The Welfare Consequences of Transition in Eastern Europe

by

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ABSTRACT

The thesis consists of three chapters. In the first chapter, a one-good, representative-agent model of consumer goods allocation under conditions of price disequilibrium and shortage is developed. An equation is derived from this model that allows for empirical estimation of the net change in welfare that resulted from the onset of transition in a typical Eastern European country. Transition fundamentally involved both price liberalization and policies that resulted in a contraction in economic activity. Welfare increased due to elimination of shortage, searching and queuing for final consumption goods, but decreased due to falling real income. Empirical data is obtained for Poland over 1987-1990, and it is shown that the net welfare effect was likely to have been positive.

The second chapter relaxes the representative-agent assumption of the first chapter. The resultant theoretical model predicts that price liberalization has regressive effects: poorer households do relatively worse after liberalization than wealthier households. Empirical evidence is examined for Poland over the 1980's to test whether one prediction of the theoretical model holds. The evidence supports the prediction, and liberalization probably had signficant regressive effects.

The third chapter explores the effects of Soviet institutions on the choice between increasing product quantity versus product quality. Empirical evidence from the Finnish automobile market, where Soviet autos competed in a competitive market with Western autos, is examined for the period 1950-1990. The evidence shows that Soviet auto quality relative to Western auto quality steadily declined in the postwar period. The data also shows that major Soviet initiatives to close the quality gap were increasingly ineffective over time.

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CHAPTER 1

THE INITIAL WELFARE CONSEQUENCES OF PRICE LIBERALIZATION AND STABILIZATION IN POLAND

I. Introduction

Polish consumer welfare apparently decreased dramatically after a major stabilization and reform program was initiated in January 1990. The statistically-measured real wage fell by almost 20% in 1990. Estimates of the drop in real private consumption change range from 5% to 16%. Recent stabilization and reform initiatives in Russia have also resulted in a sharp fall in real income and consumption.

However, due to certain characteristics of the pre-transition planned economy and the transition itself, statistical measures of real income are rather incomplete measures of overall economic welfare. Price liberalization resulted in the virtual elimination of queuing and search costs of goods procurement, and import liberalization resulted in a substantial increase in goods variety. Realignment of relative prices is bringing about an end to forced substitution, the overconsumption of some goods and underconsumption of others. After decades of hidden unemployment, open unemployment has emerged. Uncertainty concerning job tenure and income is increasing dramatically as the material and psychological security blanket of East European socialism is torn away. Perverse rigidities in the allocation and remuneration of labor and capital are being eased, and those with initiative and skills can now take advantage of opportunities that had been previously curtailed. Any account of the total welfare impact of recent reform initiatives must consider all of these factors if it is to be complete[1].

[1] See Lipton and Sachs (1990) and Berg and Sachs (1992). Anyone who doubts that searching and queuing for goods subtracted significantly from household utility should refer to Wedel (1986) for vivid descriptions of daily life in pre-liberalization Poland. Deadweight utility losses were significant and pervasive.

In what follows, I will attempt to measure the change in economic welfare using available statistical data. In particular, the joint impact on welfare of the fall in consumption and the elimination of queuing and search costs will be considered. A representative-agent model is developed that incorporates a fixed-price state market, a free market, and search and queuing costs for goods sold in the state market. Plausible empirical estimates of the net change in consumer welfare due to elimination of queuing and search costs and the initial fall in real income are calculated using Polish data. The estimates indicate that welfare gains from eliminating these costs were very significant - and in all likelihood fully offset the welfare impact of the initial fall in real income.

The approach that I take to measuring the welfare costs of searching and queuing[2] develops a formula that directly measures the change in utility resulting from the elimination of these costs. This formula does not require data on how much time is expended in searching and queuing and the value of that time to the consumer. Instead, the free-market/state price differential and the relative volume of purchases at state prices are used to infer the magnitude of deadweight utility loss. This approach contributes to the literature on the empirical evaluation of welfare loss due to rationing (Deacon and Sonstelie (1985, 1987); French and Lee (1987)). It differs from these previous efforts in that it does not calculate the monetary value of lost welfare due to rationing and thus does not require explicit empirical data on the monetary value of time to consumers. Previous efforts have also focused only on a specific market for one good[3]. This paper

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[2] It is important to note that searching for goods was as important as standing in lines to buy them but was much less visible to the casual observer. Both activities were major drains on time and energy. See Wedel (1986), among others.

[3] In fact, all three papers examine the gasoline market in California in 1980.

investigates the empirical consequences of non-price rationing across all consumer good markets for a national economy.

II. A Model of a One-Good Economy with Queuing and Free Markets

The application of neoclassical consumer analysis to the pre-transition economies is straightforward. Several researchers have made important contributions modelling consumer choice under conditions of price disequilibrium (Stahl and Alexeev (1985); Sah (1987); Weitzman (1991); Polterovich (1991); Boycko (1991); Osband (1991)). The following model extends their work by deriving an equation that allows for the empirical measurement of welfare improvement after price liberalization.

a. Generation of Price Disequilibrium

Consider the consumer goods market under pre-liberalization conditions. A given quantity of a single consumer good is sold to a representative consumer[4]. There is an official state market, with fixed price p_S, and a free market with price p_F[5]. The state price is normalized to 1, so that p_F is the relative free market price. Price disequilibrium is generated by the assumption that available monetary income for consumption exceeds the value of the consumption good supply at the prevailing state price:

$$x_T < I \ , \quad (1)$$

where x_T is total supply and I is monetary income intended to be spent on consumption.

Because of this disequilibrium, a free market emerges. Some of x_T is sold at p_F, and some at the official price. Denote that part of x_T sold at p_F as x_F, and that part sold

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[4] Alternatively, the good is sold to many consumers who have identical utility functions.

[5] There were many different kinds of free markets in pre-transformation Eastern Europe. Some were legal, such as the farmers' markets. Others were illegal but tolerated and involved little risk for sellers. The remaining were illegal and involved substantial risk for buyers and sellers alike.

at the official price as x_S. The new monetary budget constraint, which will bind in equilibrium, is

$$x_S + p_F x_F = I \ . \quad (2)$$

b. Consumer Utility Maximization

Household utility depends on both consumption and leisure and can be written as

$$\psi = U(x_S + x_F, L) \ , \quad (3)$$

where $U_1, U_2 > 0$, $U_{11}, U_{22} < 0$, (where U_i is a partial derivative), and L is leisure. The total amount of time resources available to the household is T[6].

Price disequilibrium necessarily generates methods of distributing goods that do not rely on the bidding of monetary resources. The most common method used in Poland, Russia, Romania and perhaps some of the other formerly-planned economies was distribution of goods through a time-bidding process[7].

Assume that the average amount of time and effort devoted by the household to search and queue for a unit of the consumer good sold at the state price is e, so that total time and effort spent on goods procurement is ex_S. Leisure is therefore $T - ex_S$, and utility is

---

[6] L should properly be regarded as "effective leisure" and should incorporate a measure of the quality of leisure. The psychic costs of procuring goods affected utility probably as much as the pure time loss incurred.

[7] Another method is "pure rationing," in which goods are distributed according to direct command of the state, and consumers do not have the opportunity to bid for goods with any of their resources.

$$\psi = U(x_S+x_F, T-ex_S) \ . \quad (4)$$

The utility maximization problem is:

$$\max \psi = U(x_S+x_F, T-ex_s)$$

$$\textit{with respect to } x_S, x_F \quad (5)$$

$$\textit{such that } x_S + p_F x_F = I \ .$$

First-order conditions are

$$U_1 - eU_2 = \lambda \ , \quad (6)$$

$$U_1 = \lambda p_F \ , \quad (7)$$

where λ is the marginal utility of income. Substituting (7) into (6) and multiplying by x_S, we obtain

$$\lambda(p_F-1)x_S = U_2 e x_S \ . \quad (8)$$

Thus, *if* utility is linear in leisure, rents obtained on state market purchases are completely offset in utility terms by procurement costs. The only effect of the fixed state-market price policy is the generation of deadweight utility loss.

c. Supply of the Consumer Good to the State and Free Market

It remains to determine how much output is sold on the state market and how much on the free market. If there are no incentives or constraints to force the representative agent to sell some of the good at the official price, then all of x_T would be sold on the free market. This was not the case in reality, because risks and

punishments were imposed by the government that kept suppliers from selling everything on the free market, and government officials and enterprise managers had an interest in generating shortage[8].

For the purposes of this paper, the method according to which the agent determines the magnitudes of x_S and x_F is irrelevant. All that is important is that some positive amount of x_T be sold at the official price. Various approaches could be taken in modelling the behavior of the supplier of x_T. There could be a shopkeeper/pilferer who receives x_T and then allocates it to the state and free market according to the maximization of expected profit on risky free-market sales. There could be some complicated interactic between the supplier and the state. However, changes in modelling the supplier's decision have no impact on the important results of this paper, because the manner in which the supplier makes decisions does not affect the first-order conditions resulting from consumer utility maximization.

Note that if the agent chooses the level of x_F by maximizing profits on sales of x_F, one might think that these profits should enter the RHS of the budget constraint (2). This is not the case: profits earned on free-market sales are *not* a component of consumer income, and the budget constraint (2) is correcly specified. Because this is a representative-agent model, the supplier and the consumer are the same person. The supplier-consumer receives an amount x_T which it must sell to itself. Given that the agent's income I exceeds the value of x_T at the official price, and given that the state does not permit the agent to sell all of x_T to itself at a market-clearing price, the free market and queuing/searching emerge to bring about equality between supply and

[8] See Shleifer and Vishny (1992) for a model of socialist firm behavior in which the firm wants to generate shortage in order to maximize appropriable free-market profits.

demand. The only effect of the free market and its higher price p_F is to reduce the real value of monetary income I so that it equals x_T. Queuing and searching keeps the consumer-supplier from trying to buy all of x_T from itself at the low official price. Profits on free-market sales, $(p_F-1)x_F$, are transferred from the consumer to the seller, but because they are the same person in this model, there is no distributional effect.

d. The Ratio of Utility Gains to Utility Losses

The general-equilibrium model of this one-good, representative-agent economy is fully described by four equations: (2), (6), (7), and an equation resulting from the supplier's decision-making[9]. There are four endogenous variables: x_F, p_F, λ and e. Of course, the model is not a general-equilibrium model in the full sense, since labor supply and production are neglected[10]. However, leisure does have a shadow value[11].

In order to develop an estimation equation for the value of utility lost through state-market goods procurement, substitute (7) into (6) to obtain

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[9] The supply equation could set x_F equal to some exogenous level, or it could make x_F a function of p_F.

[10] See appendix C for this extension.

[11] The constraint $L = T - ex_S$ has been substituted into the utility function. The maximization problem without substitution gives the following formula for the shadow value of time and effort resources:

$$\mu = \left(\frac{p_F - 1}{e}\right)\lambda$$

where μ is the shadow value of leisure, which equals in utility terms the value of per-unit rent obtained on the state good normalized by the per-unit time cost of the state good.

$$eU_2 = \left[\frac{p_F - 1}{p_F}\right] U_1 \ . \quad (9)$$

This can be rewritten as

$$\left[\frac{p_F - 1}{p_F}\right]\left[U_1\frac{x_T}{U}\right]\left[\frac{x_S}{x_T}\right] = \left[\frac{U_2}{U}\right] ex_S \ . \quad (10)$$

Assuming that real income/consumption x_T does not change, the ratio of post- to pre-price liberalization utilities is

$$\frac{\psi_{POST}}{\psi_{PRE}} = \frac{U(x_T, T)}{U(x_T, T - ex_S)} \ . \quad (11)$$

$U(x_T,T)$ can be approximated as

$$U(x_T, T) = U(x_T, T - ex_S) + U_2 ex_S \ , \quad (12)$$

where the derivative U_2 is calculated at $L = T - ex_S$. Note that if utility is linear in leisure, (12) holds as an equality. Combining (11) and (12) gives the approximation

$$\frac{\psi_{POST}}{\psi_{PRE}} \cong \frac{U(x_T, T - ex_S) + U_2 ex_S}{U(x_T, T - ex_S)} = 1 + \left[\frac{U_2}{U}\right] ex_S \ . \quad (13)$$

Substituting (10) into (13), the estimation equation is obtained:

$$\frac{\psi_{POST}}{\psi_{PRE}} \cong 1 + \left[\frac{p_F - 1}{p_F}\right]\left[U_1\frac{x_T}{U}\right]\left[\frac{x_S}{x_T}\right] \ , \quad (14)$$

or, in percentage terms,

$$\frac{\psi_{POST}-\psi_{PRE}}{\psi_{PRE}} \cong \left[\frac{p_F-1}{p_F}\right]\left[U_1\frac{x_T}{U}\right]\left[\frac{x_S}{x_T}\right] \quad . \quad (15)$$

Thus, the percentage increase in the level of utility due to the elimination of procurement costs equals the product of the free-market price-premium, the elasticity of utility with respect to x_T at the point of actual consumption, and the relative weight of state-market purchases in total purchases. Again note that if utility is linear in leisure, then (14) and (15) hold as equalities.

In the subsequent empirical implementation of the model, the percentage change in utility due to the elimination of state-market goods procurement costs will not be calculated. Instead, I calculate the ratio of utility gained through the elimination of procurement costs to the utility lost due to the fall in real income in the first year after price liberalization and stabilization[12]. The percentage decline in utility due to a fall in real income can be approximated as

$$\left[U_1\frac{x_T}{U}\right] \times \left|\frac{\Delta x_T}{x_T}\right| . \quad (16)$$

The ratio of percentage utility gain (15) to percentage utility loss (16) under price liberalization and a fall in real income is therefore approximated by

[12] This strategy has been adopted due to the fact that in order to make any statement about how much utility increased after the elimination of procurement costs, it would be necessary to specify a particular utility functional form.

The technique used here avoids the need to specify a particular functional form: the ratio to be empirically estimated is an approximation to *all* valid utility functions.

$$\frac{\left[\frac{p_F-1}{p_F}\right]\left[U_1\frac{x_T}{U}\right]\left[\frac{x_S}{x_T}\right]}{\left[U_1\frac{x_T}{U}\right]\times\left|\frac{\Delta x_T}{x_T}\right|} = \frac{\left[\frac{p_F-1}{p_F}\right]\left[\frac{x_S}{x_T}\right]}{\left|\frac{\Delta x_T}{x_T}\right|} \quad . \quad (17)$$

The ratio defined by (17) will be empirically estimated in the following section. It indicates the degree to which the negative utility consequences of falling real income are offset by the elimination of procurement costs. If the ratio is greater than 1, then the net welfare change is positive. If the ratio equals 0.5, say, then the utility gains offset the fall in utility by 50%. It is important to note that the ratio of first-order changes (17) is robust to *any* legitimate specification of the utility function[13].

If utility is not linear with respect to leisure, then care must be exercised in interpreting empirical results. In particular, if utility is concave with respect to leisure, then the percentage utility gain resulting from procurement-cost elimination is overestimated by the RHS of (15). The impact of utility concave in leisure is treated in appendix A.

Some goods were not distributed through search and queues in Eastern European countries. Instead, formal waiting lists were drawn up, and those wishing to obtain the good joined the list and received the good after a significant delay[14]. This method seems to be fundamentally different from the search/queue mechanism, in that no deadweight utility loss is generated. Appendix B formally models waiting lists and shows that in fact a deadweight loss *is* generated: even though monetary income is available to

[13] Also note that the fact that the utility function is an *ordinal* measure rather than a cardinal measure does not invalidate the approach taken in this paper. I am not estimating the absolute percentage increase in utility, only the degree to which utility gains offset utility losses.

[14] Housing and automobiles were distributed primarily through waiting lists in East European countries.

be spent on the good today, consumption of the good is delayed, and the utility value of consumption is reduced because future utility is discounted. The appendix shows that in the case of utility linear in consumption, the percentage increase in utility due to price liberalization equals the RHS of (15).

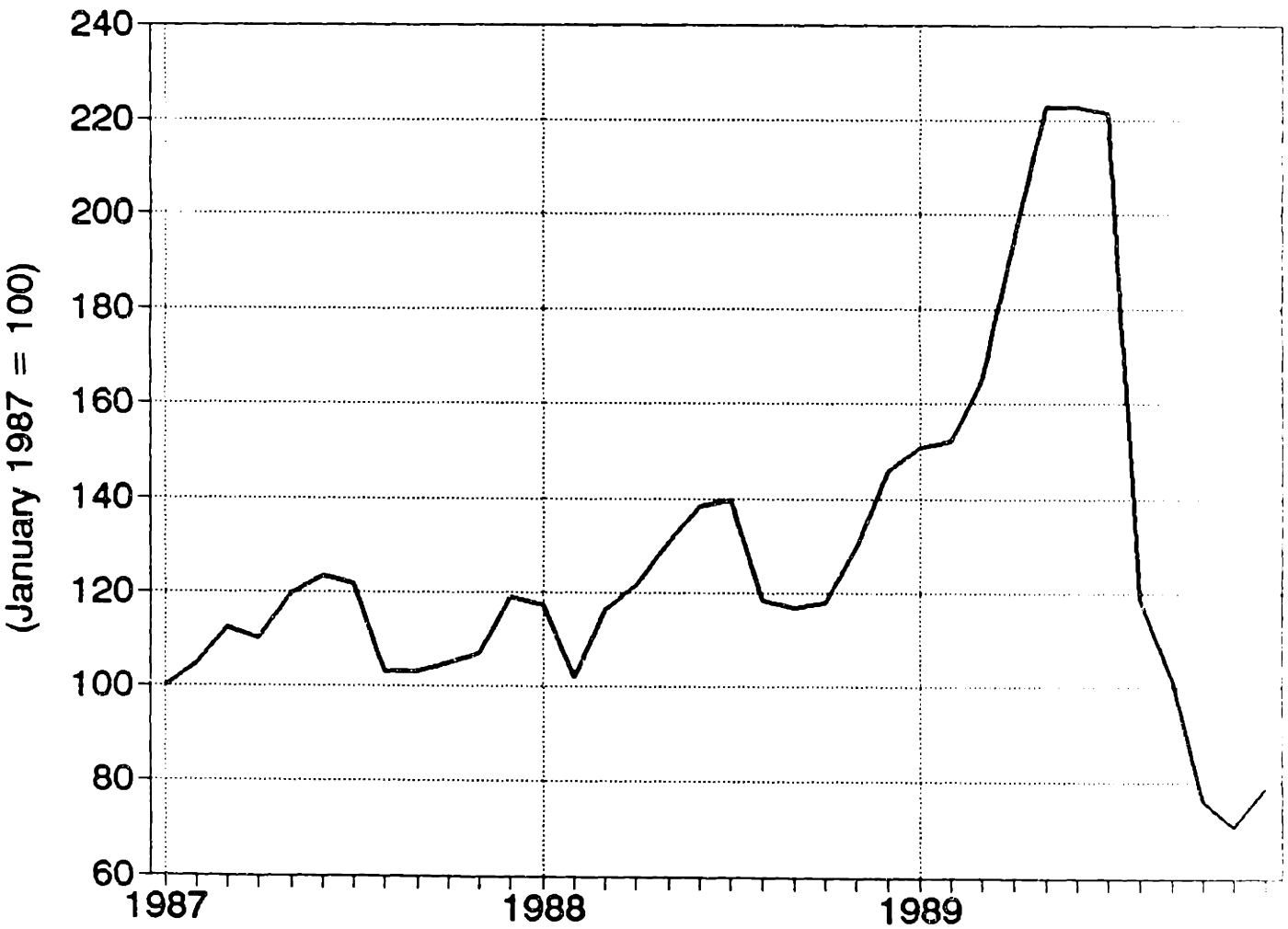
The model is easily extended to consider issues such as free-market transactions costs, transactions costs in the post-liberalization regime, and labor supply. These modifications and their empirical ramifications are developed in appendix C.

III. Empirical Estimates of the Welfare Impact of Price Liberalization and Stabilization in Poland

Estimates of welfare gain are calculated using 1987 price data. Open Polish price inflation accelerated over 1988-1989, and a hyperinflation emerged in the last half of 1989. Even as open inflation intensified, repressed inflation accelerated, and shortages worsened. However, it is unlikely that a very high level of shortage lasted for more than a brief time. This can be seen in figure 1, which graphs the ratio of the free-market food-price to the state food-price. The ratio actually fell slightly during 1983-1986, then slowly rose in 1987 and 1988. There was a brief explosion in mid-1989, which was quickly followed by a spectacular collapse in the second half of 1989 as state food-prices were liberalized. It is more sensible to estimate welfare gain on data from the very stable period 1985-1987 rather than the brief and volatile inflationary period of 1988-1989, as it is much more conceivable that conditions prevailing in the earlier period could have been sustained into the indefinite future. However, it should be kept in mind that if calculations were based on conditions prevailing in 1988 or early 1989, the estimated welfare gain would be significantly higher.

Values for the three terms in equation (17) must be obtained in order to calculate the net welfare gain resulting from price liberalization and stabilization in the first year after the initiation of the transition.

Figure 1
Farmers' Market/State Food Price Ratio



(a). Free-market/State-market Price Ratio

The ratio p_F/p_S has been calculated from a variety of official Polish data on prices

TABLE 1

POLISH FREE-MARKET/STATE PRICE RATIOS

	Aggregate Ratio	
	p_F	$(p_F-1)/p_F$
1985-87	1.22	0.18
1987	1.22	0.18

	Ratios by subcategory					
	Food	Alcohol and Tobacco	Clothing	Consumer Durables	Services	Other (*)
Ratio	1.27	1.28	1.40	1.65	1.91	1.51
% in total	44.2	4.3	14.9	15.5	13.6	6.2
% covered	96.2	64.3	44.0	43.0	24.2	13.9

% in total: Percentage of subcategory in total consumption.
% covered: Percentage of individual consumption items in subcategory for which there is free-market/state price data.
(*): Energy and fuels (including gasoline), medical, and cosmetic items.

prevailing in state and free markets. Results are given in table 1. The most important source of data is an annual household budget survey which monitors the receipts and expenditures of some 28,000 families. Separate records were kept on purchases in state

and free markets[15], and prices for a large variety of goods were derived from these data. Black-market prices for a limited number of goods were also officially reported[16], and these were used to construct price ratios for consumer durables. Ratios for individual goods and services were aggregated using consumer expenditure shares from the household budget survey and data on the structure of state retail trade sales. Complete details on the construction of the price ratios are given in appendix D.

The aggregate p_F/p_S ratio is 1.22 in 1987. The average aggregate ratio for 1985-1987 is also equal to 1.22, indicating that repressed inflationary pressures were constant over this period. The 1987 free-market price premium is 18.1%.

It should be noted that this estimate is conservative. Price ratios for many individual clothing items, durables, and services are not available. The price ratio is assumed equal to 1 for these items when constructing the aggregate price ratio. However, ratios calculated for clothing, durables, and services *excluding* items for which no price ratio data is available are much higher than 1.22 (see table 1). Full coverage of the consumer basket would substantially increase the aggregate ratio.

(b). Relative Weight of State-Sector Purchases

Evidence on the proportion of consumption goods bought on state markets and free markets were not systematically collected or reported by the statistical authorities. However, enough data exists so that reasonable values of x_S/x_T can be postulated.

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[15] More precisely, in the socialist and nonsocialist sectors.

[16] Evidently obtained through "market surveys."

x_S should include all purchases on which rents were fully dissipated, and x_F should include all purchases on which rents were not dissipated but were enjoyed by the seller or consumer or both. Goods produced and consumed by the household itself should be treated as part of x_F. x_F should include sales to workers by "special stores" run by enterprises (known as "privileged access" sales), if these sales were at the official price p_S and no procurement costs were incurred by workers in obtaining these goods. Goods sold under coupon-rationing schemes should also be included in x_F, *if* such schemes actually eliminated procurement costs. Finally, sales through formal waiting lists did generate deadweight welfare losses that were eliminated by price liberalization, and appendix B shows that for utility linear in consumption, an empirical estimation equation equivalent to (17) holds. Thus, waiting-list goods should properly be treated as a component of x_S.

(i). Official Polish Data

The Polish statistical authorities collected a large amount of statistical data on aggregate consumption that permits the calculation of many of the components of x_S and x_F. The official value of aggregate consumption includes[17]:

(a). Purchase of goods and services at state-market prices in state retail trade stores

(b). Purchase of goods and services at state-market prices in "privileged-access" stores

(c). Purchase of goods and services in the legal private sector at free-market prices

[17] See the explanatory notes for the section on "spozycie" (consumption) in any *Rocznik Statystyczny* in the 1980's for a description of what the official measure covers.

(d). Purchase of goods and services in state-owned hard-currency stores at free-market prices

(e). The value of agricultural goods produced and consumed by households

(f). Purchase of goods and services at state-market prices through waiting lists

(g). Purchase of goods and services at state-market prices using rationing coupons

(h). Purchase of goods and services at free-market prices at state stores through under-the-counter payments

In this section, values for (c), (d), and (e) are calculated, and an estimate of x_S/x_T is obtained. It is important to note that the estimated value of x_S/x_T is an *underestimate* of the true value. The calculated ratio is a ratio of nominal values and equals

$$\frac{p_S x_S}{p_F x_F + p_S x_S}, \quad (18)$$

which is less than x_S/x_T.

In most formerly-planned economies, significant amounts of food were purchased on legal "farmers' markets," where goods were priced freely[18]. Other private economic activity, for example production and sale of handicrafts and services, was also tolerated. Data on legal free-market sales of goods and services are shown in table 2. According to this official data, legal free-market sales were rather small, amounting to about 7% of total consumption in 1985-1987.

[18] In Poland, these were known as "targowiski," and in the Soviet Union as "kolkhoznye rynki." Farmers' markets sold fresh food products, including meats, vegetables, fruits, eggs, dairy products, and honey. With the exception of cheese and milk, farmers did not sell processed foods.

TABLE 2

OFFICIAL POLISH DATA ON HOUSEHOLD CONSUMPTION

	Total Household Consumption	Private Retail Sales	Private Service Sales	Hard-Currency Sales	Home-Produced Food
Billion current zloty:					
1985	6370	125	288.1	254.8	-
1986	7820	150	378.5	375.4	-
1987	10066	207	507.8	-	775.1
As percentage of total household consumption:					
1985	100	2.0	4.5	4.0	-
1986	100	1.9	4.8	4.8	-
1987	100	2.1	-	-	7.7

TABLE 3

(Private sales doubled)

	Total Household Consumption	Private Retail Sales	Private Service Sales	Hard-Currency Sales	Home-Produced Food
Billion current zloty:					
1985	6783	250	576.2	254.8	-
1986	8349	300	757.0	375.4	-
1987	10781	414	1015.6	-	830.1
As percentage of total household consumption:					
1985	100	3.7	8.5	3.8	-
1986	100	3.6	9.1	4.5	-
1987	100	3.8	9.4	-	7.7

TABLE 3

RATIO OF HARD_CURRENCY SALES TO TOTAL PRIVATE CONSUMPTION

	Total	(Food)	(Alcoholic beverages)	(Nonfood)	(Clothing)
1982	4.3%	1.2%	10.4%	4.9%	13.1%
1983	5.0%	2.3%	7.8%	5.8%	11.9%
1984	4.0%	2.2%	8.2%	4.2%	7.9%
1985	4.0%	2.4%	10.1%	3.7%	6.1%
1986	4.8%	2.7%	11.0%	4.7%	5.9%

Source: *Rocznik Statystyczny Handlu Wewnetrznego 1980-1986* and *Rocznik Statystyczny*, various issues.
Pewex sales are given in millions of US dollars. The dollar values were converted into zloty values through the parallel market exchange rate. Over 1984-1986, imports constituted 70% of Pewex sales.

TABLE 5

HOME-PRODUCED AND CONSUMED FOODSTUFFS, 1987

Household Type	Number of budgets	Expenditures on home-produced foodstuffs	Total household expenditures	(percentage)
Worker	13373	378	16221	2.3%
Worker-peasant	3897	2631	14570	18.1%
Peasant	3905	3796	16973	22.4%
Pensioner	7647	735	16304	4.5%
Total	28822	1240	16122	7.7%

Note: expenditures are zloty-per-month.
Source: Calculated from data in *Budzety Gospodarstw Domowych 1987.*

However, the official estimate of the value of these sales is widely acknowledged to be underestimated.[19] Table 3 gives new values with legal private sales doubled[20].

Many formerly-planned economies sold goods for dollars and other hard currencies to domestic citizens through a chain of domestic "export" stores. These sales of both domestically-produced and imported products were usually made at market-clearing prices. Data on sales through the Polish version of this network, known as Pewex/Polmot, are available for 1982-1986 in total and for a variety of consumption categories and are given as a percentage of consumption in table 4.

The value of agricultural products produced and consumed by households can be calculated from the household budget survey data. The value of such production and its percentage in total household expenditures for four household types in 1987 are given in table 5. It should be noted that this consumption was valued at free-market prices[21]. Assuming that the survey properly sampled the general population, these shares can be aggregated. The overall percentage of home-produced foodstuffs in total consumption in 1987 was 7.7%.

Summing these four components together, these sales were between 20-25% of total consumption in 1987 (see tables 2 and 3). The ratio x_S/x_T was therefore between

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[19] Aslund (1985) provides a thorough critique of official Polish statistical measurement of the legal private sector, particularly turnover data (pp.7-9). He then concludes that "some experts acknowledged that Polish statistics on the turnovers of private enterprises were little more than guesses. The size of biases or their trends cannot be estimated, since it is quite possible that 50 per cent should be added to the GUS estimates of private turnover" (Aslund 1985, p.9; emphasis added). Thus, doubling the official value of private turnover is more than adequate in allowing for undermeasurement of the private sector.

[20] Increasing private sales by 100% seems to be more than enough to take care of underreporting: see footnote 19. Note that the increase in the value of private sales must be added to total household consumption, the denominator.

[21] The prices used were state agricultural purchase prices, but for non-obligatory supplies. These purchase prices were generally market-clearing.

75-80%. As noted above, because (c), (d), and (e) are valued at free-market price, this is an underestimate of the true ratio x_S/x_T.

Of course, several major components of consumption that should be included in x_P are missing from this calculation, in particular coupon-rationed sales, privileged-access sales, and under-the-counter sales. Also, illegal production of goods and services sold at market-clearing prices that are definitionally not recorded in official statistics are completely neglected.

Coupon-rationed sales were practically nonexistent in Poland in 1987[22]. It is also usually the case that such schemes do not eliminate procurement costs. Even if authorities manage to set the aggregate issue of coupons equal to the aggregate supply of a good, there will be imbalances at the micro level that lead to searching and queuing[23]. For these two reasons, it is assumed that none of the consumption basket was rationed through effective coupon schemes.

No empirical data is available on privileged access sales. Apparently, most of these sales were targeted at particular groups of workers who were considered to be politically important, in particular the coal miners[24]. The elite strate of Polish society also benefited heavily from these sales, but the size of this elite was very small. It seems unlikely that privileged access sales were a large component of total consumption in 1987. This paper makes the assumption that these sales were 10% of total consumption.

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[22] See World Bank (1987), volume I, paragraph 1.27, p.12.

[23] See Deacon and Sonstelie (1989b).

[24] Personal communciation from Polish colleague.

No empirical data from official sources is available on under-the-counter sales, or on illegal private activity not recorded in official statistics. In order to fill in this part of the picture, it is necessary to look at other data sources.

(ii). Second Economy Statistical Data

An alternative to these official statistics is attempts to recalculate total household income and expenditures taking into account the items missing from the previous calculation. The Polish state statistical authority estimates that in 1987, unregistered private economic activity was about 25% of total household income[25]. Combining this with the calculation of the previous section, x_S/x_T in 1987 was about 40-45%.

Considerable quantitative evidence on total personal incomes is available for the Soviet Union. If conditions in Poland were reasonably close to those prevailing in the Soviet Union, then a review of this evidence is useful. There is little reason to suspect that the situations in the two countries were dramatically different, given that the institutions used by both countries to distribute consumer goods were remarkably similar and that official statistics on the extent of legal free-market activity for both countries show similar levels[26].

Data obtained from a survey of emigrants from the Soviet Union in the late 1970's are presented in table 6[27]. This survey sampled roughly 2000 households and

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[25] Cited in Wedel (1992), p.77 (footnote 1).

[26] For example, according to official Soviet statistics, purchases on the farmers' market in the USSR accounted for roughly 5% of total consumer expenditures in the late 1980's.

[27] See Grossman (1989).

TABLE 6

INFORMAL EXPENDITURES AND PERSONAL INCOMES,
SOVIET EMIGRANT SURVEY

	Working Households				Pensioner Households	
	Belorus, Moldova, and Ukraine	Russia and the Baltics		Armenia	Leningrad	Armenia
		Leningrad	Other cities			
Number*	558	294	382	560	164	30
Total personal income^	2174	1943	1540		1241	2839
Informal expenditures^	880	674	442		497	2023
(as % of income)	40.5%	34.7%	28.7%		40.1%	71.3%

* : Number of households in sample.
^ : Rubles per year.
Source : Grossman (1989), p.160

acquired detailed data on household incomes and expenditures, both "formal" and "informal." Informal expenditures are defined to be any expenditures associated with the "second" economy and cover almost the entire range of purchases properly included in

x_F[28]. The only items of expenditure not covered are privileged-access sales and effective coupon-rationed sales[29].

The value of x_F/x_T range from 28.7% for working households in Russian cities (excluding Leningrad) to 71.3% for pensioner households in Armenia. For various reasons, the demographic profile of the emigrant sample does not correspond closely to the profile of the Soviet population as a whole. The ratio for the entire USSR is likely to be somewhere between the ratios for households in Russian cities and Belorussia/Moldova/Ukraine, and probably closer to that for Russian cities. Thus, this data suggests that x_S/x_T could be anywhere from 60-70% in the USSR in the late 1970's[30]. Again not that this is an underestimate of the true x_S/x_T, because x_F is valued at p_F.

Various estimates of the total size of the Soviet informal economy have also been made by Russian statisticians. These estimates again include almost all of the purchases that should properly be included in x_F[31]. Using their result that second-economy turnover was from 60 to 170 billion rubles in the late 1980's[32] and the official 1988 value of personal consumption, 441.2 billion rubles, the ratio x_S/x_T ranges from 72-88%.

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[28] Expenditures included free-market purchase of food and nonfood goods, in-kind consumption of foodstuffs and goods stolen from the workplace, private service payments, gifts, bribes, under-the-counter purchases, and purchases made through "connections." See Grossman (1989), pp.165-168.

[29] There was probably very little coupon rationing in the USSR in the late 1970's.

[30] The late 1970's was a period of relatively high repressed inflation in the USSR. The government apparently implemented an austerity program in the early 1980's which may have slightly increased the value of x_S/x_T through 1985.

[31] The major omitted category that the emigrant survey *does* include is legal purchases of food from free-market sources.

[32] These estimates agree that the annual value of black market turnover in the late 1980's was on average equal to 100 billion rubles. The range used here incorporates the lowest and highest endpoints of the various ranges estimated by the Soviet analysts. See Rutgaizer (1992), p.62.

The large difference between the results of the emigre-survey and the Russian statistician calculations may be due to the fact that households in the emigre sample were much more likely to have participated in informal activity than the typical Soviet household.

(iii). Submarket Evidence

Finally, it is worthwhile to review evidence on the magnitude of x_F/x_T for several important submarkets, taking advantage of the results of several careful empirical studies.

An extensive research program on the second economy in the former Soviet Union identifies services as one area of intense black-market activity. Calculations based on 1977 data show that at least 80% of consumer services were sold at free-market prices[33]. Studies of the Polish black market also indicate that provision of services was concentrated in the second economy, although to a lesser extent than in the Soviet Union[34]. A survey of the Soviet gasoline market found that 50% of the physical quantity of gasoline was sold at illegal black market prices in the late 1970's[35].

The services and gasoline markets were studied precisely because they were ex-ante believed to be sectors of intense black market activity, and the results confirm these

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[33] See Neuhauser and Gaddy (1989), p.15. Their estimate is based on an extensive survey of emigrants from the Soviet Union in the late 1970's and 1980's.

[34] "In some areas, particularly services, the supply was dominated by various forms of unofficial activity. The second sector accounted for between 27 and 76 percent of total supplies of services provided by private and state-owned firms in the repairs of cars, TV sets, household appliances, and so forth, in 1987." (Kaminski (1991), pp.183-184)

[35] See Alexeev (1988). As in the case of services, one would have expected on the basis of a priori information that the black market for gasoline in the Soviet Union was extensive. Automobile production grew more than 20% per year in the early 1970's, but gasoline production increased much more slowly, at 6-7% per year. Intense shortage inevitably resulted.

beliefs. In contrast, a review of the housing market in Soviet urban areas revealed that only 3% of all urban households rented housing privately in 1989[36].

(iv). The Value of x_S/x_T

Taken together, this body of empirical evidence suggests that a reasonable range for x_S/x_T is 40%-60%. Using the official Polish consumption data, the Polish estimate of unregistered private activity, and a value for privileged-access sales equal to 10% of total consumption gives a range of 45%-50%. The Soviet emigre survey data suggests a value of 50%-60% (again allowing for 10% privileged-access sales). Anywhere from 5% to 10% should be added to the endpoints due to the underestimation problem resulting from valuing x_F at p_F[37].

The estimated ranges and the correction for underestimation mean that the chosen endpoint of 40% is fairly conservative. The true value was probably between 50% and 60%.

(c). Change in Real Consumption in 1990

The change in aggregate Polish real consumption over 1989-1990 is the subject of much dispute. The Polish statistical agency GUS asserts that real private per-capita

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[36] See Alexeev (1991), p.3 and p.7.

[37] Assume that the estimated value of x_S/x_T is 0.5, and the relative free-market price p_F is 1.22. Then it is easily shown that the *true* value of x_S/x_T is 0.55.

consumption fell 16%[38]. An alternative estimate of the change in personal consumption using data on the physical consumption of many types of goods obtained from household expenditure surveys and other sources has been calculated (Berg and Sachs (1992)). This estimate indicates that aggregate consumption fell about 5%.

Another recent effort relies on changes in the food budget share to infer movements in real income[39]. The statistical correlation of growth in the food budget share and growth in the GUS private consumption measure over the period 1981-1989 can be used to forecast private consumption growth in 1990. The point estimate, -0.92%, is far below the -16% value given by GUS, and even makes the Berg-Sachs estimate look rather conservative.

The Berg-Sachs and GUS estimates are assumed to bracket the actual fall in Polish real income. In order to remain consistent with the choice of 1987 as a base year for comparison purposes, the fall in real consumption is calculated over 1987-1990 rather than 1989-1990. The GUS data gives this change as 12%. A corresponding Berg-Sachs estimate is not available, and the 5% value is used. However, if the Berg-Sachs approach was applied to 1987-1990, the fall in real consumption would be less than 5%.

It should be emphasized that there are two serious calculations that show a real income change of 5% or less. Values at the lower end of the range 5%-12% are therefore more plausible as representing the true change in real consumption over 1987-

[38] *Rocznik Statystyczny w 1991 roku.*

[39] See Roberts (1993).

1990. The mid-point of this range, 8.5%, is also considered in the calculation of the net welfare change ratios[40].

(d). Estimates of Net Welfare Change

Table 7 gives the values of the ratios of welfare increase due to the elimination of procurement costs to the welfare loss brought about by the fall in real cor sumption. If a ratio is greater than 1, then welfare gain more than offset welfare reduction, and the initial net welfare effect of the reform program was positive.

The welfare gains from price liberalization were very significant. In the case of a fall in real consumption of 5% or 8.5% and x_S/x_T equal to 50%-60%, gains outweighed losses. In the case of a 12% contraction, net welfare change is almost equal to zero if x_S/x_T equals 60%. Even in the unlikely worst-case scenario, gains offset losses by more than 50%. It should be noted that the welfare gains from elimination of forced substitution and an increased variety of consumer goods due to import liberalization are not included in these calculations. Their inclusion would significantly increase ratio values.

Because the fall in real consumption was probably closer to 5% than 12%, the value of x_S/x_T closer to 60% than 40%, and other significant welfare gains are not taken into account, the results suggest rather strongly that in the case of Poland, initial welfare gains due to price liberalization and reform exceeded initial welfare losses.

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[40] It is important to note that explaining exactly why output and consumption fell after price liberalization is *irrelevant* for the purposes of this paper. In order to assess the welfare consequences of the reform program for the representative consumer, all that is necessary is to determine by how much consumption fell.

TABLE 7

RATIO OF UTILITY GAIN TO ABSOLUTE VALUE OF UTILITY LOSS

	Percentage fall in real consumption		
x_S/x_T	5%	8.5%	12%
0.4	1.45	0.85	0.60
0.5	1.81	1.06	0.75
0.6	2.17	1.28	0.91

Note: Utility linear with respect to leisure.

The effects on empirical results of modifying the model to take into account utility nonlinear in leisure are considered in appendix A. It is shown that except for very extreme and unlikely degrees of concavity, the ratio values are essentially unaffected. The effects of introducing free-market transaction costs, post-liberalization transaction costs, and labor supply in the model are reviewed in appendix A.

IV. Conclusions

Those previously familiar with the East European economies were aware that substantial welfare gains were to be had from a reform of the highly inefficient distribution system. That the gains were possibly so large, as this paper has shown, is surprising. Given the tenor of current discussion about reform in Eastern Europe and its impact on living standards, few would have expected the initial net welfare change (as defined in this paper) to be zero or positive.

This empirical finding has general implications for the reform of economies characterized by considerable expenditure of real resources on goods procurement, rent seeking and the like. Thoroughgoing, credible reform efforts can result in immediate positive net welfare effects. The received wisdom has been that such initiatives generate a welfare "J-curve," in which welfare falls initially and begins to increase only after the positive effects of reform begin to bear fruit. This impression is driven in large part by the empirical fact that sharp contraction of economic activity in certain sectors often follows major reforms. It has been demonstrated here that the experiences of Poland and Russia correspond more to a "gamma-curve"[41]. Welfare initially does not change or even rises, and is hopefully followed by significant increases as the benefits of restructuring and greater integration into the world economy are realized.

Of course, the analysis of welfare change made in this paper is incomplete. First, the effect of the reduction of real balances is not considered. The issue of real balance contraction is complex, as a large fraction of accumulated monetary holdings was

[41] A Γ-curve.

considered by many to be a "monetary overhang." It is not clear that their elimination entailed utility loss[42].

Second, the assumption that there is a single consumer, so that distributional issues are completely neglected, is clearly open to criticism. Many observers and analysts have focused precisely on distributional effects as one of the most undesirable consequences of price liberalization. Much work needs to be done on the distributional consequences of Eastern European reforms.

Third, expansion in product variety and partial elimination of forced substitution is not taken into account. In order to address these issues, a multi-good model is necessary. Both of these changes increase the level of economic welfare.

Finally, as pointed out in the introduction, the analysis does not take into account the significant increase in uncertainty about economic futures. This factor, rather than the supposed contraction in welfare due to falling real consumption, underlies much of the negative reaction in Eastern Europe to the dramatic changes now rapidly unfolding. The populations concerned are aware that economic restructuring is barely underway. Although restructuring does not necessarily result in the lowering of the living standard of a given agent, and will certainly result in an overall increase in welfare, the uncertainty and other costs associated with such fundamental change nonetheless impact on welfare defined in a broad sense.

[42] Changes in real balances are only part of the broader question of what is happening to total household assets over the course of transition.

Appendix A: Utility Nonlinear in Leisure

If utility is not linear with respect to leisure, then care must be exercised in interpreting the empirical results. In particular, if utility is concave with respect to leisure, then the percentage gain resulting from procurement-cost elimination will be overestimated. Assume that utility can be written as

$$\psi = U(x_S+x_F)h(T-ex_S) \ . \quad (19)$$

If this utility function is concave in leisure, then $h_{11} < 0$. The degree of overestimation of utility gains due to concavity for this function is shown graphically in figure 2.

Another implication of concavity is that rents obtained on state-market purchases are not fully offset by procurement costs. Applying (8) to (19), we obtain

$$\lambda(p_F-1)x_S = Uh'ex_S \ . \quad (20)$$

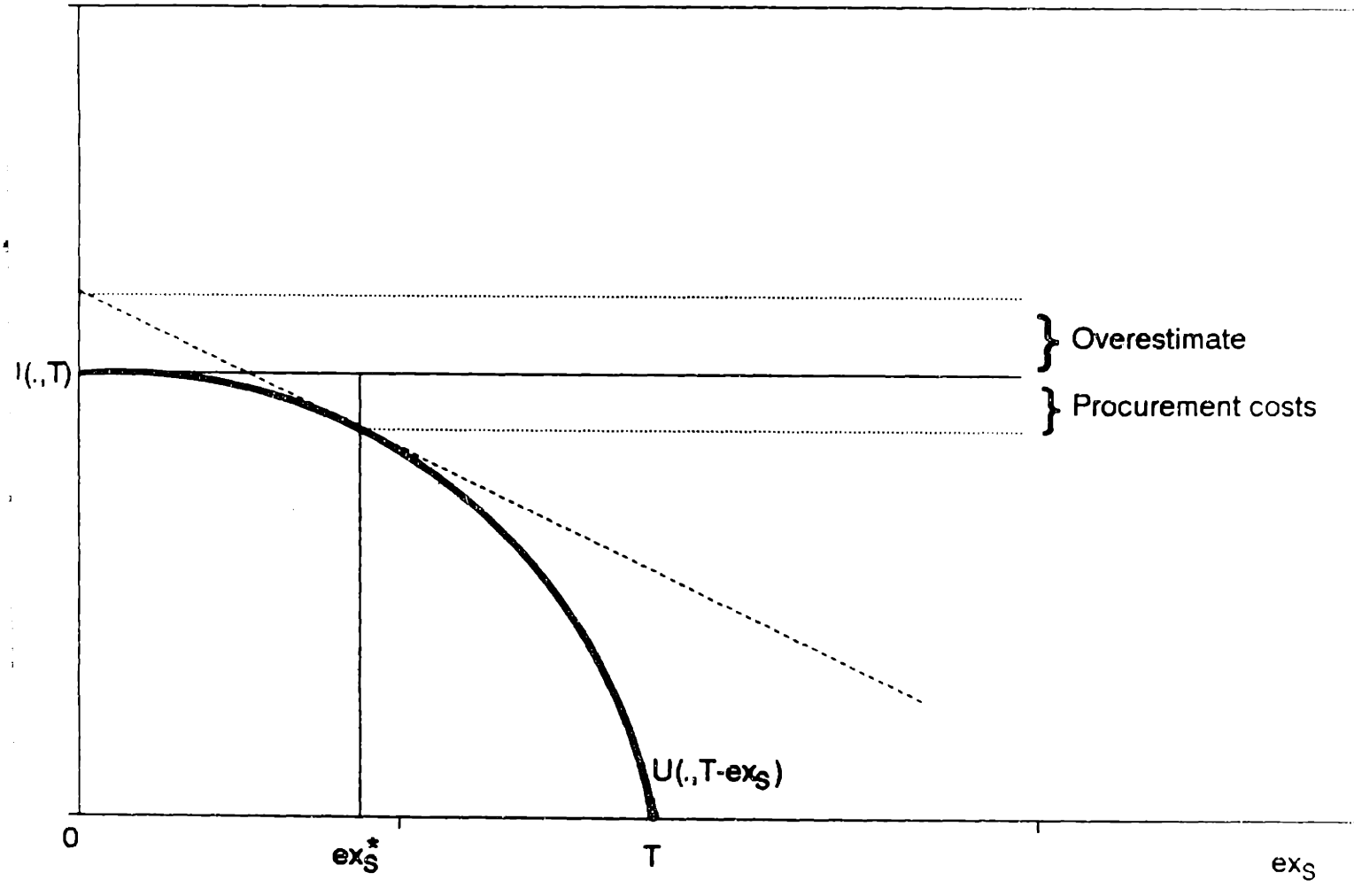
It is clear that rents exceed procurement costs (see figure 2) since

$$Uh'ex_S > U * [h(T)-h(T-ex_S)] \ . \quad (21)$$

The following utility function will be used in order to assess the impact of the concavity of utility in leisure on the empirical results derived in the paper:

$$\psi = U(x_S+x_F)\left[\frac{T-ex_S}{T}\right]^B \ , \quad (22)$$

where $B < 1$. Rearrangement of the first-order conditions of the consumer maximization


I(.,T)
Overestimate
Procurement costs
U(.,T-ex_S)
0
ex*_S
T
ex_S

problem gives

$$\left[\frac{T-ex_s}{T}\right]^{B} = \left[1 + \left[\frac{1}{B}\right]\left[\frac{p_F-1}{p_F}\right]\left[U_1\frac{x_T}{U}\right]\left[\frac{x_S}{x_T}\right]\right]^{-B}. \quad (23)$$

Consider the following sequence of changes in utility. First, prices are liberalized. Denote the pre-price liberalization utility as ψ_{PRE}, and the post-price liberalization utility level as ψ_{POST}. Second, the real income shock hits. The level of utility prior to the fall in real income is ψ_{POST}, and the level of utility after the real income fall is ψ_{REAL}.

The ratio of post- to pre-price liberalization utility is

$$\frac{\psi_{POST}}{\psi_{PRE}} = \frac{U(x_T)}{U(x_T)\left[\frac{T-ex_S}{T}\right]^{B}} = \left[\frac{T-ex_S}{T}\right]^{-B}. \quad (24)$$

Combining (23) and (24), we obtain

$$\left[\frac{\psi_{POST}}{\psi_{PRE}}\right]^{\frac{1}{B}} - 1 = \left[\frac{1}{B}\right]\left[\frac{p_F-1}{p_F}\right]\left[U_1\frac{x_T}{U}\right]\left[\frac{x_S}{x_T}\right]. \quad (25)$$

The absolute value of percentage change in utility resulting from real income fall can be approximated as

$$\left|\frac{\psi_{REAL}}{\psi_{POST}} - 1\right| = \left[U_1\frac{x_T}{U}\right] \times \left|\frac{\Delta x_T}{x_T}\right|. \quad (26)$$

Define A to be

$$A = \frac{\left[\frac{1}{B}\right]\left[\frac{p_F - 1}{p_F}\right]\left[\frac{x_S}{x_T}\right]}{\left|\frac{\Delta x_T}{x_T}\right|} \quad . \quad (27)$$

Then it is easily shown that

$$\frac{\psi_{POST}}{\psi_{PRE}} - 1 = \left[A \times \left| \frac{\psi_{REAL}}{\psi_{POST}} - 1 \right| \right]^B - 1 \quad . \quad (28)$$

Simulations have been carried out using equation (28) to test the impact of making utility concave in leisure. Assume that the utility of goods consumption function can be written as

$$U(x_S + x_T) = U(x_T) = x_T^{\gamma} \quad . \quad (29)$$

Then the elasticity of goods consumption utility with respect to x_T is γ. The value of γ should range between 0 and 1. The implications for changes in total utility due to changing levels of leisure for different values of B are graphed in figure 3.

The simulation procedure is as follows. For various values of β, x_S/x_T, and $\Delta x_T/x_T$, the value of A given by (27) is calculated. A range of values for the absolute value of the percentage change in utility level due to the fall in real consumption, $\psi_{REAL}/\psi_{POST} - 1$, is postulated: the range is from 1% to 100%. Using the values for A, β, $\psi_{REAL}/\psi_{POST} - 1$, and equation (29), the implied values of $\psi_{POST}/\psi_{PRE} - 1$ and associated net welfare gain ratio are calculated. The values of $\psi_{REAL}/\psi_{POST} - 1$ and $\Delta x_T/x_T$ are used to calculate an implied value of γ. The net welfare ratio associated with $\gamma = 1$ is then obtained: this forms a *lower bound* to the actual ratio. Ratio values greater than this

Figure 3
% Utility Left, Various Values of B

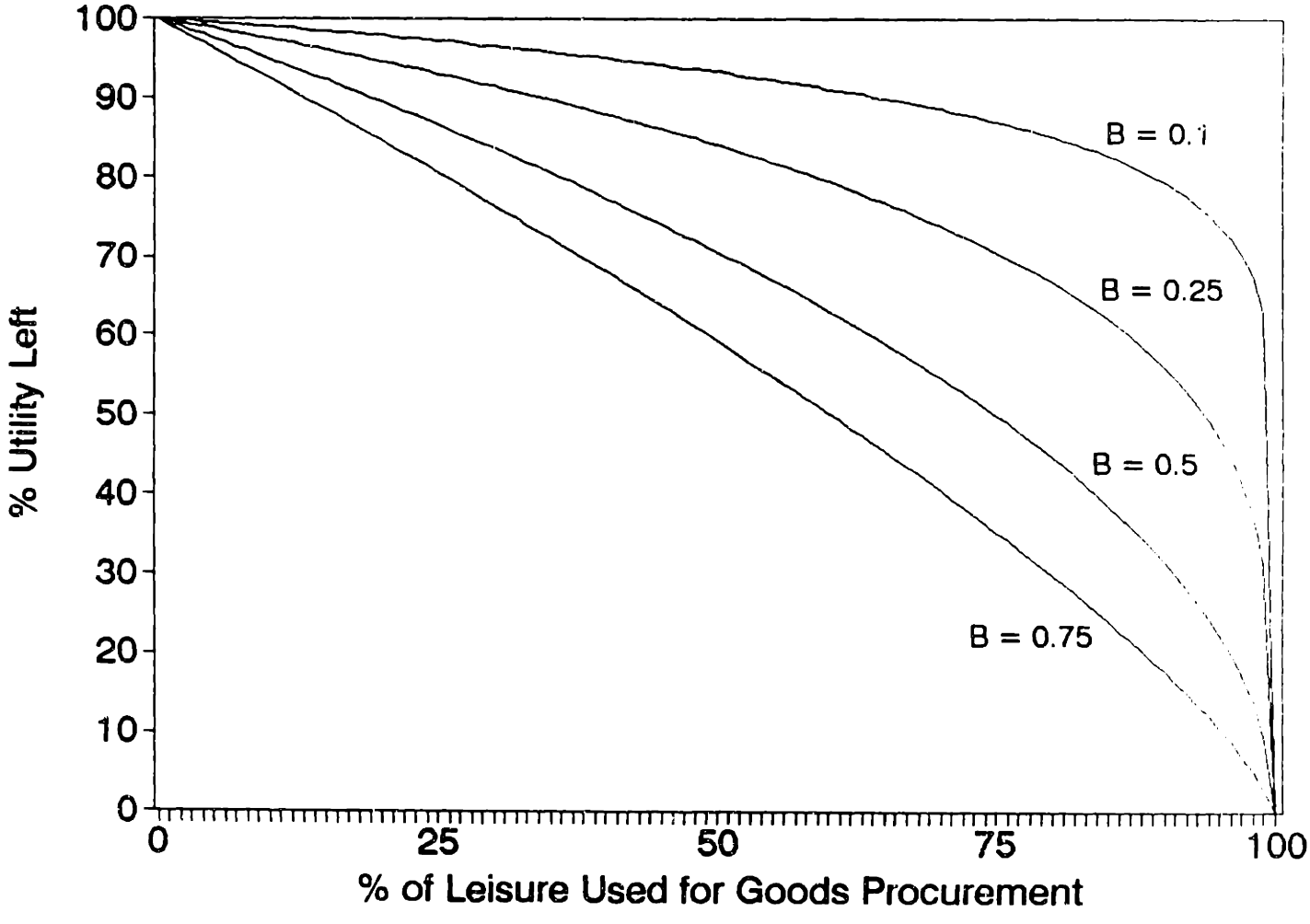


TABLE 8

RATIO OF UTILITY GAIN TO ABSOLUTE VALUE OF UTILITY LOSS

	B = 0.1	B = 0.25	B = 0.50	B = 0.75
$x_S/x_T = 0.50$ $\Delta x_T/x_T = 0.05$	0.94	1.60	1.73	1.77
$x_S/x_T = 0.50$ $\Delta x_T/x_T = 0.12$	0.26	0.67	0.72	0.74

Note: Utility is concave in leisure, and $\gamma = 1$.

correspond to values of γ less than 1. The ratio values for $\gamma = 1$ are given in table 8 (calculations were made only for $x_S/x_T = 0.1$: using 0.4 or 0.6 makes no difference to the pattern in the results).

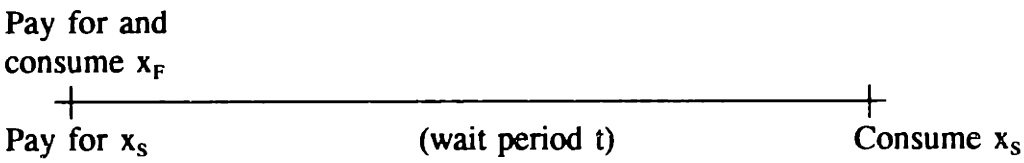
Comparing table 8 to table 7, making utility concave in leisure has very little effect on ratio values except in the case where B = 0.1, which is a case of extreme concavity: if leisure falls by 99% due to procurement costs, total utility falls by only 37%. This degree of concavity is highly unlikely to have been the case in reality.

The results of this exercise are particular to a specific functional form of the utility function. However, they suggest that the empirical results are generally robust to concavity except for extreme and unlikely cases. The conclusion that procurement cost elimination fully offset the fall in real consumption in utility terms is not substantially affected by concavity of utility with respect to leisure.

Appendix B: Rationing Through Formal Waiting Lists

Some goods were rationed through formal waiting lists rather than queues in Eastern Europe, primarily housing and automobiles. The consumer paid part or all of the official state price and then joined a waiting list which entitled him or her to receive the good after a waiting period, usually measureable in years. Like the queue rationing scheme, waiting lists generate deadweight utility loss. However, these losses are not in the form of lost leisure but of lost utility due to discounting[43]. Of course, the consumer could always purchase the good on a free market and consume it immediately.

The time path of purchase and consumption under a waiting list can be depicted as



The price of the wait good x_S is normalized to 1, and the relative price of the free-market good which can be consumed immediately is p_F. The consumer maximizes total utility at the time the waiting list is entered,

$$U(x_F) + e^{-\beta t}U(x_S) , \quad (30)$$

subject to the monetary budget constraint

[43] For a formal model of rationing through waiting lists, see Lindsay and Feigenbaum (1984). Their model does not incorporate a free market. Excess demand is eliminated not through a higher free-market price, but uncertainty over the timing of demand.

$$x_S + p_F x_F = I \ . \quad (31)$$

Note that utility from consuming x_S must be discounted at the time that the right to consume x_S is purchased.

Taking first-order conditions, combining, and rearranging give

$$p_F = e^{gt} \ . \quad (32)$$

The relative free-market price is directly related to the degree of utility lost through delay in consuming x_S, a relation analogous to the one between p_F and e in the queuing model. Substituting (32) into (30), total pre-liberalization utility is

$$U(x_F) + \frac{1}{p_F} U(x_S) \ . \quad (33)$$

It is important to note that if the waiting list is to effectively ration demand for x_T, there *must* be a free market. Delay in consumption of x_S generates a demand for x_F at a higher price p_F. In each period, total real demand equals $x_S + x_F$, which equals supply x_F[44]. Monetary income I also equals total expenditures $x_S + p_F x_F$. Excess demand is eliminated through a higher free-market price.

Price liberalization in this model amounts to elimination of the waiting list and sale of x_T at a freely-set price p_M. Delay in consumption is no longer necessary, and post-liberalization utility is $U(x_T)$. The ratio of post- to pre-liberalization utilities is

[44] Implicitly, an overlapping-generations model is assumed in which there is a young consumer and an old consumer each period, the young consumer always has the same income level I, and total supply is always x_T.

$$\frac{U(x_T)}{U(x_F) + \frac{1}{p_F}U(x_S)} \cdot \quad (34)$$

If utility is linear in consumption, this can be written as

$$\frac{U(x_T)}{U\left(x_F + \frac{1}{p_F}x_S\right)} , \quad (35)$$

or

$$\frac{U(x_T)}{U\left(x_T + \left[\frac{1-p_F}{p_F}\right]x_S\right)} \cdot \quad (36)$$

This can be rewritten as

$$\frac{U\left(x_T + \left[\frac{1-p_F}{p_F}\right]x_S\right) - U'\left[\frac{1-p_F}{p_F}\right]x_S}{U\left(x_T + \left[\frac{1-p_F}{p_F}\right]x_S\right)} , \quad (37)$$

or

$$1 + \left(\frac{p_F-1}{p_F}\right)\left(U_1\frac{x_T}{U}\right)\left(\frac{x_S}{x_T}\right) , \quad (38)$$

which is identical to (14). For neighborhoods around the point of pre-liberalization consumption, the formulas for calculating deadweight utility losses from queuing and waiting lists are identical.

Appendix C : Extending the Basic Model

The basic model can be modified in order to consider various other factors that might affect welfare over the transition. Three important variants will be developed in this appendix.

(a). Free-Market Transactions Costs

An important implicit assumption of the basic model is that there are no procurement costs in the free-market. This is unrealistic, as free-market activity was often illegal and inefficient. Free-market transaction costs can be incorporated in the model by rewriting the utility function as

$$\psi = U(x_S+x_F, T-e_S x_S-e_F x_F) \ , \quad (1)$$

where e_F is the time cost of procuring a unit of the free-market good. Of course, it must be the case that $e_F < e_S$ if the model is to have an interior solution.

Taking first-order conditions and carrying out manipulations similar to those in the main text[45], it is easily shown that the difference between the actual percentage increase in utility and the measured increase in utility,

[45] The reader might note that this is evidently a system of four equations in five unknowns, so that the model is underidentified. However, this is so only if e_F is an endogenously-determined variable, which is not the case. The forces determining e_F are not supply-demand equilibriating forces but arbitrary rules and regulations inhibiting trade. e_F is properly treated as an exogenous variable.

$$\frac{\psi_{POST}-\psi_{PRE}}{\psi_{PRE}} - \left[\frac{p_F-1}{p_F}\right]\left[U_1\frac{x_T}{U}\right]\left[\frac{x_S}{x_T}\right] , \quad (2)$$

equals the following expression:

$$\left[\frac{U_2}{U}\right]\left[e_F x_F + \frac{e_F x_S}{p_F}\right] . \quad (3)$$

(41) is always positive, and welfare gains from price liberalization are underestimated if there are transaction costs in the pre-reform free-market.

(b). Post-Liberalization Transaction Costs[46]

Another implicit assumption is that there are no transaction costs in procuring goods after prices are liberalized. This possibility is easily dealt with by rewriting the post-liberalization to pre-liberalization utility ratio as

$$\frac{\psi_{POST}}{\psi_{PRE}} = \frac{U(x_T, T-e_M x_T)}{U(x_T, T-ex_S)} , \quad (4)$$

where e_M is the post-liberalization per-unit procurement transaction cost. Expanding the numerator as in the main text and using results from pre-liberalization utility maximization, it is easy to show that the difference between the actual percentage increase in utility and the measured increase in utility is

[46] I am indebted to Peter Murrell for pointing out the possibility of significant post-liberalization transaction costs.

$$\frac{\psi_{POST}-\psi_{PRE}}{\psi_{PRE}} - \left[\frac{p_F-1}{p_F}\right]\left[U_1\frac{x_T}{U}\right]\left[\frac{x_S}{x_T}\right] = -\frac{U_2 e_M x_T}{U} \quad (5)$$

Because this term is negative, welfare gain from price liberalization is overestimated.

Values of the ratio e/e_M such that net welfare gain is zero for the empirical scenarios for Poland can be derived. If the true value of the e/e_M ratio is higher, then net welfare gain is positive, (and if lower, then negative).

	e/e_M, net welfare change = 0	
x_S/x_T	5%	12%
0.50	4.5	-
0.75	2.1	11.5

The nature of post-liberalization transaction costs requires careful consideration. Immediately after prices are liberalized, significant transaction costs may persist due to a high degree of market fragmentation and price dispersion that results in search for low prices. However, this dispersion should disappear fairly quickly if restrictions on market entry and competition are eliminated. Aside from factors such as search driven by price dispersion, it is not clear that shopping should be considered as a true utility cost to the consumer. In a typical Western economy, sellers spend considerable resources in providing services to shoppers in order to maintain market share. Shopping in this case takes on aspects of leisure activity, and the consumer might even gain utility from shopping.

(c). Labor Supply[47]

The model can be extended to incorporate a labor-supply decision and thus endogenize the level of total output x_T. Assume that labor supply is L, and output depends only on labor supply and a vector of other inputs such as captial stock and imported intermediate inputs:

$x_T = x_T(L,\mathbf{6})$, $\delta x_T/\delta L > 0$, $\delta x_T/\delta \mathbf{6}_i > 0$, $\delta^2 x_T/\delta L^2 < 0$, $\delta^2 x_T/\delta \mathbf{6}_i^2 < 0$. Also assume that labor L and procurement costs ex_S are perfect substitutes in leisure, and that the consumer/worker earns an "untied" income I and a "tied" income wL, where the wage rate w is determined exogenously[48].

The representative agent's problem is now

$$\max \psi = U(x_S+x_F, T-ex_s-L)$$

$$w.r.t. \{x_S,x_F,L\} \qquad (6)$$

$$s.t. \; x_S + p_F x_F = I + wL \; .$$

First-order conditions from this maximization together with the supplier's first-order condition which makes free-market sales a function of p_F give the equations:

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[47] I am indebted to Michael Marrese for emphasizing the importance of labor supply change over the course of reform.

[48] Endogenization of the wage rate requires explicit description of the decision calculus of the agent who produces x_T. If the agent is treated as a state firm, profit maximization would not be an appropriate decision calculus, and the wage rate is properly treated as being determined exogenously by planners.

However, a non-state production sector could also be incorporated which does maximize profits, and in this case the wage rate would be endogenous. As this paper's focus is not on comparative statics given a particular institutional regime, these complications are not relevant.

$$U_1 - U_2 e = \lambda \ , \quad (7)$$

$$U_1 = \lambda p_F \ , \quad (8)$$

$$U_2 = \lambda w \ , \quad (9)$$

$$x_S + p_F x_F = I + wL \ , \quad (10)$$

$$x_F = g(p_F) \ . \quad (11)$$

These five equations determine the five endogenous variables x_F, p_F, e, λ, and L.

The important question is whether labor supply changes over the course of reform. The ratio of post- to pre-price liberalization utilities is

$$\frac{\psi_{POST}}{\psi_{PRE}} = \frac{U(x_T(L_M,\beta_M), T-L_M)}{U(x_T(L,\beta), T-ex_S-L)} \ , \quad (12)$$

where the subscript M indicates the post-liberalization regime.

Total utility changes over the course of liberalization and reform due to the elimination of procurement costs, changes in labor supply L, and changes in the input vector $\boldsymbol{\beta}$. An increase in L will reduce utility due to falling leisure but increase utility due to rising output x_T. x_T will also change (most likely decrease) due to changes in variables not under the representative-agent's direct control, which is captured by changes in the vector $\boldsymbol{\beta}$.

If the representative agent chooses an optimal level of labor supply before reform, then any change in labor supply over the course of transition should reflect the fact that this change increases the agent's welfare level, because otherwise it would not be made.

Distributional issues concerning change in labor supply are probably more important than effects on representative-agent utility. For example, employers can now use the threat of unemployment as a device to extract a higher labor supply without increasing the real wage, thus increasing profits. In the single-agent model, the single agent enjoys the increase in real income represented by the increase in profits, and if the agent decides to increase labor supply, then it is because it increases utility. In a multi-agent model, however, some agents clearly gain and some lose.

The emergence of involuntary unemployment is also a distributional issue. In the representative-agent model, involuntary unemployment corresponds to an undesired contraction in labor supply and hence output and consumption x_T. This should be captured in the empirical estimates because the fall in consumption x_T is taken into account. Employment is only a means to obtain consumption. In a multi-agent model which takes into account distributional effects, some agents will enjoy a rise in labor supply and consumption, and others a fall.

Appendix D : The Polish Free-Market/State Price Ratio

A variety of data are available on the state and free-market prices of various Polish consumer goods for the period 1981-1987[49]:

(a). The household budget survey, which monitors some 28000 household budgets annually, recorded data on purchases in state and free markets separately. From this data, the statistical authorities calculated and reported state and free market prices for a wide variety of goods. Almost all categories of food and beverages were covered, as were most categories of clothing and many consumer durables. However, most services were not covered.

(b). Farmers' market prices for a variety of foodstuffs were collected and reported.

(c). Black market prices were reported quarterly since 1981 for a variety of foodstuffs and consumer durables. The basket of goods covered grew over time (consumer durables were added in the mid-1980's). The methodological notes of the volume in which these prices were published give no details of how these prices were obtained.

(d). Official state list prices and many state transaction prices are available. List prices were determined by state agencies legally charged with setting prices. Transaction prices were calculated by dividing the value of retail sales by quantities sold; the value of retail sales was calculated using actual transaction prices as opposed to list prices.

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[49] See *Statistical Sources* for references to the statistical publications containing all price data used in this paper.

Most of the price ratios used in this study are calculated from the household budget data. To check the accuracy of these ratios, they can be compared to ratios calculated from farmers' market, black market, and official state price data: see table 9.

The correlation of household budget and farmers' market price ratios is quite good. The correlation of household budget and black market price ratios is good in the case of meats, sugar, coffee, and tea. However, in the case of alcoholic beverages and consumer durables, the correlation is poor. The household budget ratios for consumer durables are clearly inaccurate, as they are all less than 1. This is due to the fact that few families purchased a given consumer durable in any given year, even fewer purchased it on the free market, and, most importantly, many (probably most) of the durables sold on the free market were used, not new. The black market price ratios for consumer durables are therefore used as a substitute in the calculation of the aggregate price ratio p_F. All other ratios are derived from household budget survey data.

Individual price ratios were aggregated using weights derived from household budget survey data on consumer expenditures. In some cases, the household budget survey data was not disaggregated enough, and more detailed information on the structure of retail trade sales was used to obtain weights. Household budget weights are from 1987 data, and retail trade weights are from 1985 data.

One possibility that could not be corrected for is that goods of higher quality were generally sold on free markets. This problem, if important, would lead to an overstatement of the true value of the price ratio. It is not known to what extent goods sold in state and free markets differed according to quality parameters, nor is it known to what extent those calculating the state and free-market prices from the budget survey data attempted to control for quality differences.

The available evidence does not suggest that quality differences were very important. The price ratio for new automobiles is the ratio of prices for a specific auto model, the Polski Fiat 126P, and there should be no quality difference in this case. In 1987, the ratio was 2.08 (see table 9), a value much higher than those for most other individual items in the consumer basket. Table 9 also shows that price ratios calculated from household budget data were very high for sour cream and sugar, goods which did not vary much in quality.

No price ratios are available for most services and some consumer durables and clothing[50]. In these cases, the price ratio is assumed to be 1. It is clearly counterfactual to assume that these ratios equalled 1. Because the lower limit on a price ratio is 1, and the price ratios for most goods and services for which data was not available undoubtedly exceeded 1, the assumption made in this paper is very conservative.

Given that the calculated magnitude of the ratio in 1987, 1.22, is very low, that the correction for state-free market quality differences probably would not make much of a difference, and that the assumption that ratios for goods for which data is not available clearly has a major impact in the other direction, the ratio value empirically estimated in this paper should best be treated as a *lower bound* to the true value. Correction for quality differences and missing goods would most likely increase the estimated value and thus the magnitude of welfare gain due to procurement cost elimination.

[50] Price ratios are available for 59% of all consumer goods and services. 35% should be covered but are not due to lack of data. For the remaining 6%, free markets probably did not exist.

TABLE 9

PRICE RATIO COMPARISON

GOOD	Household Budget Ratio	Farmers' Market Ratio	Black Market Ratio	State price type (1)	Notes
Potatoes	0.95	1.11	-	CTP	
Cabbage	1.12	1.27	-	CTP	
Cheese	1.36	1.49	-	CTP	
Sour cream	1.83	2.01	-	LP	
Eggs	0.97	1.08	-	CTP	
Honey	1.09	1.12	-	CTP	
Beef	1.39	-	1.31	LP	
Veal	1.12	-	1.58	LP	
Pork	0.89	-	1.07	LP	(2)
Sugar	2.36	-	2.60	LP	
Chocolate	1.87	-	4.18	CTP	
Cocoa	1.41	-	5.82	LP	
Coffee	1.48	-	1.54	CTP	
Tea	1.42	-	1.60	CTP	(3)
Clear vodka	1.14	-	1.35	LP	
Flavored vodka	1.16	-	1.42	LP	
Wine	1.35	-	1.51	LP	
Beer	1.19	-	1.88	LP	
Auto	0.91	-	2.08	LP	(4)
Washing machine	0.80	-	1.19	CTP	
Black and white TV	0.52	-	1.36	CTP	
Sewing machine	0.65	-	1.27	CTP	

(*) : LP = State list price.
CTP = Calculated transactions price.
(^) : For 1983-1984.
($) : For 1985-1986.
(#) : The black-market and state prices are for the Polski Fiat 126P model.
Sources : see appendix D.

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(a). All price data are obtained from the following publications:

1980-82 : Glowny Urzad Statystyczny. Materialy Statystyczne. *Zmiany Cen Detalicznych 1980-1983.*
1983-84 : Glowny Urzad Statystyczny. Materialy Statystyczne. *Ceny Detaliczne 1971-1985.*
1985-87 : Glowny Urzad Statystyczny. Materialy Statystyczne. *Ceny Detaliczne 1985-1987.*

(b). Household budget data are obtained from:

Glowny Urzad Statystyczny. Materialy Statystyczne. *Budzety Gospodarstw Domowych*, various years.

CHAPTER 2

ON THE DISTRIBUTIONAL CONSEQUENCES OF PRICE LIBERALIZATION IN EASTERN EUROPE

I. Introduction

The previous chapter on the welfare consequences of price liberalization in Poland makes the strong assumption that the Polish economy is characterized by a single representative consumer. This assumption is common in macroeconomic analysis, where distributional consequences are not of primary interest. However, distributional considerations may be of central importance in assessing the impact of liberalization and reform in the East European economies. Price liberalization will certainly affect relative prices and thus relative income levels, at least in the longer run. Liberalization also brings about an end to the queuing and searching for goods resulting from official prices set at disequilibrium levels. All consumers could conceivably experience an immediate increase in their standard of living, even if their real incomes fall. Theoretical results suggest that poorer consumers do relatively worse after price liberalization than wealthier consumers[51].

This paper tests the legitimacy of the representative-agent assumption of the previous chapter. A simple model with differentiated consumers, disequilibrium pricing, and searching and queuing is developed. This model makes predictions on the incidence of price liberalization on consumers at different income levels. The model is then tested against empirical evidence to determine whether it is valid for the Polish economy in the 1980's. The evidence suggests that the representative-agent assumption is untenable and that poorer consumers fared relatively worse after liberalization compared to wealthier consumers.

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[51] See Sah (1987), Polterovich (1991) and Alexeev (1990, 1991).

II. Theoretical Analysis[52]

Consider a one-good economy in which the official state price for a unit of the good is 1. At this price, aggregate demand exceeds aggregate supply:

$$x_T < I \ , \tag{51}$$

where x_T is the total amount of the good purchased for consumption and I is available monetary income for consumption. A free market emerges as a result of this disequilibrium.

Supplies to the state market and to the free market are determined according to the decisions of suppliers who maximize expected profits on risky free-market sales. Their supply decision is determined by the free-market/state price ratio and characteristics of the risk function[53].

Consumers have identical utility functions defined by

$$\psi = U(x_S+x_F)h(T-ex_S) \ , \tag{52}$$

where x_S and x_F are quantities purchased on the state market and free market respectively, T is the total amount of time and effort resources available to the consumer, and e is the per-unit time and effort cost of the state-market good. Usual assumptions on derivatives hold: $U_1 > 0$, $U_2 < 0$, $U_1(0) = \infty$, $h_1 > 0$, $h_2 < 0$, and $h_1(0) > 0$. Utility is concave with respect to leisure and has slope bounded away from zero when $T - ex_S = 0$.

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[52] The first theoretical treatment of a quantity-rationed queue economy is Stahl and Alexeev (1985). Alexeev (1990, 1991), Sah (1987), and Polterovich (1991) examine the distributional consequences of price liberalization in such an economy.

[53] See chapter 1 for more discussion on the supplier's decision.

The consumer maximizes utility subject to the budget constraint

$$x_S + p_F x_F = I \ , \tag{53}$$

where p_F is the relative free-market price[54].

Assume that a consumer buys on both the state and free market, and an interior solution obtains. Rearrangement of the first-order conditions resulting from utility maximization gives the equality

$$\frac{1}{e}\left[\frac{p_F - 1}{p_F}\right]\frac{U'(x_T)}{U(x_T)} = \frac{h'(T - ex_S)}{h(T - ex_S)} \ . \tag{54}$$

The derivative of the LHS of (4) with respect to x_T,

$$\frac{1}{e}\left[\frac{p_F - 1}{p_F}\right]\left[\frac{U''}{U} - \frac{(U')^2}{U^2}\right] \ , \tag{55}$$

is always negative. The derivative of the RHS of (4) with respect to x_S,

$$\frac{(h')^2}{h^2} - \left[\frac{h''}{h}\right]e \ , \tag{56}$$

is always positive.

Consumers have different levels of nominal monetary income I. As monetary income and real consumption increase, then clearly the LHS of (4) falls (if all prices are held constant). If the first-order condition associated with an interior solution continues to hold, the RHS of (4) must fall, which means that x_S must fall. As monetary income/real consumption continues to increase, at some point a corner solution such that $x_S = 0$, $x_T = x_F$, and the consumer shops entirely on the free market. By a similar

[54] p_S is normalized to 1.

argument, as monetary income/real consumption falls, a corner solution is attained such that all consumption is purchased on the state market, and

$x_T = x_S$[55].

This very simple model emphasizes that it is *not* necessary to have differences across consumers in wage rates or other proxies for the shadow value of time in order to generate this kind of consumer segmentation. All that is necessary is that there be a nonsingular distribution of nominal income and that the usual utility function assumptions hold.

The value of rents obtained on state-market purchases in utility terms is

$$\lambda(P_F - 1)x_S = Uh'ex_S \ . \tag{57}$$

Because utility is not linear with respect to leisure, the utility value of rents on state-market purchases is not completely offset by utility losses due to searching and queuing.

If there is enough dispersion in the distribution of nominal income, consumers are segmented into three groups. The poorest consumers shop only on the state market and receive rents which are not completely offset by procurement costs. Those consumers with intermediate monetary incomes shop on both the state market and the free market. They also enjoy positive net rents on state market purchases. The wealthiest consumers shop only on the free market. Although they do not obtain any rents on state market purchases, they do enjoy higher levels of utility than poorer consumers, because their level of real consumption is greater.

[55] The existence of this corner solution is ensured by the assumption that $h'(0) > 0$.

If there is very little dispersion of nominal incomes, then no corner solutions will obtain. However, it is still true that poorer consumers shop relatively more on the state market and wealthy consumers relatively more on the free market.

Table 1 gives some empirical evidence on the validity of this model. A survey carried out in the Soviet Union in 1990 asked consumers whether they shopped on the black market or not. The survey's results suggest that wealthier consumers were more likely to shop on the black market. Of course, the percentage of income spent on the black market as opposed to official markets was not measured, so that the survey's results are very incomplete and can only be suggestive. It is interesting to note, however, that 25% of the poorest consumers did some shopping on the black market: clearly, it was not the exclusive preserve of the rich.

The theoretical results suggest that fixed prices were used to redistribute welfare across consumers at different income levels. The wealthy were taxed by high free market prices, and the rents obtained on state-market purchases by poorer consumers were not completely offset by procurement costs. Given that the pre-transition regimes apparently sought to maintain rather equal standards of living for the large bulk of the population, the choice to control consumer good prices becomes more understandable, even though this taxation scheme is remarkably inefficient.

Price liberalization in this economy has important redistributive consequences. The poorest consumers suffer a decrease in real consumption due to the rise in p_S, and rents enjoyed on state market purchases are eliminated. The intermediate consumers suffer an elimination of rents on state market purchases and a decrease in the purchasing power of income spent on state markets due to the rise in p_S, but the fall in the free-market price p_F increases the purchasing power of income spent on the free market. The

Table 1

	All	According to monthly income in rubles :					
		< 100	101 - 150	151 - 200	201 - 250	251 - 300	> 300
% who shop on black market :	29.9	25.1	30.5	32.7	26.9	33.3	48.6

Source : *Ekonomika i zhizn'*, No.47, November 1990, p.8.

richest consumers who shop exclusively on the free market enjoy a rise in real income and welfare as the price that they face, p_F, falls.

It is important to note that everyone's welfare level may go up after price liberalization, even that of the poorest consumers. The poorest consumers' real consumption falls as p_S rises. However, the searching and queuing costs paid on the procurement of state-market goods also disappear, and the net effect of falling real income and elimination of procurement costs may be positive[56]. Thus, it is still possible that *everyone* gains from price liberalization.

The model provides several predictions that can be empirically tested. One of these is that there should be a relationship between average per-unit prices paid by consumers at different income levels and the relative free-market price p_F. In particular, the average per-unit price paid should rise with nominal income due to the fact that more expensive free-market purchases are making up a greater percentage of total purchases as income rises. The following section empirically tests this second prediction of the

[56] See chapter 1.

theoretical model by examining the relationship between the average per-unit prices paid by consumers at various income levels for a variety of foodstuffs and the relative free-market prices of the foodstuffs.

III. Comparison of Unit-Value Ratios, 1980-1988

The theoretical model suggests that poorer consumers shop relatively more in state markets, and richer consumers relatively more in free markets. The Polish household budget survey (hereafter, HBS) provides a rich dataset that permits testing of this hypothesis[57]. Approximately 28,000 households were sampled in a given year in the late 1980's, and detailed records of household income, expenditures, and consumer durable stocks were kept. Expenditures on foodstuffs are measured in nominal and real terms. The Polish HBS is a well-designed survey, and its sampling properties are generally very good[58]. However, households whose main earner works in the private sector and certain governmental organizations are not included in the survey. A large portion of the population segment earning the highest levels of real income is probably omitted as a result.

The HBS yearbooks publish data by 8 different income groups and four household types: worker, worker-peasant, peasant, and pensioner[59]. The data given for each income group is the arithmetic average of the individual data for all households falling in the income group. For example, nominal expenditures on meat for worker-household income group IV in 1988 is an average of the nominal expenditure on meat for each household whose main earner worked in the nonagricultural sector and whose total

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[57] For a detailed review of the Polish HBS and a comparison of it to the United Kingdom and other East European HBS's, see Atkins and Micklewright (1992).

[58] Atkins and Micklewright (1992) conclude that the Polish HBS compares very favorably to the United Kingdom household budget survey, and in some respects is better.

[59] These classifications are according to what sector the main earner or earners of the household work in. In the case of the worker-peasant household, there are earners who work in both the agricultural and nonagricultural sectors.

household income was from 2000 to 5000 zlotys per month. For the purposes of this section's empirical analysis, the four types of households (worker, worker-peasant, peasant and pensioner) were aggregated together at each income level to form a "representative" Polish household[60].

The Polish HBS data allow one to calculate unit-values paid by consumers of different income classes for a variety of foodstuffs. Unit-values are not true prices, as each foodstuff category aggregates a variety of different kinds of goods at different quality levels. For example, the "meat products" category includes sausage, baloney, pates, and some other processed meats, and each of these products has a range of different qualities.

Unit-values generally increase as monetary income increases. In the pre-liberalization Polish economy, there are two possible explanations of this. First, wealthier consumers may shop relatively more on the higher-priced free-market, as the theoretical model developed above predicts. Second, consumers buy a different assortment of the goods that comprise the unit-value category as their income increases, preferring those of higher quality and thus higher price.

Unit-values are calculated from the Polish HBS by dividing the average nominal expenditures of households in a certain income class on a given foodstuff by the average quantity consumed. The calculated unit-value paid by an average household in income category i is thus[61]

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[60] The aggregation weights used are the number of budgets surveyed of the particular household type as a proportion of the total number of households.

[61] Neglecting assortment effects.

$$p_{UV}^{i} = \frac{x_S^i + p_F x_F^i}{x_T^i}, \tag{58}$$

where p_{UV}^i is the unit-value paid by consumer i, x_S^i is the quantity of the good purchased on the state market by the average household in income class i, x_F^i is the quantity purchased on the free market, $x_T^i = x_S^i + x_F^i$ is the total quantity purchased, and p_F is the *relative* free-market price of the foodstuff. The theoretical model predicts that as consumer income increases, x_S/x_T falls, and x_F/x_T rises.

The empirical analysis will focus on the ratio of the average unit-value for households in the highest income category of the Polish HBS to the average unit-value for households in the lowest income category:

$$\frac{p_{UV}^H}{p_{UV}^L} = \frac{\frac{x_S^H + p_F x_F^H}{x_T^H}}{\frac{x_S^L + p_F x_F^L}{x_T^L}} \tag{59}$$

where H denotes the highest income category and L the lowest. If the prediction of the theoretical model that x_F/x_T rises with nominal income is correct, then this ratio is always greater than 1 (as shown in the appendix).

The unit-value ratio also rises with p_F if the theoretical model's prediction is correct (see appendix). One way to test the model is therefore to see whether actual unit-value ratios rose with p_F. If unit-value ratios did not generally change with p_F, then the prediction of the model is invalidated, and the representative-agent assumption is realistic. If unit-value ratios changed with p_F, then the representative-agent model is misleading, and there were significant regressive distributional effects as a result of price liberalization.

Table 2

	1980	1981	1982	1983	1984	1985	1986	1987	1988
p_F	1.27	1.88	1.47	1.33	1.30	1.27	1.26	1.29	NA
Total deviation value	284	405	164	-31	-4	5	0	115	230

Sources and explanations : see text.

The level of p_F, the aggregate repressed inflation, varied considerably in Poland over the 1980's. In 1981, p_F grew dramatically due to a temporary capitulation of the government to pressure for wage increases from the newly-formed Solidarity trade union and a continued commitment to fixing nominal prices. Martial law was declared in December 1981, and in February 1982 the government imposed an austerity program that drastically reduced the repressed inflation rate.

This can be seen in row 1 of table 2, which gives yearly values of the repressed inflation rate for foodstuffs, taken to be a good representation of p_F generally. Free-market and state-market prices for goods covering more than 95% of the food consumption basket were obtained from the Polish HBS[62], the relative free-market price p_F was calculated for individual foodstuffs, and the individual prices were aggregated using worker-household budget share weights. p_F in 1981 was almost 50% higher than in any other year in the period 1980-1987[63].

[62] See chapter 1 for details on these prices.

[63] Except 1982, a transitional year in which the austerity program was initiated.

In order to evaluate whether unit-value ratios moved with p_F, I use the following procedure. First, the year with the lowest level of aggregate repressed inflation in the period 1980-1988 is chosen as a base year. According to table 4, this is 1986, when p_F equalled 1.26. Second, the high-income/low-income unit-value ratios for individual foodstuff categories for 1986 are calculated. Third, these ratios are calculated for all other years (1980-1985, 1987). Fourth, for a given year, the percentage difference between the unit-value ratio for an individual foodstuff for that year and the same ratio for the base year (1986) is calculated. Fifth, these ratio percentage differences are summed across individual foodstuff categories to obtain a "total deviation value" (TDV) for that year. If the theoretical model is correct, there should be a high correlation between p_F and TDV over the sample period.

This procedure controls for the assortment effect that leads to higher unit-values for high-income consumers. Consumers at a given real income level should be buying similar quality baskets across years regardless of the degree of repressed inflation. The procedure outlined here should isolate those changes in unit-values due only to the effect identified in the theoretical model.

The second row of table 4 gives TDV for 1980-1988. In 1981, when p_F was at its peak, TDV equalled 405. In 1983-1985, when p_F had fallen to a much lower level, the TDV was almost 0. In 1988, when aggregate repressed inflation was clearly increasing[64], the TDV rose to 230. This correlation in the movement of the two variables suggests that wealthier consumers did shop relatively more on free markets in pre-liberalization Poland.

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[64] See chapter 1, figure 1.

Interestingly, in 1980 the TDV was high, equal to 284, but the level of aggregate repressed inflation was less than that of 1983-1986. In 1987, the TDV was also rather high, equal to 115, but the aggregate repressed inflation rate was no different than in 1983-1986. These results suggest that there may be important adjustments and lags in adjustments that are not adequately captured in this simple approach. However, the difference between the TDV in 1981 and in other years strongly suggests that the model captures an important aspect of how consumer markets functioned before price liberalization.

IV. Conclusions and Suggestions for Further Research

Empirical evidence supports the idea that poorer consumers shopped relatively more on state markets and wealthier consumers relatively more on free markets in the pre-liberalization Polish economy. The effects of price liberalization can therefore be expected to produce more beneficial results for wealthier households.

An important path of future research is suggested by this paper. The change in welfare for each income class, taking into account both the contraction in real consumption and the benefits produced by the elimination of searching and queuing, should be calculated[65]. In order to do this, it is necessary to generate estimates of the change in real income and the degree to which state and free markets were relied upon by each income group. Results from this research will indicate whether price liberalization was in fact regressive, and the standard of living[66] of the poor decreased in absolute terms and that of the wealthy rose in absolute terms, or whether everyone gained in absolute terms.

[65] The technique outlined in chapter 1 can be applied.

[66] As defined in this thesis: see the conclusion to chapter 1.

APPENDIX

1. *The High-Income/Low-Income Unit-Value Ratio*

Using (8) and the fact that $x_S^i = x_T^i - x_F^i$, rewrite the high-income unit-value as

$$p_{UV}^H = \frac{x_T^H - x_F^H + p_F x_F^H}{x_T^H}, \tag{60}$$

or

$$p_{UV}^H = 1 + \frac{(p_F - 1)x_F^H}{x_T^H}, \tag{61}$$

and the low-income unit-value as

$$p_{UV}^L = 1 + \frac{(p_F - 1)x_F^L}{x_T^L}. \tag{62}$$

The ratio of unit-values is therefore

$$\frac{p_{UV}^H}{p_{UV}^L} = \frac{1 + \dfrac{(p_F - 1)x_F^H}{x_T^H}}{1 + \dfrac{(p_F - 1)x_F^L}{x_T^L}}. \tag{63}$$

If this ratio is greater than 1, it must be the case that

$$\frac{(p_F-1)x_F^H}{x_T^H} > \frac{(p_F-1)x_F^L}{x_T^L}, \quad or \quad \frac{x_F^H}{x_T^H} > \frac{x_F^H}{x_T^H}, \tag{64}$$

and this will always be true if the theoretical model is correct. Thus, according to the model, calculated high-income/low-income unit-values should always exceed 1 due to the shopping-market effect alone, regardless of any assortment differences.

2. *The Income Unit-Value Ratio and p_F*

Denote the unit-value ratio given in (13) as R_{UV}. The derivative of R_{UV} with respect to p_F is

$$\frac{1}{p_{UV}^L}\left[\frac{x_F^H}{x_T^H} - \frac{p_{UV}^H}{p_{UV}^L}\frac{x_F^L}{x_T^L}\right]. \tag{65}$$

The derivative is positive if

$$\frac{x_F^H}{x_T^H} > \frac{p_{UV}^H}{p_{UV}^L}\frac{x_F^L}{x_T^L}. \tag{66}$$

Substituting in the definitions of p_{UV}^H and p_{UV}^L, this can be rewritten as

$$\frac{x_F^H}{x_T^H} > \frac{1 + (p_F-1)\dfrac{x_F^H}{x_T^H}}{\dfrac{1}{x_F^L/x_T^L} + (p_F-1)} \tag{67}$$

or

$$1 > \frac{\dfrac{1}{x_F^H/x_T^H} + (p_F - 1)}{\dfrac{1}{x_F^L/x_T^L} + (p_F - 1)} . \tag{68}$$

If the theoretical model is correct, then

$$\frac{x_F^H}{x_T^H} > \frac{x_F^L}{x_T^L} , \tag{69}$$

and (18) holds: the income unit-value ratio increases with p_F.

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CHAPTER 3

WHAT HAPPENED TO SOVIET PRODUCT QUALITY?

I. Introduction

The long-term deterioration and ultimate collapse of the Soviet-type economies presents the economic researcher with two interesting and important questions. The more immediate of the two is, what are the implications for these economies of fundamental reform and integration into world markets? The other question, though less urgent, is still of long-term interest and has only been partially answered: why did these economies fail?

The inability to introduce innovations and improve the quality and variety of a wide range of outputs is generally believed to have played a key role in the decline and ultimate rejection of the Soviet-type economic system. Slowdown in productivity growth resulted in a steady deterioration in dynamic economic performance over the postwar period. The effectiveness of investment's contribution to growth fell as the quality and mix of capital goods became progressively more unsatisfactory. The quality and assortment of consumer goods delivered to consumers in the Soviet-type economies was inadequate and became more so as real incomes rose and tastes changed.

Research on the collapse of Soviet-type economies has focused on quantitative developments, such as trends in aggregate output, total factor productivity and other

macroeconomic measures[67]. There has been very little exploration of developments in product quality and variety, and the research that has been done is unsatisfactory[68].

This paper discusses the choice that any economic system must make between increasing the level of quantity versus quality. The effects of Soviet-type institutions on the choice between quantity and quality are described. In the Soviet-type economy, there are no decentralized incentives to improve quality, and authorities rely upon state intervention to force quality improvement. If the effectiveness of state intervention declines over time, then the relative level of product quality and economic welfare steadily falls.

The Soviets conducted a natural experiment that reveals what actually happened in an important sector of Soviet industry. I review empirical evidence from the Finnish automobile market, where the USSR exported automobiles in significant quantity over the period 1950-1990. These autos competed in a free market with all other important brands of Western autos. The dynamic trend in the quality of Soviet autos relative to

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[67] There are two standard explanations of the Soviet economic slowdown and collapse. The first, associated with Abram Bergson, attributes the steady decline in the rate of postwar Soviet economic growth to a declining growth rate of total factor productivity (see Bergson 1983).

The second, associated with Martin Weitzman, assumes a different functional form of the aggregate production function and attributes the slowdown to a steadily declining marginal productivity of capital coupled with a policy of high rates of capital investment (see Weitzman 1983).

See Hewett 1988 for a review of the issues and empirical evidence.

[68] Hill and McKay 1988 assessed the quality of a wide variety of Soviet manufactured products and compared them to similar Western goods. However, the data used in their study, official Soviet data on quality standards, is flawed. Production often did not comply with these standards. In fact, one of the first reforms in the Gorbachev era was the creation of a state body to enforce the meeting of state quality standards, and this body's efforts caused great disruption. Also, these standards only covered a subset of all quality characteristics.

Amann and Cooper 1986 review performance in several important Soviet industrial sectors and find that poor quality and low levels of technological sophistication were important problems, but their data is fragmentary and limited. Neither of these studies sheds light on how quality and competitiveness changed over time.

Hewett 1988 discusses the problem of Soviet product quality and the lack of relevant empirical evidence (pp.78-86).

Western autos can be identified from statistical data on prices, quantities, and quality characteristics. These statistics were collected in Finland from national and university library collections and the Finnish Central Statistical Office.

The results are striking and show that the relative quality of Soviet autos deteriorated dramatically over the postwar period. According to import unit-value data, in the 1950's the price of a typical Soviet automobile was 90% of the price of a typical Western automobile. In 1990, this relative price had fallen to 32%. Exploration of data on individual auto model prices and characteristics confirm this trend. The Soviet economy was capable of producing automobiles similar in quality to those of the West in the 1950's, but that capability deteriorated steadily over the postwar period.

The results also show that the Soviet Union made two efforts in the postwar period to improve the quality of automobiles by importing Western capital and technology. The effectiveness of this strategy in boosting relative Soviet product quality fell, as the success of technology importation in reducing the Soviet-Western quality gap deteriorated over time.

The paper concludes with some observations on the implications of these empirical findings for the theory of economic reform and suggestions for further research.

II. The Choice Between Growth in Quantity and Quality

The collapse of the Soviet-type economic system must be attributed to that system's manifest inability to generate adequate increases in consumer welfare over time. Consumer welfare can be increased in two ways. First, given the product mix and quality level of output, the aggregate quantity of goods and services per capita can be increased. Second, given the quantities produced, the product mix or quality-per-unit can be improved.

In a typical market economy, productive resources are allocated to the production of quantity or quality. Skilled labor and high-tech capital equipment can be devoted to raising the level of total factor productivity and hence total quantity output per capita by innovating and implementing new process technologies. Alternatively, they can be used to increase the level of product quality by improving those quality characteristics of a good desired by end-users.

How these resources are allocated is determined by societal preferences over quantity and quality. A benign social planner or decentralized market system allocates the resources so that per-capita utility, a function of both quantity and quality, is maximized. If these resources are growing, then they will be allocated such that utility is growing maximally along the optimal growth path.

In Soviet-type economies, central authorities rely upon incentive schemes to reward producers and encourage the proper allocation of resources in order to achieve desired levels of outputs. In practice, these schemes are based upon the quantity of produced

output and only reward increases in quality for a subset of characteristics that are easily measured. For the purposes of this paper, quantity is defined to encompass both the number of units produced and the subset of easily-quantified characteristics that actually entered incentive schemes. Quality is defined to be those product characteristics that are not incorporated into planners' reward schemes or are inherently very difficult and costly to measure.

Intrinsic features of the planned and market economies suggest that it is precisely in the domain of quality characteristics that the greatest differences in the two systems will be found. Identifying the quantitative needs for various rather broad categories of consumption, although not always easy, should be possible if adequate resources are devoted to the task. However, identifying the relative values to consumers of detailed quality characteristics of individual goods is a task that is beyond the capability of any planning bureaucracy. The market mechanism does communicate this kind of information to producers, and competitive producers should feel some degree of compulsion to respond to these preferences. The planning bureaucracy in a Soviet-type economy will focus its attention and efforts on those tasks which can be sharply delineated and effectively carried out given informational resources and directives of superior organizations, while producers interacting in a market setting will carry out those tasks which best meet the needs of their customers[69].

[69] Hewett 1988, pp.197-211 and pp.216-220, discusses incentive schemes and the innovation process in a Soviet-type economy. Berliner 1988 extensively reviews the incentive schemes producers faced to introduce technological innovations and improve product quality.

The typical reward scheme faced by a producer in the Soviet-type economy relied on high-powered incentives to stimulate quantity growth and low-powered incentives to increase quality. If quality is defined to be those characteristics that the planning bureaucracy cannot effectively incorporate into its directives, then there are in fact no decentralized incentives to improve quality. All resources are devoted to increasing per-capita quantity, and the level of quality does not grow at all.

Of course, this view is extreme, as there has certainly been significant technological change and quality improvement in the Soviet/Russian economy since 1929. However, such improvements came about primarily through the intervention of planning and governmental bodies rather than through the initiatives of individual managers or innovators[70]. The capacities of these bodies to force change were limited, and their efforts often yielded dubious results[71]. Quality improvement brought about in this fashion often had an "unbalanced" flavor: some characteristics were improved, but others were not or even deteriorated, again reflecting the fact that bureaucratic intermediation is incapable of addressing many aspects of quality. It was also usually the case that

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[70] See Hewett 1988, pp.216-220, for a forceful argument.

Dearden et.al. 1990 explore innovation-eliciting incentive schemes in a hierarchy where agents differ in inherent ability and can choose to adopt a process innovation or not. They find that if principles wish to induce less-able agents to adopt an innovation, they must make payments to more-able agents to prevent them from pretending to be less-able agents. The costs of innovation-inducing incentive schemes increase as hierarchies becomes large and there is a wide spread between agent abilities. This model is motivated as an explanation of poor innovation performance in the Soviet economy.

As the authors note, "achieving increased adoption rates without prohibitive cost may require not just a tinkering with the form of incentive contracts, but a modification of the hierarchial decision-making process." (p.1106) The modification was in fact a reliance on central intervention that avoided the need to rely upon decentralized incentive schemes.

[71] Suffice it to say that one sector upon which the center concentrated considerable attention and resources was the nuclear power industry. See Hewett 1988, p.217.

central bodies relied heavily upon importation of foreign technology rather than domestically-produced innovations to bring about change[72].

These factors suggest a typical pattern of technological progress and quality change in a given sector of activity. A period of time passes during which quality stagnates, due to the lack of decentralized incentives for producers to introduce innovations on their own initiative. As the gap between the Soviet and Western quality level increases, there is increasing tension which eventually prods central authorities to focus their efforts and resources on reducing the gap[73]. This campaign usually relies on foreign technology and expertise.

If the performance of the Soviet economy relative to Western economies deteriorated over time, it must have been the case that central authorities became progressively more ineffective at reducing differences in quality levels. A variety of arguments can be put forward that suggest that this was the case. The complexity and range of final products and the input mix necessary to produce these products were increasing over time, and bureaucratic structures may have become progressively more incapable of stimulating innovation as a result. Central authority preferences over quality characteristics may have differed from those of Western and Soviet consumers in such a way that the gap between the quality level desired by consumers versus that desired by planners grew over

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[72] Sutton 1973 reviews in detail the history of Soviet technological innovation from 1917 to 1965, focusing in particular on the importation of Western technology. He found that the Soviet system was almost completely incapable of developing and implementing domestic innovations and relied on foreign technology in almost all areas.

[73] Note that it is assumed that central authorities have information adequate to enable them to be aware of the growing gap.

time[74]. Finally, there is little question that the incentive schemes used to elicit high productivity and innovation from central bureaucratic organs in the early Soviet years weakened over the postwar period[75].

An immediate implication of deteriorating bureaucratic effectiveness in promoting quality growth is the steady divergence of the level of per-capita utility in the Soviet-type economy from that which would have been obtained had resources been allocated optimally. Fundamental economic reform was bound to occur sooner or later. If fundamental reform is defined to be a complete overhaul of the incentive mechanism in order to move to the optimal growth path, then the gains from carrying out fundamental reform were steadily increasing over time. These gains would eventually outweigh the perceived costs of such reform and provoke those in charge of the Soviet-type economy to attempt to make the transition to the more optimal growth path.

It is also clear that these reformers would soon realize that any continued reliance upon a planning bureaucracy to bring about quality improvement that maximizes per-capita utility would fail. These bodies were inherently incapable of acquiring and making use of the information necessary for achieving optimal change.

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[74] For example, it may well have been the case that central authorities cared very little about features such as comfort, design, and safety. If these qualities did not increase at all over time, and they entered consumers' utility functions, then the gap between the Western and Soviet utility levels would have grown over time.

[75] For an extensive discussion, see *Journal of Comparative Economics* 15, special issue: "Public Choice and the Transformation of Socialism," especially the articles by Murrell and Olson, Nagy, and Szalai.

III. Evidence on Relative Quality Change from the Finnish Auto Market

Previous research has not produced any empirical evidence that sheds light on the trend in the quality level of Soviet manufactured goods relative to comparable Western goods. This paper explores the first and probably only set of empirical data that sheds light on this important trend.

Soviet-type economies have exported automobiles to Finland since 1949, as have all major European, North American and Asian auto producers. The competition between automobiles produced in Soviet-type economies and Western economies on a free market over a long period of time offers a unique opportunity to test the prediction of declining relative quality. Before examining the empirical evidence from this natural experiment, it will be useful to briefly review the history of the Soviet auto industry[76].

The first major Soviet auto plant was built in 1929, by the Ford Motor Company. The vehicle industry developed rapidly in the 1930's, focusing largely on truck production. By the 1950's,

"The industry had stagnated: vehicles were out-of-date in design, antiquated in appearance and very limited in model range; they were heavy, cumbersome, slow and expensive to run; the methods by which they were produced were technologically obsolete... The gap between Russia and the West had widened enormously."[77]

The major passenger autos produced at this time were the Moskvich and Volga models.

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[76] The following discussion is drawn from Parker 1980. Sutton 1973 extensively discusses the history of innovation in the Soviet auto industry over the period 1929-1965.

[77] Parker 1980, p.521.

In the mid-1960's, the central government decided that the industry needed major improvement and focused its energies on the construction of a huge new auto plant designed and equipped by Fiat, the major Italian auto producer. This plant produces the Lada model. The Moskvich plant was also reequipped, with the aid of Renault of France. Truck production was expanded dramatically through an injection of technology and expertise from West Germany and other foreign producers. After these huge efforts in the late 1960's-early 1970's, the government focused its attentions elsewhere, and auto production entered a period of stagnation which has not yet ended. The only significant change in this period was the introduction of the Samara line of autos in the mid-1980's. Samaras are produced by Lada, and their development was facilitated by the importation of engineering expertise from Porsche of West Germany[78].

It is apparent that the development of this industry corresponds rather closely to the model of the previous section. Innovation was achieved primarily through large-scale intervention by central authorities and relied heavily on foreign technology and expertise. In interim periods, there was little improvement in product quality and variety.

It is important to make the distinction between the change in the absolute level of Soviet auto quality and the change in quality relative to Western levels. The Finnish data sheds light on both. Evidence on the absolute quality level of Soviet vehicles will be examined first, followed by exploration of evidence on the relative quality level.

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[78] *Automotive News*, February 24 1986, p.38

(a). Trends in the Absolute Quality Level of Soviet Autos

Data is available on a variety of observable quality characteristics for Soviet autos sold in Finland over the period 1953-1991 and are presented for brands that had significant market share for various years in table 1. Rather than try to estimate annual percentage change in the absolute quality level of Soviet autos through estimation of hedonic price regressions, it will suffice to directly examine evidence on observable quality characteristics.

The Moskvich was listed in auto surveys over the period 1950-1988, although by the early 1980's sales had fallen to zero. There was apparently significant improvement in observable quality during the 1950's: horsepower increased from 24 to 45 through the introduction of new models. In 1965 and 1970, a new model was introduced. After 1970,there were no changes in the Moskvich product lineup. The Lada was introduced in Finland in 1972, and by 1978 Lada offered four models of autos differentiated by engine power. This product lineup remained unchanged through 1991. The Lada company began to market the Samara in 1987, and two models were offered through 1991.

Soviet autos were always in the bottom niche of the Finnish market due to their low engine power, low maximum speed, and relatively small size. They competed against models of Western autos that targeted lower-income consumers, such as the Ford Escort and the Fiat 126. After the Soviets introduced a new model, a long period ensued during which there was no change in the observable characteristics of the auto(s) on

TABLE 1

OBSERVABLE QUALITY CHARACTERISTICS OF SOVIET AUTOMOBILES

Definition of Variables :

1 : Horsepower
2 : Engine displacement (cubic volume)
3 : Length
4 : Width
5 : Height
6 : Weight
7 : Gasoline consumption (litres/100km)
8 : Maximum speed

Moskvich

	Model	1	2	3	4	5	6	7	8	
1953	Sedan	24	-	-	-	-	800	-	-	-
1959	407	45	1358	4055	1540	1560	980	7.5	115	
1965	403	45	1360	4040	1540	1560	980	9	115	
	408	50	1360	4090	1550	1480	990	9	130	
1970	1300	60	1360	4090	1550	1480	990	9	130	
	1500	80	1478	4090	1550	1480	1000	9	150	
1976	1500	80	1478	4090	1550	-	1050	-	150	
1988	1500	80	1478	4250	1550	1480	1080	-	140	

Lada

	Model	1	2	3	4	5	6	7	8
LOW-END									
1972	Lada	65	1198	4073	1611	-	940	8.5	140
1982	1200	65	1198	4040	1611	-	979	-	142
1989	1200	65	1198	4130	1620	1390	1010	7.3	142
LOWER MIDDLE									
1975	1300	74	1294	4043	1611	-	960	-	145
1983	2105	73	1294	4130	1620	-	990	7.5	145
1990	1300	73	1294	4140	1620	1390	1010	7.2	145

UPPER MIDDLE

1974	1500	84	1452	4116	1611	-	1034	10	150
1984	1500	84	1452	4130	1620	1390	1020	7.6	152
1991	1500	84	1452	4128	1620	1390	1020	7.1	150

UPPER END

1978	1600	63*	1570	4170	1611	-	1040	-	152
1985	1600	57	1568	4140	1620	1390	1030	7.2	155
1991	1600	57	1570	4145	1620	1390	1030	7.2	155

Samara

	Model	1	2	3	4	5	6	7	8
1987	1.3	48	1288	4010	1620	1340	930	5.6	148
1991	1.3	45	1288	4006	1620	1335	950	6.4	148
1988	1.5	55	1498	4010	1620	1340	930	5.7	155
1991	1.5	50	1498	4006	1620	1335	950	5.8	155

Notes :

* : Units of measurement change. Previous years not comparable.
@ : See definition of variable 9.

Source : 1952-1971: *Moottori*, annual market survey
1972-1991: *Tuulilasi*, annual market survey

offer.

Soviet autos clearly did not suffer from a deterioration in *absolute* quality. The 1988 Moskvich was superior to the Moskvich of the 1950's, and the 1991 Ladas were superior to the Lada of 1972. However, improvements in quality took place very infrequently. The Moskvich essentially did not change from the early 1970's to 1988, and the Lada from 1978 to 1991. Soviet practice was to improve quality not through incrementally upgrading existing models or introducing new model lines made by the same

manufacturer but to build new production plants that introduced entirely new brands of cars.

TABLE 2

INTRODUCTION OF NEW AUTO MODELS

Firm	Number of new models introduced	Time period
Moskvich	14	1953-1988
Fiat	154	
Lada/Samara	25	1972-1991
Fiat	124	

Source : Calculated from data given in *Mootori* and *Tuulilasi*, annual market surveys.

This can be seen by comparing data on the pace of innovation for Soviet autos with that of Fiat. The number of new models introduced into the Finnish market for Moskvich, Lada/Samara, and Fiat are given in table 2. Fiat outperformed both Soviet firms by huge margins (introducing 10 times and 5 times as many new models, respectively). Table 3 gives data on how many changes were made to a number of observable quality characteristics such as horsepower, weight, and top speed over the lifespan of a *given* model. Interestingly, Fiat performs much more like the Soviet firms in this regard. The major difference between the innovation patterns of Soviet and Western firms[79] is that the Western firms introduced new models at a much more rapid

[79] Assuming that Fiat is fairly representative of Western firms.

TABLE 3

WITHIN-MODEL CHANGES IN OBSERVABLE QUALITY CHARACTERISTICS

Number of changes in:	(1)	(2)	(3)	(4)	(5)	(6)	Years of model's life
Moskvich							
407	0	1	0	0	1	0	1959-63
408/ 1300	1	0	0	0	0	0	1965-75
1500	0	0	1	0	2	1	1970-88
Lada							
1200	0	0	2	1	2	1	1974-89
1300	2	0	2	1	2	0	1975-81, 1985-90
1500	0	0	4	1	3	1	1974-84, 1991
1600	1	2	5	1	2	1	1978-91
Total Russian	4	3	14	4	12	4	
Changes per year	0.04	0.03	0.16	0.04	0.13	0.04	(*)
Fiat							
600	5	1	1	0	5	1	1959-73
850	1	0	0	0	1	0	1965-75
128 2-d	0	0	1	0	0	1	1970-78
132 1600	0	1	2	1	3	0	1973-80
131 mira. s1600	0	0	0	2	4	1	1975-84
Ritmo 75/85	1	0	0	0	2	1	1978-87
Uno 70S	2	0	0	1	0	0	
Changes per year	0.14	0.03	0.06	0.06	0.24	0.06	(*)

(1) : Horsepower
(2) : Engine displacement
(3) : Length
(4) : Width
(5) : Weight
(6) : Maximum speed
(*) : Total number of model-life years: Moskvich/Lada = 90, Fiat = 63.

pace, and it was primarily through introducing new models that firms changed observable quality characteristics.

Two sets of data on autos sold in Finland that can shed light on trends in the Soviet quality level relative to Western levels are available. Import statistics can be used to calculate unit-values for autos by country of origin. Statistics on the prices and characteristics of individual car models can be used to infer price discounts associated with quality characteristics that are inherently difficult to measure. Both of these data sets will be considered.

(b). The Relative Price Trend Using Import Unit Values

If the price of an auto is a function of quality characteristics such that

$$P_{it} = \sum_{j=0}^{n} \alpha_j x_{ijt} \ , \qquad (1)$$

where P_{it} is the price of country i's automobile at time t, x_{ijt} is the amount of quality characteristic j at time t, and α_j is the weighting coefficient for characteristic j, then the ratio of the prices of autos 1 and 2,

$$\frac{P_{1t}}{P_{2t}} = \frac{\sum_{j=0}^{n} \alpha_j x_{1jt}}{\sum_{j=0}^{n} \alpha_j x_{i2t}}, \qquad (71)$$

reflects the relative amounts of embodied quality characteristics. If the α-weights are stable over time, any trend in this ratio reflects a trend in the level of quality of good 1 relative to good 2[80].

Unit-values for automobile imports from a given country can be calculated from Finnish trade statistics by dividing the total value of Finland's imports from that country by the number of autos imported. A unit-value differs from a true price in that it aggregates together automobiles sold at different prices and reflects both the prices of given automobile models and the composition of the basket of models imported from a given country.

An average Western auto unit-value was constructed by weighting each Western country's unit-value by its quantitative market share and summing. The ratio of the Soviet auto unit-value to this average Western unit-value is graphed in figure 1. Data on the change in Soviet unit-value relative to individual countries over 1950-1991 are given in table 4.

[80] The hedonic approach to product price determination is extensively discussed in Griliches (ed.) 1971, Berndt, and Rosen 1974.


Soviet-Western Relative Auto Price
(import unit-value data)
120
110
100
90
80
70
60
50
40
30
1950
1955
1960
1965
1970
1975
1980
1985
1990

TABLE 4

CHANGE IN SOVIET RELATIVE UNIT-VALUE PRICE, 1950-1991

	Average Annual Growth Rate, Soviet Relative Price, avg(1950-53)-1991	Soviet Relative Price, avg(1950-53)	Soviet Relative Price, 1991
West Germany	-3.76%	115.8	24.1
Britain	-2.76%	101.4	32.1
France	-2.36%	96.5	36.2
Sweden	-3.76%	90.1	18.7
US	-2.19%	66.9	27.0
Italy	-2.29%	95.7	37.0
Japan	-2.22%	69.8 (*)	38.1
Weighted Western price	-2.50%	90.8	32.1

(*) : Base year is 1966.
Source : See *Auto ja Tie*, 1960-1990; *Yearbook of Foreign Trade Statistics*, Tilastokeskus

The results are striking. In the 1950's, the unit-value of a Soviet auto was 90% of that of the typical Western auto. In 1960, the relative Soviet unit-value began to decline fairly steadily and equalled 32% in 1991. The implied average annual change over 1950-1991 is -2.5%. This relative deterioration also holds if the Soviet unit-value is compared to individual Western country unit-values (see table 4). In no case is the absolute value of the average annual rate of change less than 2.19%.

These results suggest that the quality levels of Soviet autos and Western autos were diverging at a rapid pace in the postwar period. However, there are several issues that complicate using the trend in relative auto unit-values as an indicator of the trend in

relative qualities. These issues need to be carefully considered in order to determine what the unit-value trend actually represents.

First, Soviet-Finnish trade was conducted under special arrangements that may have fundamentally affected the pricing of Soviet products sold on Finnish markets. Soviet-Finnish trade was carried out through a clearing arrangement established in 1950[81]. Goods and service prices were denominated in rubles, and clearing accounts were maintained in the Finnish and the Soviet central banks. It may have been that the prices of Soviet products on Finnish markets were affected by this trading mechanism such that prices did not reflect competitive conditions.

The Finnish central bank bought and sold clearing account rubles for Finnish marks from exporters and importers. The mark-ruble exchange rate was determined by dollar-ruble and mark-dollar exchange rates. The domestic Soviet dollar-ruble rate was quoted by the Soviet central bank, and the mark-dollar rate was the commercial rate quoted by the Finnish central bank.

Clearing-account ruble prices for traded goods and services were negotiated between individual buyers and sellers[82]. Finnish importers generally set ruble prices paid to Soviet suppliers according to the mark price received for the product in the domestic Finnish market and was evidently a form of pricing-to-market. The recorded FOB price in Finnish trade statistics therefore primarily reflects competitive conditions in the

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[81] This discussion is based on Mottola et.al. 1983, particularly the chapters by Rantanen (pp.43-52) and Holopainen (pp.173-181).

[82] Finnish trade agents were private companies. Soviet trade agents were large state foreign trade monopolies who managed specific sectors of the economy.

domestic Finnish market. Institutional arrangements governing Soviet-Finnish trade do not appear to have affected the competitive pricing of Soviet autos in Finland.

Second, the decline in the Soviet auto price relative to Western auto prices may reflect developments in the cross exchange rates of the clearing-account ruble versus Western currencies. The Soviet auto price equals $E_R^{FM}P_R$, where E_R^{FM} is the nominal finnmark-clearing account ruble exchange rate, and P_R is the ruble auto price. If a Western auto is priced in dollars, the Western price is $E_\$^{FM}P_\$$. The ratio of the Soviet finnmark price to the Western finnmark price equals $E_R^\$(P_R/P_\$)$, where $E_R^\$$ is the dollar-ruble cross exchange rate. If the price ratio $P_R/P_\$$, which captures among other things relative quality levels, remains unchanged, the relative Soviet finnmark price may still decline if the dollar-ruble cross exchange rate appreciates (or the ruble-dollar rate depreciates).

The implied cross exchange rates of the clearing-account ruble versus a variety of Western currencies are given in table 5. The ruble actually appreciated significantly against all Western currencies except the West German mark. Exchange rate movements indicate that the relative auto price fell even further than the unit-value data suggests.

Third, the declining relative Soviet price may have reflected shifts in the supply curve of Soviet autos rather than a contraction in demand due to diminishing relative quality[83]. If the Soviet market share in the Finnish auto market was rising as its relative price was falling, the Soviet auto supply curve was shifting to the right as a result of greater productivity in car production, reduced demands from East European trading partners, etc. In this case, the price movement reveals nothing about the change in relative

[83] Rosen 1974 models the supply of and demand for products differentiated according to quality characteristics. His work makes clear the difficulties of inferring relative quality change from changes in relative prices.

TABLE 5
RUBLE CROSS-EXCHANGE RATES, 1950-1990

Rubles per:	U.S. Dollar	German Mark	French Franc	Italian Lira	UK Pound	Swedish Crown
1950	4.00	NA	1.14	NA	11.19	0.77
1951	4.00	NA	1.14	NA	11.19	0.77
1952	4.00	0.95	1.14	NA	11.19	0.77
1953	4.00	0.95	1.14	NA	11.19	0.77
1954	4.00	0.95	1.14	NA	11.19	0.77
1955	4.00	0.95	1.14	NA	11.19	0.77
1956	4.00	0.95	1.14	NA	11.17	0.78
1957	4.00	0.95	0.95	0.64	11.18	0.77
1958	3.99	0.95	0.81	0.64	11.17	0.77
1959	3.99	0.96	0.81	0.64	11.17	0.77
1960	3.99	0.96	0.81	0.64	11.20	0.77
1961	0.90	0.23	0.18	0.15	2.54	0.17
1962	0.90	0.23	0.18	0.15	2.53	0.17
1963	0.90	0.23	0.18	0.14	2.53	0.17
1964	0.90	0.23	0.18	0.14	2.52	0.18
1965	0.90	0.23	0.18	0.14	2.53	0.17
1966	0.90	0.23	0.18	0.14	2.53	0.18
1967	0.90	0.23	0.18	0.14	2.47	0.17
1968	0.90	0.22	0.18	0.14	2.14	0.17
1969	0.90	0.23	0.17	0.14	2.15	0.17
1970	0.89	0.25	0.16	0.14	2.14	0.17
1971	0.89	0.26	0.16	0.14	2.18	0.17
1972	0.84	0.26	0.17	0.14	2.09	0.18
1973	0.74	0.28	0.17	0.13	1.81	0.17
1974	0.76	0.29	0.16	0.12	1.77	0.17
1975	0.72	0.29	0.17	0.11	1.60	0.17
1976	0.78	0.30	0.16	0.09	1.36	0.17
1977	0.74	0.32	0.15	0.08	1.29	0.16
1978	0.68	0.34	0.15	0.08	1.31	0.15
1979	0.66	0.36	0.15	0.08	1.39	0.15
1980	0.65	0.36	0.15	0.08	1.51	0.15
1981	0.72	0.32	0.13	0.06	1.46	0.14
1982	0.73	0.30	0.11	0.05	1.27	0.12
1983	0.74	0.29	0.10	0.05	1.13	0.10
1984	0.82	0.29	0.09	0.05	1.09	0.10
1985	0.84	0.28	0.09	0.04	1.08	0.10
1986	0.70	0.32	0.10	0.05	1.03	0.10
1987	0.63	0.35	0.11	0.05	1.04	0.10
1988	0.61	0.35	0.10	0.05	1.08	0.10
1989	0.63	0.34	0.10	0.05	1.03	0.10
1990	0.58	0.36	0.11	0.05	1.04	0.10

Source : Reports of the Finnish Central Bank, 1955-1991.

quality.

The share of Soviet auto imports in total Finnish imports is graphed in figure 2. The share was quite high in the 1950's but fell to about 5% in the mid-1960's. The introduction of the Lada caused market share to surge to 8-10% over the 1970's. It is important to note that the quality level of the Lada was significantly higher than that of previous generations of Soviet autos. In fact, the only period of sustained rise in the Soviet relative price was over 1972-1976, as the Lada rapidly built up market share. After the late 1970's, the Soviet market share stagnated and began to fall towards the end of the 1980's.

The downward trend in relative unit-values cannot be attributed to rightward shifts of the supply curve. During periods of falling or constant market share, the relative price fell. During the one period when market share increased significantly, the relative price rose. These movements suggest that the demand curve was shifting due to changes in relative quality.

Fourth, the high relative price of Soviet automobiles in the 1950's may have reflected the fact that the Finnish road network was poorly developed, and Soviet automobiles were considered to be particularly well-suited for bad road conditions. To quote one student of the Soviet auto industry, "...the first Soviet car...had to be able to withstand wretchedly bad roads and extreme climatic conditions, and to run in a country which lacked roadside service stations. These were to be the major considerations underlying construction for the next forty years....(Parker 1980, p.516)."

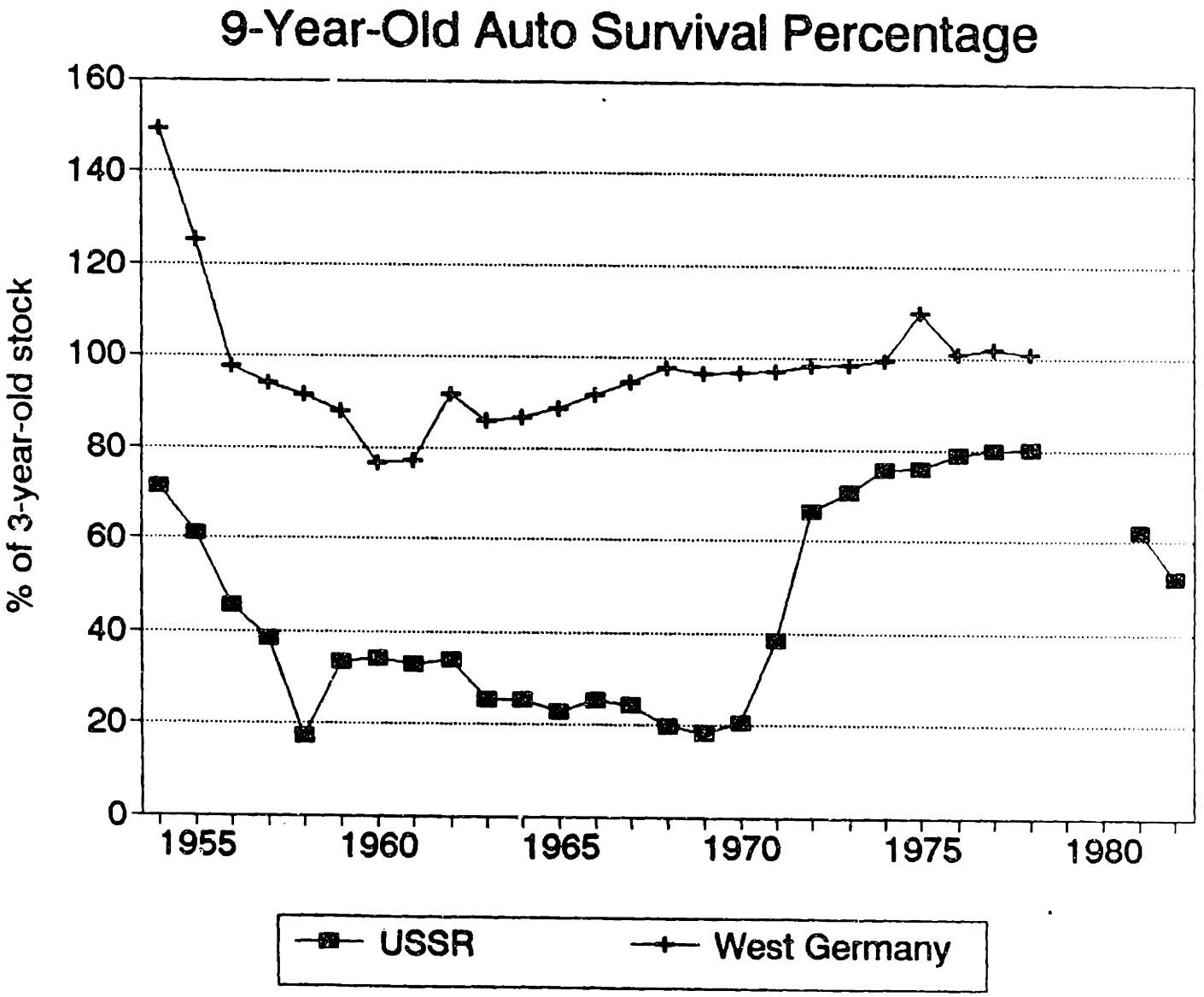

Soviet Market Share
35
30
25
20
15
10
5
0
1950
1955
1960
1965
1970
1975
1980
1985
1990

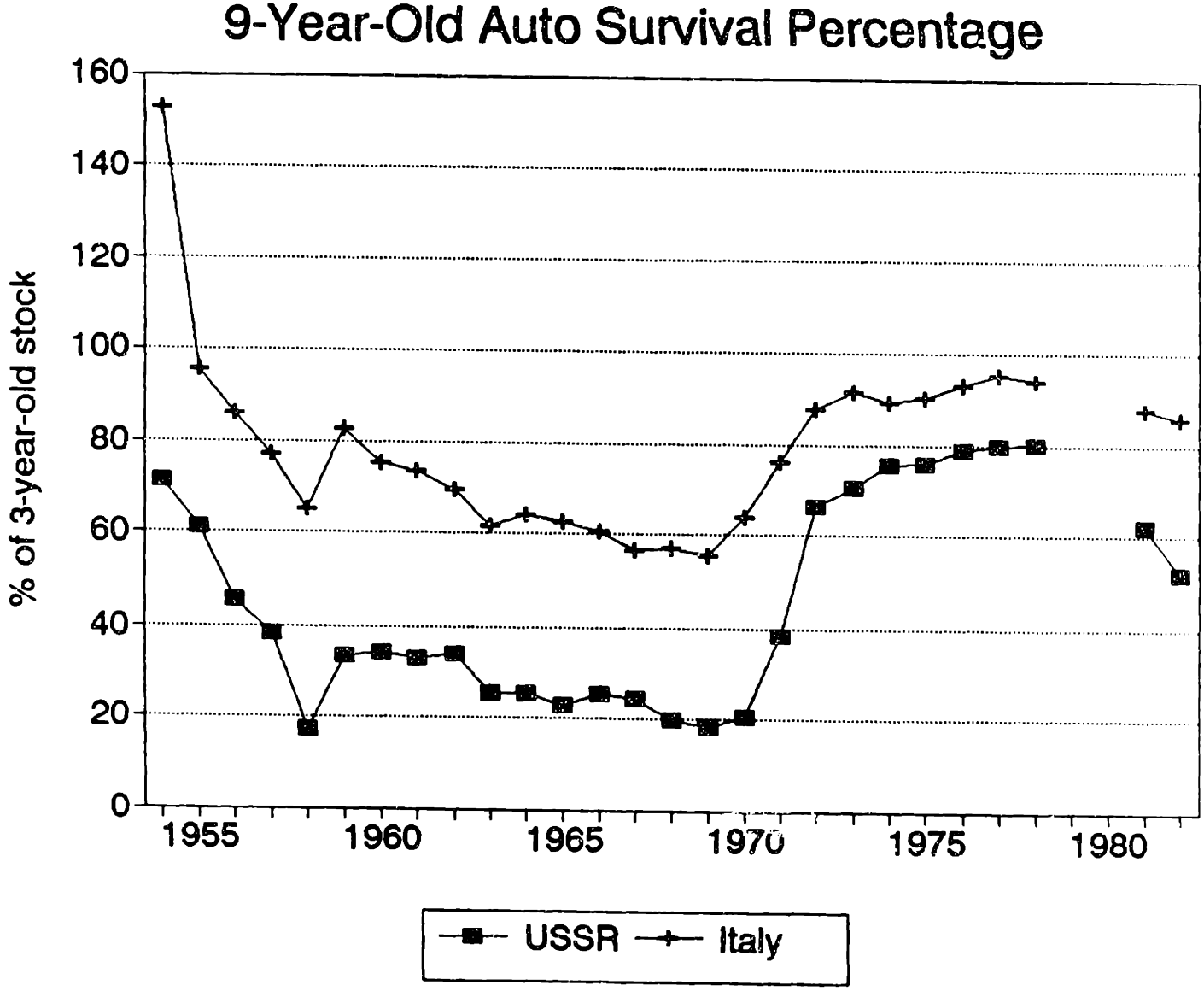
As Finland extended and upgraded the quality of her road network, demand for Soviet autos may have fallen as the need for tough, long-lasting autos contracted. This change can be interpreted as a change in the α-weight on durability characteristics and does not represent deterioration in relative quality associated with the poor functioning of the Soviet economy.

If this hypothesis is true, it should be the case that Soviet autos were more durable than their Western counterparts. Data are available on the Finnish stock of registered autos produced in various countries by year of production. The durability of a country's autos can be assessed by examining how many autos produced in year t survive to year t+n.

The percentage of autos surviving for 9 years for the USSR, West Germany, and Italy are graphed in figures 3 and 4 for years-of-production 1954-1982. In both cases, the Soviet survival rate was far below the Western survival rate, particularly in the case of Germany (Italy is the Western survival percentage lower bound). In the early 1970's, the introduction of the Lada caused the durability gap to narrow, indicating that the Lada was a tougher car than its predecessors. The size of the durability gap in the 1950's is far too large to support the idea that Soviet autos were in high demand due to greater toughness.

Fifth, it may have been the case that Finnish real income was growing at a rapid rate, and poorer consumers were able to afford better autos as time went on. These consumers may have chosen Soviet autos in the 1950's because these autos were at the bottom of the market and were very inexpensive, but as their real incomes went up, this


9-Year-Old Auto Survival Percentage
% of 3-year-old stock
160
140
120
100
80
60
40
20
0
1955
1960
1965
1970
1975
1980
USSR
West Germany


9-Year-Old Auto Survival Percentage
% of 3-year-old stock
160
140
120
100
80
60
40
20
0
1955
1960
1965
1970
1975
1980
USSR
Italy

consumer group was able to move into better makes and models of cars. If this was the case, then the fall in the Soviet relative auto price was due to both changes in relative quality and the shift in consumer demand induced by rising real incomes of the poorer Finns.

The important question is what this means for the implicit assumption that the Western rate of quality increase was an appropriate rate for the Soviet Union. The answer to this depends on how Soviet and Finnish real incomes were changing. Assume that preferences in the two countries were similar. If Soviet real income was increasing at a slower rate than Finnish real income, then the optimal rate of quality increase would have been less than the Finnish rate. If real incomes were increasing at the same pace, then the optimal growth in quality should have been the same. Comparison of statistical evidence on changes in Soviet and Finnish national income should therefore allow us to evaluate this objection.

The debate over the quality of Soviet national income statistics and various Western and Soviet recalculations is extensive[84]. The data presented here include only those series calculated by the CIA and the Russian economist Khanin, who developed the most plausible alternative to the CIA series. These recalculations attempt to correct for hidden inflation, the most important problem in official Soviet data. The CIA also tried to construct a measure comparable to GNP. The author believes that the CIA series is the more reliable of the two. In any event, the behaviors of the two series do not differ much.

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[84] See Hewett 1988, Ericson 1990 and Aslund 1991 for discussions and further references.

TABLE 6

FINNISH AND SOVIET PER-CAPITA NATIONAL INCOME GROWTH, 1950-1990

	Finland	USSR (CIA)	USSR (Khanin)
	(average annual growth rate)		
1950-60	4.01	4.25	5.15
1960-65	4.02	3.23	2.83
1965-70	4.80	3.87	3.07
1970-75	3.37	2.06	2.26
1975-80	2.68	1.03	0.13
1980-85	2.39	0.92	-0.28

Finnish figures for gross domestic product.
CIA Soviet figures for GNP.
Khanin Soviet figures for NMP (net material product).
Sources: Finnish values from *Suomen Tilastollinen Vuosikirja* (Finnish Statistical Yearbook), 1975, 1980 and 1991
Soviet national income values from Ericson 1990, p.77.
Soviet population values from *Naselenia SSSR 1987.*

Data on Finnish and Soviet national income growth are given in table 6. The Soviet economy did actually grow in the postwar period, even on a per-capita basis. However, the growth rate of national income fell rather dramatically so that by the late 1970's-early 1980's, per-capita growth was probably zero. In the 1950's, Soviet economic growth mildly outpaced Finnish growth. In the 1960's, growth was about the same. Finland grew a bit faster than the USSR in the early 1970's, and significantly more quickly in the late 1970's-early 1980's, especially according to Khanin's estimates. I have not yet obtained data for the USSR in the late 1980's: the growth gap between Finland and the USSR undoubtedly continued and may have worsened.

The argument that the Western rate of increase in auto quality was not an appropriate rate for the Soviet Union in the post-war period due to differential national income growth does not seem to be relevant until the late 1970's-early 1980's, when the USSR was clearly in the midst of a growth crisis. This is towards the end of the sample period under review. The case that the rate of growth of the Western quality level was not appropriate for the USSR does not seem very compelling.

Finally, the price as defined in (1) takes into account all of an automobile's characteristics. Some of these characteristics, such as horsepower and car size, are easily quantified and may well have entered Soviet incentive schemes. It would be interesting to determine the magnitude of the discount on Soviet autos relative to Western ones attributable only to those quality characteristics that are inherently difficult to measure and pose the most problems for Soviet-type economies. This can be done using model-specific price and characteristic data.

(c). The Relative Discount on Soviet Autos Calculated From Hedonic Price Regressions

Assume that the price of automobile i at time t is given by

$$P_{it} = e^{A} e^{B_i} e^{C_i} , \tag{72}$$

$$B_i = \sum_{j=0}^{m} \alpha_j x_{ijt} , \tag{73}$$

and

$$C_i = \sum_{m+1}^{n} \alpha_j x_{ijt} , \tag{74}$$

where B_i is the sum of weighted observable quality characteristics, C_i is the sum of weighted unobservable quality characteristics, and A is a common component that affects all auto model prices equally (general price inflation). The ratio of two auto prices is the product of two terms:

$$\frac{e^{B_1}}{e^{B_2}} * \frac{e^{C_1}}{e^{C_2}} . \tag{75}$$

The first term determines that part of the relative price due to observable characteristics, and the second term that part due to unobservable characteristics.

If a cross-model hedonic price regression is run that includes all observable characteristics as independent variables and also includes dummies for individual auto manufacturing firms, then the coefficient on a given dummy variable reflects the price discount or premium relative to the base firm due to unobservable quality characteristics.

The change in the dummy coefficient for a given firm over time indicates how relative unobservable quality is changing[85].

The choice of the base firm for which no dummy has been included will dramatically affect not only the levels of relative unobservable quality, but the dynamic trend of these levels. It is not possible to obtain an estimate of Soviet unobservable quality relative to some average Western level: the comparison must be firm-specific. If a base firm is chosen that experiences a steady deterioration in quality relative to the rest of the Western producers, then the discount on firms that are estimated to have less unobservable quality relative to the base firm will be too small, and the premium on firms that appear to have more will be too large.

I run hedonic price regressions on Finnish auto market data for the years 1959, 1966, 1973, 1984, and 1988. Information is available on horsepower, engine displacement, number of cylinders, length, width, weight, gasoline consumption (liters per 100 km), maximum speed, whether the car is a station wagon, and whether the car is equipped with an automatic transmission or four-wheel drive. Although these features do not completely exhaust the list of observable characteristics, there is probably little that could be added that would significantly change results[86].

In order to generate conservative estimates of the dynamic trend in discounts on Soviet vehicles, I chose Fiat as the base firm. Import unit-value data and regression results

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[85] Because the regression is in semi-log form, and the auto price at time t is given by (13), general price inflation is completely captured by the regression intercept.

[86] For 1959 and 1966, compression ratio and turn radius are also available. Incorporating them does not significantly affect regression results for those years.

show that Fiat was one of the top producers in the early 1950's, but its relative position steadily deteriorated through 1984. Over the period 1966-1984, it was at the bottom of the group of Western auto producers[87]. Because discounts on Soviet autos relative to Fiat also fell over this period, the change in the Soviet discount relative to the Western market as a whole is understated. Over 1984-1988, Fiat improved its market position, so that the discount increase is somewhat overstated.

Regression results are given in table 7. The data for each year is a cross-section of auto models[88]. The unobservable quality discounts for the Soviet autos Moskvich (1959-1984), Lada (1973-1988), and Samara (1988) are graphed in figure 3. Unobservable quality for the Moskvich and Lada relative to that of Fiat clearly fell over time, confirming the trend detected in the import unit-value data. The rise in the Moskvich discount is particularly sharp. Note that the Lada discount estimate in 1973 is relative to Fiat, not Western producers as a whole, and is therefore an underestimate. This discount also rises through 1988.

The hypothesis that the trend in Soviet product quality relative to the Western level was negative over the postwar period is confirmed. The unobservable quality discount on the Moskvich was low in 1959 but grew dramatically over the 1960's and 1970's. By the late 1970's, the Moskvich was for all practical purposes out of the

[87] In 1966, Japanese firms were discounted relative to Fiat. This was the year when Japan first sold significant quantities on the Finnish market.

[88] Each firm produced several models.

TABLE 7
HEDONIC PRICE REGRESSIONS, 1959-1990

1959 # of Observations = 91 R adj. = 0.96 Dependent variable = ln(price)

	Coefficient	T-Statistic		Coefficient	T-Statistic
Cylinders	0.0483	2.18	Volvo	-0.1386	-1.29
Cubic volume	-0.0002	-2.43	Armstrong	0.0847	0.67
Horsepower	0.0034	2.49	Borgward	-0.0754	-0.66
Length	0.0002	1.71	Buick	-0.1601	-0.77
Width	0.0003	0.68	Cadillac	0.1416	0.64
Weight	0.0006	3.37	Chevrolet	-0.0594	-0.42
Mileage	-0.0125	-0.48	Hansa	-0.0307	-0.26
Top speed	0.0020	1.60	Hillman	-0.0307	-0.29
Constant	4.6317	10.08	Lincoln	-0.1744	-0.80
			Lloyd	0.0321	0.30
Alfa Romeo	0.4119	4.91	Mercury	0.0774	0.38
Austin	0.0064	0.09	MG	0.0894	0.80
BMW	0.1103	1.28	Oldsmobile	-0.0227	-0.12
Citroen	-0.0087	-0.09	Panhard	-0.2628	-1.78
Donau	-0.0354	-0.32	Rambler	0.0654	0.54
Ford	-0.1207	-1.59	Saab	0.0056	0.05
Goggo	0.0134	0.18	Simca	-0.0788	-0.67
Humber	0.0245	0.28	Studebaker	0.1940	1.52
Jaguar	0.0633	0.65	Vedette	-0.2943	-2.33
Mercedes	0.1022	1.34	Volkswagen	-0.1347	-1.18
Morris	-0.0818	-0.97			
Opel	-0.0641	-0.71	Moskvich	-0.2967	-2.76
Peugeot	-0.2388	-2.63	Volga	-0.2258	-1.89
Renault	-0.1796	-2.20	Zil	-0.2433	-1.54
Riley	0.0069	0.08	Zwickau	-0.3223	-2.94
Rover	-0.0476	-0.53	Sachsenring	-0.1565	-1.33
Standard	0.0155	0.18	Wartburg	-0.4320	-3.75
Vauxhall	0.0059	0.07	Skoda	-0.4496	-5.46
Wolseley	-0.0093	-0.12	Warszawa	-0.3864	-2.83

Note : Cylinders = Number of engine cylinders.
Cubic volume = engine displacement.
Mileage = litres/100 kilometers.

1966 # of Observations = 243 R adj. = 0.94

	Coefficient	T-Statistic		Coefficient	T-Statistic
Cylinders	0.1541	0.65	Porsche	0.4545	3.66
Cubic volume	-0.0003	-4.06	PMC	-0.2304	-2.14
Horsepower	0.0029	2.41	Rambler	0.1125	1.26
Length	0.0001	0.49	Renault	0.0384	0.55
Width	0.0007	2.84	Rover	0.1171	1.28
Weight	0.0006	3.95	Saab	0.0041	0.05
Mileage	0.0414	2.51	Sunbeam	0.1549	1.39
Top speed	0.0093	7.58	Toyota	-0.1579	-1.97
Automatic	0.1896	2.00	Triumph	0.0143	0.20
Station wagon	0.1356	2.96	Vauxhall	-0.0816	-0.72
Constant	5.9828	18.54	Volkswagen	0.1611	2.13
Alfa Romeo	0.1551	1.90	Wolseley	0.1957	2.23
Austin	0.0708	0.97	Volvo	0.0809	1.18
BMW	0.2978	2.94	Audi	0.1491	0.97
Citroen	-0.0069	-0.08	DAF	0.2059	1.31
DKW	0.0990	0.85	Datsun	-0.2302	-1.55
Dodge	0.0445	0.47	Humber	0.2157	1.41
Glas	0.1746	2.37	Isuzu	-0.2398	-1.60
Hillman	0.0912	1.17	Karman	0.3177	2.06
Jaguar	0.0422	0.49			
Mercedes	0.3456	4.61	Moskvich	-0.4366	-4.70
MG	0.1183	1.51	Volga	-0.4718	-3.59
Morris	0.0914	1.33	Skoda	-0.3236	-3.32
Neckar	0.0303	0.36	Wartburg	-0.4694	-4.65
NSU	-0.0303	-0.50	Trabant	-0.3246	-3.39
Opel	-0.0935	-1.42	Jalta	-0.1506	-0.98
Peugeot	0.0708	1.11	RAF Latvia	-0.2682	-1.56

1973 # of Observations = 235 R adj. = 0.97

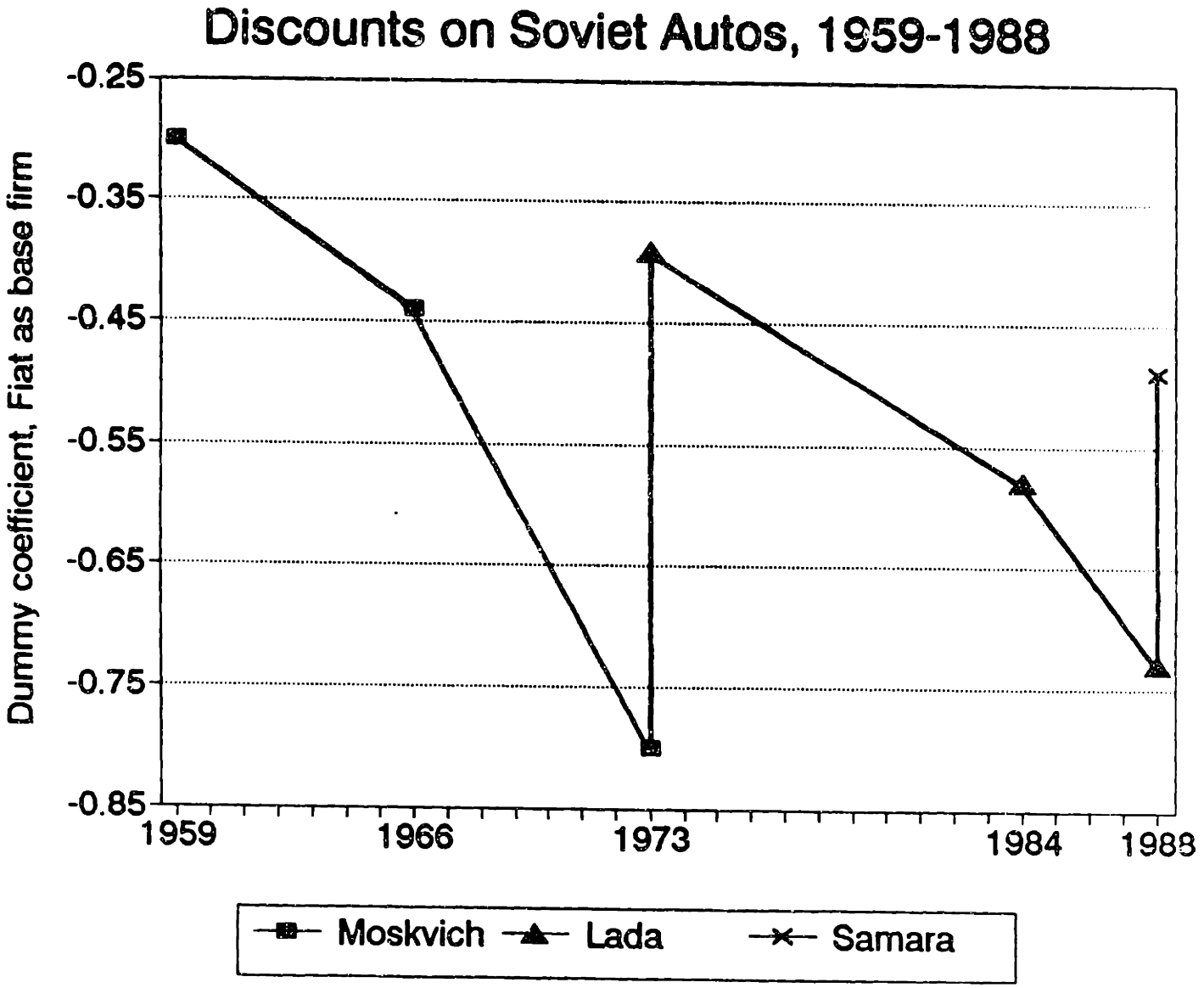
	Coefficient	T-Statistic		Coefficient	T-Statistic
Cylinders	0.0366	2.69	Plymouth	0.2900	3.86
Cubic volume	-0.0001	-4.03	Rambler	0.2821	3.59
Horsepower	0.0009	1.31	Renault	0.0975	2.27
Length	-0.0001	-1.09	Rover	0.0341	0.49
Width	0.0006	2.25	Saab	0.0371	0.75
Weight	0.0012	9.30	Simca	-0.0504	-1.03
Mileage	0.0004	0.05	Sunbeam	0.0283	0.44
Top speed	0.0080	9.42	Toyota	-0.0254	-0.56
Automatic	0.1585	3.72	Triumph	0.1778	2.14
Station wagon	0.0652	1.61	Volvo	0.2717	5.96
Constant	6.8271	20.06	Volkswagen	0.1114	2.53
			Honda	0.1614	1.61
Alfa Romeo	0.1590	1.99	Jeep	-0.4723	-3.81
Audi	0.1787	3.05	Mini	0.0386	0.37
Austin	-0.0096	-0.13			
BMW	0.3697	6.93			
Chrysler	0.0994	1.23			
Citroen	0.1458	2.90			
Datsun	0.0390	0.39	Lada	-0.3877	-5.15
Ford	-0.0473	-1.21	Moskvich	-0.7959	-11.58
Mazda	-0.0849	-1.30	Volga	-0.5006	-4.88
Mercedes	0.4663	9.07	Skoda	-0.0548	-0.76
Morris	-0.1126	-1.73	Wartburg	-0.5163	-7.95
Opel	0.1348	3.20	Polski-Fiat	-0.2341	-3.16
Peugeot	0.2433	5.07	Zastava	-0.0724	-0.93

1984 # of Observations = 427 R adj. = 0.97

	Coefficient	T-Statistic		Coefficient	T-Statistic
Cylinders	-0.0143	-1.19	Mercedes	0.3337	9.56
Cubic volume	-0.0001	-2.23	Mitsubishi	0.0970	2.53
Horsepower	0.0051	6.00	Nissan	0.0499	1.73
Length	0.0002	0.61	Opel	0.0588	2.10
Width	-0.0034	-1.60	Peugeot	0.0773	2.27
Weight	0.0013	10.88	Renault	0.2659	9.06
Mileage	-0.0010	-0.10	Rover	0.1540	1.91
Top speed	0.0058	6.88	Saab	0.0311	0.96
Automatic	0.1012	5.94	Subaru	0.0795	1.20
Station wagon	-0.0031	-0.13	Suzuki	0.0964	1.74
Constant	9.2144	30.35	Talbot	-0.0578	-1.37
			Toyota	0.0580	2.09
Alfa Romeo	0.1245	2.77	Volkswagen	0.2415	6.93
Audi	0.4619	11.88	Volvo	0.1024	3.43
Austin	0.0967	1.33			
BMW	0.2912	9.87	Lada	-0.5764	-14.34
Citroen	0.1755	4.88	Moskvich	-1.0141	-9.82
Ford	0.0869	3.34	Skoda	-0.5602	-9.36
Daihatsu	0.1046	2.44	Wartburg	-0.6373	-8.33
Honda	0.2355	6.21	Polonez	-0.6256	-6.26
Mazda	0.0427	1.49	Polski-Fiat	-0.7508	-12.23

1988 # of Observations = 674 R adj. = 0.98

	Coefficient	T-Statistic		Coefficient	T-Statistic
Cylinders	-0.0330	-3.40	Mazda	-0.0641	-2.18
Cubic volume	-0.0001	-2.22	Mercedes	0.4094	11.98
Horsepower	0.0056	7.23	Mitsubishi	0.0064	0.20
Length	-0.0001	-0.32	Nissan	-0.1189	-3.83
Width	0.0035	2.08	Opel	0.0028	0.09
Weight	0.0012	14.85	Peugeot	-0.0125	-0.42
Mileage	0.0126	1.35	Porsche	0.5836	11.39
Top speed	0.0034	4.36	Reliant	0.5670	5.37
Automatic	0.0811	6.00	Renault	0.1440	4.20
Station wagon	0.0165	0.80	Rover	0.0019	0.03
Four-wheel drive	0.0893	4.16	Saab	-0.0273	-0.73
Constant	8.9007	35.22	Seat	-0.1363	-2.96
			Subaru	-0.0790	-1.98
Alfa Romeo	-0.0312	-0.79	Suzuki	0.0655	1.37
Audi	0.3285	8.95	Toyota	-0.0883	-2.98
BMW	0.1963	6.10	Volkswagen	0.1654	5.45
Citroen	0.1246	3.88	Volvo	0.1039	3.33
Daihatsu	0.0581	1.01			
Ford	0.0437	1.50	Lada	-0.7297	-17.12
Honda	0.0610	1.64	Samara	-0.4924	-7.64
Jaguar	-0.0340	-0.52	Wartburg	-0.9525	-11.51
Lancia	0.0325	0.62	Skoda	-0.7649	-15.09
Lotus	0.6680	7.98	Polonez	-0.9090	-17.69


Discounts on Soviet Autos, 1959-1988
Dummy coefficient, Fiat as base firm
-0.25
-0.35
-0.45
-0.55
-0.65
-0.75
-0.85
1959
1966
1973
1984
1988
Moskvich
Lada
Samara

Finnish market[89]. The Lada model was introduced in the early 1970's and brought about a discrete increase in the quality level of Soviet autos. However, the Lada's initial quality discount was much higher that the discount on the Moskvich in the 1950's, and it increased significantly over the 1970's and 1980's. The Samara model, introduced in 1988, had an even higher initial unobservable quality discount than the Lada.

The behavior of the discount at the time of the two major central interventions to improve the technological level of autos, when the Lada was introduced in 1973 and when the Samara was introduced in 1988, indicate that central intervention was becoming less effective. The initial discount on the Lada was much larger than the discount on the Moskvich in the 1950's, and the initial discount on the Samara was larger than that of the Lada.

[89] Moskvich market share had fallen to zero.

IV. Conclusions

The Soviet economy experienced tremendous difficulty in innovating and achieving technological progress. Central authorities did not rely upon decentralized incentive schemes to encourage technical improvement, but upon intervention which made use of imported foreign technology and expertise. The findings of this paper show that for the Soviet auto industry, this resulted in a strong deterioration in quality relative to the West. Central interventions did produce significant one-time improvements in quality, but they were very infrequent and became progressively less effective. If these empirical results generalize to other industrial sectors, then the Soviet economy as a whole became relatively more backward over time, and the central intervention mechanism became increasingly ineffective in reversing this trend.

These findings have implications for the general theory of economic growth and reform. The institutions that guided Soviet economic development and decision-making were very inefficient, not only in a static sense but also in a dynamic sense. However, it took the Soviets fifty years to abandon these institutions in an attempt to move the economy onto a more efficient growth path, even though Soviet decision-makers knew about the serious inefficiencies at an early stage. This suggests that trying to explain economic development and growth without explaining why very inefficient policies and institutions are chosen and maintained for long periods of time is seriously incomplete.

If the findings for Soviet product quality in the 1950's generalize to other sectors, then undertaking the transition in the 1950's would have been much less painful than

undertaking it in the 1990's. However, authorities initiated a program of fundamental change only after the economy had deteriorated to a very poor state relative to the West, so that the overall costs of making the transition were much higher. This choice pattern seems odd from the point of view of dynamic cost-benefit analysis and suggests a need for a theory of economic reform that can explain it. This observation is strengthened by the fact that other third-world countries have experienced similar developments in the postwar period.

Finally, the recent radical changes brought about in formerly-socialist economies should bring intense pressure to bear on producers who manufacture poor-quality products. This pressure will be most sharply felt by those firms exposed to international competition. The typical East European producer manufactures goods of a very low quality compared to Western competitors, and product variety is much smaller. The per-unit costs of increasing quality characteristics are significantly higher than those of Western firms. One interesting topic for future research is to assess the effects on domestic producers in such a situation of sudden integration into world markets using the tools of modern trade theory.

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