REPORT TO
NATIONAL COUNCIL FOR SOVIET AND EAST EUROPEAN RESEARCH

TITLE: SOVIET HOUSEHOLD SAVING UNDER QUANTITY CONSTRAINTS: EVIDENCE FROM THE SOVIET INTERVIEW PROJECT

AUTHORS: Paul R. Gregory and Manouchehr Mokhtari

CONTRACTOR: University of Houston

PRINCIPAL INVESTIGATOR: Paul R. Gregory

COUNCIL CONTRACT NUMBER: 803-05

DATE: June 1989

The work leading to this report was supported by funds provided by the National Council for Soviet and East European Research. The analysis and interpretations contained in the report are those of the author.
NOTE

This report is an incidental product of the Council Contract noted on the title page. This is not the Final Report, which will be distributed at a later date.
This study uses a survey of former Soviet citizens (the Soviet Interview Project) to investigate household saving behavior in the Soviet Union. We combine objective data on income, consumption, and wealth with respondent perceptions of consumer market shortages to which they were subjected in the Soviet Union. The latter information allows us to classify households as "severely" or "moderately" quantity constrained or unconstrained in consumer markets. The data set also allows us to study the effects of privilege and underground economy purchases on Soviet household saving behavior.

We present relatively conclusive evidence to support the proposition that marginal saving rates are positively related to the severity of quantity constraints. Soviet households subject to severe quantity constraints have marginal saving rates more than double those of unconstrained households. Surprisingly, the high marginal saving rate of severely constrained Soviet households is very close to that of U.S. households during the rationing of World War II. As a consequence of including quantity constraints, the unconstrained marginal saving rate (estimated from a conventional saving model) is reduced from being relatively high by international standards to being relatively low. We also find that Soviet households have higher marginal saving rates out of high-variance private income (in keeping with the permanent income hypothesis) when quantity-constraint variables are included.

The effects of quantity constraints on marginal saving rates are most visible at above-average income levels. At low levels of income, quantity-constrained households save considerably less than their unconstrained counterparts. At average income levels, they save slightly more. Only at above-average incomes, do the average saving rates of constrained Soviet households markedly exceed those of unconstrained households.

We find a relatively minor (although statistically significant) effect of underground economy purchases on Soviet household saving. Quantity-constrained households do participate more in underground markets at relatively high prices, as would be expected. Nevertheless, this difference in underground market participation accounts for only a small difference in saving between constrained and unconstrained households.

With or without adjustment for quantity constraints, Soviet household saving behavior follows normal patterns with respect to life-cycle effects and household size.
I. SOVIET HOUSEHOLD SAVING UNDER QUANTITY CONSTRAINTS

Soviet households operate in what is generally perceived to be a quantity-constrained consumer market in which choices of key consumer goods are constrained by formal and informal rationing devices. According to Kornai (1980, 1982), such shortage is not explained by transitory planning problems. Chronic excess demand is endemic to planned socialism, which creates what Kornai calls a "shortage equilibrium" (Kornai 1985, p.381). Barro and Grossman (1971) focused attention on the effects of quantity constraints on the economic behavior of households, arguing that households substitute leisure or saving for consumption when faced with quantity constraints. The Barro/Grossman model, hence, raises the possibility that quantity constraints lower Soviet economic performance by reducing scarce labor inputs. As a planned socialist economy, potentially characterized by economy-wide excess demand, the saving behavior of Soviet households promises to shed light on the Barro/Grossman proposition.

The Soviet leadership has an intense interest in household saving behavior. Soviet authorities believe that Soviet households follow the basic proposition of the quantity-constraint model: increases in the stock of household saving are attributed almost exclusively to economy-wide increases in excess demand. In an economy in which public saving is supposed to provide investment
finance, private saving is viewed as a disturbing sign of growing disequilibrium. The stock of private saving is perceived as an overfull dam threatening to de-stabilize the already fragile consumer market. The thinking of the Soviet leadership has been buttressed by Western analysts of the Soviet economy [Bronson and Severin (1970, 1973), Bush (1973) and Schroeder (1975)], who contend that increases in Soviet saving are forced by general shortages of consumer goods.

This paper estimates the effects of quantity constraints on the saving behavior of Soviet households. It uses a unique micro data source -- interviews with 2,793 former Soviet citizens who left the Soviet Union in the late 1970s. These interviews were conducted by the National Opinion Research Center on behalf of the Soviet Interview Project (henceforth, SIP). ¹ Along with conventional information on income, consumption expenditures, wealth and demographic characteristics, the Soviet Interview Project asked a series of questions concerning consumer goods shortages, purchases in collective farm markets and in underground markets, and access to "closed shops."

The Soviet Interview Project provides rare direct information on excess demand that can be used to gauge the effects of shortage on household saving. Past studies have

¹ Background information and first results of the Soviet Interview Project are found in James R. Millar (1987).
attempted to test for economy-wide quantity constraints; they have not focused on the effects of quantity constraints on household saving behavior. With direct information on shortages, differentiated by households, we are in a position to estimate their effects on household behavior.

II. TESTING FOR QUANTITY CONSTRAINTS

The Barro/Grossman model has been the subject of considerable amplification over the years. Its theoretical properties have been examined by Portes (1976), Malinvaud (1977), Howard (1977), and Muellbauer and Portes (1978). Quandt (1978, 1982) and Portes (1986) have formulated empirical methods for detecting economy-wide disequilibria in consumer and labor markets. For a survey of applied research on disequilibrium models, see Laffont (1985).

Empirical testing of the Barro/Grossman model has centered on the planned socialist economies of Eastern Europe and the Soviet Union. Although virtually all economies have quantity-constrained markets (such as rent-controlled housing or price-controlled medical care), the planned socialist economies are perceived as being most prone to economy-wide excess demand. Kornai (1985) provides a brief survey and relevant bibliographies of research on quantity constraints in Eastern European economies.
With the significant exception of Ofer and Pickersgill (1980), empirical tests of the Barro/Grossman saving model have used time series data to detect consumer market disequilibria in planned socialist economies. Ofer and Pickersgill (1980) use a cross section sample of former residents of the Soviet Union who emigrated to Israel in the early 1970s. Henceforth, the sample used by Ofer and Pickersgill will be referred to as the Israel Soviet Interview Project, or ISIP. Empirical tests of disequilibrium models employ two different procedures. One is to compare the parameters of the saving function of one or more planned economies with international studies of Western countries (where general quantity constraints do not prevail). Examples are the studies of Portes and Winter (1978), Pickersgill (1976), and Ofer and Pickersgill (1980) who find that the estimated planned-economy saving-function parameters are consistent with non-quantity-constrained economies. If the planned economies were indeed subject to general excess demand in consumer markets, it is argued, the planned-economy saving functions would not be well behaved.

The second approach uses formal disequilibrium models (Quandt 1978) that allow for disequilibria between specified aggregate consumer supply and aggregate consumer demand equations. Although excess demand (or supply) cannot be directly observed, the determinants of aggregate consumer supply and demand can be specified and likelihood tests
applied to test for general disequilibrium. An example of this second type of approach is Portes, Quandt, and Yeo (1988), who use a disequilibrium model to reject general excess demand for Poland -- the planned economy most would single out as suffering from chronic excess demand.

Most empirical studies of saving in the planned socialist economies conclude that the hypothesis of sustained consumer-market disequilibrium cannot be accepted [Pickersgill (1976, 1977), Millar and Pickersgill (1977), Portes and Winter (1977)]. Although few would dispute the widespread presence of queues in these economies, spillover purchases allow notional consumer demand to be realized in non-quantity-constrained markets, thereby eliminating general excess demand.

Past studies of quantity-constrained economies suffer from three weaknesses. First, international comparisons yield such a broad band of feasible parameter estimates that the planned socialist estimates must be highly unusual to fall outside the band. Second, only asymptotic likelihood tests are available when the model specification directly allows disequilibrium in consumer markets. Third, tests on

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2 Podkaminer (1982, p.429) does find evidence of excess saving for Poland between 1970 and 1978. Podkaminer applies linear expenditure models using Irish and Italian demand parameters to Poland to come to this conclusion.
microeconomic data tend to yield more robust results than those on macroeconomic time series. 3

III. SOVIET INTERVIEW PROJECT, BIASES, DATA ON CONSUMPTION, INCOME, SAVING, AND WEALTH

Sample Size and Biases

The Soviet Interview Project sample is described in various publications (Millar, 1987, Swafford 1987, Gregory and Kohlhase 1988, Gregory and Collier 1988). The interviews were conducted between April and December of 1983. Respondents were asked to speak about their lives prior to the break caused by the emigration decision. For most respondents, this last period of normal life in the Soviet Union was 1978 or 1979. The SIP sample was stratified from 33,000 cases according to the geographic, educational, and nationality characteristics of the Soviet urban population.

3 Time series tests are influenced by the time series properties of the data; i.e. number of unit roots in the observations. For the usual integrated (non-stationary) data process different critical values are required. For example, t-statistics do not have the usual distribution and, sometimes, t-values in excess of 3 are needed (see, for example, Hendry, 1986). Phillips and Durlauf (1986) show that in tests of hypotheses involving integrated processes the limiting distribution of F-statistics depends on nuisance parameters and "lacks its usual rationale" (p.483). They also show that other test criteria, e.g. likelihood ratios, suffer from the same problem. On empirical grounds, Nelson and Plosser (1982) show that the U.S. macroeconomic time series follow some non-stationary process, and Mokhtari (1988) provides international evidence to the same effect for aggregate income and consumption data.
residing in medium to large cities. Some 90 percent of the SIP respondents were Jewish.

Inferences concerning the referent Soviet population should be drawn with caution from the SIP sample. The sample's mean values of key economic and demographic variables such as earnings and household size are close to the referent population (Gregory 1987), although service employment is higher and respondents are more educated than the referent population. Because of the sample's general similarity to the referent population, its behavioral parameters should be reasonably representative of the referent population. This would not be the case if a pure Jewish distortion causes Soviet Interview Project respondents to behave differently from respondents drawn from the referent population having the identical attributes except Jewishness. We seen no reason to expect strong biases with respect to household saving behavior.

After dropping redundant interviews conducted with another members of the same household, cases with missing values, and 46 cases of extreme values, we were left with 2108 households. 4 As noted above, the sample mean values of income, household size, and age are close to those of the

4 We found 46 cases, 2 percent of the responses, to show extreme values without being supported by the rest of responses to the questions for each case. This compares favorably with the 52 cases, or 5 percent of the ISIP data, considered as extreme values by Ofer and Pickersgill. Given the size of the SIP data and our unsuccessful attempts to adjust extreme values, we decided to discard these observations.
referent Soviet population. They are also close in most cases to the mean values of the Ofer-Pickersgill Israel Soviet Interview Project, although the Ofer-Pickersgill study deals with the early 1970s.

Income Data

Household monthly income is defined as:

\[ Y = Y_1 + Y_2 + Y_3 + Y_4 \]

where

- \( Y_1 \): monthly salary from the respondent's main state-sector job
- \( Y_2 \): monthly salary from any second job in the state sector
- \( Y_3 \): monthly salary from any private job
- \( Y_4 \): monthly salary of spouse from main job

The above sum may exclude some sources of household income, such as from a spouse's second job or private earnings or the earnings of an adult child. Respondent confusion over the definition of family income made the above summation a more reliable household income measure than the direct answer to family income. 5

We distinguish between the income from public-sector sources (\( Y_P = Y_1 + Y_2 + Y_4 \)) and private sources (\( Y_T = Y_3 \)). Table 1 shows that private income accounts for seven percent of household income. Among the four types of income, \( Y_T \) is the most variable source for Soviet households.

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5 Anderson and Silver (1987) have demonstrated the basic unreliability of the SIP family income measure. Ofer and Vinokur's study of SIP income distribution (Vinokur and Ofer 1987) also uses the same summation to represent household income.
Expenditure and Saving

Soviet Interview Project respondents were asked a number of questions concerning their monthly expenditures by source. Monthly household saving is obtained by: \( S = Y - C \); where consumer spending \( (C = C_1 + C_2 + C_3) \) components are:

- \( C_1 \): amount spent in collective farm markets (rynok)
- \( C_2 \): amount spent in the underground economy (na levo)
- \( C_3 \): amount spent in official state outlets

Respondents reported total monthly expenditures along with \( C_1 \) and \( C_2 \); therefore, \( C_3 \) is a residual. Table 1 provides descriptive statistics on \( S, C_1, C_2, C_3 \). Table 1 shows that \( C_2 \) has the highest variation among the three expenditure categories. Expenditures in the underground economy and in collective farm markets, on average, account for 16% and 27% of total spending, respectively. For a Soviet household that is quantity-constrained in official outlets, collective farm markets and underground purchases provide the opportunity to convert notional demand into goods, but at prices that are higher than state stores.

Wealth

Liquid wealth (WL) consists of the sum of currency, savings, 3 percent bonds, and the resale value of valuables.

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6 These figures may cause an understatement of consumer spending in state stores because some respondents apparently included goods purchased by bribes and other unofficial means in state stores in underground purchases.
or collectibles (like precious metals or jewels). Illiquid wealth (WI) consists of the resale value of furniture, cars, dachas, houses or cooperative apartments. Wealth (W) is the sum of liquid and illiquid assets.

Table 1 yields a 35 percent income-wealth ratio (based on an annualized income) for the sample. This ratio is slightly lower than the 43 percent ratio obtained for the U.S. (Venti and Wise, 1986). The 35 percent ratio is one quarter of the income-wealth ratio found by Ofer and Pickersgill (p.138). Soviet Interview respondents were, on average, 3.6 times as wealthy as those of Ofer and Pickersgill. Although there is general comparability of mean values, the difference in wealth between the Soviet Interview Project and Israel Soviet Interview Project samples is significant. Wealth (W) has a coefficient of variation that is about twice the coefficient of variation of Y. Wealth inequality is higher than income inequality among the Soviet households -- a result confirmed by Vinokur and Ofer (1987, p.196).

The Average Propensity to Save

Table 1 shows that average saving of Soviet interview project households to be 50 rubles per month. This figure is higher than the 33 rubles average of Ofer and Pickersgill.
Table 1
Descriptive Statistics of the Soviet Interview Project
Sample of Former Soviet Citizen, 1978-79
(Number of Households: 2108)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Coefficient of Variation</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
<td>50.0</td>
<td>132.2</td>
<td>264.2</td>
</tr>
<tr>
<td>C</td>
<td>281.8</td>
<td>197.3</td>
<td>70.0</td>
</tr>
<tr>
<td>C1</td>
<td>76.7</td>
<td>83.9</td>
<td>109.3</td>
</tr>
<tr>
<td>C2</td>
<td>46.8</td>
<td>76.9</td>
<td>164.2</td>
</tr>
<tr>
<td>C3</td>
<td>158.1</td>
<td>167.3</td>
<td>105.8</td>
</tr>
<tr>
<td>Y</td>
<td>331.8</td>
<td>238.1</td>
<td>71.7</td>
</tr>
<tr>
<td>YP</td>
<td>308.1</td>
<td>188.2</td>
<td>61.1</td>
</tr>
<tr>
<td>YT</td>
<td>23.7</td>
<td>145.7</td>
<td>614.0</td>
</tr>
<tr>
<td>H</td>
<td>3.2</td>
<td>1.3</td>
<td>40.0</td>
</tr>
<tr>
<td>W</td>
<td>11,425.9</td>
<td>15,053.1</td>
<td>131.7</td>
</tr>
<tr>
<td>WL</td>
<td>5,439.9</td>
<td>9,099.1</td>
<td>167.2</td>
</tr>
<tr>
<td>WI</td>
<td>5,985.9</td>
<td>9,149.1</td>
<td>152.8</td>
</tr>
<tr>
<td>AGE</td>
<td>42.2</td>
<td>13.6</td>
<td>32.2</td>
</tr>
</tbody>
</table>

S: Total savings
C: Total amount spent in all markets
C1: amount spent in collective farm markets (rynok)
C2: amount spent in the underground economy (na levo)
C3: amount spent in official state outlets
Y: Total income
YP: Income from public sources
YT: Income from Private sources
H: Household size
W: Total wealth
WL: Liquid wealth
WI: Non-liquid wealth
AGE: Age of the respondent
The higher saving figure is expected because of the wealth differences noted above. Moreover, our data refer to 1978-79 while Ofer-Pickersgill refer to 1972-73. Nevertheless, the higher saving figure is surprising because the negative saving of 205 Soviet Interview Project households have been included, unlike Ofer and Pickersgill who lacked information on negative saving. 7

The average propensity to save (APS) of the Soviet Interview Project sample is 15 percent. This APS ratio is generally higher than those obtained from budget studies of other nations, but its close to a number of countries. The 15 percent ratio is only slightly higher than Germany and Holland, 5 to 10 percentage points above Belgium, France, U.K., U.S. and Switzerland (Katona, Strumpel and Zahn 1971, p.89; Mayer 1972a, p.286-7, Mayer 1972b, p.758), and three times larger than Israel (Liviatan 1963, p.33). The 15 percent ratio is more than twice Ofer and Pickersgill's (1980, p.132).

The relatively high Soviet average propensity to save is consistent with the proposition that quantity constraints in Soviet consumer markets have "forced" an unusually high saving rate from Soviet households. It fails to offer

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7 Ofer and Pickersgill (p.130) "conclude that negative savings was not reported because the respondents did not understand that they could report it, not because it did not exist." Ceteris paribus, this, lack of the data on dissaving, can introduce an upward bias in the estimated intercept of saving function. Indeed, we obtain smaller intercepts than those that are reported by Ofer and Pickersgill.
decisive evidence for two reasons. First, it measures the average rather than the relevant marginal propensity to save, and it is marginal behavior that should be affected by quantity constraints. Second, other factors that affect saving rates (age, household size, and so on) are not being held constant.

IV. A CONVENTIONAL SAVING MODEL

We begin by estimating a standard microeconomic saving function from the Soviet Interview Project data assuming no quantity constraints, e.g., that no respondent had a general excess demand for consumer goods. The estimated saving function (Table 2) is specified in the conventional fashion (Modigliani 1975) to include household income, liquid and illiquid wealth (Venti and Wise, 1986), household size, and age. The age variable enters in nonlinear form to allow for life-cycle effects (Hall and Mishkin, 1982).

For those familiar with the empirical estimates of saving functions using cross-sectional data, Table 2 contains no surprises (see Mayer, 1972a, Modigliani, 1975, and Thomas 1985). The effect of age is very similar to the U.S. (Hall and Mishkin 1982) with Soviet households exhibiting familiar life-cycle behavior. As in the other countries and in the Ofer and Pickersgill study, household size negatively affects household saving. The net effect of
Table 2
Conventional Saving Model Without Quantity Constraints
Soviet Interview Project Households
Estimation Technique: OLS
Dependent Variable: Savings

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coefficient Estimates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>-88.9</td>
</tr>
<tr>
<td></td>
<td>(3.6)</td>
</tr>
<tr>
<td>Income</td>
<td>.33</td>
</tr>
<tr>
<td></td>
<td>(31.9)</td>
</tr>
<tr>
<td>Liquid wealth</td>
<td>.001</td>
</tr>
<tr>
<td></td>
<td>(4.9)</td>
</tr>
<tr>
<td>Illiquid wealth</td>
<td>-.001</td>
</tr>
<tr>
<td></td>
<td>(4.6)</td>
</tr>
<tr>
<td>Household size</td>
<td>-17.3</td>
</tr>
<tr>
<td></td>
<td>(9.1)</td>
</tr>
<tr>
<td>Age</td>
<td>3.5</td>
</tr>
<tr>
<td></td>
<td>(3.1)</td>
</tr>
<tr>
<td>Age-squared</td>
<td>-.03</td>
</tr>
<tr>
<td></td>
<td>(2.6)</td>
</tr>
<tr>
<td>R²</td>
<td>.36</td>
</tr>
</tbody>
</table>
wealth appears to be insignificant with the positive effect of liquid wealth cancelling the negative effect of illiquid wealth. Venti and Wise (1986) also find a negative effect of non-liquid wealth and a positive effect of liquid wealth on U.S. savings.

The estimated marginal propensity to save (MPS) of .33 falls in the higher range of MPS estimates from household studies for other countries (See Table 3). It is closest to Canada (0.35), the United States (0.20 to 0.41) and Israel (0.42). The .33 MPS is two to 3.5 times the range estimated by Ofer and Pickersgill for Israel Soviet Interview Project households. Part of this difference is explained by Ofer and Pickersgill's lack of data on negative saving, which would bias downward their MPS estimate. 8

The permanent income hypothesis (Friedman 1957) postulates that transitory income has a larger effect on marginal saving than permanent income. The conventional model was also run separating income into its high-variance component (private earnings) and low-variance component (earnings from state jobs). This model yielded identical MPS coefficients. We mention this point because the MPSs differ when quantity constraints are introduced in the next section.

8 Lack of observations on dissavings, leading to the correlation of residuals and right hand-side variables, renders the OLS estimates inconsistent (see, Maddala, 1983 and references therein).
Table 3 reveals why it is difficult to test quantity-constraint propositions by comparing Soviet parameters with other countries. To fall within bounds set by international studies, the Soviet MPS need only fall within the wide range of .12 (lower estimate for the U.K.) to .46 (Belgium).

V. AN UNCONVENTIONAL SAVING MODEL WITH QUANTITY CONSTRAINTS

The conventional model of Soviet household saving reported in Table 2 was estimated assuming the absence of quantity constraints. It ignored as well other important Soviet institutional arrangements associated with quantity constraints. No distinction was drawn between purchases in state stores at official prices and in collective farm markets and in the underground economy at higher market-clearing prices. Moreover, no allowance was made for households with privileged access to state stores. Household income was not differentiated according to whether it was earned in private (illegal) activities or in state jobs.

Identifying Quantity-Constrained Households

The Soviet Interview Project asked a series of questions about how respondents perceived consumer-market shortages. In the Soviet Union, household experience with consumer-market disequilibria would be expected to vary. Some households live in cities and regions (such as capital cities or where key industrial sites are located) where
<table>
<thead>
<tr>
<th>Country</th>
<th>MPS</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belgium</td>
<td>.46</td>
<td>Moulaert and Canniere (1988)</td>
</tr>
<tr>
<td>Israel</td>
<td>.42</td>
<td>Sadan and Tropp (1973)</td>
</tr>
<tr>
<td>India</td>
<td>.15</td>
<td>Ramanathan (1968)</td>
</tr>
<tr>
<td>Canada</td>
<td>.35</td>
<td>Agarwala and Drinkwater (1971)</td>
</tr>
<tr>
<td>Germany</td>
<td>.17</td>
<td>Mayer (1972b)</td>
</tr>
<tr>
<td>Swiss</td>
<td>.15</td>
<td>Mayer (1972b)</td>
</tr>
<tr>
<td>U.K</td>
<td>.12-.27</td>
<td>Parry (1967)</td>
</tr>
<tr>
<td>U.S.A</td>
<td>.20-.41</td>
<td>Husby (1971)</td>
</tr>
<tr>
<td>U.S.A</td>
<td>.21-.43</td>
<td>Friedman (1957)</td>
</tr>
</tbody>
</table>
"deficit goods" are less prominent. Others, through privileged professions or positions, are less likely to encounter shortages. Still others are particularly "information rich" and have developed skills to circumvent shortages.

The Soviet Interview Project asked each respondent: "how satisfied were you with the availability (accessibility) of consumer goods in your town." A random subset of one third of the respondents was asked about shortages (deficits) of meat and dairy products in state stores (at official prices) and about shortages of luxury items (cars, fashionable clothing, furniture) in their community.

More than fifty percent (53 percent) reported being "extremely dissatisfied" with consumer goods availability (accessibility). Another 23 percent were "somewhat

9 Soviet respondents clearly understand in meaning of "deficit goods" (defitsitnye tovary) in the economist's sense of excess demand at prevailing prices.

10 The Russian term for "availability" is dostupnost' which conveys the meaning of availability-accessibility. A follow-up survey of ten persons drawn from the universe of potential SIP respondents showed that respondents interpret "availability" as the ability to purchase in state stores at established prices. "Unavailability" means that goods that they are prepared to buy in state stores cannot be purchased.

11 The questions are: "Thinking about the city or town where you lived, would you say that the state stores usually had a large enough supply of meat and dairy products, or that usually there was a shortage (deficits)? "We have heard that in the Soviet Union there are some goods, such as cars, fashionable clothing, and furniture, that are frequently in short supply. Was this true in your town or not?"
dissatisfied." Twenty four percent fell in the "somewhat" or "very satisfied" category. Although the vast majority of respondents expressed dissatisfaction with goods availability, about one quarter did not consider consumer goods shortages to be significant. The experiences of respondent households with consumer-market shortages were not uniform. Over 80 percent of the subsample asked about "deficits" of specific goods agreed that meat and dairy products were in short supply in state stores, and virtually all (96 percent) agreed that luxury goods (cars, furniture, etc.) were in short supply. Again, although most respondents agreed on the presence of shortages, some twenty percent did not consider shortages of meat and dairy products in state stores to be significant.

Our unconventional model of household saving partitions households into different quantity-constraint groupings. Group I respondents, who reported "extreme dissatisfaction" with goods availability, are classified as experiencing "severe quantity constraints" in consumer markets. In Table 4, group I respondents are assigned $D_1 = 1$. Group II respondents ($D_2 = 1$), who reported being "somewhat dissatisfied," are classified as experiencing "moderate quantity constraints." The residual Group III respondents ($D_1 = D_2 = 0$) are classified as being free of general quantity constraints in consumer markets.
Characteristics of Quantity-Constrained Households

Soviet Interview Project respondents self-identified themselves according to their perceptions of the severity of quantity constraints they faced in Soviet consumer markets.

Table 4 shows the characteristics of severely constrained (Group I), moderately constrained (Group II), and unconstrained households (Group III). The basic proposition of the Barro/Grossman model is that quantity-constrained households substitute saving or leisure for unfulfilled notional demand. Group I's $S$ and $S/Y$ should be higher than Group II's and its $Y$ should be lower holding other factors constant. Similarly, Group II's $S$ and $S/Y$ should be higher and its $Y$ lower than Group III's. The higher $S$ and $S/Y$ reflect the notion that the more severe the quantity constraint, the greater the "forced saving," and the lower $Y$ reflects the substitution of leisure for consumption by the quantity-constrained household.

The average values for saving ($S$), consumption ($C$), income ($Y$) for the three groups of households in Table 4 do not support these propositions. The ruble value of household saving rises from 44 rubles to 50 rubles and then to 64 rubles as quantity constraints are relaxed from Group I to Group III. The average propensity to save rises from 13 percent to 16 percent to 20 percent. There is no significant difference in income levels between constrained and unconstrained households.
Table 4
Average Values for Data Grouped by Quantity Constraints

<table>
<thead>
<tr>
<th>Number of Households</th>
<th>Group I (1132)</th>
<th>Group II (493)</th>
<th>Group III (483)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variables</td>
<td>$D_1=1$</td>
<td>$D_2=1$</td>
<td>$D_1=D_2=0$</td>
</tr>
<tr>
<td>$S$</td>
<td>43.8</td>
<td>50.1</td>
<td>64.4</td>
</tr>
<tr>
<td>$C$</td>
<td>294.1</td>
<td>270.3</td>
<td>264.6</td>
</tr>
<tr>
<td>$C_1$</td>
<td>81.1</td>
<td>69.2</td>
<td>74.3</td>
</tr>
<tr>
<td>$C_2$</td>
<td>60.1</td>
<td>37.7</td>
<td>24.5</td>
</tr>
<tr>
<td>$C_3$</td>
<td>152.6</td>
<td>163.3</td>
<td>165.8</td>
</tr>
<tr>
<td>$S/Y$</td>
<td>13.0</td>
<td>15.6</td>
<td>19.6</td>
</tr>
<tr>
<td>$Y$</td>
<td>337.9</td>
<td>320.4</td>
<td>329.0</td>
</tr>
<tr>
<td>$YP$</td>
<td>313.3</td>
<td>306.5</td>
<td>297.4</td>
</tr>
<tr>
<td>$YT$</td>
<td>24.6</td>
<td>13.9</td>
<td>31.6</td>
</tr>
<tr>
<td>$H$</td>
<td>3.3</td>
<td>3.2</td>
<td>3.1</td>
</tr>
<tr>
<td>$W$</td>
<td>10,775.2</td>
<td>10,417.1</td>
<td>13,980.4</td>
</tr>
<tr>
<td>$WL$</td>
<td>4,990.2</td>
<td>5,187.7</td>
<td>675.5</td>
</tr>
<tr>
<td>$WI$</td>
<td>5,785.0</td>
<td>5,229.3</td>
<td>7,228.8</td>
</tr>
<tr>
<td>$AGE$</td>
<td>39.4</td>
<td>44.8</td>
<td>46.2</td>
</tr>
<tr>
<td>$C_2/C$</td>
<td>.18</td>
<td>.12</td>
<td>.08</td>
</tr>
<tr>
<td>$CS$</td>
<td>.04</td>
<td>.05</td>
<td>.05</td>
</tr>
</tbody>
</table>

Group I: Households with Severe Quantity Constraint
Group II: Households with Some Quantity Constraint
Group III: Households with No Quantity Constraint

$S$: Total savings
$C$: Total amount spent in all markets
$C_1$: amount spent in collective farm markets (rynok)
$C_2$: amount spent in the underground economy (na_levo)
$C_3$: amount spent in official state outlets
$Y$: Total income
$YP$: Income from public sources
$YT$: Income from Private sources
$H$: Household size
$W$: Total wealth
$WL$: Liquid wealth
$WI$: Non-liquid wealth
$AGE$: Age of the respondent
$CS$: Households with access to closed shops
Comparisons of average values serve as a poor test of the quantity-constraint model. The theory of quantity constraints predicts the effects of shortages on marginal behavior, not on average behavior. The issue is the effect of quantity constraints on marginal behavior, not on average behavior. Moreover, other variables that affect average saving are not being held constant. Table 4 shows that the most severely quantity-constrained households average seven years younger than unconstrained households. Severely quantity constrained households make 18 percent of their purchases in the underground economy, while unconstrained households make only 8 percent of their purchases there. Unconstrained households have higher average wealth.

Insofar as age, wealth, and propensity to purchase in underground markets may systematically affect household saving, the lower average saving of quantity-constrained households may be the consequence of these differences. Higher dissaving by younger households is a well-established empirical phenomenon and adjustment for age differences would reduce the average saving differential. Adjustment for the greater propensity of constrained households to purchase in underground markets (a predictable result of quantity constraints) would also be expected to reduce the differential because of the higher underground market prices. The empirical literature makes no uniform predictions about the effects of wealth on saving. Although
some elegant specifications allowing for wealth and its composition have been put forward (Pesaran and Evans, 1984), reliable wealth data is not available for estimation. 12

Table 4 does not show mean differences among the three groups in access to closed shops (respondents having access to closed shops are recorded as CS=1 and CS=0 otherwise). some five percent of each group had access to closed shops. Closed shops can have a significant effect on household saving because preferential access to shortage markets relaxes quantity constraints. Although closed shops are not important in explaining mean differences, they are potentially important in explaining individual household behavior.

Estimating a Model With Quantity Constraints

The above discussion illustrates the importance of enforcing the ceteris paribus assumption in investigating the effects of quantity constraints on Soviet household saving behavior. Table 5 shows the results of reestimating the conventional model, allowing for three categories of quantity-constrained households ($D_1$, $D_2$, $D_3$), differential access to closed shops (CS), and for purchase in the

12 The evidence that is available suggests that the composition of wealth is a significant determinant of saving (Pesaran and Evans, 1984; Venti and Wise, 1986; Hadjimatheaoou, 1987).
underground economy (C₂/C). We also distinguish between high-variance privately-earned income (YT) and low-variance income from jobs in the public sector (YP) to allow for different propensities to save out of permanent and transitory income.

Our main focus is whether marginal saving propensities vary significantly and positively with the severity of quantity constraints. Table 5's specification allows both intercept differences and interactions between quantity constraints and income. The D*Y interaction coefficients measure differences in the slope of the income-saving curve (by YP and YT) among the three quantity-constraint groups.

The model specification also allows for interactions between quantity constraints and liquid and illiquid wealth. Tests for interactions between closed shops (CS) and quantity constraints failed to yield significant interaction terms; hence, these interactions were not included. Access to closed shops was found to interact significantly with income, and these interactions are reported in Table 5.

Table 5 presents parameter estimates (t values in parentheses) and their standardized coefficients. The unconventional saving model yields an MPS out of income of .19 (as compared to the conventional model's .33). ¹³ This

¹³ Income is not divided into private and public sources because the two coefficients are nearly identical. It is only in the interaction terms that differences between YT and YP can be found.
Table 5
Unconventional Saving Model Allowing For Quantity Constraints
Estimation Technique: OLS
Dependent Variable: Savings

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coefficient Estimates</th>
<th>B</th>
<th>Variables</th>
<th>Coefficient Estimates</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>-29.3</td>
<td>(1.2)</td>
<td>D1*YP</td>
<td>.25</td>
<td>(.39)</td>
</tr>
<tr>
<td>(Total Income)</td>
<td></td>
<td></td>
<td>D1*YT</td>
<td>.40</td>
<td>(.25)</td>
</tr>
<tr>
<td>Y</td>
<td>.19</td>
<td>(.34)</td>
<td>D1*WL</td>
<td>-.00006</td>
<td>(.00)</td>
</tr>
<tr>
<td>(Liquid Wealth)</td>
<td></td>
<td></td>
<td>D1*WI</td>
<td>-.002</td>
<td>(.14)</td>
</tr>
<tr>
<td>WL</td>
<td>.0009</td>
<td>(.06)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Illiquid Wealth)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WI</td>
<td>.0007</td>
<td>(.05)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Household Size)</td>
<td>-18.2</td>
<td>(.18)</td>
<td>D2*YP</td>
<td>.10</td>
<td>(.13)</td>
</tr>
<tr>
<td>H</td>
<td>-18.2</td>
<td>(.18)</td>
<td>D2*YT</td>
<td>.33</td>
<td>(.08)</td>
</tr>
<tr>
<td>(Age)</td>
<td>3.3</td>
<td>(.34)</td>
<td>D2*WL</td>
<td>.0006</td>
<td>(.02)</td>
</tr>
<tr>
<td>AGE</td>
<td></td>
<td></td>
<td>D2*WI</td>
<td>-.003</td>
<td>(.11)</td>
</tr>
<tr>
<td>(Age-squared)</td>
<td>-.03</td>
<td>(.30)</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>AGE2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Severely Quantity Constrained)</td>
<td>-84.5</td>
<td>(.30)</td>
<td>D2*WP</td>
<td>-.0005</td>
<td>(.01)</td>
</tr>
<tr>
<td>D1</td>
<td>-84.5</td>
<td>(.30)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Moderately Quantity Constrained)</td>
<td>-30.9</td>
<td>(.09)</td>
<td>CS*YP</td>
<td>.16</td>
<td>(.10)</td>
</tr>
<tr>
<td>D2</td>
<td>-30.9</td>
<td>(.09)</td>
<td>CS*YT</td>
<td>.33</td>
<td>(.06)</td>
</tr>
<tr>
<td>(Underground Expenditure Ratio)</td>
<td>-33.6</td>
<td>(.05)</td>
<td>CS*WL</td>
<td>-.0005</td>
<td>(.01)</td>
</tr>
<tr>
<td>C2/C</td>
<td>-33.6</td>
<td>(.05)</td>
<td>CS*WI</td>
<td>.001</td>
<td>(.02)</td>
</tr>
<tr>
<td>(Access to Closed Shops)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CS</td>
<td>-63.5</td>
<td>(.10)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R²</td>
<td></td>
<td></td>
<td></td>
<td>.43</td>
<td></td>
</tr>
</tbody>
</table>

*: Interaction terms
[.]: Absolute values of standardized coefficient estimates (B).
( .): Absolute values of t-statistics.
YP: Income from public sources
YT: Income from private sources
Other variables are given in the table.
MPS is to be interpreted as the marginal propensity to save of households that are not quantity constrained. The unconstrained MPS is close to the upper bound value (.17) found by Ofer and Pickersgill (see Table 3), and it is similar to the lower bound value (.21) found by Friedman (1957) for U.S. "peacetime" cross-section data. International comparisons (Table 3) show that the unconstrained Soviet MPS moves from the upper to the lower range of marginal saving propensities estimated from household data.

Table 5 reveals that household size, age, and liquid wealth effects are scarcely changed by the revised specification (although illiquid wealth becomes insignificant). The standardized coefficients (in brackets) emphasize the importance of life-cycle effects in explaining Soviet household saving. Age effects are as prominent as income in accounting for variation in saving.

The introduction of quantity constraints raises the proportion of variance explained ($R^2$ rises by 20 percent between Tables 2 and 5). The $D*Y$ parameters support the key proposition of the quantity-constraint model: quantity constrained households have higher MPSs than unconstrained households. Severely quantity constrained households ($D_1=1$) have an MPS out of public-sector income ($YP$) 25 percentage points above and an MPS out of private income ($YT$) 40 percentage points higher than unconstrained households.
Households with moderate quantity constraints have MPSs 10 and 33 percentage points higher than unconstrained households for public-sector and private incomes, respectively.

Table 6 summarizes the marginal propensities and elasticities for different household types with respect to income and wealth. The MPS of unconstrained households of \(0.19\) (elasticity of 1.25) is smaller than that of moderately constrained households (MPS out of \(YP\) = 0.29, elasticity = 1.77). The MPS of severely constrained households is more than double that of unconstrained households (MPS out of \(YP\) = 0.44, elasticity = 2.24). Table 6 also detects systematic permanent income effects for constrained households. The MPSs out of high-variance private income are uniformly higher than those out of low-variance public-sector earnings.

Soviet Interview Project households earn more than 90 percent of their income from jobs in the state sector; therefore, the MPS out of income from public jobs is the most relevant measure of marginal saving propensities. The MPS of severely constrained households is 0.44 (more than double that of unconstrained households). Friedman's study of U.S. marginal saving propensities during the Second World War (Friedman, 1957) provides a frame of reference due to the extensive rationing in effect at that time. It is noteworthy that the 44 percent Soviet MPS is virtually the
Table 6  
Marginal Propensities to Save  
[Income and Wealth Elasticities to Save]

<table>
<thead>
<tr>
<th>Variable</th>
<th>Household Type</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No Quantity</td>
<td>Some Quantity</td>
<td>Severe Quantity</td>
<td>Privileged</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Constraint</td>
<td>Constraint</td>
<td>Constraint</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Total income)</td>
<td>Y</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>.19</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>[1.25]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Income from public sources)</td>
<td>YP</td>
<td>.29</td>
<td>.44</td>
<td>.35</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>[1.77]</td>
<td>[2.76]</td>
<td>[2.24]</td>
<td></td>
</tr>
<tr>
<td>(income from private sources)</td>
<td>YT</td>
<td>.52</td>
<td>.59</td>
<td>.52</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>[1.51]</td>
<td>[1.97]</td>
<td>[1.82]</td>
<td></td>
</tr>
<tr>
<td>(liquid wealth)</td>
<td>WL</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>.0009</td>
<td>.001</td>
<td>.0008</td>
<td>.0004</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[.09]</td>
<td>[.18]</td>
<td>[.10]</td>
<td>[.08]</td>
</tr>
<tr>
<td>(Illiquid wealth)</td>
<td>WI</td>
<td>.0007</td>
<td>-.002</td>
<td>-.001</td>
<td>.001</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[.08]</td>
<td>[.21]</td>
<td>[.12]</td>
<td>[.18]</td>
</tr>
</tbody>
</table>

[.] : Elasticities measured at the means.
same as Friedman's wartime cross-section MPS of 43 percent. The closeness of the two MPS figures suggests that quantity constraints have similar effects even in quite different institutional settings.

The $D_1$ intercept (Table 5) shows that being severely quantity-constrained lowers household saving by a substantial 85 rubles per month. Being moderately constrained lowers household saving by 31 rubles per month. It is unclear what these intercept shifts reflect -- taste differences, institutional effects, pension provisions, and so on. What they do show is that severely constrained households save less than unconstrained households at low levels of income. As income rises, the higher MPS causes constrained households to increase their saving at a faster rate than unconstrained households. When severely constrained households earn the average income, their saving is slightly higher than unconstrained households also earning average income. As their income rises above the average, severely-constrained households save much more than unconstrained households earning the same income. The same pattern holds for moderate quantity constraints. Moderately constrained households save less at low levels of income than their unconstrained counterparts; they save more at average income; and much more at above average incomes.

The combination of negative intercept shifts and higher MPSs dictates a distinctive pattern of average saving rates
for quantity-constrained households. At low incomes, their saving rate is below unconstrained households; at average income, it is slightly above; and at above average incomes, their saving rate is well above that of unconstrained households. The effect of quantity constraints on the average saving rates of Soviet households is most visible at above average incomes. This pattern appears to make sense: Quantity constraints should be most binding at high levels of income. Quantity constraints are more likely to "force" saving from high income families than from low income families, and this is what our empirical results show.

International studies fail to yield substantial wealth effects with respect to household saving, and the same is true for this study. The liquid wealth standardized coefficient is small for unconstrained families and the illiquid wealth coefficient is insignificant. However, for constrained households, illiquid wealth yields statistically significant but small effects on savings. Constrained households with an extra 1,000 rubles of illiquid wealth save 2 to 3 rubles less per month.

Soviet households that encounter shortages in official markets do have the option of spilling over into private markets characterized by higher market-clearing prices. The fact that quantity constraints have such significant effects on Soviet household saving demonstrates that underground markets serve as an imperfect substitute for official
markets. In fact, underground markets would not exist by
definition if they were perfect substitutes.

Table 5 shows that the effect of underground purchases
on Soviet household saving is relatively small, although it
is statistically significant. The negative underground
expenditure share \( \frac{C_2}{C} \) coefficient shows that higher
prices paid in underground markets depress household saving
ceteris paribus. Table 4 showed that severely constrained
households spent 18 percent of their budgets in the
underground economy as compared with 8 percent for
unconstrained households. Applying these shares to the \( \frac{C_2}{C} \) coefficient (-33.6) reveals that greater underground
purchases depress the saving of severely constrained
households by approximately 3 rubles per month relative to
unconstrained households. The small standardized \( \frac{C_2}{C} \) coefficient (.05) confirms that the relatively slight effect
of underground purchases on Soviet household saving.

Table 4 showed that a relatively small share of Soviet
Interview respondents had access to closed shops and that
this privilege was uniform across the three groups.
Surprisingly, access to closed shops did not preclude
respondents from reporting severe quantity constraints.
Insofar as privilege would be expected to relax quantity
constraints, the closed shop interaction with income should
have a negative coefficient. Table 5, however, shows that
access to closed shops raises the MPS out of private and
public income. This perverse result can be interpreted in different ways. First, it may suggest that quantity constraints apply in closed shops as well as in official outlets. A second interpretation is that respondents are reporting a mixed bag of closed-shop privileges, ranging from access to factory supplies to being allowed to buy in stores reserved only for the truly privileged. In other words, the privilege measure is subject to serious measurement error. In any case, the previously reported results are unchanged by the inclusion or exclusion of the closed shop variable, and the standardized coefficients show that its relative effect is slight.

SUMMARY OF FINDINGS

This study uses a survey of former Soviet citizens (the Soviet Interview Project) to investigate household saving behavior in the Soviet Union. We combine objective data on income, consumption, and wealth with respondent perceptions of consumer market shortages to which they were subjected in the Soviet Union. The latter information allows us to classify households as "severely" or "moderately" quantity constrained or as unconstrained in consumer markets. The data set also allows us to study the effects of privilege and underground economy purchases on Soviet household saving behavior.
We present relatively conclusive evidence to support the proposition that marginal saving rates are positively related to the severity of quantity constraints. Soviet households subject to severe quantity constraints have marginal saving rates more than double those of unconstrained households. Surprisingly, the high marginal saving rate of severely constrained Soviet households is very close to that of U.S. households during the rationing of World War II. As a consequence of including quantity constraints, the unconstrained marginal saving rate (estimated from a conventional saving model) is reduced from being relatively high by international standards to being relatively low. We also find that Soviet households have higher marginal saving rates out of high-variance private income (in keeping with the permanent income hypothesis) when quantity-constraint variables are included.

The effects of quantity constraints on marginal saving rates are most visible at above-average income levels. At low levels of income, quantity-constrained households save considerably less than their unconstrained counterparts. At average income levels, they save slightly more. Only at above average incomes, do the average saving rates of constrained Soviet households markedly exceed those of unconstrained households.

We find a relatively minor (although statistically significant) effect of underground economy purchases on
Soviet household saving. Quantity-constrained households do participate more in underground markets at relatively high prices, as would be expected. Nevertheless, this difference in underground market participation accounts for only a small difference in saving between constrained and unconstrained households.

With or without adjustment for quantity constraints, Soviet household saving behavior follows normal patterns with respect to life-cycle effects and household size.
REFERENCES


