

EQUITY-EFFICIENCY PREFERENCES IN POLAND AND
THE SOVIET UNION:
ORDER-REVERSALS UNDER THE ATKINSON INDEX

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In this paper, the relation between inequality and welfare index "reversals" is characterized. By the identification of these reversals, upper and lower bounds are established for Atkinson's parameter of inequality aversion. This exercise shows that a level of inequality aversion high enough to show welfare improving over the "egalitarian decline" of 1978-81 in Poland is too high to show improvement over the "elitist growth" of 1981-86 in the Soviet Union. However, even if the lower bound of inequality aversion is assumed, plausible projections on Soviet growth and distribution still show social welfare declining.

INTRODUCTION

Many political-economic studies on the Soviet and East European reforms stress the critical "tradeoffs" between efficiency and equity. See, for example, *Reforming the Soviet Economy; Equality versus Efficiency* by Hewett (1988) or "Gorbachev's Social Contract" by Hauslhoner (1987). However, no one has tried to estimate the quantitative terms at which this tradeoff occurs, perhaps because equity preference seems hopelessly subjective.

However, just as stock brokers ask clients to choose among portfolios to estimate the terms of their yield-security tradeoff, so does economic history sometimes offer sequential outcomes which imply bounds on a group's efficiency-equity tradeoff—if there was a consensus ranking those outcomes. Either type of ordering can be parameterized by essentially the same revealed preference exercise if one uses Atkinson's (1970) measure of inequality aversion or its ancestor, the Arrow-Pratt measure of risk aversion.

This paper is organized as follows. The first part characterizes the relation between preference dependent order-reversals by inequality and welfare indexes. The second part presents data on Soviet and Polish welfare order reversals and uses them to place bounds on the level of equity preference. In the third part, these bounds allow projections on minimal necessary growth to make the trend of Soviet inequality acceptable. The fourth and final part notes conclusions and extensions of method. An appendix describes data limitations and operative assumptions.

I. THE ATKINSON INDEX AND THE "EQUALITY" WAGE

Atkinson assumes a Social Welfare Function (SWF) that weights the utilities of different income levels i by their proportion of total population, π^i , and where

the income elasticity of marginal utility, ε , is constant. Atkinson refers to ε as the *degree of inequality aversion*; its bounds are $0 \leq \varepsilon \leq \infty^+$. Then the “equally distributed equivalent” or *equality wage* for ε , $W^E[\varepsilon]$, is

$$(1) \quad w^E[\varepsilon] = \left[\sum_{i=1}^n \pi^i (w^i)^{1-\varepsilon} \right]^{1/(1-\varepsilon)}; \quad \varepsilon \neq 1$$

$$w^E[\varepsilon] = \exp \left[\sum_{i=1}^n \pi^i \ln(w^i) \right]; \quad \varepsilon = 1.$$

Since Atkinson was concerned with mean-independent comparisons between countries like India and Great Britain, it was the inequality index $I \equiv 1 - w^E/\bar{w}$; where $\bar{w} \equiv \sum_{i=1}^n \pi^i (w^i)$, that was most important to him, and not the “equality wage” w^E itself. Most of the subsequent uses of the Atkinson index have followed this application. However, within a given country, a change in the equality wage allows us to place bounds on the level of ε , if there is a consensus that welfare between two periods has gone up or down.

In order to specify these bounds on ε , the ordering of welfare levels given by (1) must be reversible by changes in ε . Define $w_p^E(\varepsilon)$ as the equality wage in period p , given ε . A *welfare order-reversal* is defined as any two periods where

$$\bar{w}_2 > \bar{w}_1 \quad \text{and} \quad w_2^E[\varepsilon'] > w_1^E[\varepsilon'] \quad \forall \varepsilon' < \bar{\varepsilon},$$

but

$$w_2^E[\varepsilon''] \leq w_1^E[\varepsilon''] \quad \text{as} \quad \varepsilon'' \geq \bar{\varepsilon}.$$

It is well-known (see Theorem 2 below) that such welfare order-reversals for concave monotonic SWFs can only occur under either *progressive transfers* with *leakages* or, *regressive transfers* with *growth*. A *progressive transfer* is defined as having occurred from period 1 to 2 if, for all income groups i at or below some lower level L , total income has not fallen for any and has risen for at least one:

$$w_i^1 \leq w_i^2 \quad \forall i \leq L < n, \quad \text{and} \quad \exists i' \leq L \quad \text{s.t.} \quad w_{i'}^1 < w_{i'}^2,$$

while for all groups $j > L$, the above inequalities are reversed. Such a transfer will show *leakages* if $\bar{w}_1 > \bar{w}_2$. A progressive transfer with leakages becomes a *regressive transfer with growth* if these period subscripts 1 and 2 are transposed.

To see these transfers in graphic terms, consider transfers between income groups 1 and 2, with $w^1 \leq w^2$. Total differentiation of (1), with $dw^E = 0$, yields

$$(2) \quad \frac{dw^1}{dw^2} \Big|_{w^E} \equiv \frac{U'(w^2)}{U'(w^1)} = - \frac{(w^1/w^2)^\varepsilon}{\pi^1/\pi^2}.$$

Thus the realization of period 1 for income levels 1 and 2 is shown in the following figure as (w_1^1, w_1^2) .

Here social indifference curves are drawn on polar assumptions $\varepsilon = 0$ and $\varepsilon = \infty^+$. Equation (2) allows us to calculate the *rate of marginal income substitution* between two groups along an indifference curve: their population-weighted income ratio raised to the power of ε .

This slope of the indifference curve in Figure 1 has the useful interpretation of the minimum acceptable rate of *after-leakage effective transfer* from the richer

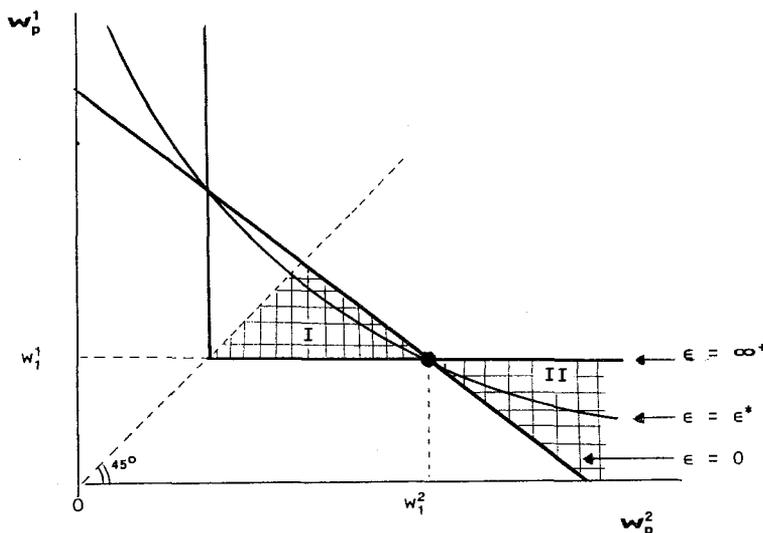


Figure 1. Conditions for Welfare Order-Reversal. Movement from a first period (w_1^1, w_1^1) to any second period outcome (w_2^1, w_2^2) within the cross-hatched area I would represent a progressive transfer with leakage; any outcome within area II would be a regressive transfer with growth. For a second period outcome in area I or II, the indifference level ϵ^* defining a contour through both the first period and second period's outcomes can then be calculated.

group 2 to the poorer group 1, or, as its inverse, the minimum acceptable rate of *after-growth effective transfer* from the poorer group 1 to the richer group 2. Atkinson used levels of ϵ between 1 and 2.5 in the international comparisons of his original paper, and this has been the range of ϵ used in most subsequent applications. However, it is not clear that such values actually correspond to common individual preferences.

Consider Okun's famous "leaky bucket" thought-experiment (pp. 91-95, 1975). He says that he would find the transfer of money from families in the top 5 percent to those in the bottom 20 percent of the American income distribution socially improving, even if only 40 percent of this income were to be effectively transferred, net of leaks. In terms of equation (2), since the income ratio of these groups is $w^1/w^2 = 1/9$, if $\epsilon = 1$ then any effective transfer of more than $1/9$ would be welfare improving! Okun's experiment implies an ϵ of only 0.42.

Recall that the ordinary *Lorenz Curve* is the mapping from the cumulative population proportions, $\pi(k) \equiv \sum_i^k \pi^i$, to the cumulative wage levels $w(k) \equiv \sum_i^k w^i$; $k \leq n$. Thus

$$(3) \quad L[\pi(k)] \equiv w(k)/n\bar{w}.$$

Atkinson considers what I call "generic-SWF" inequality measures. A SWF is "generic" if it is impersonal, concave, monotonic, and additively separable. A measure is *generic-SWF* if saying that distribution *A* is "less unequal" than *B* means that when both have the same mean, then *A* is preferred by any generic SWF. Atkinson shows

Theorem 1. The generic-SWF inequality ordering of two distributions will

not show reversals *if and only if* one distribution can be derived from the other solely through mean-preserving and progressive transfers; or, equivalently—if and only if their ordinary Lorenz curves do not cross.

To see the equivalence mentioned, note that a transfer from the middle class to both poor and rich would cause the lower end of the Lorenz curve to rise and its middle portion to fall.

Shorrocks (1983) has introduced the device of a *Generalized Lorenz Curve* to illustrate a basic result for transfers which are not mean-preserving. The *Generalized Lorenz Curve* simply scales the measure of (3) up by \bar{w} :

$$(4) \quad \text{GL}[\pi(k), \bar{w}] \equiv \mathbf{w}(k)/n.$$

Shorrocks shows that a welfare order-reversal occurs if and only if the Generalized Lorenz curves of two distributions cross. The following combines results from Dasgupta *et al.* (1973), Rothschild and Stiglitz (1973), and Shorrocks (1983):

Theorem 2. Order-reversals under a generic SWF for two distributions will occur *if and only if* one can be derived from the other solely by progressive transfers with leakage; or, equivalently—if and only if their Generalized Lorenz curves cross.

To see the equivalence, note that a progressive transfer will raise the lower end of the Generalized Lorenz curve, while leakages mean that its vertical axis will shrink. Therefore the old and new curves must cross.

These results do not fully characterize the relationship between inequality and welfare order-reversals. It is well-known that an inequality order-reversal implies a welfare order-reversal only if average income changes substantially. Thus ordinary Lorenz curves for developed and less-developed countries often cross while their Generalized Lorenz curves do not (Atkinson, 1970; Shorrocks, 1983). Conversely, a welfare order-reversal *does* imply inequality reversal unless very strong conditions are met—the progressive transfer with leakage must be made “perfectly” progressive. For a *perfectly progressive transfer*, not only (as in the previous definition) must the income of all groups $i \leq L$ be raised or not lowered by the transfer, but all groups at or above some $U > L$ must have their *cumulative total* incomes absolutely lowered, i.e.

$$(5) \quad \begin{aligned} &\text{not only } \sum_{i=1}^L w_2^i \equiv \mathbf{w}_2(L) > \mathbf{w}_1(L) \equiv \sum_{i=1}^L w_1^i, \\ &\text{but also } \sum_{j=U}^n w_2^j < \sum_{j=U}^n w_1^j; \quad \forall U > L. \end{aligned}$$

A *perfectly regressive transfer* simply transposes the above period subscripts.

Proposition 1. A welfare order-reversal implies an inequality order-reversal *if and only if* the transfer with leakage is not *perfectly progressive*.

Proof. (If) If the progressive transfer with leakage is not perfectly progressive, then there is an income group U such that

$$\sum_{j=U}^n w_2^j \geq \sum_{j=U}^n w_1^j.$$

Since progressivity means L has received a transfer from some higher income group, and since there is leakage, this inequality implies $U > L + 1$. From $\bar{w}_2 < \bar{w}_1$, we get

$$(6) \quad \sum_{j=U}^n w_2^j / \bar{w}_2 n > \sum_{j=U}^n w_1^j / \bar{w}_1 n \Rightarrow$$

$$(7) \quad w_2(U-1) / \bar{w}_2 n = 1 - \left(\sum_{j=U}^n w_2^j / \bar{w}_2 n \right) < 1 - \left(\sum_{j=U}^n w_1^j / \bar{w}_1 n \right) = w_1(U-1) / \bar{w}_1 n.$$

Thus the period 2 curve is below that for period 1 at $k = U - 1$. However, the transfer was progressive, so by the top line of (5), the Lorenz curve for period 2 is above that for 1 at $k = L$. Thus the curves must cross, and by Theorem 1 this is an inequality reversal.

(*Only If*) Suppose the transfer with leakage was perfectly progressive. Again by (5), the ordinary Lorenz curve of period 2 is above that of 1 at $k = L$. Then for any $U > L$, the relative share of all uppermost groups must have been larger in period 1,

$$\frac{(\sum_{i=U-1}^{U-1} w_1^i + \sum_{j=U}^n w_1^j) / n}{(\sum_{i=U-1}^{U-1} w_2^i + \sum_{j=U}^n w_2^j) / n} \equiv \frac{\bar{w}_1}{\bar{w}_2} \Rightarrow \frac{\sum_{j=U}^n w_1^j / \bar{w}_1}{\sum_{j=U}^n w_2^j / \bar{w}_2} > 1$$

since $\sum_{i=U-1}^{U-1} w_1^i < \sum_{i=U-1}^{U-1} w_2^i$. Thus the inequality signs in (6) and (7) are reversed, and the Lorenz curve for period 2 is higher than for period 1 for any $U - 1 > L$ as well. The ordinary Lorenz curves do not cross, so by Theorem 1 there is no inequality-reversal.

All welfare order-reversals shown in the data below occur without inequality reversals. The transfers are perfectly progressive with leakage in the case of Poland, and perfectly regressive with growth for the Soviet Union—at least for the level of aggregation presented. This final qualification is non-trivial:

Corollary to Proposition 1. Any progressive transfer between two income groups on different sides of the median appears perfect if the number of groups is reduced to $n \geq 2$.

Thus a progressive transfer of one million rubles from the ninth to the first decile—leaving the income of the tenth decile untouched—appears perfect if n is reduced from 10 to 5.

II. ORDER-REVERSALS FOR SOVIET AND POLISH WAGE DISTRIBUTIONS

The following table gives Soviet average monthly real wages as distributed by quintile, for selected years between 1946 and 1985.

In examining this table, we see that there is only one pair of years in which Theorem 2's conditions for welfare order-reversal are met; 1981-86 is a clear case of regressive transfer with growth. Note the size of the decline in real wages for the two lowest quintiles over this period—by more than 6 percent and 4 percent for the poorest and next-to-poorest, respectively. As explained in the appendix, these statistics overstate the income of the lowest and understate that of the highest. Thus a fall in the real wages of the two poorest quintiles underscores

TABLE 1
AVERAGE MONTHLY WAGES AND SALARIES REAL (\bar{w}) AND NOMINAL (\tilde{w}) AND DISTRIBUTION BY QUINTILE (w^1, w^2, w^3, w^4, w^5) IN 1982 RUBLES, OF SOVIET EMPLOYEES IN THE STATE SECTOR. SELECTED YEARS 1956-86

Year	\tilde{w}	\bar{w}	w^1	w^2	w^3	w^4	w^5
1956	73.4	106.38	41.52	69.82	97.61	133.26	189.67
1957	76.2	109.89	42.47	72.61	102.61	143.42	188.35*
1959	79.1	112.20	52.77	78.58	107.59	147.59	174.47*
1961	83.9	116.27	58.90	80.52	104.63*	140.94*	195.68
1964	90.8	120.31	64.00	94.28	118.72	154.50	170.73*
1966	100.2	129.86	70.36	95.27	119.71	161.74	202.72
1968	112.7	144.67	84.66	112.32	143.00	173.43	209.95
1970	122.0	156.11	85.43	117.68	141.09*	198.73	237.60
1981	172.5	178.76	96.06	130.78	166.42	217.62	282.90
1986	195.6	182.29	90.21*	124.98*	168.50	214.82*	312.94

Sources: Average nominal wages from *Narodnoe Khozyaystvo (NK)*, (p. 350, 1972; p. 472, 1977; p. 431, 1987), "Srednemyachnaya Denezhnaya Zarobotnaya Plata Rabochix i Sluzhix po Otrasyam Narodnovo Khozyastova" (Average Monthly Montearly Labor Wage of Workers and Employees in Branches of the State Sector). CIA (1989b) estimates of Average Retail Price Index (ARPI) deflator (Table A-4). Distributional data is from McAuley (p. 220, 1979).

*Indicates a year with value lower than the previous entry.

the atmosphere of economic crisis in which Gorbachev assumed power. Although it is often stressed that *perestroika* implies a new "social contract" (Hauslohner, 1987) to trade off more inequality for faster growth, I have not seen it noted that a radically regressive transfer "with growth" was well underway by 1986, although the growth was meager.

The following table shows the relation between the average wage, equality wage, and inequality index, for equality preferences of $\varepsilon = 1$ and $\varepsilon = 3$.

TABLE 2
AVERAGE MONTHLY REAL WAGE IN 1982 RUBLES (\bar{w}) AND EQUALITY WAGES ($w^E[\varepsilon = 1]$), ($w^E[\varepsilon = 3]$), WITH ATKINSON ($I[\varepsilon = 1]$, $I[\varepsilon = 3]$), DECILE RATIO (D^9/D^1), AND GINI INDEXES FOR SOVIET EMPLOYEES IN THE STATE SECTOR, 1946-86

Year	\bar{w}	$w^E[\varepsilon = 1]$	$w^E[\varepsilon = 3]$	$I[\varepsilon = 1]$	$I[\varepsilon = 3]$	D^9/D^1	Gini
1946	66.89	—	—	—	—	7.24	—
1956	106.38	93.52	71.64	0.1209	0.3266	4.44	0.271
1957	109.89	96.91	73.89	0.1181	0.3276	—	0.264
1959	112.20	102.81	85.36	0.0837	0.2392	4.21	0.223
1961	116.27	106.47	90.51	0.0843	0.2206	4.02	0.230
1964	120.31	113.57	99.62	0.0560	0.1729	3.69	0.182
1966	129.96	121.35	106.06	0.0663	0.1839	3.26	0.204
1968	144.67	137.70	124.30	0.0482	0.1408	2.83	0.172
1970	155.22	146.28	128.57	0.0576	0.1764	3.1	0.198
1972	158.78	—	—	—	—	3.10	—
1976	177.28	—	—	—	—	3.35	—
1980	181.42	—	—	—	—	3.0	—
1981	178.76*	166.60—	145.39	0.0680	0.1867	3.3	0.206
1985	182.79	—	—	—	—	3.35	—
1986	182.29*	166.47—	140.30	0.0868	0.2303	—	0.235

Sources: Previous Table; CIA (1989b), Tables A-1, A-4; Decile Ratios are from Wiles (p. 25, 1974), and Chapman (p. 16, 1989)

Note: *Entry lower than previous year; | = welfare reversal.

As already noted from the previous table, there is only one case of welfare order-reversal shown: 1981–86 at a critical value near $\varepsilon = 1$. This gives the lower bound on equity preference. If we believe that welfare deteriorated in 1981–86, and if the standard errors on these income distribution statistics are not too large, then ε should be greater than or equal to 1.¹ On the “crisis” of Gorbachev’s ascension, note that 1986 shows the highest level of Soviet wage inequality since the late 1950s, by both the Atkinson indexes and the Gini coefficient. The official “Decile Ratio” is less pessimistic about the rise in inequality—but this a deliberately misleading statistic on which I later comment.

There is considerable evidence that the Soviet leadership considered the terms of the tradeoff in 1981–86 unacceptable. Many Soviet economists maintain that differentials in wages had become so low by the late 70s and early 80s as to constitute a barrier to effective allocation, and there is now also widespread leadership agreement that equity needs to be reduced (Chapman, 1989; Hauslohner, 1987).

We can now ask if there has been enough growth to make this tradeoff acceptable in the 1981–86 period. There is overwhelming evidence that this was a period of unacceptably low growth in the eyes of many Soviet policy-makers. Indeed, this is the fundamental axiom of *perestroika* (Aslund, 1989). The growth in average real wages shown by Table 1 is less than 2 percent over this entire 5 year period, or less than 0.4 percent at an annualized rate. The widely noted decline in post-war inequality, and the gradual increase of inequality since the late 70s is clear from the inequality index series. To get an upper bound estimate on ε , we might look for a pair of years in which there was a progressive transfer with unacceptably high leakage, but recent Soviet economic history has not provided us with any examples of egalitarian decline. We can find such examples, however, in the Polish experience of the early Solidarity union movement, as seen in the tables below.

Polish income declines in all quintiles from 1970–72 and 1976–78 and does not show any growth-equity tradeoff. However, we do have more welfare order-reversal pairs at “reasonable” levels of ε than in the Soviet case, 4 pairs of years in which welfare order-reversals will occur for some ε , according to Theorem 2: 1976 paired with 1980 and 1981(J), and both 1978 and 1980 paired with 1981(J).

The modest decline in average wage traded for more equity in 1978–81(J) may have seemed an improvement to moderate elements in Polish Solidarity. If they did count these years an improvement, then this implies $\varepsilon > 1$. However, if they could not justify the more precipitous egalitarian decline between the high average wage year of 1976 (the highest in this series) and 1981, then this would imply an upper bound of $\varepsilon < 3$.

These bounds of $1 < \varepsilon < 3$ overlap with the lower bound estimated for the Soviet data, of $1 \leq \varepsilon$. A level of equity preference high enough to make the “egalitarian decline” of Polish Solidarity 1978–81 acceptable, would make the

¹A World Bank study qualifies the general national income accounts as “good” for the U.S.S.R., with confidence margins of ± 5 percent, and as “somewhat problematic” with margins within ± 10 percent for Poland (Marer, p. 25, 1985). I know of no detailed study on the statistical reliability of the *distributional* estimates, but see this Appendix, Schroeder (1972) and McAuley (1979) on the U.S.S.R., and Flakierski (pp. 40–44, 1986) on Poland. These numerous caveats have led me to compute ε values without the implied accuracy of a decimal point.

TABLE 3
AVERAGE MONTHLY INCOME IN REAL (\bar{w}) AND NOMINAL (\tilde{w}) DISTRIBUTION BY
QUINTILE (w^1, w^2, w^3, w^4, w^5) IN 1970 ZLOTYS, OF POLISH EMPLOYEES IN THE STATE
SECTOR, SELECTED YEARS 1970-81

Year	\tilde{w}	\bar{w}	w^1	w^2	w^3	w^4	w^5
1970	2,235	2,235	1,162	1,665	2,056	2,537	3,755
1972	2,509	2,144*	1,137*	1,587*	1,951*	2,413*	3,635*
1976	4,116	2,899	1,478	2,106	2,608	3,275	5,029
1978	4,686	2,775*	1,400*	2,010*	2,509*	3,147*	4,811*
1980	5,789	2,866	1,519	2,106	2,622	3,253	4,829
1981 ⁺	6,617	2,647*	1,575	2,091*	2,488*	3,017*	4,089*

Sources: *Rocznik Statystyczny*, (p. 163, Table 5(183), 1981) "Przecietne Place Miesieczne Netto W Gospodarce Uspolecznionej" (Average Monthly Net Wage in the State Sector). CIA estimates of ARPI deflator, (Scherer, p. 144, 1988) with interpolation. Distributional Data from Flakierski (p. 70, Table 8, 1979).

*Value lower than previous year; ⁺January only for 1981.

TABLE 4
MONTHLY INCOME, 1970 ZLOTYS, AVERAGE (\bar{w}) AND EQUALITY WAGES WITH ATKINSON,
DECILE RATIO (D^9/D^1), AND GINI INDEXES FOR POLISH STATE SECTOR EMPLOYEES
1970-81

Year	\bar{w}	$w^E[\varepsilon = 1]$	$w^E[\varepsilon = 3]$	$I[\varepsilon = 1]$	$I[\varepsilon = 3]$	D^9/D^1	Gini
1970	2,235	2,068	1,788	0.0743	0.2000	2.84	0.217
1972	2,144	1,986	1,725	0.0741	0.1958	2.82	0.217
1976	2,899	2,661	2,278-	0.0819	0.2142	3.05	0.228
1978	2,775	2,546-	2,171	0.0819	0.2169	3.05	0.231
1980	2,866	2,654	2,304	0.0738	0.1960	2.88	0.217
1981 ⁺	2,647	2,517-	2,279-	0.0489	0.1392	2.36	0.182

Source: Previous table, and official Polish data; see Appendix.

Note: | = welfare reversal; || = inequality reversal; + = January, 1981

"unequal growth" of the Soviet Union from 1981-86 unacceptable; one low enough to make the Soviet change acceptable would have the opposite effect on the early Solidarity experience. Of course there is no reason to expect preferences on equity-efficiency to remain stable over long enough periods to estimate upper and lower bounds. However, different readings of social consensus do not invalidate the usefulness of the revealed preference exercise—they simply change upper bounds into lower bounds, and *vice versa*.

As for the inequality data, the egalitarian trend encouraged in the early Solidarity era of 1978-81 is unmistakable. In any of the 4 pairs of years noted above which meet the conditions for welfare order-reversals, there are no inequality order-reversals, by Proposition 1. This follows since all these pairs show perfectly progressive transfers with leakage. The inequality order-reversal of 1976-78 cannot, by Theorem 2, be a welfare order-reversal, since there is no progressive transfer. Theorem 1 can be applied if the income of each quintile in 1978 is scaled up so as to equate the overall average income of that year to 1976. It is then confirmed that this inequality reversal is equivalent to mean-preserving

but non-progressive transfers to the middle from both rich and poor. These transfers can be represented

$$D^i \equiv w_{1978}^i(1.0446846) - w_{1976}^i; \quad i = (1, 2, 3, 4, 5),$$

$$(D^1, D^2, D^3, D^4, D^5) = (-15.4, -6.2, 13.1, 12.6, -3.0).$$

It is fascinating to speculate why Soviet and Polish official sources used the "decile ratio" which is the ratio of the first and ninth deciles, rather than the first and tenth. This is similar to the Soviet practice of presenting histograms without information on the maximum wage in the top group. These choices of course make the distribution look more equal. However, the Soviet Union's and Poland's ratio of the tenth to first deciles has also been higher than in many developed Western countries, while their distribution among the bottom 90 percent has been more equal. Consider the following estimates of the ratio of total income for the tenth to first deciles, and the ratio of the first, second, third, and fourth Deciles to the total (10 times the mean), for a cross-section of countries, in estimates by Morrison (1984), who tried to adjust for elite perquisites.

TABLE 5
RATIOS OF ADJUSTED TOTAL INCOMES, VARIOUS COUNTRIES

Country (Year)	y^{10}/y^1	$(y^1 + y^2 + y^3 + y^4)/10\bar{y}$
Hungary (1977)	5.2	0.62
Poland (1975)	8.4	0.54
U.S.S.R. (1973)	8.5	0.54
Czechoslovakia (1973)	4.3	0.65
U.K. (1975)	4.7	0.60
Sweden (1970)	4.8	0.60
Canada (1969)	8.5	0.51
U.S.A. (1970)	9.9	0.45

Source: Morrison, p. 133, 1984.

The Polish political commentator Lidia Biskid (1982), called this type of distribution "egalitarian-elitarian." Atkinson (1970) notes that this is also the pattern typical of many less-developed countries, so that they can be ranked as more equal than the typical developed country if ε is high enough.

III. PROJECTIONS OF SOVIET GROWTH UNDER EQUITY CONSTRAINTS

The estimated bounds on equity preferences yield no information on the opportunity set for trading off efficiency vs. equity, whether one is on that set's frontier, or how the frontier will change. However, these bounds can be used to chart the range of short-run growth-equity changes that will be tolerable up to the "objective social limits on the differentiation of incomes," in the words of Soviet economists Shatalin and Gayder (1986).

Let us take the lower bound $\varepsilon = 1$ as an approximation of the social consensus on equity preference for Soviet society. A lower level of equity preference is

“optimistic” for the reform leadership, since it means imposing a less binding equity constraint on growth. The data in Table 1 show the Atkinson index of inequality at $\varepsilon = 1$ increasing by 27.7 percent between 1981 and 1986. Let us suppose inequality increases by this same rate from 1986 to 1991, from a level of $I_{1986}(\varepsilon = 1) = 0.0868$, taken from Table 2. The twelfth Five-Year-Plan of 1986–90 was for a growth of 2.6 percent a year in average wages (*Vestnik Statistiki*, 1986). If average wages were growing at this very rapid rate—which we know they were not—but inequality continued to grow as projected, then projecting forward from 1986 to 1991 with an average wage of 182.29 in the earlier year, and using the definition of $I \equiv 1 - w^E/\bar{w}$, we solve

$$0.0868(1.277) = 1 - w_{1991}^E[\varepsilon = 1]/182.29(1.026)^5 \Rightarrow w_{1991}^E[\varepsilon = 1] = 184.27.$$

This would be a dramatic increase indeed for the equality wage, and hence for welfare—an increase of more than 10 percent in 5 years. This index has actually risen by only 16 percent from 1970–86.

However, these conclusions are based on unrealistic growth projections. The CIA estimates of real per-capita consumption growth (1989a) are much lower: an annualized rate of only 0.3 percent for 1986–88; journalistic accounts point to a recession in the current year (1990). Using the CIA estimate of consumption growth and the same rate of inequality increase would mean an equality wage of only 164.53 for 1992. This would be below the equality wage of 1986, and even further below that of 1981—the last year of the “Brezhnev period of stagnation.”

These pessimistic conclusions are put in perspective by the consideration of an egalitarian “Solidarity Scenario.” Polish $I[\varepsilon = 1]$ in 1981(J) was only 59.7 percent of what it had been in 1978 in Poland. However, average real wages had also fallen so far that this decrease in inequality was not enough to keep the equality wage calculated at $\varepsilon = 1$ from falling as well. How far could the average Soviet wage fall, if a similar decrease in inequality were to occur? If this had occurred over the last three years in the Soviet Union, from 1986 to 1989, and given the equality wage level for 1986 of $w_{1986}^E[\varepsilon = 1] = 166.47$, the rate of “growth” necessary to maintain that level of welfare is

$$0.0868(0.597) = 1 - 166.47/182.29(1+x)^3 \Rightarrow x = -0.0125.$$

Thus a decrease in inequality of the proportion imposed by the early Solidarity period in Poland would allow Soviet welfare to remain constant—as long as the average wage did not fall by more than 1.25 percent per year. Since Table 2 shows much larger reductions in the average real wage having occurred in recent years, such wage leveling seems to offer “cheap” welfare improvement.

Since the actual decline in average wage in Poland 1978–81 was almost 4 times larger than this projected 1.25 percent, the Solidarity period could only be seen as welfare-improving if ε was considerably larger than 1. Since general strikes in the Soviet Union are likely to lead to more inter-ethnic violence than in relatively homogeneous Poland, it is unlikely that wage leveling can be purchased as “cheaply” as it was by the early Solidarity.

IV. CONCLUSIONS AND LIMITATIONS

The “revealed preference” methodology of this paper tries to find an empirical virtue in the theoretical necessity for preference-dependent welfare orderings. It is crucial for this method that a consensus has in fact been reached—here argued on anecdotal evidence. Of course it would be better to have surveys evaluating one outcome as an improvement over some other. This would specify “consensus” at a given level.

At the estimated lower bound of equity preference, the only possibilities for an increase in Soviet economic welfare are (a) faster rates of real wage growth than are likely to soon be feasible, (b) a disruptive “Solidarity scenario” in which wage differences are substantially leveled, or some unlikely combination of both. None of these possibilities seems consistent with the current trajectory of *perestroika*. The projections of this paper confirm the impression that the efficiency-equity tradeoff is particularly painful for the Soviet Union at present, even at levels of equity preference low by the standards of applied work.

APPENDIX: THREE QUESTIONS ON THE DATA

1. *Why should official wage statistics be taken at face value?* The short answer is that this has been the traditional practice of the CIA, as explained in (1989b). The wage fund is closely monitored by financial organs and may be distorted less than many other income series. See Schroeder (1972) for the basic study of wage data reliability. Of course the many sources of income and earnings not covered by this index have become more important since 1985 with the growing importance of private cooperatives, unemployment, and the second economy.

2. *How useful are data on state sector workers and their earnings alone?* McAuley (p. 216, 1979) estimates that the state portion of the Soviet workforce grew from 50 percent in 1950 to 80 percent in 1970. In the official accounts the trend is similar, but about 20 percent lower over this same period, showing no large change for 1970–85. For most of this period, these state workers received about three-quarters of their personal income from wages, with transfer payments making up another 17–18 percent. McAuley shows (pp. 88–98, pp. 265–283) that these transfers were, until the late 1970s at least, anti-egalitarian: transfers correlated positively with earnings. It seems unlikely that this correlation would have been reversed during the early 1980s, given the growing tendency to criticize egalitarianism.

The portion of the Polish workforce in the state sector grew slightly from 68 percent in 1970 to 73 percent in 1980 (RS, 1981). However, many in the state sector continue to work part-time on private farms; Ascherson (1981) quotes an estimate of 10 percent in 1968. The transfer portion of income was similar to the Soviet case, 19–21 percent in the years 1970–81. Also as in the Soviet case, a larger proportion went to the higher income groups. (Flakierski, pp. 120–125, 1986).

3. *How were distributional data obtained?* McAuley (p. 220, 1979) has painstakingly reconstructed histograms of Soviet average nominal monthly wages from Soviet sources with large gaps of censored information. I have reconstructed this data in the form of the quintile measures presented for years 1956–70.

Recently, a histogram for the years 1956–86 has appeared in *Trud v SSSR* (1988), the first national income distribution data to be published in many years, so far as I know. Only for 1981–86 was the size of the lowest groups in the histograms small enough to be useful. The histograms do not give the minimum wage or the maximum wage.

In reconstructing these Soviet histograms into a size-distribution of income, I assumed that:

- (1) the average wage in all wage groups except the highest is the top wage in that range;
- (2) the average wage level for the highest wage group is the residual between total real wages and the previously calculated wages of all the lower groups;
- (3) students and part-time workers are in the lowest wage ranking.

Assumptions (1) and (2) lend an equalizing bias to the calculations, since the average income of the lowest group must be overestimated while that of the highest is underestimated.

The Polish distributional data (Flakierski, 1986) presents no special problems. I have aggregated the Polish decile data into quintiles for comparability with the available Soviet data, recognizing that increased aggregation understates inequality.

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