Re-evaluation of Welfare Changes during the Transition in Poland

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Abstract

The costs of shortages and rationing are not captured by standard consumer price indices. Thus the change in real gross domestic product (GDP) per capita is an overestimate of welfare losses in transition economies. In this study virtual prices are used to calculate new cost-of-living indices, making it possible to construct more accurate pre- and postreform welfare comparisons. The results for Poland using virtual prices show a 62 to 84 percent decline in welfare over the transition period 1987 to 1992. This welfare loss is approximately one-third the value obtained using actual prices.

Key Words: Transition economy, Poland, cost-of-living indices.

RE-EVALUATION OF WELFARE CHANGES DURING THE TRANSITION IN POLAND

Introduction

Many Central and Eastern European (CEE) nations transitioned from a centrally planned to a market economy during the early 1990s. Under a centralized economy, as the name suggests, production and distribution were planned. Consumer prices and wages, determined by the central planners, were kept low. Therefore, the resulting resource allocation was highly inefficient and created many distortions throughout the economy. Under the old system many goods, such as housing and food, were rationed. Rationing distorted consumers' behavior because they could not buy the desired quantities at government control prices, given the available supplies. Podkaminer (1982, 1986, 1988) has documented these distortions in relative prices for Poland. Rationing may have led to increased demand for goods that could be purchased freely because consumers spent less than desired on the rationed goods. According to the World Bank, rationing of meat resulted in free market prices three to four times higher than the official prices in state shops in Poland during 1988 and 1989 (Atkinson and Micklewrigth 1992).

During the transition from a centrally planned to a market economy for the CEE nations, the supply and demand for consumption goods changed. The trade barriers were reduced and domestic production changed, resulting in increased variety and availability of goods and services. The opportunity set for consumers after the reform was constrained only by the income and prices. Over the transition, prices rose, relative prices changed (due to removal of prereform distortions and improved terms of trade), and the real incomes for the majority of households fell (Milanovic 1996).

Because of the rationing of important consumer goods and services, estimates of welfare decline using data on reported prices in the Consumer Price Index (CPI) are overestimated. The queuing and rationing under central planning resulted in shadow prices being much larger than reported prices. Hence, there is considerable uncertainty

about exactly how much household welfare has declined over the transition and how different socioeconomic groups have been affected.

This study sheds new light on these issues. Welfare implications of the transition are derived from a model of household consumption that explicitly reflects the effects of rationing. The empirical analysis is conducted for Poland, using quarterly household expenditure data and a complete demand system. Artificially low prices for selected goods and services in the pretransition period created shortages. Virtual prices, the prices at which the consumers would voluntarily choose to consume the ration levels of goods and services, provide a more precise and useful way to calculate the cost-of-living indices and to estimate welfare impacts. Over the period 1987 to 1992, the results show that the decline in real household welfare in Poland was 62 to 84 percent, and this welfare loss was approximately one-third the value obtained using reported prices. These results for Poland appear to be indicative of the welfare implications of the transitions in other CEE nations (Erjavec et al. 1997).

Transition in Poland

Poland was the first country in Central and Eastern Europe to reestablish a market economy. Table 1 presents selected macroeconomic indicators for key years of the Polish transition. The economic and political transformation in Poland commenced at the beginning of 1990. The goals of the first market-determined reform package, often called the Balcerowicz Plan, were macroeconomic stabilization, rapid price liberalization, and sharp reductions of subsidies (Wozniak 1998). The Polish economy rapidly made the transition from relatively tightly controlled prices to nearly no control of prices.[1] The opening of the economy to international competition and the collapse of the Council for Mutual Economic Assistance led to a massive contraction of output and a sharp increase in unemployment. These effects of the reform were of shorter duration and sharper than in neighboring transition economies. Economic growth resumed in 1992 when the economy started to rebound, spurred by the rapid expansion of a private sector that

accounted for 52 percent of GDP in 1994 compared with 18.8 percent of GDP in 1988 (Strong et al. 1996). Economic growth has continued in Poland since 1992.

During the transition the income inequality in Poland increased. Declines in real income[2] have resulted for all centrally planned economies, but the burden of these declines has not been spread equally. Real income fell in the first year after the introduction of the reforms for nearly all of the socioeconomic groups for which information is available. However, it is apparent from examining simple partitions of households that the reform impact varied for different population segments. Table 2 shows the changes in real income (changes in nominal personal incomes deflated by CPI) from 1989 to 1991 for the four different sources—wages, social transfers, farmer income, and other. The main impact during the years following the reform was on wages and farmer income, whereas the incomes from social transfers and other sources actually rose during the period.

Table 1. Selected macroeconomic indicators for Poland, 1989 through 1994

	Unit	1989	1990	1991	1992	1993	1994
GDP (annual change)	%	n.a.	-11.6	-7.0	1.9	4.0	5.0
Real GDP per capita	1990 $US	1824	1633	1506	1538	1590	1670
Unemployment rate	%	n.a.	6.3	11.8	13.6	15.5	16.0
Consumer Price Index (annual change)	%	251.0	586.0	70.0	43.0	37.0	32.2
Exchange rate (annual average)	zl/$	1446	9500	10582	13631	18200	24400
Government budget deficit (% of GDP)	%	-3.0	0.4	-3.8	-6.0	-2.8	-2.7

Sources: GUS (Main Statistical Office 1994) and Strong et al. (1996) pp. 256-61.

Table 2. Annual percentage changes in real incomes by source in Poland 1989 to 1991 (percent)

	1989	1990	1991
Total incomes	+6.0	-14.7	+5.9
Wages	+6.3	-32.3	-6.6
Social transfers	+8.6	-14.3	+29.3
Farms' income	+13.5	-49.9	-18.7
Other incomes	+5.3	+19.2	+16.5

Source: Euromonitor PLC (1994).

Due to increased unemployment compensation and accelerated retirements, social transfers were increasing. Agricultural incomes fell significantly when input subsidies were withdrawn and more liberal import policies established. During the transition the Polish government ended consumer and producer subsidies as well as most agricultural export subsidies. The farmers faced sharply lower real output prices, escalating real input prices, and difficulties marketing their products, mainly due to the loss of external markets within the former Soviet Union and a weak domestic market.

The hardships caused by a large drop in real purchasing power at the beginning of the transition were not experienced uniformly across the whole population. Certain groups with low and fixed nominal incomes—e.g., unemployed and retired people—found themselves in a much worse situation than before. Other households were able to earn good wages in the private sector or become successfully self-employed.

Demand System under Rationing: Estimation

Researchers in the area of quantity rationing have been concerned primarily with how the demands for nonrationed market goods were affected by the rationed levels. Neary and Roberts (1980) extended the work of Tobin and Houthakker (1951) who derived the properties of the demand functions under rationing and compared them with the nonrationed outcomes. Neary and Roberts (1980) used a virtual price framework to characterize consumption demand under rationing. Deaton (1981) presented a technique for generating rationed from nonrationed demands and applied them to an extended version of the Linear Expenditure System (LES) and the Almost Ideal Demand System (AIDS). Deaton's (1981) approach was applied by Wang and Chern (1992) to estimate a complete demand system under rationing for China. Recent work of Hausman (1997) on valuation of new goods estimates the preferences and then uses them to back out the virtual prices.

The virtual price demand system presented below was developed using a modification of the AIDS cost function and draws on the previous work by Deaton and

Muellbauer (1980b). The virtual price form of the AIDS cost function in logarithmic form is:

$$\log C(U, p, p^V) = (1-U) \log[a(p, p^V)] + U \log[b(p, p^V)] \quad (1)$$

where $C(U, p, p^V)$ is the cost function, p is a vector of market prices, p^V is a vector of virtual prices (prices of rationed goods), and U is the utility level. For $a(p, p^V)$ and $b(p, p^V)$ specific functional forms are given that are positive, linearly homogeneous, and concave in prices. Following Deaton and Muellbauer (1980b), a translog flexible functional form is chosen for $a(p, p^V)$ that depends both on market and virtual prices. That is,

$$\begin{aligned}\log a(p, p^V) = {} & \alpha^0 + \Sigma\Sigma_j \alpha_j \log p_j + \Sigma_j \alpha_{Vj} \log p_j^V \\ & + 1/2[\Sigma_i\Sigma_j \gamma_{ij}^* \log p_i \log p_j \\ & + \Sigma_i\Sigma_j \gamma_{ViVj}^* \log p_i^V \log p_j^V \\ & + \Sigma_i\Sigma_j \gamma_{iVj}^* \log p_i \log p_j^V \\ & + \Sigma_i\Sigma_j \gamma_{Vij}^* \log p_i^V \log p_j]. \end{aligned} \quad (2)$$

Compared with the standard AIDS model, the linear portion here contains an extra term, $3_j \alpha_{Vj} \log p_j^V$, involving virtual prices, and the quadratic part includes extra cross-product terms. The function $b(p, p^V)$ is defined as

$$\log b(p, p^V) = \log a(p, p^V) + \Pi p_j^{\beta j} \Pi p_j^{V \beta j V} \ . \quad (3)$$

Substituting the expressions for $a(p, p^V)$ and $b(p, p^V)$ into the cost function (1) leads to virtual budget shares obtained by using Shephard's lemma, $M\log C/M\log p_i = w_i$. These shares are functions of virtual prices, market prices, and the utility level. Substituting for the unobserved utility level from the cost function into the virtual share equations we obtain,

$$w_i *_{pV} = \alpha_i + \Sigma_j \gamma_{ij} \log p_j + \Sigma_j \gamma_{iVj} \log p_j^V + \beta_i \log [I^V/a(p, p^V)], \quad (4)$$

where I^V is the virtual total expenditure, $\gamma_{ij} = 1/2(\gamma_{ij}^* + \gamma_{ji}^*)$, and $\gamma_{iVj} = 1/2(\gamma_{ViVj}^* + \gamma_{VjVi}^*)$. When the price index $\log a(p, p^V)$ is replaced by the Stone index $\log P(p, p^V) = \Sigma_i w_i \log p_i + \Sigma_j w_j \log p_j^V$, the virtual share equations become linear,

$$w_i *_{pV} = \alpha_i + \Sigma_j \gamma_{ij} \log p_j + \Sigma_j \gamma_{iVj} \log p_j^V + \beta_i \log [I^V/ P(p, p^V)]. \quad (5)$$

The restrictions on the parameters assuming the theoretical properties for utility maximization are homogeneity $\Sigma_j\gamma_{ij}+\Sigma_j\gamma_{iVj} = 0$ for $\forall i$; symmetry $\gamma_{ij} = \gamma_{ji}$ and $\gamma_{iVj} = \gamma_{jVi}$; and the adding up conditions are $\Sigma_i\alpha_i = 1$, $\Sigma_i\gamma_{ij}+\Sigma_i\gamma_{iVj} = 0$ for $\forall j$, and $\Sigma_i\beta_i = 0$.

For the analysis of the transition in Poland, the virtual price demand system was estimated for the prereform period, and the standard AIDS model was estimated for the postreform period. The final specification of the equations for estimating of the AIDS with virtual prices is,

$$w_{it}*_{pV} = \alpha_{io} + \Sigma_s \delta_{is} D_{st} + \Sigma_j\gamma_{ij} \log p_{jt} + \Sigma_j\gamma_{iVj} \log p_{jt}^{V} + \beta_i \log[I_t^{V}/P(p_t, p_t^{V})] + u_{it,} \quad (6)$$

where D_s represents qualitative demographic variables, i = 1, ..., n goods, and t = 1, ..., T observations. The final specification for estimating of the standard AIDS is,

$$w_{it} = \alpha_{io}^{\sim} + \Sigma_s \delta_{is}^{\sim} D_{st} + \Sigma_j \gamma_{ij}^{\sim} \log p_{jt} + \beta_i^{\sim} \log (I_t/P_t) + u_{it}^{\sim}. \quad (7)$$

If the additive disturbance terms u_{it} and $u_{it}^{\sim}$ in equations (6) and (7) satisfy the usual stochastic assumptions (the errors are independently and identically distributed with zero mean and constant variance), ordinary least squares (OLS) can be applied to estimate the expenditure share equations. But if the errors are contemporaneously correlated across equations, then the generalized least squares procedure is used to gain an asymptotic efficiency. The widely used estimator for sets of expenditure share equations is the Seemingly Unrelated Regressions (SUR). The SUR method results in consistent and asymptotically more efficient parameter estimates and is asymptotically equivalent to the maximum likelihood estimation (Barten 1969). The latter results are invariant to the equation dropped or residually computed to accommodate the singularity of the error covariance matrix. The share equation for "other goods" was dropped and its parameters were recovered using the adding up restrictions. A special feature of the SUR procedure is that if there are cross-equation restrictions as suggested by economic theory (e.g., Symmetry), the SUR procedure is more efficient than OLS.

Virtual Prices and Cost-of-Living Indices

Calculating the virtual prices is critical to the results of the analysis. The size and evolution of the virtual prices will show the economic impacts of rationing. It is difficult,

of course, to estimate the virtual prices of rationed goods. To calculate the individual virtual prices we need exact information on prices and quantities. But the data set does not contain information on the quantities (quantities of rationed goods), it only contains data on actual expenditures. Therefore, this limits the approaches we can apply; hence, we used the instrumental variable approach or proxy variable approach to construct the virtual prices of rationed goods. A practical approach was taken for this analysis, arguing that the prices in Germany provided a good measure of nonrationed prices of goods consumed in Poland. The two countries are geographically close, and Germany is a major trading partner. The unregulated prices in Poland and Germany moved together during the period 1987 to 1989. For example, we found a high positive correlation between the relative prices of clothing (a nonrationed good) in Germany and Poland. If the prices move together, the markets are not segmented. The standard models of international goods markets apply when the markets are integrated (Mundlak and Larson 1992). Also, for 1993 to 1998, we compared prices of some food items in Germany and Poland and found a high positive correlation between the relative prices of sugar, milk, and bread.[3] The quality differences due to the higher incomes in Germany were assumed to be eliminated by the use of relative prices. Given these assumptions and choices, the basic issue was to construct an estimate of how much the relative prices of rationed goods were distorted in Poland.

Food, alcohol, clothing and footwear, housing**,** electricity and gas, communications, and transportation were goods consumed both in Poland and Germany. The Polish goods were divided into two groups. In group I, we placed the rationed goods—food and housing. In group II, we placed the nonrationed goods—alcohol, clothing and footwear, electricity and gas, communications, and transportation. To derive the relative price effect of rationing on food we computed

$$\ln RP_F = \ln[(p_F^G/p_{OG}^G)/(p_F^P/p_{OG}^P)], \tag{8}$$

where p_F^G/p_{OG}^G and p_F^P/p_{OG}^P are the relative price of food with respect to the other goods for Germany and Poland, respectively. $\ln RP^F$ is the proportional increase in the relative

price of food in Germany compared with Poland. *The virtual food price in Poland was then defined to be (1 + $lnRP^F$) multiplied by the actual Polish food price.*

The relative price for housing was computed using the same procedure,

$$\ln RP_H = \ln[(p_H^G/p_{OG}^G)/(p_H^P/p_{OG}^P)], \quad (9)$$

where p_H^G/p_{OG}^G and p_H^P/p_{OG}^P are the relative price of housing with respect to the other goods in Germany and Poland, respectively. *The virtual housing price in Poland was then defined to be (1 + $lnRP^H$) multiplied by the actual Polish housing price index.*[4]

Cost-of-living indices are calculated using the estimated parameters from the complete demand system. The cost-of-living index measures computed were the relative costs of reaching a given standard of living for the two different regimes, the pre- and postreform years. The most commonly used measure of cost-of-living is the CPI, which is essentially a Laspeyres price index: $L(p^1, p^0)=3p_1x_0/3p_0x_0=3p_1x_0/I_0$, where p_0 and p_1 are the prices under the two different regimes, and x_0 is the quantity for the base regime. The Laspeyres price index gives an upward biased estimate of the cost-of-living because, in keeping constant weights for the base period basket of goods, it does not account for substitution among commodities due to relative price changes (Deaton and Muellbauer 1980a). In short, the CPI is a relatively crude instrument for measuring the impact of inflation on individual welfare.

The true cost-of-living index more completely invokes the theory of consumer demand. It is the ratio of the minimum expenditures, under two different price regimes, necessary to maintain a constant utility level as opposed to a constant basket of goods as in the Laspeyres price index. The base-weighted true cost-of-living index from the cost function (1) can be written as,

$$\log P(p^0, p^1, U^0) = (1-U^0) \log [a(p^1)/ a(p^0)] + U^0 \log[b(p^1)/ b(p^0)], \quad (10)$$

where U^0, the base utility level is equal to $\log [I^{V0}/a(p^0)]/\log [b(p^0)/a(p^0)]$, p^0 is a vector of market and virtual prices at the base period, and I^{V0} is the virtual income for the base period. As previously indicated, the base period was defined to represent the prereform years. Using the estimated parameters from the virtual AIDS model[5] we can calculate the indirect utilities from the functional forms in equation (2) and (3) and, finally, the virtual

cost-of-living indices from equation (10). The cost-of-living indices show the impacts of price liberalization on households' welfare in transition economy. Using the cost-of-living indices calculated for available sample partitions, the impacts of price changes on households with different demographic characteristics can be estimated.

With the estimated coefficients from the virtual AIDS before the reform and AIDS after the reform[6] we can calculate indirect utilities both before and after the reform. The compensating variations (CV) given by the differences in cost function or $CV = C(p^1, U^0) - C(p^0, U^0)$ for each household can be evaluated directly.[7] Positive differences indicate that the household experienced a welfare loss as a result of the price liberalization. Finally, the change in real total income/expenditure can be used to show the total welfare change during the transition in the Polish economy.

Data and Empirical Results

Data

The data for the analysis of the Polish transition are a subsample from the original Polish Household Budget Survey conducted by the Social and Demographic Statistics Division of the Central Statistical Office of Poland (GUS) during the years 1987 to 1992. The survey is part of a long series of annual household budget surveys in Poland, consisting of both cross-sectional and panel data. The survey provides extensive information on household size, household composition, age, gender, occupational status of household members, sources of income, and expenditure patterns. The survey is conducted quarterly, but each household is surveyed only once per year (Gorecki and Peczkowski 1992). The expenditure data are quarterly. Detailed information on the survey data is given in Adam (1993).

For the present analysis the survey data from 1987, 1988, and 1989 were classified as the "prereform" period (18,682 observations), and data from 1990, 1991, and 1992 were classified as the "postreform" period (14,303 observations). A limitation of the data is the fact that the sample was not fully representative of the population; specifically, the sample was designed to represent the population of non-privately employed individuals.

Information on entrepreneurs was not available from this survey—all individuals who privately owned a business or who were nonagriculturally self-employed were removed from the sample.

In the application of the AIDS, the dependent variables are the budgeted shares for the six expenditure groups:

- food (including the value of self-consumption);
- alcohol and tobacco;
- clothing and footwear;
- housing (actual implicit rental);
- fuel, electricity, communications, (i.e., household utilities), and transportation; and
- other.

Expenditure covers household spending on all consumption goods and services. In the prereform demand model, food and housing are assumed the rationed goods. The independent variables for the AIDS model are logarithms of prices (virtual prices for the rationed goods and actual prices for nonrationed goods) and total household expenditure.

The main source for the prices of different commodities and services in Poland was the Polish Statistical Yearbook 1993 and 1994, published by the Central Statistical Office of Poland (GUS 1993, 1994). The GUS recorded regional price variation for food items before and after the reform. The main source for German prices of goods and services was the German Statistical Yearbook 1991 and 1992 (Statistisches Bundesamt 1991, 1992). We used the available information on the shares of different food items and other goods and services in the survey of total expenditures taken from *Understanding Poverty in Poland* (World Bank 1995, Table A 2.3, p.154, *Expenditure Categories for Price Index* [percent] for 1993). Regional price indices were constructed for food using the available price information for the following food items—bread, pork, milk, and sugar.[8] All price indices are 100 at the end of 1990 (4 quarters). Quarterly price indices were constructed using the data on quarterly inflation rates in Poland for 1987 to 1992, obtained from the GUS.

Empirical Results

A main goal of the estimation of the Polish household demand system was to determine how much the households were better- or worse-off as a result of the transformation from the centrally planned to the market economy. With the estimated coefficients from the virtual AIDS before the reform and the standard AIDS after the reform we can calculate the compensating variations for each household in the final quarter, the fourth quarter of 1992. The base period was the fourth quarter of 1987. We calculated indirect utilities for the period before the reform. Compensating variation is the transfer necessary to compensate a household for the price changes, while holding utility constant. The calculated *compensating variations were positive for every family*, indicating that each household type experienced a welfare loss at the given utility as a result of the price liberalization. To illustrate these changes we have plotted the compensating variations for each household in Figure 1. Specifically, the welfare losses in millions of zlotys per quarter were plotted against the total expenditures of the households. All households had positive welfare losses at the given utility, and these losses increased with total expenditures. Figure 1 shows that in general the highest-spending households had the largest estimated compensating variation measure of welfare losses.

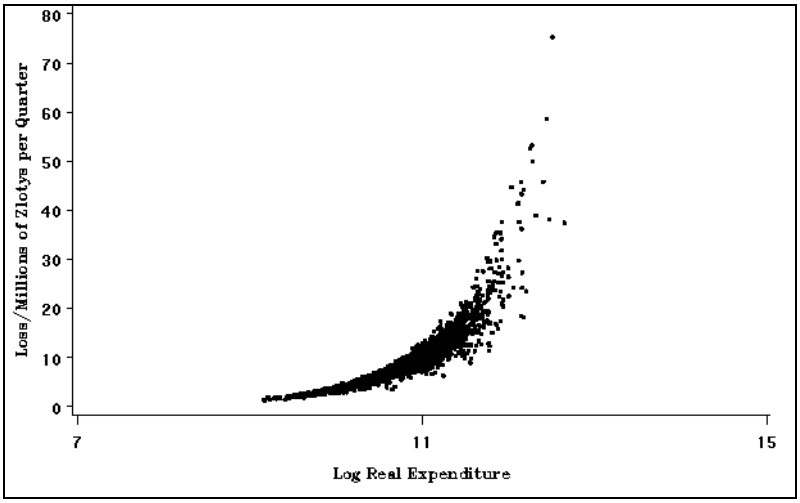

FIGURE 1. Estimated Welfare Loss due to Price Liberalization, Based on Measured Compensating Variation.

Using the estimated coefficients from the virtual prices AIDS before the reform and AIDS after the reform, the cost-of-living indices from equation (10) are calculated for seven different household groups. The resulting index numbers using the 1987 utility level as a base and expressed as annual rates of growth are shown in Table 3. This cost-of-living index increases over the period 1987 to 1992, reaching 3.034 in 1992 for families without children and 3.069 for families with four or more children. Although the cost-of-living index increases over time at a similar rate for all seven household groups, it increases the most for families with four or more children and the least for families without children.

Tables 4 and 5 show the cost-of-living indices for the seven household types and two different expenditure levels. The households were divided into two groups—one group with total expenditure less than the mean expenditure in 1987 and the other group with total expenditure greater than the mean expenditure. The virtual cost-of-living index increases faster for those households with expenditures greater than the mean expenditure for 1987 than for those households having expenditures lower than the mean expenditure. The estimates range between 3.011 and 3.041 for the "poorer" households and between 3.071 and 3.079 for the "richer" households. In the group of "poorer" households, the highest index value was for families with four or more children and the lowest index was for "other" families. In the group of "richer" households, the highest and lowest index values were for families with four or more children, and single parent with one or more children, respectively. The largest effects of price changes among both the poorer and richer households were for families with four or more children.

Table 3. Virtual cost-of-living indices for seven household groups

Year	Families w/o children	Families with 1 child	Families with 2 children	Families with 3 children	Families 4, more children	Single Parent w/children	Other
1988	0.669	0.675	0.677	0.677	0.680	0.669	0.670
1989	1.929	1.928	1.927	1.927	1.926	1.929	1.929
1990	2.144	2.155	2.158	2.159	2.163	2.145	2.147
1991	2.682	2.702	2.708	2.709	2.718	2.684	2.687
1992	3.034	3.054	3.059	3.061	3.069	3.035	3.039
Number families	543	320	435	151	66	101	1063

Table 4. Virtual cost-of-living indices for seven household groups and total expenditure less than the mean total expenditure

Year	Families w/o children	Families with 1 child	Families with 2 children	Families with 3 children	Families 4, more children	Single Parent w/children	Other
1988	0.665	0.669	0.670	0.670	0.671	0.665	0.661
1989	1.931	1.929	1.929	1.929	1.929	1.931	1.932
1990	2.138	2.145	2.147	2.149	2.148	2.138	2.131
1991	2.671	2.683	2.688	2.687	2.689	2.671	2.659
1992	3.023	3.035	3.039	3.039	3.041	3.023	3.011
Number families	416	165	186	62	16	75	618

Table 5. Virtual cost-of-living indices for seven household groups and total expenditure greater than the mean total expenditure

Year	Families w/o children	Families with 1 child	Families with 2 children	Families with 3 children	Families 4, more children	Single Parent w/children	Other
1988	0.681	0.682	0.682	0.682	0.683	0.681	0.682
1989	1.926	1.926	1.926	1.925	1.925	1.926	1.925
1990	2.165	2.166	2.166	2.167	2.168	2.164	2.168
1991	2.720	2.723	2.723	2.725	2.727	2.720	2.726
1992	3.072	3.074	3.074	3.076	3.079	3.071	3.077
Number families	127	155	249	89	50	26	445

The total welfare loss for different family groups was computed and reported in Table 6. We draw two calculations for comparison, one allowing for rationing and a second ignoring rationing. The welfare losses increased with the number of children in the family. The highest losses of 12.92 million zlotys per quarter were for the families with four or more children. The lowest welfare losses, 7.21 million zlotys per quarter, were for the single parents with children. However, to know whether the household is better- or worse-off after the reform, we need to know how much the income changed. Table 6 shows this as the estimated virtual expenditure change. For the case that ignores rationing this is the actual expenditure change. Finally, the ratio of total welfare loss to the 1987 real total expenditures was computed for all household groups. The group most affected by the economic reform in Poland was families with three children. This group had a total welfare loss of 15.04 million zlotys, or 84 percent of the 1987 average income.

The least-affected group was single parents with one or more children. This group had a total welfare loss of 6.74 million zlotys, or 62 percent of the 1987 average income.

Next, we compare the welfare loss over the period 1987 to 1992. The loss was three to four times higher when ignoring rationing than when allowing for it. In particular, the total welfare losses were between 27.58 million zlotys and 48.07 million zlotys when we did not consider rationing effects versus between 6.74 million zlotys and 15.04 million zlotys when we allowed for rationing. The virtual prices were much larger than the actual or reported prices for the rationed goods during the prereform period. The actual prices for rationed goods increased much more than the virtual prices with the reform. Therefore, using the CPI overestimated the welfare loss during the transition. The results for Poland showed a *62 to 84 percent decline in real household welfare*, which was approximately *one-third the value obtained using the actual prices*.

Table 7 presents the welfare losses for households with different income sources (worker, farmer, worker-farmer, and pensioner), for small versus large families,[9] and for young versus old people.[10] The compensating variation indicates that the welfare loss was the largest for the worker-farmer group (13.11 million zlotys), and the smallest for pensioners (6.24 million zlotys). The loss was larger for the large families (13.09 million zlotys) than the small families (8.88 million zlotys), and for the younger people (10.55 million zlotys) than for the older people (6.35 million zlotys). The total welfare loss was the greatest for three groups:

1) for farmers—13.26 million zlotys, 78 percent of their real total expenditure in 1987;
2) for large families—14.57 million zlotys, 77 percent of their real total expenditure in 1987; and
3) for young people—11.53 million zlotys, 75 percent of their real total expenditure in 1987.

Thus, those most affected by the reforms were farmers, larger families, and younger people.

Table 6. Welfare losses and household group (in million zlotys)

Variable	Families w/o children	Families with 1 child	Families with 2 children	Families with 3 children	Families 4, more children	Single Parent w/children	Other
Loss With Rationing Effects							
Compensating Variation	8.04	10.47	11.14	12.37	12.92	7.21	9.11
Virtual expenditure change[a]	-0.64	-0.58	-0.14	-2.67	-0.43	0.47	-1.39
Total loss[b]	-8.68	-11.05	-11.28	-15.04	-13.35	-6.74	-10.50
Virtual real total expenditure in 1987	11.92	15.30	16.24	17.89	18.65	10.79	13.34
Relative loss[c]	0.73	0.72	0.69	0.84	0.72	0.62	0.79
Loss Without Rationing Effects							
Compensating Variation	26.82	36.42	38.72	41.29	41.18	25.32	30.47
Expenditure change[d]	-3.21	-4.78	-4.58	-6.78	-3.72	-2.24	-4.4
Total loss[e]	-30.02	-41.20	-43.30	-48.07	-44.90	-27.58	-34.87
Relative loss[f]	2.07	2.11	2.09	2.19	2.05	2.04	2.13

Notes: [a]Mean real expenditure of the family group in 1992 less mean virtual real total expenditure for the family group in 1987 at 1992 prices.
[b]Total measured loss = - CV + change in virtual real total expenditure at 1992 prices.
[c]Total welfare loss relative to virtual real total expenditures in 1987 at 1992 prices.
[d]Mean real expenditures of the family group in 1992 less mean real expenditures of family group in 1987 at 1992 prices.
[e]Total measured loss = - CV + change in real total expenditure at 1992 prices.
[f]Total welfare loss relative to real total expenditures in 1987 at 1992 prices.

Table 7. Welfare losses by demographic characteristics and income sources (in million zlotys)

Variable	Worker	Farmer	Worker farmer	Pensioner	Small Family	Large Family	Old People	Young People
Loss With Rationing								
Compensating Variation	10.27	11.70	13.11	6.24	8.88	13.09	6.35	10.55
Virtual expenditure change[a]	0.17	-1.56	0.05	-0.20	-0.93	-1.48	-0.50	-0.98
Total loss[b]	-10.10	-13.26	-13.06	-6.44	-9.81	-14.57	-6.85	-11.53
Virtual real total expenditure in 1987	15.03	16.92	18.86	9.36	13.07	18.88	9.52	15.39
Relative loss[c]	0.67	0.78	0.69	0.69	0.75	0.77	0.72	0.75

Notes: [a]-Mean real expenditure of group in 1992 less mean virtual real total expenditure of group in 1987 at 1992 prices.
[b]- Total measured loss = - CV + change in virtual real total expenditure at 1992 prices.
[c]- Total welfare loss relative to virtual real total expenditures in 1987 at 1992 prices.

Conclusions

Poland was the first country in Eastern Europe to reestablish a market economy. The new government introduced a number of dramatic economic reforms, including eliminating most of a large state sector, ending the state control of prices, and liberalizing trade. These economic reforms affected the availability of goods, commodity prices, and family incomes, implying changing consumption patterns and total expenditures. As subsidies were withdrawn, prices rose rapidly and the Polish living standard declined.

Estimates from a virtual AIDS model were used to calculate cost-of-living indices for the prereform period and to make pre- and postreform comparisons. The cost-of-living index was increasing over time (by a similar rate for all seven of the household groups identified for comparison), but it increased the most for families with four or more children and the least for single parents with children. The compensating variation measures of welfare changes associated with reform were then estimated. The largest estimates were for the prereform highest-spending households, and the values were large

for most households. The cost-of-living index increased faster for the richer households (having expenditures larger than mean expenditures in 1987) than for the poorer households (having less than mean expenditure in 1987), and for families with four or more children.

Accurately assessing the effects of the transition to the market economy for Poland requires careful analysis of consumption patterns, total expenditure, rationing, and prices. The virtual prices were much larger than the actual or reported prices for the rationed goods during the prereform period. Most evaluations of the welfare impacts of the reform have ignored the impacts of rationing both for Poland and for the other transition economies. More fully reflecting rationing and incorporating the effects of rationing before the reform yielded estimates of welfare loss that were orders of magnitude lower than those commonly reported.

The GDP in real terms divided by the population greatly overestimated the welfare loss for Poland and probably for the other transition economies, too. Specifically, the welfare loss estimates using this simple method exaggerated by three to four times the changes in the true cost-of-living. Perhaps this is why the transitions in Poland and other CEE economies occurred relatively peacefully. The populations were actually much better off than was known or understood by those who used crude measures to chronicle the reforms. Incorporating the effects of consumer rationing not only improves our understanding of transition processes, but also provides results that can improve the basis for targeting compensation packages.

Endnotes

1. Prices of a few items such as coal, fuel, and rental housing still remained under price control but periodic increases were permitted (Shen 1992).

2. These changes in real income have been estimated by crude proxies, usually GDP deflated by CPI.

3. With the available prices for some food items in Germany and Poland we created relative prices of pork and bread with respect to the price of sugar for 1990 to 1994, and relative prices of milk and sugar with respect to the price of butter for 1993, 1994, 1996, and 1998. We found a large positive correlation between the relative prices of milk in Germany and Poland (the correlation coefficient is 0.684), between the relative prices of bread (the correlation coefficient is 0.683), and between the relative prices of sugar (the correlation coefficient is 0.963). A positive but smaller correlation existed for the relative price of pork (the correlation coefficient is 0.16).

4. From equations (8) and (9) we found how much higher the relative price of food and housing was in Germany than in Poland. The resulting ratios for food were 4.85, 5, and 4.56 for 1987, 1988, and 1989; for housing the ratios were 6.01, 6.87, and 6.52 for 1987, 1988, and 1989. These ratios were comparable to other anecdotal evidence. According to a World Bank study for Poland, the rationing of meat was associated with free market prices of three to four times higher than the official prices in state shops for 1988 and 1989 (Atkinson and Micklewrigth 1992).

5. The parameter estimates and their t statistics are presented in Appendix Table 3, and the own price and income elasticities are reported in Appendix Table 4.

6. The parameter estimates and their t statistics are presented in Appendix Table 1, and the own price and income elasticities are reported in Appendix Table 2.

7. See Banks et al. (1997) for the similar procedure.

8. From a World Bank study of Poland (1995) it was evident that bread, pork, milk, and sugar are the most important food items in terms of budget shares. Specifically, the expenditure shares in 1993 were bread, 33 percent; pork, 33 percent; milk, 17 percent; and sugar, 17 percent.

9. The large family group included more than four members.

10. The group of older people included heads of households who were older than 60 years of age.

Appendix

Table 1. Demand system parameter estimates and t-ratios: AIDS with virtual prices

Variables	Food	Alcohol	Clothing	Housing	Fuel
Constant	1.902	-0.025	-0.215	-0.292	-0.019
	(71.53)	(-3.16)	(-11.15)	(-7.25)	(-0.96)
Food price	0.160	0.005	-0.025	-0.160	-0.030
	(16.03)	(3.47)	(-6.22)	(-14.67)	(-8.74)
Alcohol price	0.005	-0.011	0.015	-0.006	0.036
	(3.47)	(-1.11)	(1.40)	(-1.84)	(6.71)
Clothing price	-0.025	0.015	-0.045	0.086	-0.022
	(-6.22)	(1.40)	(-3.46)	(10.69)	(-2.91)
Housing price	-0.160	-0.006	0.086	-0.038	0.006
	(-14.67)	(-1.84)	(10.69)	(-2.24)	(0.72)
Fuel price	-0.030	0.036	-0.022	0.006	0.027
	(-8.74)	(6.71)	(-2.91)	(0.72)	(2.16)
ln(expenditure)	-0.125	0.003	0.015	0.089	0.007
	(-59.66)	(13.85)	(23.90)	(38.53)	(13.92)
Adult equivalents	0.043	-0.002	-0.003	-0.003	-0.003
	(32.31)	(-11.42)	(-7.87)	(-10.26)	(-10.26)
Age	0.003	-4E-05	-6E-05	-0.003	-9E-05
	(7.68)	(-0.97)	(-0.53)	(-6.74)	(-1.01)
Age squared	-3E-05	-1E-06	-2E-06	3E-05	2E-06
	(-6.71)	(-3.17)	(-1.89)	(-6.74)	(2.54)
Education	0.009	0.001	-2E-04	-0.005	-0.001
	(16.84)	(12.59)	(-1.30)	(-8.57)	(-7.23)

Notes: All prices are in logarithms. Parameter for "other" group not reported.

Table 2. Estimated demand elasticities and standard errors before the reforms with virtual prices[a]

Group[b]	Hicks own price elasticity	Income elasticity
Food	-0.08 (0.01)	0.82 (0.003)
Alcohol	-1.90 (0.82)	1.26 (0.019)
Clothing	-1.97 (0.29)	1.33 (0.014)
Housing	-1.03 (0.09)	1.49 (0.013)
Fuel	-0.01 (0.46)	1.28 (0.020)

Notes: [a]Figures in parentheses are the estimated standard errors of elasticities.
[b]Alcohol includes tobacco. Clothing includes footwear. Fuel includes electricity, transportation, and communications.

Table 3. Demand system parameter estimates and t-ratios: AIDS after the reforms

Variables	Food	Alcohol	Clothing	Housing	Fuel
Constant	2.031	-0.034	-0.203	-0.229	0.031
	(75.56)	(-4.38)	(-15.77)	(-11.59)	(1.63)
Food price	0.111	-0.010	-0.054	-0.009	-0.091
	(9.27)	(-2.24)	(-6.94)	(-0.92)	(-18.21)
Alcohol price	-0.010	-0.021	0.032	0.009	-0.005
	(-2.24)	(-1.96)	(2.33)	(0.78)	(0.84)
Clothing price	-0.054	0.032	-0.154	0.110	-0.012
	(-6.94)	(2.33)	(-3.94)	(6.19)	(0.80)
Housing price	-0.009	0.009	0.110	0.060	-0.020
	(-0.92)	(0.78)	(6.19)	(-2.40)	(-2.23)
Fuel price	-0.091	-0.005	-0.012	-0.020	0.092
	(-18.21)	(0.84)	(0.80)	(-2.23)	(13.13)
ln(expenditure)	-0.165	0.006	0.028	0.038	0.011
	(-67.34)	(8.47)	(23.90)	(20.89)	(6.52)
Adult equivalents	0.066	-0.003	-0.002	-0.019	-0.009
	(45.41)	(-8.19)	(-15.77)	(-17.93)	(-8.52)
Age	0.003	4E-04	-2-04	-0.001	-0.001
	(6.91)	(3.30)	(-0.83)	(-4.90)	(-3.12)
Age squared	-2E-05	-8E-06	-1E-06	1E-05	1E-05
	(-5.81)	(-7.30)	(-0.71)	(4.74)	(4.89)
Education	0.013	0.002	4E-04	-0.002	-0.004
	(-18.21)	(12.65)	(1.39)	(-5.55)	(-10.25)

Notes: All prices are in logarithms. Parameter for "other" group not reported.

Table 4. Estimated demand elasticities after the reforms[a]

Group[b]	Hicks own price elasticity	Income elasticity
Food	-0.27 (0.02)	0.68 (0.004)
Alcohol	-1.67 (0.36)	1.20 (0.008)
Clothing	-2.85 (0.49)	1.35 (0.008)
Housing	-1.57 (0.28)	1.42 (0.026)
Fuel	-0.28 (0.05)	1.09 (0.004)

Notes: [a]Figures in parentheses are the estimated standard errors of elasticities.
[b]Alcohol includes tobacco. Clothing includes footwear. Fuel includes electricity, transportation, and communications.

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