Comparative Economic Studies, 2005, 47, (333–345)

www.palgrave-journals.com/ces

The 'Welfare Standard' and Soviet Consumers

IRWIN L COLLIER[1]

Freie Universität Berlin, Fachbereich Wirtschaftswissenschaft, Institut für öffentliche Finanzen und Sozialpolitik, Boltzmarnnstr. 20, 14195, Berlin, Germany.
E-mail: collier@wiwiss.fu-berlin.de

Quantity constraints faced by consumers in centrally planned economies prevented official relative prices in those economies from reflecting the subjective trade-offs of consumers. This has important consequences for the methodology of intersystem comparisons of consumption levels as well as the meaning of relative purchasing power. When households are subject to significant quantity constraints, traditional measures of real consumption and purchasing power parity for cross-national comparisons are afflicted with quite a different index number problem than occurs for standard comparisons between typical market economies. Data from the Soviet Union in 1976 are used to illustrate the method.
Comparative Economic Studies (2005) **47,** 333–345. doi:10.1057/palgrave.ces.8100115

Keywords: Soviet economics, consumption, disequilibrium, index numbers

JEL Classifications: C43, D12, P24

…granting the predominance of money income and the opportunities to spend it, how nearly real corresponds with money income in the USSR is another matter. In order for household money income to be freely exchanged for consumers' goods at established prices, such prices must limit household demand at least to levels corresponding to available supplies. Prices of consumers' goods in the USSR apparently are again and again below such levels

[1]In the Spring of 1975, the author participated in Abram Bergson's graduate research seminar in socialist economics at Harvard University as a cross-registered MIT graduate student. I am grateful to Paul Gregory for suggesting an important revision to this paper as well as for years of intellectual encouragement.

…With prices below clearing levels, money income ceases to be the sole determinant of capacity to acquire goods.

Abram Bergson (1984)

INTRODUCTION

There is a path dependency to the work of scientists. One problem naturally leads to another and the research trajectory of a scholar can easily pass fertile fields in the hot pursuit of an elusive partial truth. Abram Bergson was of course theoretically equipped to have worked either or both sides of the street of national income and product accounting, that is, using either the production potential standard or the welfare standard as the ideal behind his calculations.

I have often wondered why Abram Bergson's revealed preference in his empirical work seemed to have been for the production potential standard as opposed to the welfare standard. The simplest explanation would be data availability. It is the nature of a material balances system to collect and publish a lot information about quantities and less about prices. To apply the welfare standard, consumer prices are needed and the collection of consumer price data must have seemed of relatively low priority for Western embassy staff and the intelligence professionals compared to the determination of the order of battle.[2] Another explanation can be found in the substitution of planners' preferences for consumer sovereignty to explain economic performance of centrally planned economies, which leaves ordinary households as economic objects rather than economic subjects.[3] My final speculation is that Moorsteen–Bergson quantity index number theory, Moorsteen (1961) and Bergson (1961), requires no econometrics for its implementation[4] whereas index numbers à la Konüs have been closely linked with the statistical art of demand systems estimation. Econometrics beyond

[2] My own work on the cost of living in the GDR relied on the detailed consumer price comparisons conducted by members of the German Institute for Economic Research in West Berlin, and one presumes their friends and families in trips to East Berlin. For this paper, a similar critical role is played by the Schroeder and Edwards (1981) purchasing power parity comparisons for the USSR and the USA.

[3] One could argue that Gregory Grossman's success in getting us to think seriously about the second economy helped to provide an opening for the welfare standard.

[4] This is by no means a weakness. One of the strengths of Erwin Diewert's superlative index numbers is that budget shares and price or quantity relatives are all that are required for their calculation and there is no need for an econometric estimation of the underlying aggregator functions (i.e., utility or production functions).

the descriptive use of multiple regression was very specialised human capital for Abram Bergson's generation.

While it is an interesting question in scientific biography why Abram Bergson chose the path of the production potential standard, there is the larger question of why others did not try or were not as successful in their attempts to apply the welfare standard. Since everyone suffered the same data constraints with regard to consumer prices, I believe the answer can be found in scientific fashion or, to sound more profound, the sociology of knowledge. The early 1970s was an age of disequilibrium macroeconomics. Barro and Grossman's (1971) break from the IS-LM general equilibrium framework to one of general disequilibrium caught the fantasy of many able younger economists hungry for a scientific revolution. Young hounds like Richard Portes, see Portes and Winter (1980) and Portes *et al*. (1987), were off chasing macro-disequilibrium foxes and applied demand analysis was not where crowds gathered in comparative economics.

Nonetheless, it turns out that there were enough parts available in the first half of the 1980s to have applied the welfare standard to the Soviet consumer. In what is to follow I will describe those parts and provide a table to illustrate how one can actually quantify the microeconomic reality experienced by Soviet consumers.

ECONOMIC INTUITION

The budget constrained choice set of consumers in a centrally planned economy was limited by a host of constraints on the availability of goods and services at official prices. The typical case was housing with the average household desiring to have more housing than it has been allocated. This excess demand for housing resulted in household demand spilling over into other kinds of spending, for example, (hard) drink. The issues are (i) how to quantify the extent of the mismatch between the supplies of consumer goods and services with the demands of consumers and (ii) how to aggregate the mismatches across expenditure groups.

This paper will focus on the quantity constraints faced by consumers in centrally planned economies, which prevented the established relative prices in those economies from reflecting the subjective trade-offs of consumers. This has important consequences for the methodology of intersystem comparisons of consumption levels as well as the meaning of relative purchasing power. When households are subject to quantity constraints, traditional measures of real consumption and purchasing power parity for cross-national comparisons are afflicted with quite a different index number

problem than the choice of weights or inaccuracies from approximating curved isoquants or indifference curves with linear approximations.[5]

Quantity constraints are understood here to include all forms of non-price rationing, for example, formal rationing with coupons and allocation by waiting lists, queues, 'elbows', etc.

Notional demand is the quantity of a good that consumers would be willing to buy at existing prices and incomes without the interference of quantity constraints (a.k.a. Marshallian demand). When actual purchases exceed notional demands, we observe spillover demand. When actual purchases are less than notional demands, there is excess demand.[6]

Effective demand for a particular commodity is defined as the relationship between its own price and quantity demanded obtained from utility maximisation subject to the budget constraint and the quantity constraints for all other commodities.

An equally valid way of expressing consumer market disequilibrium is to calculate what the structure of relative prices would have needed to be in order for quantity constrained consumers to have freely chosen their observed effective demands. Such prices were designated as 'virtual prices' by Erwin Rothbarth (1941) who was interested in the implications of war-time rationing in Britain for the measurement of real income, stricter rations could then be analysed with Marshallian demand tools as if there had been an increase in the virtual price of a commodity.[7]

Effective purchasing power (EPP) is an average measure of the extent of spillover and excess demands, much as the change in a price index may be regarded as an average measure of price changes. EPP is defined as the answer to the following hypothetical question:

> What is the most a quantity-constrained household would pay for the right of attaining its notional demands at existing prices?

[5] The existence of quantity constraints is also the reason that estimation of demand curves with Soviet price and quantity data would lead to biased estimates of the demand parameters and why it turns out to be necessary to transplant a demand system estimated for market economies in order to interpret observed Soviet consumption choices.

[6] Leon Podkaminer (1982, 1988) used demand systems estimated for Irish and Italian consumers to interpret observed Polish consumer demands in this manner.

[7] Neary and Roberts (1980) rescued the original Rothbarth paper from relative obscurity that was due perhaps in part to Rothbarth's death in combat during the Second World War fighting for the British. Rothbarth wrote another paper regarding the measurement of household equivalence scales that has become a classic paper in that branch of the economic measurement literature as well. Two papers still cited 60 years after their publication is an impressive indicator of the scientific contributions probably lost due to Rothbarth's premature death.

The *EPP gap* is defined as the reply to this question expressed as a per cent of total consumption expenditure in the quantity-constrained economy.[8]

THE STATISTICAL 'RAW' MATERIAL

For empirical demand systems to quantify the concepts illustrated in Figures 1–3, they need to be tailored to the data and are not readily available off-the-rack. We need both highly disaggregated and comparable data to reaggregate into categories useful for any particular analysis. The International Comparisons Project Phase III report, *World Product and Income*, by Kravis *et al*. (1982) is the mother lode of such detailed expenditure and purchasing power parity (PPP) data.

The sample of market economies used are: Austria, Belgium, Denmark, France, Germany, Italy, Ireland, Luxembourg, Netherlands, Spain, UK and US Data on per capita expenditure and PPPs for 107 categories of consumer expenditure in 1975 have been aggregated into 15 categories to correspond to categories for the USSR-US comparison available in Schroeder and Edwards (1981).

Fortunately, the international comparison project served as the methodological frame of reference for much of the Schroeder and Edwards consumption comparison for the USSR. The actual per capita consumption figures for column 3, Table 1 of this paper are taken directly from Table 8 in Schroeder and Edwards (1981). Their Appendix F, describes the alterations they required to get the ICP classifications to fit their Soviet data.

The bridge between the ICP Phase 3 (1975) and the USSR/US comparison (1976) are the consumption expenditures data from OECD national income accounts for the US in 1975 and 1976 with consumer price indexes from the BLS used to link the ICP PPPs to the ruble/dollar parities estimated by Schroeder and Edwards.

The PPPs reported in column 1 of Table 1 of this paper were reaggregated from the Schroeder/Edwards data by Joe Glenn Smith (1994, data revised 1995) expressed in terms of Austrian shillings, that is, the 'price' for each category of goods in Austria has been normalised to unity.

Specification of preferences

The specification used in this paper is a generalisation of the Cobb-Douglas demand system[9] that permits budget shares to vary systematically with real

[8] This summary measure was proposed and implemented by Collier (1986, 1988, 1989, 2001) to interpret the GDR family budget data using demand systems estimated from budgets of West German households.

[9] For an earlier application of the generalised Cobb-Douglas demand system used here, see Collier (1986, 1989).

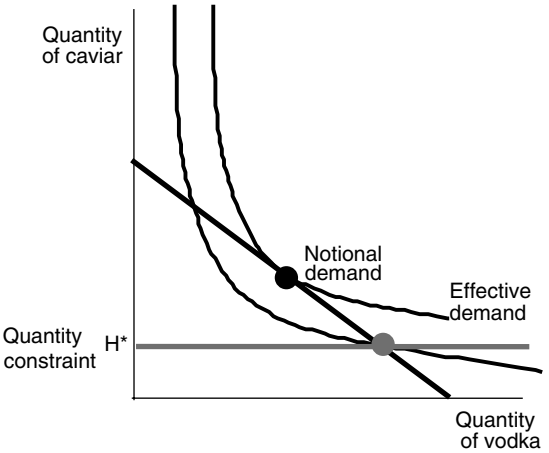

Figure 1: You can't always get what you want. An obvious way to gauge the disequilibrium is to consider the individual deviations between notional and effective demands. Warning: conventional methods of demand analysis cannot be used to combine effective demand points and budget constraints to estimate the map of consumer preferences!

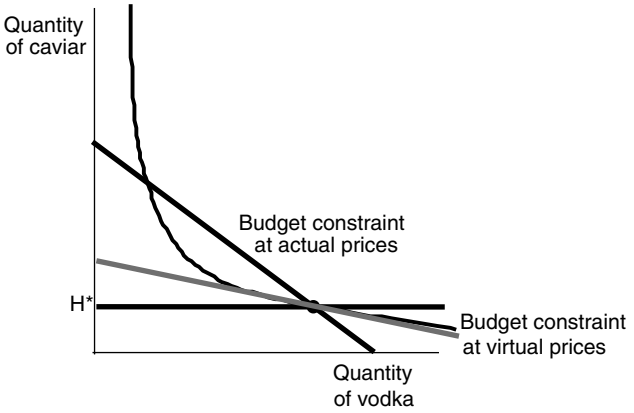

Figure 2: But you can (virtually) like what you get. An alternate way to characterise the degree of microeconomic disequilibrium is by determining the change in the prices that would be necessary for consumers to choose their effective demand freely. Here the relative price of caviar, which is subject to a quantity constraint, would need to rise relatively to the price of vodka for the consumer to choose the point of effective demand at the original prices. Like notional demands, virtual prices require knowledge of consumer preferences before we calculate them.

income. As in the simple Cobb–Douglas specification, the compensated price elasticity of each good is minus unity. The point of this generalisation is that income elasticities are *not* constrained to be equal to unity which is necessary

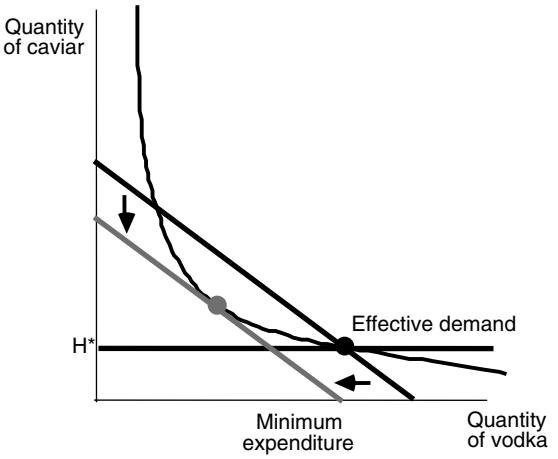

Figure 3: 'Willingness to pay' to be 'free to choose'. A simple summary measure of the deviations between actual and virtual prices is found in the reduction of the nominal budget a consumer could still accept after being freed from quantity constraints yet be no worse off than he/she was with the higher budget and quantity constraints.

since ICP data comply with Engel's Law, that is, budget shares vary systematically with increasing real budgets.

The geometric intuition behind this generalisation of Cobb-Douglas preferences comes from the fact that in *log-quantity space*, a simple (i.e., *constant* expenditure share) Cobb–Douglas preferences would be represented as a family of parallel indifference planes, the slopes of which are a function of the budget shares. The point of the generalisation is to allow the indifference planes in log quantity space to 'fan out' with increasing income so that budget shares will change with changing real income.

We begin with the indirect utility function that expresses the maximum level of utility achievable by a household in a market economy, that is, subject solely to a budget constraint (y), conditional on that budget constraint and conditional on the prices of goods it faces (expressed as a vector $\mathbf{p}$):

$$v(\mathbf{p}_i, y_i) = \prod_{k=1}^{K} (y_i / p_{ki})^{\beta_{ki}} = y_i \Big/ \prod_{k=1}^{K} (p_{ki})^{\beta_{ki}} \qquad (1)$$

where i $(=1, \ldots, N)$ denotes the country and k $(=1, \ldots, K)$ denotes the category of expenditure.[10] The second equality in equation (1) is due to the

[10] By force of habit some readers might mistakenly regard the budget shares as constants that would only be true for a traditional Cobb-Douglas world, which is of course just one particular case of the generalised Cobb-Douglas specification.

Table 1: Consumer purchasing power parities (PPP), implicit per capita quantities (Q) and per capita expenditures (X) USSR 1976

	Actual PPP (1)	Actual Q (2)	Actual X (3)	Notional Q (4)	Notional X (5)	Virtual P (6)	Virtual X (7)
Food	0.0614	6227.24	382.29	8015.01	492.04	0.0848	527.77
Beverages	0.0455	3271.41	148.98	1476.99	67.26	0.0208	68.03
Tobacco	0.0571	259.86	14.83	803.13	45.83	0.1917	49.80
Clothing	0.0815	1945.18	158.61	1079.26	88.00	0.0447	87.03
Footwear	0.0549	736.11	40.42	474.98	26.08	0.0370	27.24
Furniture, appliances	0.0852	464.10	39.56	435.99	37.16	0.0733	34.04
Household supplies, operations	0.0605	363.41	21.99	741.23	44.85	0.1237	44.95
Transport	0.0450	1305.64	58.78	1560.20	70.24	0.0477	62.30
Communications	0.0083	747.29	6.21	402.30	3.34	0.0035	2.61
Gross rent	0.0411	1054.04	43.30	1494.34	61.39	0.0500	52.66
Fuel, power	0.0186	1020.92	19.03	1595.80	29.75	0.0267	27.28
Medical care	0.0356	1278.68	45.47	1019.40	36.25	0.0231	29.60
Recreation	0.0396	1563.35	61.94	2320.23	91.93	0.0572	89.48
Education	0.0223	3137.47	69.84	1636.26	36.42	0.0101	31.58
Other expenditures	0.0319	1256.81	40.13	652.23	20.83	0.0135	17.00
Total expenditure			1151.38		1151.38	0.0601[a]	1151.38

Cols. (1),(6): Prices expressed relative to Austrian prices in each category (rubles/shilling).
Cols. (2),(4): Implicit quantities. (2)=(3)/(1) and (4)=(5)/(1). Dimension is Austrian shillings of expenditure at 1975 prices for each category.
Col. (7): Actual quantities valued at virtual prices. (7)=(2) $\times$ (6).
[a] Exact deflator to convert 1976 per capita ruble expenditure into 1975 Austrian shillings.
Sources: (1) Smith (1994), revised in 1995; (2) linking Schroeder and Edwards PPPs in Table 8 to ICP phase 3 binary comparison US and Austria; (3) Schroeder and Edwards (1981), Table 8.

fact that the budget shares (β_k) sum to unity in any period. We transform equation (1) into log-form and obtain

$$\ln v_i = \ln y_i - \sum_k \beta_{ik} \ln p_{ik} \tag{2}$$

In order for these preferences to comply with Engel's law, we explicitly let the budget shares vary systematically with real income (indirect utility) itself.

$$\beta_{ki} = \frac{\alpha_k v_i^{\gamma_k}}{\sum_{m=1}^{K} \alpha_m v_i^{\gamma_m}} \tag{3}$$

where the α_k would in fact be proportional to the budget shares β_k were these not to differ in their response γ_k with respect to real income (which itself is hidden in the indirect utility v) from the responses γ_m of other goods. To

eliminate the denominator, we choose a reference category n (here food) and drop the country subscript (i) for convenience

$$\frac{\beta_k}{\beta_n} = \frac{\alpha_k v^{\gamma_k}}{\alpha_n v^{\gamma_n}} = \left(\frac{\alpha_k}{\alpha_n}\right) v^{(\gamma_k - \gamma_n)} \tag{4}$$

The log-form of equation (4) provides us an estimation equation:

$$\ln(\beta_k/\beta_n) = \ln(\alpha_k/\alpha_n) + (\gamma_k - \gamma_n)\ln v = \tilde{\alpha}_k + \tilde{\gamma}_k \ln v \tag{5}$$

where the log indirect utility on the right-hand side of equation (5) can be calculated with observed prices, total budget and budget shares using equation (2).[11] Weighted two-stage least-squares coefficient estimates are reported in Appendix A.

RESULTS

Given the parameter estimates for the generalised Cobb-Douglas preferences of 12 market economies in 1975 and the Schroeder and Edwards data for the Soviet Union in 1976, it is possible to compute values that correspond to the points, slopes and shifts seen in Figures 1–3. Table 1 gives the disaggregated measures of the impact of quantity constraints for the individual categories of expenditure. The first three columns are essentially what Schroeder and Edwards 'saw'. Columns (4) and (5) are what Alfred Marshall would have predicted, given the Soviet budget constraint of 1,151 rubles and Soviet prices (column (1)). The last two columns are what Erwin Rothbarth would have imagined, given Soviet quantities (column (2)) and the Soviet budget constraint of 1,151 rubles.

The numbers that correspond to Figure 1 can be found by comparing along expenditure rows the actual quantities with notional quantities (columns (2) *versus* (4)) or actual expenditures with notional expenditures (columns (3) *versus* (5)). We can see that the notional demand for gross rent per capita is estimated to have been 61.39 rubles compared to the 43.30 rubles reported by Schroeder and Edwards for actual consumption in 1976. The reverse

[11] Statistically sensitive readers will be offended by the fact that the 'independent' variable on the right-hand side of (5) is in fact dependent in a nonlinear way on the budget shares found on the left-hand side. Fortunately, an obvious instrument to use for two-stage least-squares estimation is an alternate measure of log real total consumption derived by deflating total per capita consumption with an *unweighted* geometric average of the underying PPPs.

pattern is seen for actual beverage expenditure, which was 148.98 rubles compared to the estimated notional demand of 67.26 rubles. These two items correspond to what one could have expected *a priori*. It is important to note, that even when Table 1 indicates an excess of actual expenditure over notional demand, it is possible that households could still have been limited by a quantity constraint at this higher level of expenditure. Without additional information, for example, direct consumer surveys, we are still unable to say whether quantity constraints rather than consumer choice was decisive in such cases.

The numbers that correspond to Figure 2 are found by comparing the actual PPP with the virtual prices (columns (1) *versus* (6)) row by row. The effective gross rent quantity (units of housing that could be rented for 1054 Austrian shillings) would have been demanded had the budget constraint remained constant at 1,151 rubles per capita and the entire column (6) of virtual prices determined the budget constraint. One can see this would have implied a change in the gross rent price of about 25% (i.e., from 0.0411 rubles per shilling of housing to 0.05 rubles per shilling of housing).

The EPP gap (Figure 3) is calculated to be approximately 12% of total per capita ruble expenditure, which turns out to be larger than EPP values calculated with the ICP data set using the same method for Hungary, Poland, Romania and Yugoslavia in 1975 according to Collier and Mokhtari (1989).

There is one more trick that the last two columns of Table 1 can be made to perform: it is to convert the nominal USSR per capita consumption in 1976 of 1151.38 rubles into Austrian shillings (at 1975 prices), which would establish a link to the existing multilateral comparisons of the ICP. One only needs to calculate the value of the indirect utility function (equation (1)) for the USSR (using budget shares calculated from column (7)!) for the actual ruble budget and the virtual prices in column (6). Because Austrian prices are normalised to unity for this paper, the denominator of the right-hand side of equation (1) would be unity were we to put Austrian prices into the indirect utility function. Hence, we may conclude that the value of the indirect utility function for the USSR for its virtual budget and prices of 1976 is expressed in the money metric of Austrian shillings at 1975 prices. Dividing the value of the USSR indirect utility into the actual ruble budget gives the exact deflator of 0.0601 rubles/shilling found at the bottom of column (6) in Table 1. Thus, Soviet consumption can be brought before a welfare standard!

ANTICIPATION OF CRITICISM

The Schroeder and Edwards data are too frail to survive such calculations
In an earlier age, Laspeyres and Paasche might have been able to approach their respective formulas innocent of any theoretical underpinnings.

However, anyone today who uses such price indexes to deflate a nominal income or expenditure variable has (knowingly or not) bought into an underlying economic theory, that is, a particular specification. I am reminded of Evsey Domar's (1971) comment on Abram Bergson's (1971) productivity paper in the Eckstein volume: '… everyone who constructs index numbers transgresses against honesty, and … every user therof is an accomplice in the act.'

From the point of view of theoretical depth, all that the method sketched here does is to allow a generalisation of income elasticities. The family resemblance between the simplest arithmetic or geometric average and what has been calculated here is strong. Thus if one loves the blended Fisher index of relative consumption in Schroeder and Edwards, Table 8, it would be fickle not to at least like the right half of Table 1 here.

Preferences are not identical

While there is no obvious moral law that prohibits the transplantation of demand systems across different species of economics systems as is required for this method, one does have to be careful about predicting out of sample. The calculations of this paper require a leap from a broad set of market economies to the USSR so than in all honesty, the numbers in Table 1 are best regarded as tentative and interesting rather than conclusive.

The lists of goods in the market economies and centrally planned economies differ too much

This is indeed an Achilles heel. In fact, it constitutes one of the fundamental criticisms of the Consumer Price Index coming out of the Boskin Commission. Perhaps there will be a day when this problem will be adequately solved for market economies with vast quantities of useable economic data. This is a genuine reason to treat the numbers in Table 1 as tentative and suggestive.

CONCLUSION

The Soviet Union will continue to occupy a special wing in the virtual museum of comparative economics. The Bergsonian legion was never large in proportion to the enormity of the task of analysing the USSR economy in real time. Still we can be sure that future scholars, having had the benefit of the present and subsequent generations of Soviet archive miners, will confirm that Abram Bergson knew the right economic questions to ask. Pioneers earn the glory that comes with establishing early claims. Because the stakes are so high when answers are hazarded to important difficult questions, early claims

are bound to be challenged by later research. Many exhibits in the virtual museum of comparative economics will require serious restoration work and some will be replaced with new discoveries.

The estimates in Table 1 are presented here as an illustration of the principle that old data and new angles are complements in the production of knowledge. The Schroeder and Edwards consumer price comparisons together with their estimates of consumption spending are among the most precious artefacts[12] from the Soviet era for applying the welfare standard to Soviet economic reality.

REFERENCES

Barro, RJ and Grossman, HI. 1971: A general disequilibrium model of income and employment. *American Economic Review* 61: 82–93.

Bergson, A. 1961: *The real national income of Soviet Russia since 1928*. Harvard University Press: Cambridge.

Bergson, A. 1971: Comparative productivity and efficiency in the USA and the USSR. In: Eckstein, A (ed). *Comparison of Economic Systems: Theoretical and Methodological Approaches*. University of California Press: Berkeley.

Bergson, A. 1984: Income inequality under Soviet socialism. *Journal of Economic Literature* 22(3): 1052–1099.

Collier, IL. 1986: Effective purchasing power in a quantity constrained economy: An estimate for the German Democratic Republic. *Review of Economics and Statistics* 68(1): 24–32.

Collier, IL. 1988: The simple analytics (and a few pitfalls) of purchasing power parity and real consumption indexes. *Comparative Economic Studies* 30: 1–16.

Collier, IL. 1989: The measurement and interpretation of real consumption and purchasing power parity for a quantity constrained economy: The case of East and West Germany. *Economica* 56(221): 109–120.

Collier, IL. 2001: *The DM and the Ossi consumer: Price indexes during transition*. Working paper presented at the CEPR/ECB workshop Issues in the Measurement of Price Indices. Downloadable at www.ecb.int/home/conf/other/impi/pdf/collier.pdf.

Collier, IL and Mokhtari, M. 1989: Comparisons of consumer market disequilibria in Hungary, Poland, Romania, Yugoslavia and the German Democratic Republic. In: Childs, D. *et al*. (eds). *East Germany in Comparative Perspective*. Routledge: London.

Domar, E. 1971: On the measurement of comparative efficiency. In: Eckstein, A (ed). *Comparison of Economic System: Theoretical and Methodological Approaches*. University of California Press: Berkeley, pp. 219–232.

Kravis, IB, Heston, A and Summers, R. 1982: *World product and income: International comparisons of real gross domestic product*. Johns Hopkins University Press: Baltimore.

Moorsteen, RH. 1961: On measuring productive potential and relative efficiency. *Quarterly Journal of Economics* 75: 451–467.

Neary, JP and Roberts, KWS. 1980: The theory of household behaviour under rationing. *European Economic Review* 13: 25–42.

Podkaminer, L. 1982: Estimates of the disequilibria in Poland's consumer markets, 1965–1978. *Review of Economics and Statistics* 64: 423–431.

[12] Neither word play nor irony is intended here. The Schroeder and Edwards data are certainly not 'statistical artefacts' in the (pejorative) technical sense.

Podkaminer, L. 1988: Disequilibrium in Poland's consumer markets: Further evidence on intermarket spillovers. *Journal of Comparative Economics* 12(1): 43–60.

Portes, R and Winter, D. 1980: Disequilibrium estimates for consumption goods markets in centrally planned economies. *Review of Economic Studies* 47: 137–159.

Portes, R, Quandt, RE, Winter, D and Yeo, S. 1987: Macroeconomic planning and disequilibrium: Estimates for Poland, 1955–1980. *Econometrica* 55: 19–41.

Rothbarth, E. 1941: The measurement of changes in real income under conditions of rationing. *Review of Economic Studies* 8: 100–107.

Schroeder, G and Edwards, I. 1981: *Consumption in the USSR: An international comparison*. Joint Economic Committee, US Congress. US Government Printing Office: Washington, DC.

Smith, JG. 1994: *Measuring the effects of quantity constraints in the former USSR on consumption and international comparison indexes*. Ph.D. dissertation, University of Houston.

APPENDIX A

Weighted two-stage least-squares coefficient estimates.

Table A1: Estimates of generalised Cobb Douglas coefficients. ICP Phase 3 Western European countries and US, 1975

	$\ln(\alpha_i - \alpha_n)$	$\gamma_i - \gamma_n$	Adj R^2
Beverages	−6.12 (3.72)	0.413 (0.337)	0.112
Tobacco	−1.46 (5.87)	−0.909 (0.533)	−0.105
Clothing	−7.43 (2.28)	0.571 (0.207)	0.393
Footwear	−4.82 (2.19)	0.188 (0.199)	0.001
Furniture, appliances	−13.69 (3.24)	1.110 (0.294)	0.562
Household supplies and operations	−7.17 (4.08)	0.477 (0.371)	0.128
Transport	−15.31 (1.86)	1.34 (0.168)	0.841
Communications	−27.25 (5.87)	2.225 (.533)	0.579
Gross rent	−17.79 (2.61)	1.570 (0.237)	0.778
Heating fuel, power	−13.81 (3.12)	1.100 (0.283)	0.579
Medical care	−21.78 (2.64)	1.917 (0.239)	0.837
Recreation	−8.50 (3.03)	.682 (.275)	0.336
Education	−17.57 (3.26)	1.496 (0.296)	0.671
Other expenditures	−22.38 (2.27)	1.921 (0.206)	0.875

Note: Instruments are the constant and the log of total consumption expenditure deflated by an unweighted geometric index of PPPs. Twelve market economies were in the sample. Observations were weighted by the country population.