for changes in demand. So, if the incomes of both the poor and the nonpoor rise by one-quarter, consumption by the poor will remain unchanged. The intuition for this result is that, with fixed supply in the short run, the allocation process is a zero-sum game; those who gain inevitably do so at the expense of others. The ability to expand one's share of the pie necessitates increasing one's relative purchasing power in the market place. The

consumption of the poor will fall unless income increases by a greater fraction than the income of the nonpoor. Only compensation that helps the most vulnerable groups proportionally more than others (e.g., equal-sized lump-sum payments or other transfers more skewed toward the poor) will redistribute purchasing power to those who have lost most. These conclusions are shown below.

Assume that group i 's full income, y_i , is made up of the sum of wage income, w_i , and consumer subsidies. It will be simplest to define subsidies as a fraction s_i of wage income:

$$y_i = w_i(1 + s_i) \quad i = 1, 2. \tag{7}$$

After the price liberalization, full income is made up of wage income plus compensation in the form of transfers. Like subsidies, transfers can be written as a fraction t of wage income (where every group receives the same proportional wage increase). The change in full income is then simply

$$\hat{y}_i = (t - s_i)/(1 + s_i) \quad i = 1, 2. \tag{8}$$

Suppose that group 1 is the poor group and group 2 is nonpoor. The difference in the changes in their full incomes is

$$\hat{y}_1 - \hat{y}_2 = \frac{(s_2 - s_1)(1 + t)}{(1 + s_1)(1 + s_2)} < 0 \quad \text{when } s_1 > s_2. \tag{9}$$

After substituting into equation (6), the derivative of consumption change with respect to the rate of wage increase is found to be negative for the poor group (group 1), given that for group 1 subsidies are larger as a fraction of wage income ($s_1 > s_2$):

$$\frac{\partial \hat{d}_1}{\partial t} = \frac{s_2 - s_1}{(1 + s_1)(1 + s_2)} \epsilon^y \omega < 0. \tag{10}$$

The poor are made worse off by across-the-board wage increases. Despite popular sentiments to the contrary, the poor would be better off if there were no wage increases at all—as opposed to universal wage increases granted to every group. This suggests that immediately after liberalization calls for indexation of wages to movements in the price index should be resisted if the aim is to protect the poor.⁷

In contrast, equal-sized lump-sum transfers help the poor more than they do the rich. In this case, the change in income is

$$\hat{y}_1 = (\tau/w_1 - s_1)/(1 + s_1), \tag{11}$$

where τ is the lump-sum transfer. The derivative of consumption change with respect to size of lump-sum transfers is positive for group 1, given that group 1 has a lower income than group 2 ($y_1 < y_2$):

$$\frac{\partial \hat{d}_1}{\partial \tau} = \frac{y_2 - y_1}{w_1 w_2 (1 + s_1)(1 + s_2)} \epsilon^y \omega > 0. \quad (12)$$

Thus equal-sized lump-sum transfers help the poor more than do across-the-board increases in wages and pensions. Lump-sum transfers that are not targeted by need, however, are expensive and generally less effective than means-tested money transfers.

IV. Numerical Simulations of Alternative Policies

In order to determine relative changes in the purchasing power of different groups and the consequent implications for welfare, we have constructed a computable equilibrium model of Russian food demand. As above, we focus on short-term effects, taking supply as exogenous, but we expand the framework to consider 10 food aggregates purchased, each of which may be obtained through the three main channels described above: state, cooperative, and kolkhoz markets. When subsidies are eliminated, distinctions between the channels are effectively removed and a unified price prevails.

The model is designed around a system of linear equations that are expansions of equations (5) and (6) above. Cross-price elasticities allow spillovers between markets, and prices on kolkhoz markets are determined within the model, given exogenous changes in subsidies, wages, and supplies. The model is solved iteratively in 10 steps, to allow for nonlinearities in demand in light of the large changes.⁸

The benchmark data on consumption are annual averages for the Russian Federation as a whole, both rural and urban, and correspond roughly to the first half of 1991. Price data are for the summer of 1991; they include the administered price increase of April 1991 but exclude the unusual developments in prices during the fall. We consider only a fraction of total expenditure and leave out nonfood items such as fuel, transportation, alcohol, and clothing. This focus reflects the fact that food consumption is the issue at hand, and food accounts for the greatest part of total expenditure, especially in the months following the price liberalization. The effects that we discuss are most relevant to the period before supply responds to the liberalization.

We consider the distributional consequences for three groups within society: a small poor population (13% of the total), a large middle group (70%), and a high-income group (17%). Before the liberalization, their total annual nominal income per capita was assumed to be 1,200, 2,700, and 6,000 rubles, respectively, not inclusive of the

value of food or other subsidies. Table 2 shows that once food subsidies are considered, full income increases by 52%, 43%, and 24%, respectively. The proportionate importance of food subsidies is thus greatest for the poor, even though the rich receive a greater absolute amount of subsidy.

The table shows that when money income is increased by 50% at the same time that subsidies are eliminated, the poor group's full income (not deflated by the price increase) falls by 29%, and when money income is doubled, their full income falls by just 5%. However, increases in money income, as, for example, in wage and pension escalators, help the richer groups more, since relatively more of their full income comes from wages and pensions. Thus, subsidy elimination coupled with a doubling of wages and pensions increases the full income of the richer groups by half, while the poorest group suffers a slight income loss under the same policy. The implications of these price and income changes are the subject of the simulations discussed below.

Table 3 gives the summary results of a series of eight policy simulations. Two scenarios are considered: first, all prices are set free and supplies are unchanged; second, all prices are set free but some supplies are reduced, reflecting shortages in early 1992 (see Appendix). For each scenario we examine four cases: first, no group is compensated for its losses; second, the poorer group's nominal income is doubled and the nominal incomes of others are raised by one-half; third, both the poorer and middle groups' nominal incomes are doubled and the highest group's income is raised by one-half; and, fourth, all nominal incomes are doubled. The eight scenarios reflect types of policy options debated in Russia in December 1991, and they span the concerns outlined in the section above. The liberalization implemented in January 1992 entailed doubling of wages of people paid directly from the state budget, doubling of pensions and allowances, and continued controls on a broad range of consumer items. Enterprises implemented their own wage increase, although much of this increase preceded and

TABLE 2
BENCHMARK DATA: INCOME AND SUBSIDIES (Rubles)

INCOME GROUP	MONEY INCOME	VALUE OF SUBSIDIES	FULL INCOME	PERCENT CHANGE IN FULL INCOME AFTER REMOVAL OF SUBSIDIES AND MONEY INCOME INCREASE BY		
				0%	50%	100%
Lower	1,200	1,337	2,537	-53	-29	-5
Middle	2,700	2,049	4,749	-43	-14	+14
Higher	6,000	1,938	7,938	-24	+13	+51

TABLE 3

NUMERICAL SIMULATIONS OF POLICY CHANGES (Pre-liberalization Values = 1.00)

Policy Scenario, Income Group, and Compensation (%)	Kolkhoz Price Index	Average Consumption Index	Average Price Index
All prices free:			
Lower, 0	.48	.93	1.08
Middle, 0	.48	.98	1.08
Higher, 0	.48	1.09	.84
Lower, 100	.87	1.01	2.15
Middle, 50	.87	.97	1.95
Higher, 50	.87	1.08	1.54
Lower, 100	1.22	.94	2.83
Middle, 100	1.22	1.01	2.83
Higher, 50	1.22	1.00	2.00
Lower, 100	1.40	.92	3.16
Middle, 100	1.40	.98	3.16
Higher, 100	1.40	1.09	2.50
All prices free; adverse supply shocks:			
Lower, 0	.95	.80	1.93
Middle, 0	.95	.84	1.84
Higher, 0	.95	.93	1.41
Lower, 100	2.19	.87	4.95
Middle, 50	2.19	.83	4.27
Higher, 50	2.19	.92	3.22
Lower, 100	3.80	.82	8.91
Middle, 100	3.80	.86	7.78
Higher, 50	3.80	.86	5.15
Lower, 100	4.90	.80	12.9
Middle, 100	4.90	.84	10.02
Higher, 100	4.90	.93	6.88

NOTE.—Compensation refers to percentage increases in nominal incomes of each of the three groups. The consumption and price indexes are Laspeyres indexes. The supply shocks are described in the Appendix. See Jonathan Morduch and Alan Taylor, "A Model of Price Liberalization in Russia," in *The Economics of Transformation*, ed. A. Schipke and A. Taylor (Berlin and New York: Springer, 1994), for further details.

anticipated the January liberalization. The actual path of incomes and food prices is shown in figure 2.⁹ Following March 1992, most of the price ceilings retained in January were removed, although local regulations still appear to be important.

We begin by focusing on the first set of results (scenarios 1–4). Kolkhoz market prices fall by 52% and 17% in the first two scenarios with limited compensation—and they rise, by 22% and 40%, only when the middle group is compensated substantially in scenarios 3 and 4. However, average prices rise in all scenarios, since prices through state and cooperative markets increase. The lower-income group consumes roughly the same quantities when there is no compensation as when there are 100%, 50%, and 50% increases in nominal incomes; the latter policy combination is close to being a one-for-one substitution of increased payments for lost subsidies. The lower-income group is best off when compensation is greatly biased in its favor (scenario 2; con-

Russia, December 1991 = 100

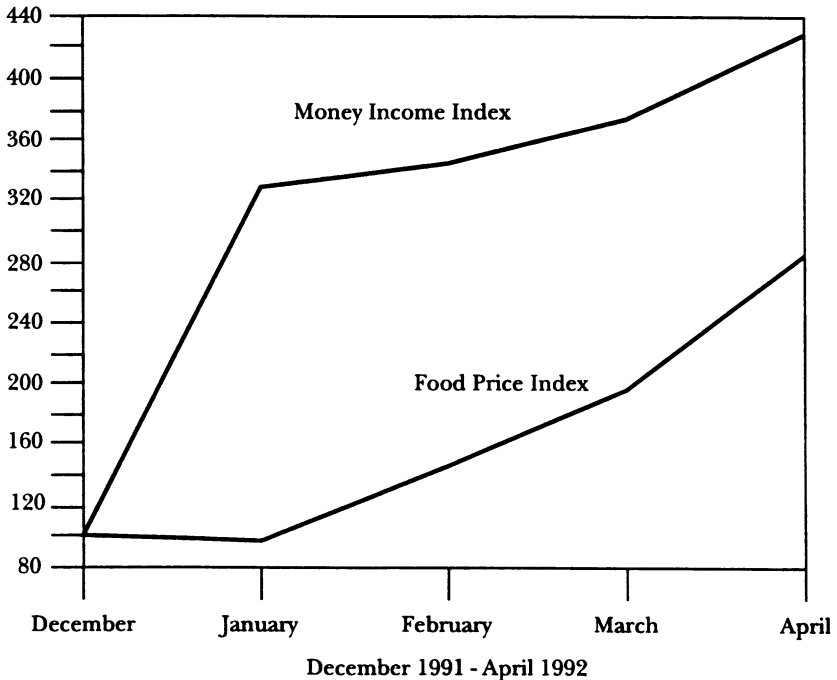


FIG. 2.—Average food prices and money incomes, from Center for Economic Analysis and Forecasting, Moscow, May 1992.

sumption index = 1.01), next best off when it is slightly biased (scenario 3; consumption index = 0.94). It is worse off when there is no compensation (scenario 1; consumption index = 0.93) and least well-off after a universal doubling of wages and pensions (scenario 4; consumption index = 0.92).

The consumption indexes in the case of universal doubling of nominal income are nearly identical to the indexes when no one is compensated at all. These results can be explained in the framework described in Section III above: relative changes in income determine absolute changes in consumption in the short run.

The second set of results, in which supply is reduced, shows a similar pattern of distribution, although the negative supply shock leads to much higher prices and considerably lower consumption. Consumption falls by 7%–20% for all groups, and the simulation shows clearly the importance of the middle-income group. Since the middle group comprises 70% of the population under consideration, even small changes in its income can have major effects on the other two groups. With its income protected (as in scenario 3), it drives prices up and, as a result, depresses the welfare of others. This has particularly sharp implications for the poorer group. Again, consumption in-

dexes are similar in the cases where there is no compensation and when there is universal wage doubling. In the latter case, however, kolkhoz prices rise nearly five times, while they change little in the former case.

V. Concluding Comments

Beyond the transition period, a wide array of factors will affect distribution of goods in Russia. Ultimately, increases in productivity and access to markets will determine standards of living. In the short run, changes of the magnitude of those currently under way in Russia and imminent in other countries of the former Soviet Union can, in principle, push the welfare of the poor to unacceptable levels. Both our exercise and subsequent events in Russia indicate that the Russian liberalization did not have that effect. Poor people receiving cash benefits or wages that roughly doubled in January and increased further in later months appear to have been adequately protected. Poor people excluded from the programs of cash benefits suffered a severe decline in welfare; however it is not well-known how many of these people there are. Wage indexation has been advocated as an instrument to protect the poor during liberalization, but indexation will hurt poorer groups, given fixed or falling production and a high degree of price response to increases in incomes.

This issue is germane to the current policy debate for several reasons. Each of the countries of the former Soviet Union has undertaken some kind of partial price liberalization. But with the current turn toward more conservative policies, reimposition of price and wage indexation is being considered. We have shown that without a substantial increase in production these moves will not necessarily help the poor and could be detrimental to them. Even in Russia, the liberalization is proceeding in stages, since local governments have retained some price controls despite liberalization at the federal level. We have shown that since the poor received a larger share of their preliberalization incomes as food subsidies and that they paid lower average prices, only a compensation program that is targeted toward the poor will protect their welfare during liberalization.

Our focus on distribution has centered on the welfare of large groups within the Russian Federation, and our numerical simulations have treated a region with the average attributes of the federation. Wide geographic variation in production and income persists in Russia, and distributional weaknesses remain, as signaled by wide price differentials across cities. Our arguments have centered on intraregional changes in distribution, given fixed supplies at the regional level. Addressing the interregional distribution of welfare, and the implications of market integration, is an important separate issue.

Appendix
Base Data for Numerical Simulations

TABLE A1
ANNUAL CONSUMPTION PER PERSON AND CONSUMER PRICES (in Rubles)

	Meat (Kg)	Milk (Liters)	Eggs (Number)	Fish (Kg)	Sugar (Kg)	Oils (Kg)	Potatoes (Kg)	Vegetables (Kg)	Fruit (Kg)	Bread (Kg)
State and cooperative markets:										
Low	31	226	129	6	18	5	61	45	15	95
Middle	56	295	176	14	27	6	71	68	30	87
High	57	253	154	20	23	8	37	43	22	95
Kolkhoz/free market:										
Low	3	25	14	0	0	0	7	5	2	0
Middle	8	42	25	0	0	0	10	10	4	0
High	37	169	103	0	0	0	56	64	32	0
Consumer prices:										
State	7	.65	.26	1.5	2.4	3	1	1	3	1.19
Co-op	14	.65	.27	1.5	3.5	6	1.5	4	6	1.19
Kolkhoz/virtual	25	1.95	.67	1.7	5	12	1.5	5	12	1.19

SOURCES.—Derived from average consumption and price data of Goskomstat and unpublished household budget surveys. Because of anomalies in both original sources, benchmark data shown above reflect adjustments we made.

TABLE A2

ELASTICITIES

	DEMAND FOR									
	Meat	Milk	Eggs	Fish	Sugar	Oils	Potatoes	Vegetables	Fruit	Bread
Price elasticities with respect to price of:*										
Meat	-.5	.02	.06	.02	0	.01	0	0	0	0
Milk	0	-.2	.04	.00	0	0	0	0	-.02	0
Eggs	.05	.05	-.2	.01	0	0	0	0	-.01	0
Fish	0	.01	.01	-.3	0	0	0	0	-.02	0
Sugar	0	0	0	0	-.4	0	0	0	.047	0
Oils	0	.01	0	0	0	-.2	0	0	-.01	0
Potatoes	0	.01	0	0	0	.01	-.1	0	.014	0
Vegetables	0	0	0	0	0	0	0	-.7	.124	0
Fruit	0	0	0	0	-.05	0	0	.1	-.8	0
Bread	0	0	0	0	0	0	0	0	0	-.1
Income elasticities†	.5	.2	.2	.3	.2	.2	.02	.3	.5	.1
Supply shocks (per cent of total supply)	-.15	-.10	-.5	-.10	-.15	-.20	-.10	-.15	-.25	-.1

*Upper-right-hand off-diagonal elements are calculated to ensure symmetry of the Slutsky matrix.

†These elasticities were imposed with reference to estimates for comparator countries and in consultation with analysts at the Center for Economic Analysis and Forecasting, Moscow.

Notes

* This article derives from work of the Food Sector Initiative, conducted jointly by the Russian Federation and the World Bank, with participation of the European Bank for Reconstruction and Development and the Organization for Economic Cooperation and Development (OECD). It draws from parts of that work described in Karen Brooks, with Harold Alderman, Jonathan Morduch, Barry Popkin, and Alan Taylor, "Price Liberalization in the Short-Run: Prices, Protection of the Poor, and Food Aid," Working Paper no. 1 in support of World Bank, *Food and Agricultural Policy Reforms in the Former USSR* (World Bank, Washington, D.C., September 1992). We are grateful to Alan Taylor for his collaboration on the initial modeling exercise and to D. Gale Johnson for helpful comments. We also thank Richard Nordin and Sharon Sheffield for expert research assistance. The views expressed here are ours only.

1. We show below that prices in channels that were least subsidized in the past fall in some simulations.

2. "Full income" refers here to money income plus transfers implicit in subsidies.

3. This holds whether or not there is rationing on the margin. As discussed below, rationing for most goods is inframarginal. When this is not the case, analysis should proceed using virtual prices, rather than observed prices, following J. P. Neary and K. W. S. Roberts, "The Theory of Household Behavior under Rationing," *European Economic Review* 13 (1980): 25-42.

4. A fourth channel is consumption of own-produced goods, but its importance is hard to quantify. Even in urban areas, households often have plots on which they grow potatoes and other vegetables. A fifth channel is purchases from private traders. It is likely that the size of kolkhoz markets and private traders has been underestimated in the official data.

5. *Narodnoe Khoziatstvo RSFSR v 1988: Statisticheskii ezhegodnik* (National economy of the Russian republic in 1988: Statistical yearbook) (Moscow: Finansy i statistika, 1989), p. 116.

6. Because we employ differentiation, the equation holds strictly only for very small changes in prices and income. However, in the empirical section we use an iterative technique based on this formulation to address large changes. Note that we assume that elasticities are equal for both groups; relaxing the assumption will not change the qualitative results for reasonable parameters.

7. It is important to bear in mind that this result derives from the sensitivity of food prices in Russia to changes in nominal incomes and the income shock of subsidy removal. In a small open economy with a more standard inflationary process, wage indexation would not have the same effect.

8. The model is described in greater detail in Jonathan Morduch and Alan Taylor, "A Model of Price Liberalization in Russia," in *The Economics of Transformation*, ed. A. Schipke and A. Taylor (Berlin and New York: Springer, 1994). Simulations were carried out using up to 100 steps, but the results were substantively the same. However, there were clear differences between the one iteration and the 10 iteration cases. The modeling strategy was to develop a flexible model that incorporated some of the important complexities of computable general equilibrium models but that allowed greater transparency and that could be implemented in the operational time frame during which the reform was designed.

9. The food price index is an index of 70 main food prices. The April 1992 money income index includes the release of compensation for savings.