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United States Comparisons

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SOVIET LIVESTOCK CYCLES WITH UNITED STATES COMPARISONS

by Kenneth R. Gray

HIGHLIGHTS*

This report is a technical study of livestock cycles in the USSR since World War II with comparisons to those of the U. S. The main conclusion possibly relevant to near term policy is that in the late 1970s and 1980 feed supply has been inadequate for growing livestock inventories. The evidence is:

1. Milk yields per cow have declined for three consecutive years, 1978, 1979, and 1980**.

2. The average weight for cattle sold to the state for slaughter fell in 1979 and 1980**.

3. There was an absolute reduction in beef production in 1979 and 1980**.

4. 1978 increases in swine inventories on all farms were followed by a 1979 stand-still of pork production and decline of average (carcass) weights.

5. The Soviet press is carrying articles critical of policies which allow for continued increase of livestock inventories in the face of feed shortages.

These points are covered in Section 7 of the Report.

Section 1 of the Report is the author's summary and introduction.

Section 2 of this Report summarizes mechanisms for US cattle and swine cycles, and describes elements of the Soviet system which determine inventory level and production targets. There is no mechanism for interaction between prices and the market place in the USSR. The liquidation phase of the Soviet cycle may, however, be triggered by feed shortages.

One reason for too many livestock is a system of financial incentives which seems to delay slaughter in the face of harvest failure, a two-tiered price system with one price for "below," and another for "above" quota amounts. It is thus in the interest of a farm to increase herd size (without consideration of weight of the animals) to bring higher final average prices. A decline in production, on the other hand, guarantees reduction in farm revenue.

Another reason for keeping herds which are too large in face of feed base insufficiency is a continuing central Government failure to order reductions of herd size, even if rational economics indicates it should do so.

A last reason for the relatively constant number of cattle in the face of feed shortages may be that, whereas in the US about 75% of the cattle are specialized for meat, only 3.7% are in the USSR, the rest being dairy or dual purpose breeds.

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* Prepared by the National Council.

** 1980 data for state and collective farms only.

Section 3 argues that production of meat in the USSR is much more uneven than in the US. Production peaks occur roughly every three months with relatively high production in the fall (during and after harvest). The quarterly peaks are evidence of "storming " which is omnipresent in Soviet society to meet quarterly plan targets. Production might even out if price played a role in meat production. In the US peaks would tend to lower meat prices, but the market mechanism promotes a smoothing out over time. Soviet poultry production does not exhibit as much seasonal flux which may be largely due to the growth of industrial production of poultry and the priority it has been receiving in investment policy.

Section 4 focuses on the annual level of US and USSR swine and cattle inventories since World War II. It argues that US cattle liquidation and accumulation phases are both longer than the Soviet counterparts; that Soviet swine accumulation phases have been longer than the US; and that Soviet swine liquidation phases are shorter. One of the reasons for relative shortness of the swine liquidation phases is the continued growth of demand for pork in the USSR. Other reasons are also offered in Section 4.

A major reason for the difference in cattle cycles is that liquidation is common in the US, whereas there has been a reduction of Soviet cattle inventories only once since 1946. The frequency of Soviet phases may be attributed to climatically-induced changes in the availability of feed. The shorter and milder liquidation phases are therefore reactions to feed stress and not a reflection of the interaction between price and market place as occurs in the US.

Interestingly, in the past American liquidation phases coincided roughly with Soviet accumulation phases and vise versa, but since 1970 a "synchronization" of phases has appeared which can be explained by 1) the emergence of the USSR as a major net importer of feed grains in the 1970s which brings it into the world's feed complex; 2) the apparent change in the US cattle cycle in 1965-68 when there was a standstill in inventory growth rather than any real liquidation; and 3) a turn to more "intensive" livestock management from 1965 to the late 1970s, and a changed attitude toward distress slaughter.

Intensive livestock management, which allows for reduction of herd size during periods of limited feed supply to ensure proper levels of feed per cow, was present in the post-Khrushchev years. As has been noted, a return to more "extensive" management--maintanence of herd size no matter the feed supply base --appears to have been occuring since the late 1970s.

Section 5 examines USSR and Ukrainian inventory data by category of farm (state or "socialist" versus private), and argues that there is a growing interrelation between the two sectors. Private cattle inventories appear to have been a buffer so that socialist farms could maintain growth; private inventories have gone through more liquidation phases and often preceed socialist phases by one year and thus serve as a predictor of them.

Private swine inventories are on the same level since 1954, although as socialist inventories have grown they have declined as a fraction of the whole. Harvest failures are rapidly reflected in the socialist sector. This is because

of 1) priority allocation of feed to the socialist sector; 2) perhaps the greater net transfer of private feeder animals to socialist farms; and 3) the increase in the slughter of private swine for sale to take advantage of high prices on collective farm markets. Presently, delays in reduction of swine inventories after two bad harvests (1979, 1980) reflect a return the "extensive" policies of the late 1950s or perhaps a policy of delaying slaughter.

Section 6 examines variation in Soviet livestock production in distress periods by type of livestock and type of farm and argues that increasingly slaughter of cattle is delayed, and poultry production maintained in periods of feed shortage. While pork production declines by approximately the same percentage as inventory reduction in the previous year, cattle liquidation adds much to current meat production. The Soviets tend to delay cattle slaughter until after year end which tends to smooth out annual meat production series. Milk production, however, tends to fall in the same year as the harvest.

In general, the policy factors affecting the livestock cycle are: meat import policies, meat price controls, interest rate and credit policy, and feed grain management. In the US and other market economies, prices serve as the major impetus to livestock cycles. Because the biology of the animals is the same, the major difference between US and other market economies and the Soviet system is, needless to say, the presence of a price mechanism in the former. The difference then becomes not how producers view current production capital formation decisions, but that the decisions of firms in markets interact with price feedback. A process of self-generated downward spiral of prices could not result in the USSR following herd liquidation because of the livestock sector's relatively fixed prices. While in market economies cycle mechanisms may deline if feed is very plentiful and demand grows, in the Soviet case it is almost always feed interruptions which presage a liquidation phase for livestock.

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I. Introduction and Summary

As explained in the NCSEER application, two elements promised new insight from this study of the Soviet livestock economy. The first of these was new fragmentary data on the Soviet livestock inventories and production in several compilations of the Soviet Statistical Administration. The second element was the perceived opportunity to compare Soviet livestock series with more complete series available for United States livestock production.

Two hypotheses were proposed. The first acknowledges a common perception that U.S. livestock cycles are a manifestation of market failure; that is, they are less than efficient from an optimal control point of view. This prompts comparison with Soviet livestock series with the question in mind: "Are 'planned' livestock movements somehow 'superior'?" The description and discussion of welfare implications of Soviet and American livestock series contained in this study should be of interest to western agricultural economists interested in alternative public policies toward meat production.

A second justification for the present study has been to attempt to improve our understanding of and ability to predict changes in the Soviet livestock economy. It is increasingly obvious that there is an international meat system. (Witness the forthcoming book, The World Beef System by Farris and Simpson.) In this setting, the Soviet livestock system is of vast importance. The Soviet Union now has greater inventories of both swine and cattle than does the United States. Soviet imports of grain are largely for feed purposes and now exert a large impact upon world grain prices (Mackie, 1976). The data and analysis here should also be

of interest to those engaged in the emerging study of the world livestock and feed system.

Variations in Soviet grain purchases depend, in the first instance, upon their own harvest, but they depend also upon Soviet slaughter and inventory management policy. As indicated in the proposal, the magnitude of 1972 grain purchases surprised western analysts, not because of inadequate estimates of the Soviet crop results, but because of Soviet response to those results. The Soviets chose to largely retain inventories and keep livestock fed at relatively high rates. One determinant of Soviet capacity to utilize imported feed lies in the number and composition of their animal inventories and Soviet judgment of the value of additional feed at any particular time. Thus, Soviet calculations of the desired relative intensity of feeding, as well as slaughter, is a factor in their import decisions.

The second hypothesis, about which the current study has been organized, is the question: "Has the Soviet Union maintained too many underfed animals?" Some indications of this are presented here. An interesting observation is that some of the same relationships between production and inventories which existed at the end of the Khruschev era are now recurring in the last few years of the 1970s and in 1980. Depending upon Soviet evaluation of these events, this may mean more conservative inventory expansion for swine and cattle in the future.

A small number of econometric studies (Green, 1977 & 1979; Licari, et.al., 1980) have attempted to find systematic relationships among available time series for Soviet inventories, productio, crop harvests, feed utilization, and imports--with mixed results. This report at this point of the study can be viewed as "pre-econometric". It presents a good deal of data on Soviet livestock, some of it relatively inaccessible,

in an attempt to identify regular relationships among more disaggregated variables. The relationships which are identified are at this time qualitative, and focused upon the phases of the cycle. They may, however, help explain some of the dummy variables and paradosical results of the aforementioned, more systematic, studies.

Section 2 gives a synopsis of the mechanism that accounts for U.S. cattle and swine cycles, distilled from some of theliterature on the topic, and a description of some elements of the Soviet planning system which dictate both inventory and production targets. There is no Soviet mechanism for the creation of cycles through price interplay, rather reductions of Soviet livestock inventories are forced through reductions of feed supply, and followed by the universal biology of livestock reproduction. One special feature of the Soviet system are financial incentives which would seem to delay liquidation in the face of harvest failure.

Section 3 compares seasonal marketing and production of meat in the US and USSR, and finds that the distribution of production in the USSR is much more uneven than in the US. This may be partly attributable to a lack of seasonally-differentiated prices for meat and other livestock products in the Soviet Union.

Section 4 is an examination of annual US and USSR swine and cattle inventories since World War II. The focus is upon the length and intensity of accumulation and liquidations phases of the cycle (defined as the period between one low in inventory numbers and the next low). US cattle liquidation and accumulation phases are both longer than the Soviet counterparts. Soviet swine accumulation phases have been longer than is true for the US, and swine liquidation phases are shorter. The relative brevity of Soviet liquidation phases is the result of sustained growth of

demand and the fact that the decline reflects only the initial feed shortfall, uncomplicated by the downward spiral created by the price-liquidation mechanism.

An interesting, possibly coincidental, pattern is that whereas in the past, American liquidation phases have coincided roughly with Soviet accumulation phases, and vice versa, since 1970 there has appeared a "synchronization" of phases. The leading candidate an an explaination of this change is the advent of the USSR as a major importer of grain from world markets.

Section 5 examines USSR and Ukrainian inventory data by category of farm. Some information on the transfer of intermediate animals between private and socialist sectors is presented (private farms are net exporters of cattle, and net importers of poultry and pigs) and the growing interrelation of the two sectors is commented upon. One reason for disaggregating by type of farm is to distinguish slaughter behavior during periods of feed-stress. This information, together with changes in structure of production by type of farm, may better indicate future responses to shortage. With current data, not much difference can befound among socialist categories; however, private inventories have had more liquidation phases and appear to have been a buffer so that socialist farms could maintain inventory growth. Reductions in inventories in private possession often preceded by one year reductions of socialist inventories.

Section 6 looks at variation in Soviet livestock production in distress periods, by type of product and farm. The relationship between distress slaughter and changes in meat production in the current and following years are examined for pork and cattle, illustrating the variability of the relationship between inventory change and production depending upon composition by livestock type. It appears that the Soviet response by type

of livestock is changing; increasingly, slaughter of cattle is delayed, and poultry production maintained in feed-stress periods. This policy helped lead to relatively less reduction of production in annual data for 1975-76 and occured in 1963-64.

Sections 6 and 7 (on changing Soviet policies toward "intensive" versus "extensive" livestock production) present other examples of how changes in policy and aggregation lessen the value as predictors, of simple formulations of the inventory-feed-production relationship. Possible improved econometric specification is thereby indicated: (1) The response of production change to change in feed supply dependes upon the composition of adjustments in inventories; these policies have changed. (2) Comparisons for the USSR as a whole and for the Ukraine show that aggregate USSR data sometimes grossly misrepresents the degree of feed-stress in particular regions and years. (3) Response to feed-stress varies by type of farm: particularly, private production and inventories are peculiar in annual statistics. (4) In the mid 1960s there was a major change in policy regarding livestock intensity, followed by apparently deliberate inventory reductions in the 1966-69 period.

Further research is suggested along three avenues: (1) Discovery and incorporation of additional years of the fragmented Soviet data sources used here. (2) Further examination of the Soviet technical literature on livestock management, particularly for the period 1965-68. (3) Systematic regression analysis incorporating disaggregated variables and indicators of feed stress other than harvest, such as lagged measures of milk yield and average slaughter weight. Hopefully, feedback from this report will further benefit future iterations.

Section 2: Mechanisms of Livestock Cycles in U.S. Market and Soviet Planned Economies

The term "livestock cycle" usually refers to inventories and to the "period from one low point in livestock numbers to the next low point" (Simpson, 1978). In market economies cycles of inventories, production, and prices are attributable to several causes. These include exogenous natural and climatic conditions which affect feed supplies and animal health, as well as biological life cycles which are farily fixed (though somewhat alterable through management) different for each type of livestock. In addition, in market economies the price system enters; given high prices producers take decisions which later result in greater supply, lower prices, and an inventory liquidation phase which itself brings even lower prices and greater liquidation. This liquidation phase then sets the stage for later lower supply, and again, high prices.

Focus in market economies is on the cattle cycle. Because of the long reproduction period for cattle they have greater relative capital value than either swine or poultry, and inventory decisions have an effect for several years. The beef price cycle then affects, and is in turn influenced by capacity for expansion or contraction of production of competing meats. The poultry and swine industries production may step in to fill the partial void of beef production in the cattle accumulation phase. Depending upon cross elasticities and the length of lags, these supplies of competing meats may moderate beef prices and the process of accumulation. Similar reasoning holds during the cattle liquidation phase.

There is essentially a four year time lapse involved in the accumulation phase of beef cattle production. The gestation period for a cow is nine

months, fifteen to eighteen months are required to pass before a heifer can be bred, then similar gestation and growing periods must pass before progeny can be slaughtered for meat. However, whereas there is no way to increase inventory and domestic production move quickly than biology allows, the liquidation phase can be as rapid as slaughter can occur.

Some public policy factors affect the livestock cycle. These include: meat import policies, meat price controls, interest rate and credit policy, and policies affecting feed grains policies.

A crucial concept in the analysis of livestock production is the idea of livestock as capital goods, capable of consumption now or producing more later. Another way to put it is that livestock feeding and reproduction produce joint products. Because of the joint product (consumption-capital) nature of livestock management, increasing prices usually ellicit a , at first paradoxical seeming, reduction of meat supply, as capital is accumulated (steers put on feed, heifers held back for breeding, etc.). This process of deciding between sales now or later has been modeled for a profit-maximizer, differentiated by type of animal, and verified econometrically by Jarvis (1974). Jarvis' work clarifies the complexities of this dynamic supply situation, and emphasizes the importance of: (1) the feed-meat ratio, and (2) the rate of discount.

A Mechanism for Soviet Livestock Cycles?

By the above definition, Soviet swine and cattle inventory cycles certainly exist. In Section 5 they are compared in purely descriptive terms with those of the U.S. But given the vasts different objective function of American and Soviet livestock producers, and the role for Soviet prices and mandatory plans, the process by which Soviet cycles occur does not at first seem understandable through the standard arsenal of Western cycle

FIG. 2.1

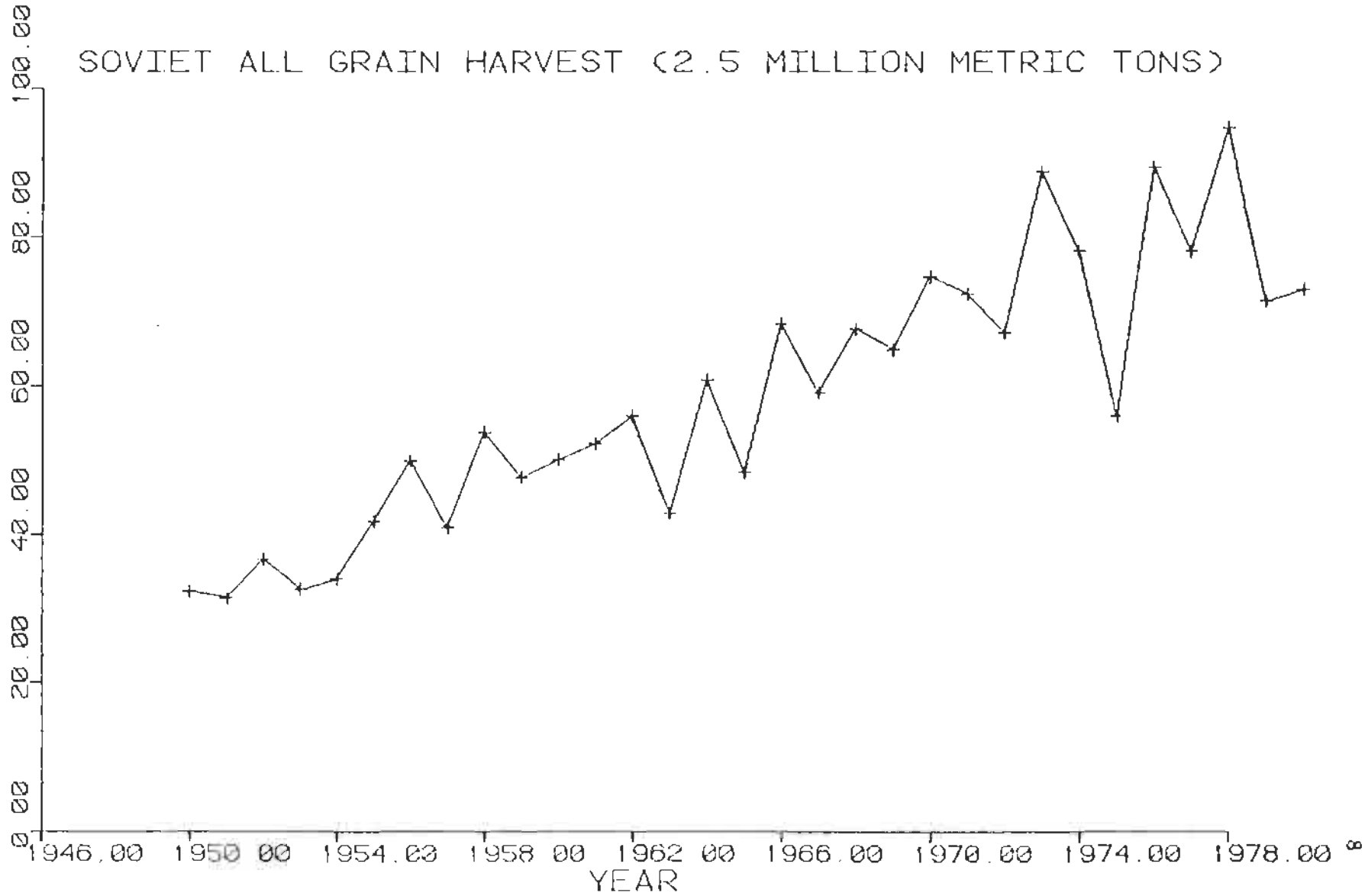

SOVIET ALL GRAIN HARVEST (2.5 MILLION METRIC TONS)
100.00
80.00
60.00
40.00
20.00
0.00
1946.00
1950.00
1954.00
1958.00
1962.00
1966.00
1970.00
1974.00
1978.00
YEAR

Table 2.1

USSR GRAIN HARVEST & LINEAR TREND, RESIDUAL AS A PERCENTAGE OF PREDICTED HARVEST, AND PERCENT CHANGE OF CONCENTRATES FED, 1954-1980 (Th. m. t.)

YEAR	HARV	HRVHAT	HRVRES	RES/HRVHAT	Annual Change (%)	Concentrates Fed, % Chng.
1954	853	986.74	-133.74	-.14	4.024	.
1955	1047	1031.80	15.20	.01	22.743	.
1956	1250	1076.87	173.13	.16	19.389	.
1957	1026	1121.94	-95.94	-.09	-17.920	.
1958	1347	1167.00	180.00	.15	31.287	33.711
1959	1195	1212.07	-17.07	-.01	-11.284	11.864
1960	1255	1257.14	-2.14	.00	5.021	1.705
1961	1308	1302.21	5.79	.00	4.223	10.428
1962	1402	1347.27	54.73	.04	7.187	3.541
1963	1075	1392.34	-317.34	-.23	-23.324	-14.821
1964	1521	1437.41	83.59	.06	41.488	-7.839
1965	1211	1482.48	-271.48	-.18	-20.381	35.477
1966	1712	1527.54	184.46	.12	41.371	7.963
1967	1479	1572.61	-93.61	-.06	-13.610	6.525
1968	1695	1617.68	77.32	.05	14.604	6.924
1969	1624	1662.75	-38.75	-.02	-4.189	11.457
1970	1868	1707.81	160.19	.09	15.025	15.307
1971	1812	1752.88	59.12	.03	-2.998	6.298
1972	1682	1797.95	-115.95	-.06	-7.174	-0.091
1973	2225	1843.01	381.99	.21	32.283	6.752
1974	1957	1888.08	68.92	.04	-12.045	9.316
1975	1401	1933.15	-532.15	-.28	-28.411	-7.037
1976	2238	1978.22	259.78	.13	59.743	-1.262
1977	1957	2023.28	-66.28	-.03	-12.556	21.806
1978	2372	2068.35	303.65	.15	21.206	2.028
1979	1790	2113.42	-323.42	-.15	-24.536	C.480
1980	(1820)	2158.49	(-338.49)	(-.16)	2.235	.

Trend is for period, 1954-1979.

analysis and no complete theory of Soviet livestock cycles is presented here-rather some elements.

The reproductive biology is, of course, the same and Soviet climatic conditions create enough variation downward in feed supply to cause liquidation from inventory levels achieved in years of more favorable feed production. (Table 2.1 depicts the Soviet harvest and feed supply and identifies years of stress.) Also, even with fixed government prices for the sale of meat, were Soviet livestock managers unrestrained profit-maximizers, they might still respond to price changes must as the Jarvis model predicts, or as would predict any other model incorporating the important relative feed-meat price variable. This is because, even though the absolute price of meat or livestock is fixed, the shadow price for feed would rise and fall.

Soviet producers would, of course, have different expectations about output prices. They might never, for example, hold back animals at the top of the inventory cycle when prices first fall, in the hope of strengthened prices. Nor would they increase marketing because of fear of further falling prices. Thus the major difference in the systems is not how producers view current production-capital formation decisions (because the biology is the same), but that decisions of firms in markets interact with feedback through prices. A process of self-generated downward spiral of prices in herd liquidation would be impossible for the Soviet socialist sector, with its relatively fixed livestock prices.

Prices are somewhat important for Soviet livestock producers. Farm income is a basis for incentive funds from which various managerial and worker payments are made. However, payment of the latter has been and continues to be, contingent upon fullfillment of a number of physical plan indicators (Gray, 1976). During the Khruschev era (this is apparent in the time series presented in Section 4) a prime plan indicator was the number

of livestock themselves. (After Khruschev, and in particular, after the March 1965 Party Plenum on agriculture, decisions about agricultural production (including inventory policy) were supposed to devolve to the farms themselves, which were theoretically subordinate only to state-determined marketing quotas).

As typical in the Soviet system, fullfillment of farm marketing quotas brings a bonus. "Storming" to fullfill a quota at the last moment in order receive the bonus, is omnipresent in the USSR, could be predicted in the livestock sector, and is apparent in data presented in Section 3.

The relative importance to the Soviet livestock producer of the two plan indices it has historically received-for current meat production and inventory accumulation-has an interesting interpretation in Western analytic models (eg. Jarvis') as the rate of discount. The inventory accumulation rates of the Khruschev era which may be recuring in the early 1980s reflect a high rate of discount. (Section 7.)

Price Specifics

State purchase prices are "fixed", with the qualification expressed below. Prices for goods sold on the collective farm market by private producers or socialist enterprises in excess of plan, are determined by supply and demand with partial state intervention. State livestock prices are currently fixed throughout the year without seasonal variation (Section 3).

Yet another factor compounding Soviet enterprise decisions-to the extent they maneuver within the marketing quota-is the state's purchase of meat at two prices one for "below", another for "above-quota" amounts. There are a standard element in both industrial and agricultural management, although they were eliminated for agriculture in 1958 and not reinstated

for livestock purchases until 1970. A 50% price premium now applies to all over-plan sales of meat, poultry, eggs, and milk (Gray, 1976, pp. 66-68).

When the two-tiered system is in effect it is thus incorrect to say that Soviet farms encounter absolute marketing price certainty. The tier price parameters (marginal prices) are known, but the average price received is known only given the farm's marketing quota and actual sales, which depend upon highly variable production and climate, as well as livestock management.

Some of the implications of this arrangement (which resembles the economics of overtime) are examined in Gray (1976, pp. 314-319). Two interesting comparisons regarding the Soviet livestock manager versus the manager in a market economy are worth noting: (1) Given the arrangement, the Soviet farm is not a price-taken, but can through its efforts influence the final average price. Unlike a capitalist firm with monopoly power, this effort brings higher, not lower prices. (However, because of a "Kink" in its iso-revenue line, changes in quantities sold by Socialist farms caused by changes in quotas or state prices will theoretically be less continuous than would be the case under a single-tiered pricing system). (2) Because of a positively-sloped average revenue curve (not horizontal demand as faces the competitive firm, or a negatively-sloped demand facing the industry) farm revenue (for all as well as individual farms) is guaranteed to fall with output decline. This is true for individual farms as well as farms as a group. Thus, if the discussion of comparative stability for livestock producers in these systems refers to income, rather than prices, within certain ranges the Soviet system lacks price variation to compensate for quantity variation. Instead, price changes reinforce quantity changes. This means that variation of revenue from livestock sales may be greater in the Soviet case than during the market livestock cycle.

Yet another element affecting the "cycle mechanism" for Soviet Socialist farms is continued central strictures against inventory reductions. Its mentioned above and as apparent in earlier time series (Section 4) socialist farms had central plans for livestock inventory growth. Interference/in farm decisions regarding herd selection and inventory policy would seem at odds with the thrust of the 1965 Plenum but they obviously occur (Gray, 1979, p. 558). One strong financial incentive exists not to reduce inventories below previous levels, until after the January 1 count has been determined (Iur'ev, 1979, p. 68). The provision that a farm's eligivility for payment of the 50% premium for above plan sales to the state, be subject to retention of last year's inventory levels, is obviously meant to prevent actions which the system might otherwise engender; namely short run "storming" and bonus maximization through remunerative above-quota sales at the expense of inventory disinvestment. At the same time, this financial provision would seem occasionally to interfere with rational adjustments in inventories at the conclusion of the agricultural year. At the same time the ruling may be a rational part of the entire Soviet livestock management system. (See the comparison in Section 6 of disastrous 1963 slaughter and possibly better handling in later distress periods when inventory reductions were delayed.)

There is an additional requirement (Iur'ev, 1979, p. 68) that the premium for meat not be paid if inventory levels slip before January 1 for each type of livestock. This would seem to further reduce flexibility in adjusting livestock types differentially to decreases in feed availability.

Section 3: Comparison of Seasonal Inventory and Production Variation for the United States and Soviet Union

Some of the manifestations of the Soviet price and planning mechanism are observable in seasonal data, which are here compared to seasonal data for meat production for the U.S. While abundant monthly and even weekly livestock statistics are available in the United States, similar Soviet statistics have become available to western observers only in the second half of the 1970s (published in Ekonomicheskaia gazeta monthly)..

Available monthly data show a regular phenomonen of socialist farm production bunched every three months, with production relative concentrated in the fall.

The U.S. experiences seasonal livestock patterns, of course. For instance, there is a peak of swine marketing in November, seven months after peak March farrowing, but marketings are less concentrated than farrowings (McCoy, 1972, p. 77). U. S. data on liveweight in commercial livestock slaughter show consistently less variation than Soviet data. For the years, 1970-78, the coefficient of variation for monthly meat production ranged as follows: Beef: 4.29-8.05; Veal: 5.06-29.96; Pork: 6.89-12.46; Red Meat: 4.33-7.78. (All calculated from data in Livestock and Meat Statistics for 1978.)

In comparison, the coefficient of variation of production on Soviet state and collective farms for 1975, 1977 and 1978 (years for which twelve months data is available) was a great deal more. Beef (including veal) ranged from 22.23-25.16; Pork: 16.73-33.87 (the latter in 1975). The coefficients of variation in 1977 and 1978 for mutton were 85.08 and 88.67; Poultry, 21.97 and 20.14; and for all meat including poultry it was

FIG. 3.1

Distribution of Shares of Monthly Beef Production in the US and USSR, 1977

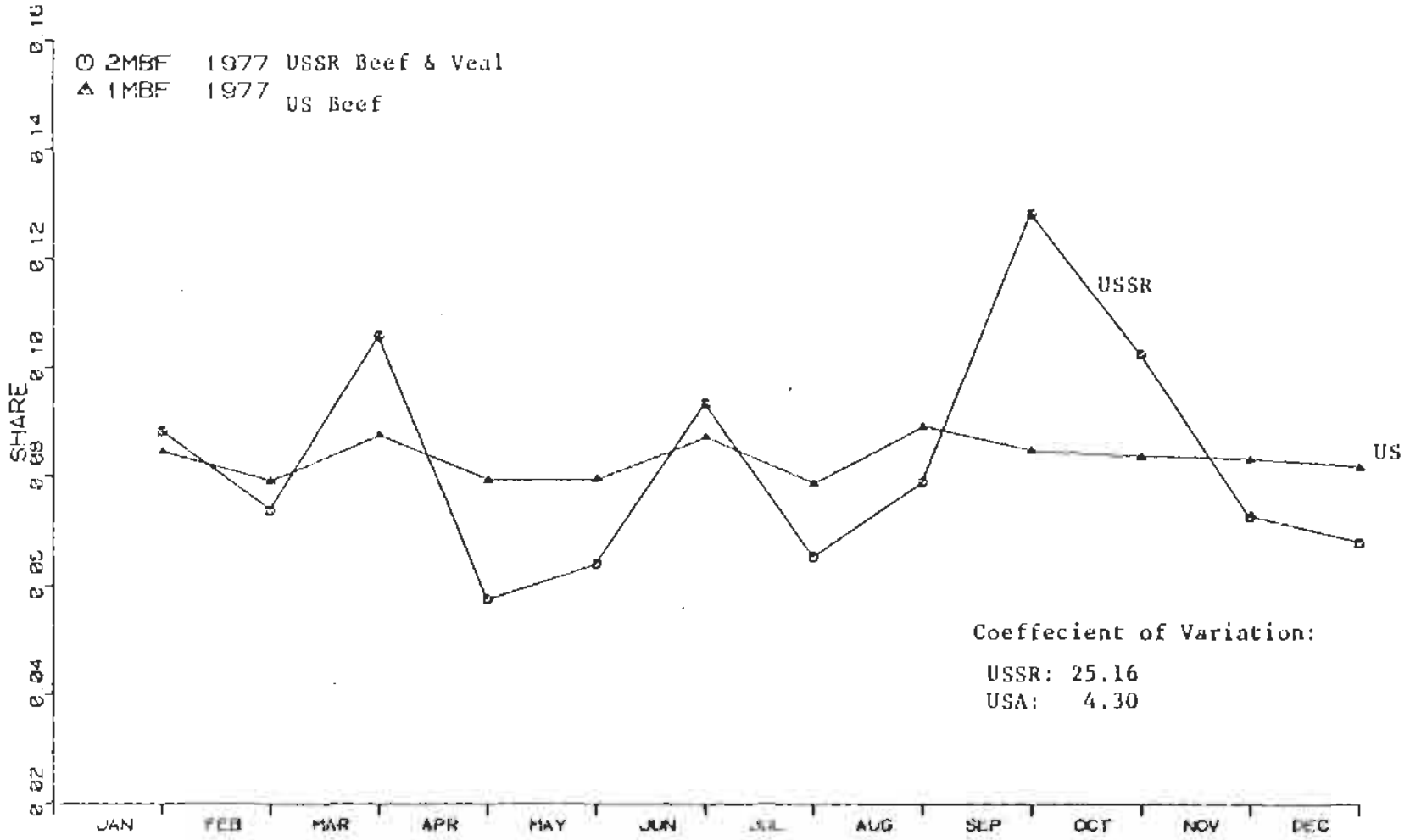
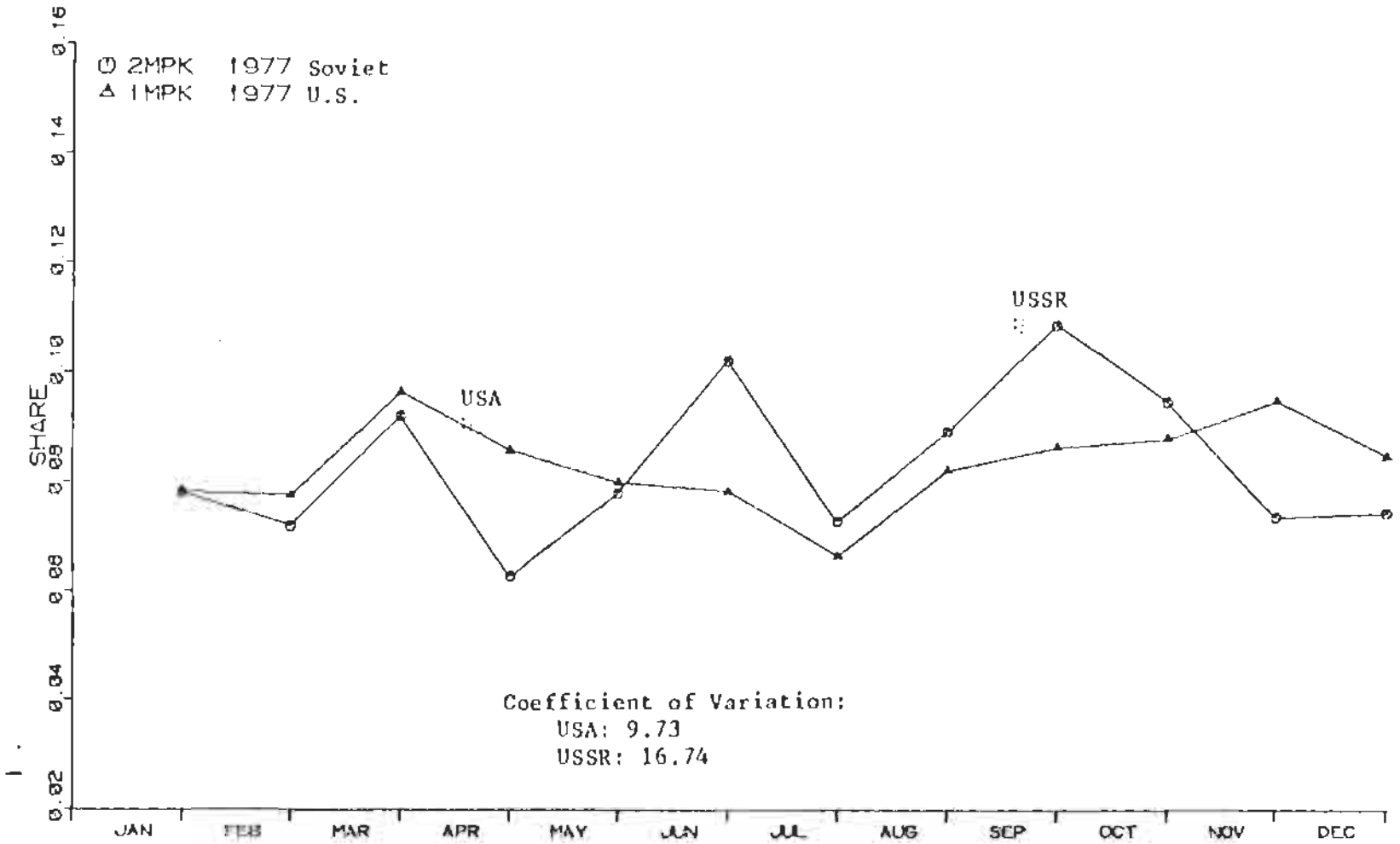


FIG. 3.2
Distribution of Shares of Monthly Pork Production in the US and USSR, 1977



Coefficient of Variation:
USA: 9.73
USSR: 16.74

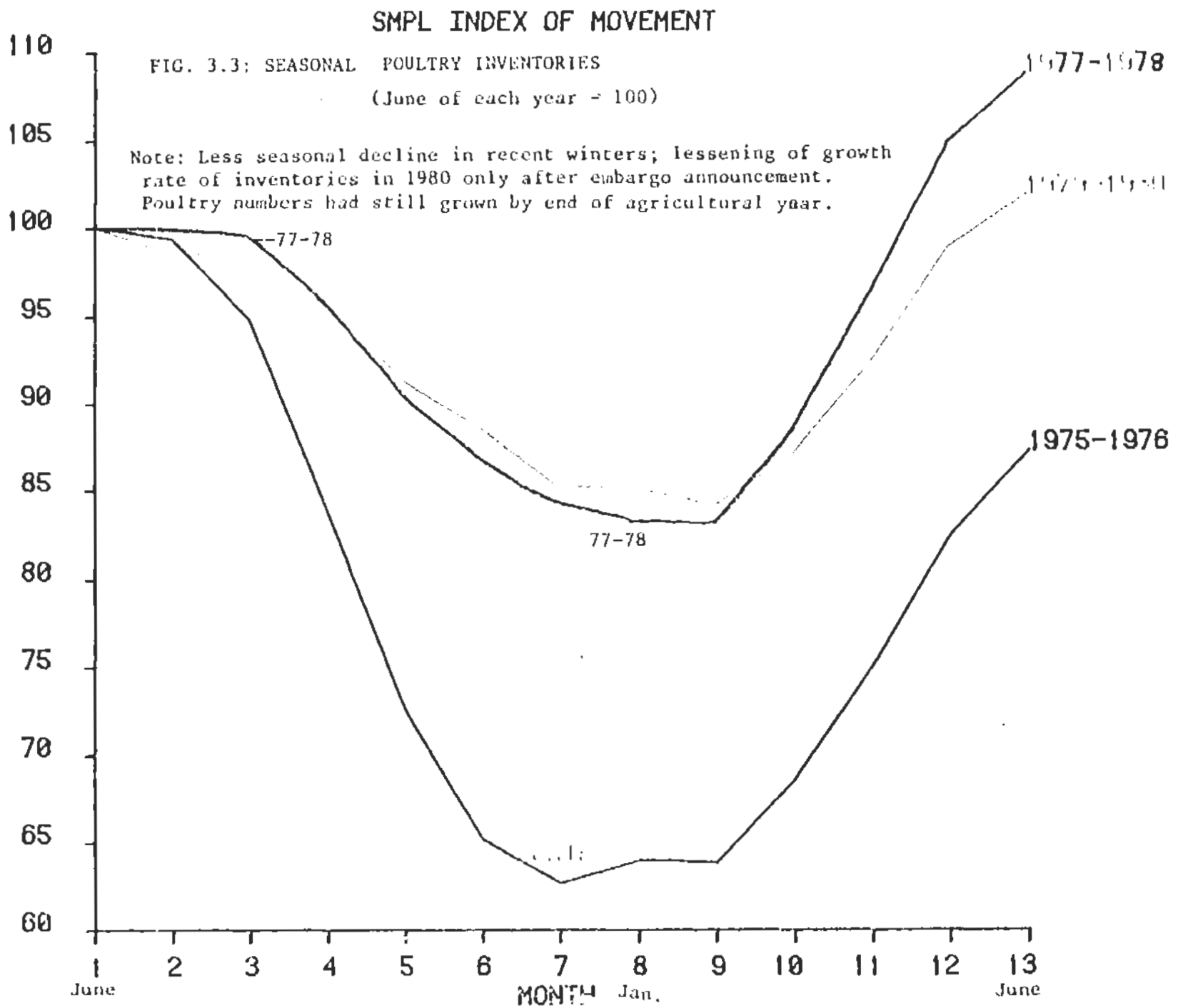
23.55 and 22.64. (Claculated from data in Ekonomicheskaya gazeta, monthly. These and other raw data referred to here are in Gray, 1981.)

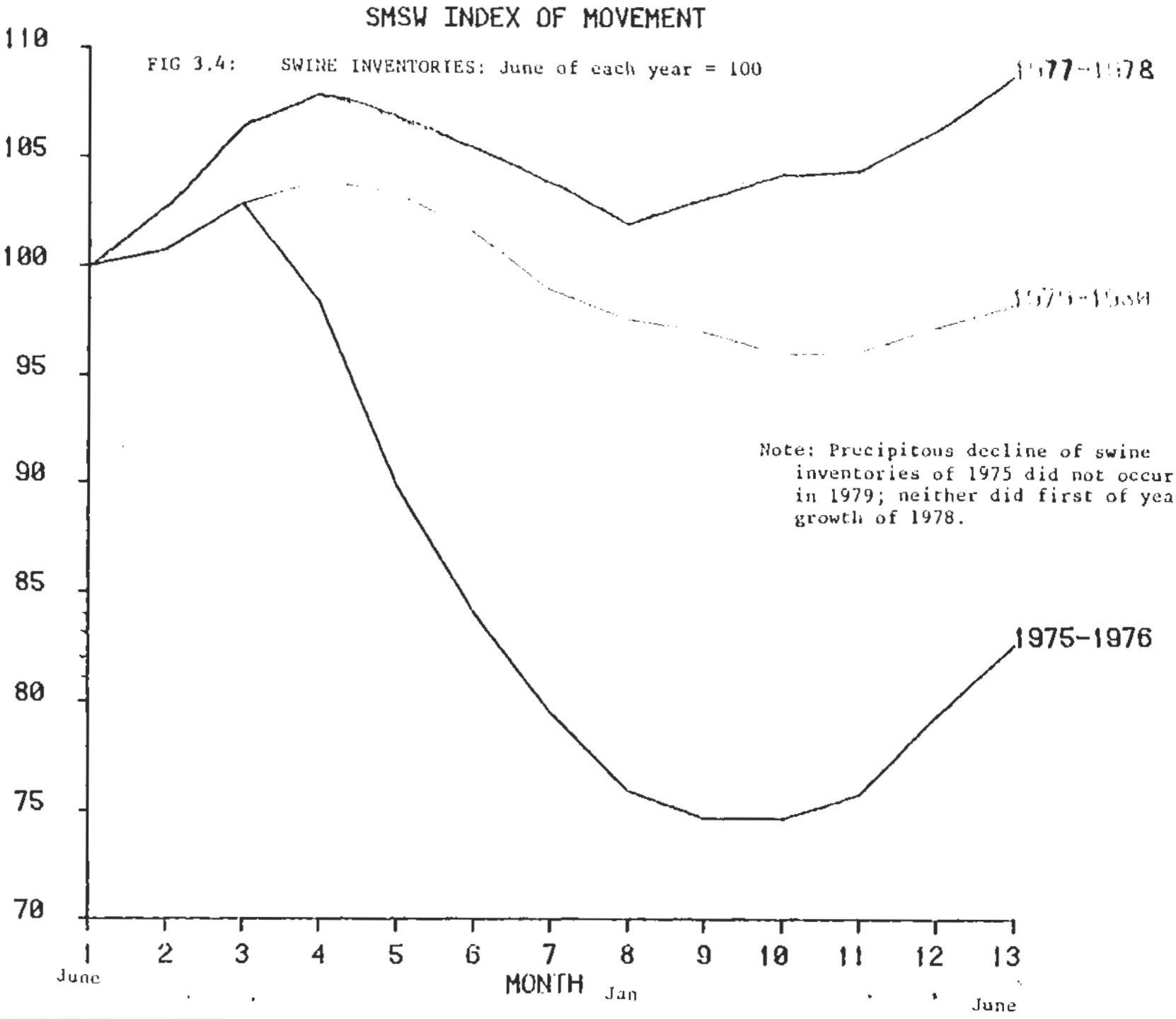
Figures 3.1 and 3.2 depict the distribution through the year of monthly liveweight production of pork and beef in the U.S. and USSR for 1977, a "normal year". Other figures in the Appendix depict total meat of all types for 1977 and distributions for specific types of meat in other years.

The quarterly peaks which are found in the Soviet data, but not in U.S. data, indicate the influence of "storming" to meet quarterly plan targets. The bunching of the procurement (sale) of animals in March, June and especially September has been recognized by Soviet writers (e.g., Dekel'man, 1978; see his similar diagrams). This bunching of sales by farms has been criticized for making difficult efficient low-cost production in packing plants (Snitser, 1979, p. 88). In the U.S., bunching up of sales to processing plants at the convenience of livestock producers' production schedules, were it to occur, would simply result in drastically lower prices at those times. Flexible prices prevent this, and promote the smoothing out over time of sales. Such is not the situation in the Soviet Union, where seasonal variation in prices for livestock products (unlike potatoes, vegetables and fruit) has not existed since 1962. A year-round single-price prevails (Dobrynin, 1975, p. 47). (Seasonally-varied prices for feeder animals sold to Soviet finishing enterprises were eliminated on May 1, 1971. (Kutikov, 1971, p. 182).

Other Uses of Soviet Monthly Data

Intra-year data on Soviet livestock and meat production and inventories have been of interest to western analysts interested in predicting Soviet livestock performance. Published data on first-of-month inventories and monthly production on state and collective farms played


SMPL INDEX OF MOVEMENT
FIG. 3.3: SEASONAL POULTRY INVENTORIES
(June of each year = 100)
Note: Less seasonal decline in recent winters; lessening of growth rate of inventories in 1980 only after embargo announcement. Poultry numbers had still grown by end of agricultural year.
1977-1978
1975-1976
77-78
110
105
100
95
90
85
80
75
70
65
60
1
June
2
3
4
5
6
7
8
9
10
11
12
13
June
MONTH
Jan.


SMSW INDEX OF MOVEMENT
FIG 3.4: SWINE INVENTORIES: June of each year = 100
1977-1978
1975-1976
Note: Precipitous decline of swine inventories of 1975 did not occur in 1979; neither did first of year growth of 1978.
110
105
100
95
90
85
80
75
70
1 2 3 4 5 6 7 8 9 10 11 12 13
June
MONTH
Jan
June

an important part in Western monitoring of the effect of the January 4, 1980 partial suspension of sales to the USSR (Wädekin, 1980; Byrne and Malish, 1980; Gray, 1981). Production figures showed unseasonal increases in beef and pork production in the early months of 1980 coinciding with the announcement, slowed growth of inventories, and a relative dearth of production (and low slaughter weights) in the summer months before the new 1980 harvest was in.

Monthly data also show systematic changes in seasonality of at least one type of livestock: poultry inventories and broiler and egg production now exhibit much less seasonal decline in winter months than was once the case. (Figure 3.3). This may be attributed largely to the growth of industrial production of poultry, and to the priority they have received in investment policy.

One question which always nags inferences drawn about current progress of the Soviet livestock economy based on monthly statistics of collective and state farms alone is to what extent omissions of other state enterprises and private production in published reports biases trends. The hypothesis that in tight feed situations particularly, inventories shift from the private towards the socialized sector is examined in Section 5.

Section 4: Descriptive Comparison of U.S. and Soviet Swine and Cattle Inventory Cycles: Annual Data

This section refers only to annual first-of-year swine and cattle inventory data for the U.S. and USSR. Using Simpson's definition of the cycle as the span between two inventory lows, this section breaks the cycle down into its two phases. It is assumed that the mechanisms described in Section 2 drive these cycles. No explicit mention is made of the events in Soviet feed supply which usually begin each Soviet liquidation phase. Harvest is introduced in the episodal descriptions of livestock production in Section 7. Soviet annual inventory time series by category of farm are considered in Section 6.

Accumulation and Liquidation Phases of U.S. and USSR Cattle Cycles

Burmeister (1949) notes that inventory cycles first appeared in the U.S. when herds first reached the carrying capacity of land. As illustrated in Simpson ( ) Brazil which has yet unlimited land (its cattle have been called "four-legged pioneers") exhibits monotonic cattle growth, and does not manifest a cycle. These observations hint that, market economies may be not likely to have cycle mechanics if feed is very plentifull, and demand grows. As will be seen in the Soviet case, it is almost always feed interruptions which presage a liquidation phase for any type of livestock.

Using the definition of an inventory cycle as the period between one low in cattle numbers to the next there have been seven major complete cycles in recorded U.S. time series (disregarding one-year "pauses" in 1921 and 1938, but counting 1965-66 as a minor liquidation). See Table 4.1.

TABLE 4.1: United States All Cattle Numbers, Liquidation and Accumulation

1896	49205	2.52
1897	50447	4.80
1898	52868	5.79
1899	55927	6.82
1900	59739	4.75
1901	62576	2.94
1902	64418	2.46
1903	66004	0.66
TOTAL ACCUMULATION		35.03
1904	66442	-0.50
1905	66111	-1.67
1906	65009	-1.93
1907	63754	-2.77
1908	61989	-1.96
1909	60774	-2.93
1910	58993	-3.00
1911	57225	-2.71
TOTAL LIQUIDATION		-16.21
1912	55675	1.65
1913	56592	5.07
1914	59461	7.38
1915	63849	5.62
1916	67438	5.25
1917	70979	2.90
TOTAL ACCUMULATION		31.19
1918	73040	-1.30
1919	72094	-2.35
1920	70400	-2.39
TOTAL LIQUIDATION		-5.92
1921	68714	0.12
TOTAL ACCUMULATION		0.12
1922	68795	-1.82
1923	67546	-2.29
1924	65996	-3.97
1925	63373	-4.41
1926	60576	-3.96
1927	58178	-1.47
TOTAL LIQUIDATION		-16.68
1928	57322	2.71
1929	58877	3.61
1930	61003	3.32
1931	63030	4.40
1932	65801	6.81
1933	70280	5.82
TOTAL ACCUMULATION		29.74
1934	74369	-7.43
1935	68846	-1.45
1936	67847	-2.58
TOTAL LIQUIDATION		-11.12
1937	66098	0.23
TOTAL ACCUMULATION		0.23
1938	66249	-0.33
TOTAL LIQUIDATION		-0.33
1939	66029	3.45
1940	68309	5.04
1941	71755	5.95
1942	76025	6.81
1943	81204	5.09
1944	85334	0.28
TOTAL ACCUMULATION		29.60
1945	85573	-3.90
1946	82235	-2.04
1947	80554	-4.20
1948	77171	-0.44
TOTAL LIQUIDATION		-10.22
1949	76830	1.47
1950	77963	5.28
1951	82083	7.30
1952	88072	7.00
1953	94241	1.53
1954	95679	0.95
TOTAL ACCUMULATION		25.72
1955	96592	-0.72
1956	95900	-3.17
1957	92860	-1.81
TOTAL LIQUIDATION		-5.61
1958	91176	2.35
1959	93322	3.12
1960	96236	0.79
1961	97000	3.47
1962	100369	4.10
1963	104488	3.27
1964	107903	1.02
TOTAL ACCUMULATION		19.55
1965	109000	-0.13
1966	108862	-0.20
TOTAL LIQUIDATION		-0.33
1967	108645	0.47
1968	109152	0.67
1969	109885	2.20
1970	112303	1.93
1971	114470	3.01
1972	117916	3.07
1973	121539	5.14
1974	127788	3.32
TOTAL ACCUMULATION		21.52
1975	132028	-3.07
1976	127980	-4.04
1977	122810	-5.24
1978	116375	-4.74
TOTAL LIQUIDATION		-16.03
1979	110864	0.09
1980	110961	---

The cyclical pattern in U.S. cattle numbers has been confined almost entirely to cattle other than milk cows. (Burmeister). A major difference in Soviet conditions is that, whereas in the U.S. about 75% of cattle are specialized for meat, only about 3.7% are in the USSR, the rest being dairy or dual purpose breeds. (Ruban, 1977). This fact (as in the dairy cattle economies of Western Europe) would mean less impetus for the price-driven cycle. I.e., milk production would be an important stabilizing part of the value of a cow; milk production is of course a joint product of reproduction and capital investment, and milk supply, unlike meat production does not increase with liquidation, temporarily depressing price. However, given mandatory quotas and the fact that Soviet meat prices are already fixed it is not clear that this additional potentially stabilizing factor is of any additional importance, except with regard to private holdings of cows and changes in them, with respect to the collective farm market prices.

Since 1896, U.S. cattle cycles have each lasted 9-16 years. The expansion phases have been longer then the liquidation phases (6-8 vs. 4-5 years). This asymetry is attributable to the long-run increase in demand for beef. The sixth cycle (9 years) ended oddly in 1966 with only two consecutive years of mild liquidation. Except for these two years, there would have been 17 years of accumulation since 1957, finally ended by four years (1975-78) of real liquidation totalling 16%. (This is interesting because in these years the U.S. experience was approximating the Soviet).

From 1945-80 in the U.S. there have been three complete accumulation phases (of 5, 7, and 8 years duration) and four complete liquidation phases (of 4, 3, 2, and 4 years). (See Table 4.1) Accumulation phases have averaged 6.66 years with 22% average cumulative growth. Liquidation phases have averaged three years with 8% average cumulative decline.

From 1947-76 the Soviet Union has experiences 5 complete accumulation phases in total cattle inventories held on all categories of farm and has been in a sixth accumulation phase since 1977. The complete accumulation phases have been of 3, 1, 9, 4 and 6 years duration, averaging 4.6 years and 22.5% average cumulative growth. There have been five complete liquidation phases (1, 2, 1, 2, 1 years duration) averages 1.4 years with an average cumulative decrease of only 2%. (See Table 4.3)

Thus both the U.S. accumulation and liquidation phases are longer (40% and 110% respectively) than the Soviet phases. The most remarkable difference has been the relative short duration of Soviet cattle liquidation phases and their mildness. A major reason for this is that whereas (beef) cow liquidation is common in the U.S., there has been reduction of Soviet cow inventories only once since 1946. This occured in the 1968 and 1969 period of general adjustment of Soviet livestock herds. The frequency of Soviet phases may be attributed to climatically-induced feed variance and the until recently very extensive, or marginal, state of Soviet livestock management (Section 7, below). The shorter and milder Soviet liquidation phases which are not generally accompanied by net liquidation of breeding stock, are reactions to feed stress and not manifestations of the self-generating price-liquidation process, as in the U.S.

In the past approximate 10 years there has been approximately 1 complete cycle in the U.S. while there have been 2 in the USSR. Both phases are basically unchanged in each country, compared to earlier. This is not so for swine cycles.

Swine Cycles

The reproductive period for swine is shorter than that for cattle, hence both liquidation and accumulation phases are both shorter than the

Table 4.2: United States Swine Numbers, Liquidation and Accumulation Phases

1867	34489	-3.44
1868	33304	-2.20
1869	32570	-22.83
TOTAL LIQUIDATION		-27.12
1870	25135	45.96
1871	36688	7.11
1872	39296	1.27
TOTAL ACCUMULATION		58.32
1873	39794	-3.56
1874	38377	-6.63
1875	35834	-0.33
TOTAL LIQUIDATION		-10.25
1876	35715	10.13
1877	39333	10.28
1878	43375	0.90
1879	43767	1.28
TOTAL ACCUMULATION		24.11
1880	44327	-2.82
1881	43076	-1.18
TOTAL LIQUIDATION		-3.97
1882	42566	2.05
1883	43440	5.80
1884	45961	2.98
TOTAL ACCUMULATION		11.19
1885	47330	-3.96
1886	45457	-6.37
1887	42563	-1.01
TOTAL LIQUIDATION		-10.98
1888	42134	5.63
1889	44508	8.14
TOTAL ACCUMULATION		14.23
1890	48130	-1.44
1891	47435	-4.79
1892	45165	-3.35
TOTAL LIQUIDATION		-9.30
1893	43652	6.57
1894	46522	2.38
1895	47628	3.20
1896	49154	4.23
1897	51232	4.00
TOTAL ACCUMULATION		22.06
1898	53282	-3.24
1899	51558	-0.98
1900	51055	-0.73
1901	50681	-5.57
TOTAL LIQUIDATION		-10.18
1902	47858	0.51
1903	48100	7.32
1904	51623	3.01
1905	53176	0.86
1906	53633	5.43
1907	56543	3.26
TOTAL ACCUMULATION		22.00
1908	58388	-10.07
1909	52508	-8.45
TOTAL LIQUIDATION		-17.67
1910	48072	15.17
1911	55366	0.05
TOTAL ACCUMULATION		15.23
1912	55394	-2.97
1913	53747	-1.66
TOTAL LIQUIDATION		-4.59
1914	52853	7.09
1915	56600	7.06
TOTAL ACCUMULATION		14.65
1916	60596	-4.98
TOTAL LIQUIDATION		-4.98
1917	57578	9.30
1918	62931	2.22
TOTAL ACCUMULATION		11.72
1919	64326	-6.48
1920	60159	-2.02
TOTAL LIQUIDATION		-8.37
1921	58942	1.54
1922	59849	15.80
TOTAL ACCUMULATION		17.58
1923	69304	-3.94
1924	66576	-16.23
1925	55770	-6.57
TOTAL LIQUIDATION		-24.82
1926	52105	6.51
1927	55496	11.49
TOTAL ACCUMULATION		18.75
1928	61873	-4.58

Table 4.2: United States Swine Numbers, cont'd.

1929	59042	-5.65
1930	55705	-1.56
TOTAL LIQUIDATION		-11.37
1931	54835	8.14
1932	59301	4.77
TOTAL ACCUMULATION		13.30
1933	62127	-5.64
1934	58621	-33.46
TOTAL LIQUIDATION		-37.22
1935	39004	9.83
TOTAL ACCUMULATION		9.83
1936	42837	-0.16
TOTAL LIQUIDATION		-0.16
1937	42770	3.39
1938	44218	11.48
1939	49293	24.08
TOTAL ACCUMULATION		43.01
1940	61165	-11.14
TOTAL LIQUIDATION		-11.14
1941	54353	11.51
1942	60607	21.90
1943	73881	13.35
TOTAL ACCUMULATION		54.07
1944	83741	-29.15
TOTAL LIQUIDATION		-29.15
1945	59331	3.32
TOTAL ACCUMULATION		3.32
1946	61301	-7.15
1947	56921	-3.33
TOTAL LIQUIDATION		-10.23
1948	55028	3.82
1949	57128	3.17
1950	58937	5.65
TOTAL ACCUMULATION		13.16
1951	62269	-0.24
1952	62117	-16.68
1953	51755	-12.83
TOTAL LIQUIDATION		-27.55
1954	45114	11.88
1955	50474	9.67
TOTAL ACCUMULATION		22.70
1956	55354	-6.25
1957	51897	-0.73
TOTAL LIQUIDATION		-6.93
1958	51517	12.67
1959	58045	1.69
TOTAL ACCUMULATION		14.58
1960	54026	-5.96
TOTAL LIQUIDATION		-5.96
1961	55506	2.69
1962	57000	3.30
1963	58883	5.40
TOTAL ACCUMULATION		11.81
1964	62060	-9.59
1965	56106	-9.96
TOTAL LIQUIDATION		-18.60
1966	50519	13.08
1967	57125	2.96
1968	58818	3.42
TOTAL ACCUMULATION		20.41
1969	60829	-6.22
TOTAL LIQUIDATION		-6.22
1970	57046	18.21
TOTAL ACCUMULATION		18.21
1971	67433	-7.31
1972	62507	-5.32
TOTAL LIQUIDATION		-12.24
1973	59180	3.25
TOTAL ACCUMULATION		3.25
1974	61106	-9.89
1975	55062	-10.52
TOTAL LIQUIDATION		-19.37
1976	49267	11.50
1977	54934	2.92
1978	56539	6.30
1979	60100	11.40
1980	66950	---

corresponding phases of the cattle cycle. From 1946 to 1975, the United States experienced 7 complete swine inventory accumulation phases and by January 1980 had finished four years of an eigth. The seven complete accumulations each lasted either one, two or three years, averaging 2.1. However, there are a record four years in the current unfinished phase. Accumulative growth during each completed phase was 15% (30% in the unfinished phase).

The swine cycle is more nearly symetric than the cattle cycle. Eight liquidation phases since 1946 have also lasted one, two or three years, and averaged 2.1 years. The average cumulative decline of each has been 15% as well.

Unlike the Soviet swine cycle, there appears to be no change in the basic U.S. swine cycle. The three U.S. liquidations of the 1970s appear to be of the same length as the average since 1946. The same holds approximately true for the accumulation phases.

The Soviet Union has experienced five accumulation phases (with a sixth unfinished one) since 1948. There have been 7, 8, 2, 3, 1 (and 3+) years in length with an average of 4.2 years and 102% average cumulative growth in each. Liquidation phases since 1947 have been much shorter (1, 2, 3, 1, 1) years in length; the five of them average 1.6 years with an average cumulative decline of 17%. Compared to the U.S., these figures reflect a much larger growth over the period of demand for pork.

In comparing U.S. and Soviet inventory changes, Soviet liquidation phases have been shorter (1.6 vs. 2.1) but sharper (averaging 17% vs. 15% decline for shorter phases). Accumulation phases have been longer than in the U.S. (4.2 year vs. 2.1).

Dominating these averages (and discussed in Section 7 below) is the monotonic (except for 1954) increase in swine inventories over the very

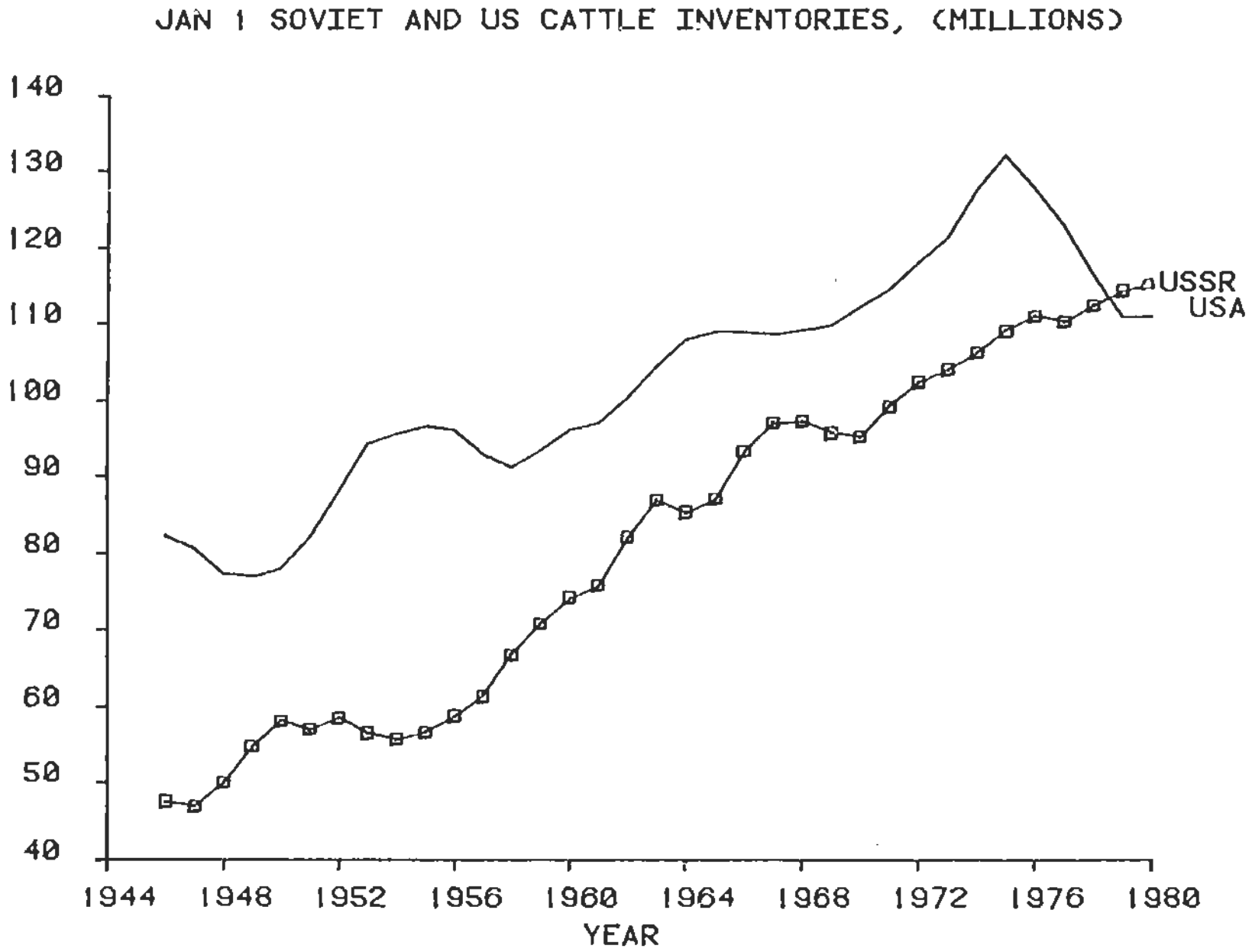
Table 4.3: All Soviet Cattle
(100,000 head)

1946	476	-1.26
TOTAL LIQUIDATION		-1.26
1947	470	6.60
1948	501	9.38
1949	548	6.02
TOTAL ACCUMULATION		23.62
1950	581	-1.72
TOTAL LIQUIDATION		-1.72
1951	571	2.45
TOTAL ACCUMULATION		2.45
1952	585	-3.25
1953	566	-1.41
TOTAL LIQUIDATION		-4.62
1954	558	1.61
1955	567	3.70
1956	588	4.42
1957	614	8.79
1958	668	5.99
1959	708	4.80
1960	742	2.16
1961	758	8.31
1962	821	5.97
TOTAL ACCUMULATION		55.91
1963	870	-1.84
TOTAL LIQUIDATION		-1.84
1964	854	2.11
1965	872	7.11
1966	934	3.96
1967	971	0.10
TOTAL ACCUMULATION		13.82
1968	972	-1.54
1969	957	-0.52
TOTAL LIQUIDATION		-2.06
1970	952	4.20
1971	992	3.23
1972	1024	1.56
1973	1040	2.21
1974	1063	2.63
1975	1091	1.74
TOTAL ACCUMULATION		16.60
1976	1110	-0.63
TOTAL LIQUIDATION		-0.63
1977	1103	1.99
1978	1125	1.42
1979	1141	0.90
1980	1151	--

Table 4.4: All Soviet Swine
(100,000 head).

1946	106	-17.92
TOTAL LIQUIDATION		-17.92
1947	87	11.49
1948	97	56.70
1949	152	46.05
1950	222	9.91
1951	244	11.07
1952	271	5.17
1953	285	16.84
TOTAL ACCUMULATION		282.76
1954	333	-7.21
TOTAL LIQUIDATION		-7.21
1955	309	10.03
1956	340	20.00
1957	408	8.58
1958	443	9.93
1959	487	9.65
1960	534	9.93
1961	587	13.63
1962	667	4.95
TOTAL ACCUMULATION		126.54
1963	700	-41.57
TOTAL LIQUIDATION		-41.57
1964	409	29.10
1965	528	12.88
TOTAL ACCUMULATION		45.72
1966	596	-2.68
1967	580	-12.24
1968	509	-3.73
TOTAL LIQUIDATION		-17.79
1969	490	14.49
1970	561	20.32
1971	675	5.78
TOTAL ACCUMULATION		45.71
1972	714	-6.72
TOTAL LIQUIDATION		-6.72
1973	666	5.11
1974	700	3.29
TOTAL ACCUMULATION		8.56
1975	723	-19.92
TOTAL LIQUIDATION		-19.92
1976	579	8.98
1977	631	11.73
1978	705	4.25
1979	735	0.54
1980	739	--

FIG. 4.1


JAN 1 SOVIET AND US CATTLE INVENTORIES, (MILLIONS)
140
130
120
110
100
90
80
70
60
50
40
1944
1948
1952
1956
1960
1964
1968
1972
1976
1980
YEAR
USSR
USA

long period 1947 to 1962. Since 1963, swine inventory phases have been more symetric and more like those of the U.S. in duration, though sharper in growth and decline. Four liquidation phases (including the 3-year planned reduction of 1966-68) averaged 1.5 years (21% total decline) and three complete accumulation phases have averaged 2.3 years (and 33% cumulative growth).

Synchronization of Soviet and American Inventory Cycles?

Figure 4.1 shows cattle inventory levels over time for the U.S. and USSR. Figure 4.2 shows swine numbers for both countries.

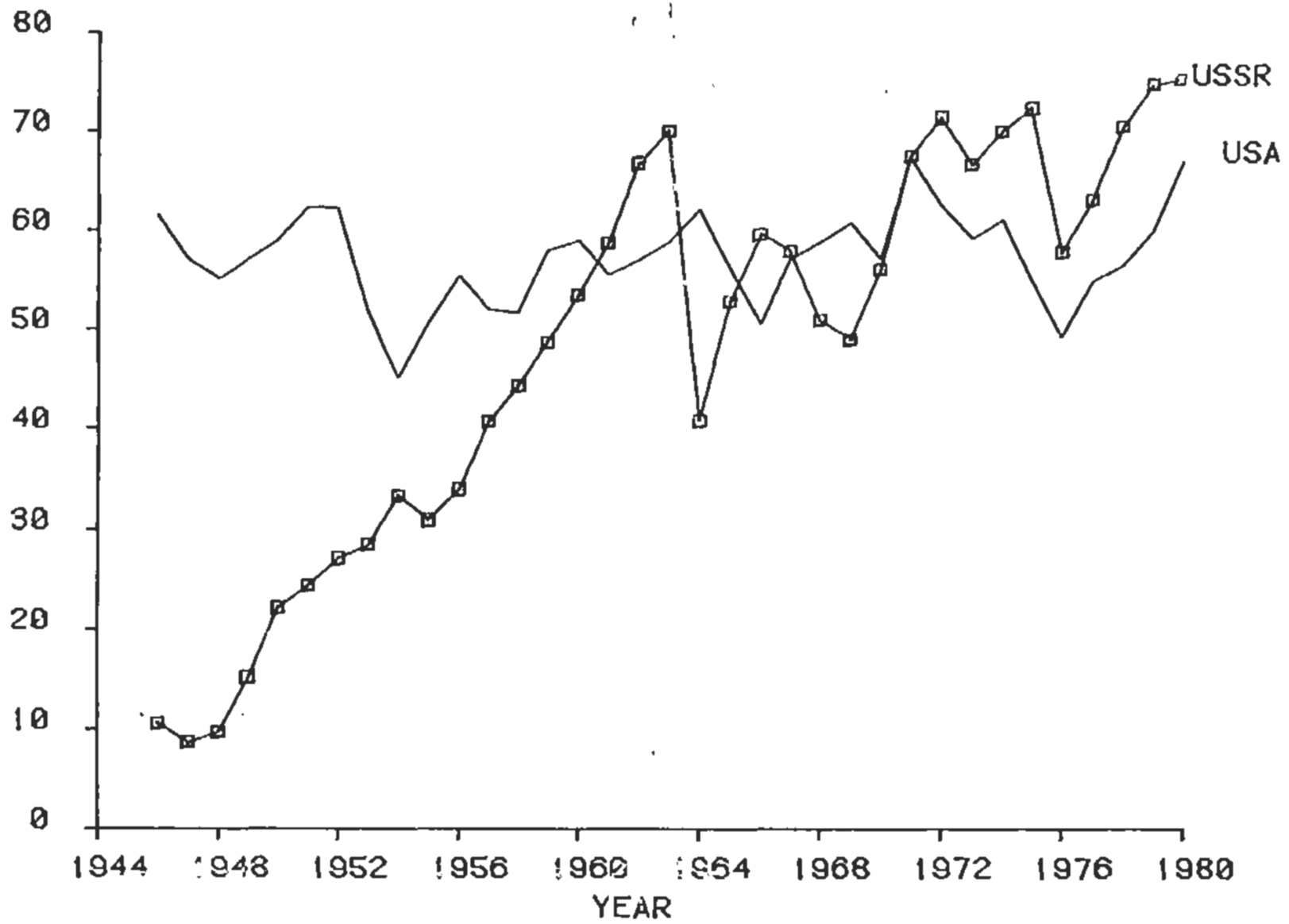
Perhaps only coincidental, but in any case of potential interest to students of international livestock-feed linkages are the changing patterns of "synchronization" of U.S. and Soviet inventory phases. While both Soviet swine and cattle numbers have now surpased U.S. inventories, the manner in which they have done this is interesting.

Regarding cattle, until about 1970 post-war Soviet and American liquidation and accumulation phases ran largely contrary to each other.

When American liquidation occurred there was Sovie accumulation. When U.S. cattle accumulation began in 1950 it coincided with a faltering Soviet inventory and a Soviet trough in 1954-55 corresponding to a U.S. peak. Then, U.S. contraction to 1958 coincided with Soviet expansion. Bovine inventories in both countries then expanded together until 1963, but a Soviet trough in 1964-65 again corresponded to an American peak. In 1967, 1968, and 1969 Soviet contraction corresponded to U.S. expansion. From 1970-75 both countries accumulation phases coincided. U.S. liquidation began in 1975, a year before the Soviet bovine liquidation which was delayed several months into 1976, after the great 1975 harvest failure. The Soviet liquidation then lasted one year and the American, 4 years.

FIG. 4.2

JAN 1 SOVIET AND US SWINE INVENTORIES, (MILLIONS)



U.S. and Soviet swine phases show a similar, if not identical, relative relationship. Because Soviet swine numbers increased so regularly to 1963, there is really no phase activity to compare. However, since 1963 there has been interesting variation in Soviet swine inventories which are also interesting with respect to U.S. inventories.

In 1964-66 there was a coincidence of Soviet accumulation and U.S. liquidation, which was reversed in the period 1966-69. Since the phases in each country were of equal duration but in opposite directions they produced coicident but inverse peaks and troughs in 1964, 1966, and 1969. A short one-year liquidation in 1969 brought U.S. swine inventories just equal to Soviet inventories on January 1, 1970.

For ten years now since January 1, 1970 there is an appearance of "synchronization" of Soviet and U.S. cycles, each county having had two liquidations and three accumulation phases. The accumulation phases began simultaneously in 1970, 1973, and 1976; this has produced a pattern of coincident troughs in 1973 and 1976. Both countries have experienced four years of expanded swine inventories since 1975. These post-1970 cycles are not identical however, mainly in that the two U.S. liquidation phases have lasted two years each versus one for the Soviet.

The apparent "counter-synchronization" of cattle inventory changes from 1945 to 1970 and of swine inventory phases from 1964 to 1970, and the growing similarity of each after 1970 may be completely accidental. I see no explanation for the apparent prior relationship of livestock phases, however, three factors present themselves and possible explanators of the change in 1970:

(1) The growing intensity of Soviet livestock production since 1965 and a changed attitude toward distress slaughter,

(2) The emergence of the Soviet Union as a major net importer of feed grains in the 1970s-establishing a link between the Soviet feed-livestock complex and that of the rest of the world. The coincidental 1973 and 1976 troughs in U.S. swine numbers must certainly relate to world grain prices. Here the causation may be assumed to have run from the Soviet harvests of 1972 and 1975 and the result of the Soviet imports. Were harvest failure occurring elsewhere to cause similar effects on world markets, it is doubtfull that this would cause a similar effect on the inventories of Soviet ruminants, although it might have some through effect on reduced Soviet grain imports.(Mackie, 1974, quantifies USSR impact on grain price.)

(3) On the U.S. side, there was an apparent change in the cattle cycle in 1965-68 in that in these years there was merely a standstill in inventory growth, rather than any real liquidation.

Also an unusually short American liquidation in 1969 put U.S. and Soviet cycles "in-synch" in 1970.

Section 5: Soviet & Ukrainian Inventory Variation By Category of Farm

This section looks at differences several issues regarding livestock holdings by type of Soviet or Ukrainian farm. First, some data is presented on the transfer among categories of farms of animals, and some implications of this are noted: among them, that it is hazardous to calculate feed efficiency of the private sector without noting net imports. Secondly, private inventory reduction for cattle and swine seem to have often farm the brunt of harvest failure, particularly in the late 1950s, perhaps as a buffer to allow mandated rapid growth of socialist inventories. Lastly, reduction of private inventories have often preceded socialist liquidations by one year, and thus may serve as a predictor of the latter.

Collective and state swine inventory movements behave similarly. On the other hand, sovkhoz (no "other" state enterprises) have never experienced an annual decline in cattle numbers.

Transfers of Animals Among Categories of Farm

In examining data illustrating growth (or decline) of inventory by category of farm it is important to realize changes may reflect not only changes in reproduction and slaughter, but also transfers among categories.

From data in Prozvodstvo prod. it is possible to calculate net transfers "in" or "out" by five categories of farm for two years. Were more of these sources available with a complete series of years, it would be possible to relate the change in these intermediate flows to harvest fortunes. Then one could test further the hypothesis that private inventories provide a "buffer" to maintain or allow growth on socialist farms of year-end inventories.

Table 5.1:
USSR Births, Slaughter and Intermediate Transfer of Animals by Type of Farm in 1975 (& 1970). (Th. Head)

All Cattle	All Private	Collective Private	Kolkhoz	Sovkhoz	Sovkhoz & Other State
Births	14,231	7,357	15,513	11,924	12,723
Purchases	1,921	1,041	7,608	4,916	5,384
As % of Births	13%	14%			
(1970)	13%	13%			
Slaughter	8,682	3,984	15,331	11,823	12,584
Sold & Transfered	7,609	4,589	4,365	2,625	2,958
Net Sales Not for Slaughter	5,688	3,548	-3,243	-2,291	-2,425
As % of Births	40%	48%	21%	-19%	19%
(1970)	34%	43%			
Swine					
Births	12,849	7,729	33,185	22,843	25,503
Purchase	12,534	7,358	3,828	3,264	4,700
As % of Births	98%	95%			
(1970)	93%	81%			
Slaughter	21,603	12,779	30,345	21,391	24,360
Sold & Transfered	3,099	1,939	10,547	6,217	7,344
Net Sales Not for Slaughter	-9,435	-5,419	6,719	2,953	2,644
As % of Births	-73%	-70%	20%	13%	10%
(1970)	-51%	-51%			

Calulated from Proizvodstvo produktov zhivotnovodstva (Moscow, 1971 & 1975). On the disposition side: "realizovano na uboi," translated as "slaughter" is taken to mean slaughtered on farm, or sold for slaughter. On the disposition side, there is also a death loss category.

Table 5.1, cont'd.

Cows	All Private	Collective Private	Kolkhoz	Sovkhoz	Sovkhoz & Other State
Trans. from Heifers	1,801	896	3,240	2,873	3,066
Purchases	356	199	387	366	413
As % of Births	20%	22%	12%	9%	13%
(1970)	--	--			
Slaughter	1,896	917	2,976	2,976	2,667
Sold & Transfered	608	402	280	227	265
Net Sales Not for Slaughter	252	203	-108	-140	148
As % of Heif. Trns.	14%	23%	-28%	-5%	-5%
(1970)	--	--	--	-	-
Poultry (Mil. Head)					
Births	261	149	325	928	1,368
Purchase	493	281	302	196	212
As % of Births	189%	189%	93%	21%	16%
(1970)	163%	153%			
Slaughter	518	298	198	555	584
Sold & Transfered	34	17	341	233	635
Net Sales Not for Slaughter	-459	-265	40	38	422
As % of Births	-176%	-178%	12%	4%	13%
(1970)	-120%	-145%			

*Proizvodstvo produktov contains no 1970 data for cows.

Table 5.1 shows net intermediate transfers (other than for slaughter) of animals among private and socialist farms in 1970 and 1975. Collective farmers and other holders of private livestock presumedly transfer animals to socialist farms for final fattening, for resale, and to get rid of heifers and cows above the limit allowed private farmers. Sales by socialist farms to each other and to private farms presumedly include breeding stock from enterprises with this specialization, feeders for farms with that specialization, and young stock (especially pigs and pullets) for private raising.

Realization that private farms have specialization different than socialist farms (cows for milk production and calves to be sold, and the raising, not production, of pigs and poultry) should temper attempts to calculate and compare various partial productivity indices (feed conversion, etc.) for private and socialist farms.

A recent development in a number of Soviet oblasts may significantly obscure the difference between socialist and private livestock inventories. In recent years, collective farms have contracted with their members to raise livestock (particularly pigs) supplied to them, and then then transfer them back to the farm at an older age and agreed-upon price. (Lubiak, 1980, p. 7.)

Private and Socialist Swine Inventory Changes

On the whole, private swine inventories have remained at approximately the same level since 1954, shrinking as a fraction of total numbers, as socialist holdings have grown. This is true in both the Ukraine and USSR as a whole.

Soviet and Ukrainian cyclical movements of private livestock numbers are more like the U.S. series than socialist inventories in that they exhibit accumulation phases which are shorter (Table 5.1). In fact USSR private accumulation phases are always two years, except the three-year one of

Table 5.2: Annual Percentage Changes in Ukrainian Grain Harvest and Swine & Pork By Category of Farm

		All Farms		Private		Collective		State & Other St. Ent.	
	Grain Harv.	Inventory	Production	Inventory	Production	Inventory	Production	Inventory	Production
		-34.681	.	-38.999	.	-35.771	.	28.474	.
		12.985	.	-7.446	.	66.350	.	29.703	.
		88.836	.	73.797	.	129.706	.	69.113	.
		73.857	67.798	61.347	83.184	99.656	63.265	56.111	110.976
1950	.	10.958	117.663	-3.139	149.264	25.698	96.562	19.996	90.751
1951	1.961	7.386	10.427	-17.008	9.193	25.841	15.421	18.851	29.091
1952	32.212	10.078	7.162	8.703	2.446	10.339	31.129	4.164	20.188
1953	-22.182	22.833	23.434	104.247	15.934	-14.697	63.866	5.570	9.180
1954	-33.178	-19.949	25.898	-11.979	43.464	-32.525	-1.538	-10.126	-16.279
1955	127.273	30.018	-19.403	18.884	-27.546	48.714	-1.563	20.751	10.256
1956	-32.000	20.743	20.047	5.747	8.238	32.996	63.690	54.796	-6.977
1957	12.670	-1.332	32.123	-26.359	26.455	18.264	30.061	21.401	64.375
1958	10.442	13.391	-4.840	8.485	-2.849	17.098	-12.271	14.193	-2.662
1959	-14.909	3.772	12.193	-19.924	6.446	13.058	21.282	20.699	16.406
1960	-6.838	10.587	-21.423	19.236	-31.605	2.847	-14.248	13.633	-4.474
1961	55.963	19.012	18.375	17.883	30.827	20.732	5.277	16.007	8.899
1962	-15.588	-0.076	11.773	-8.613	10.275	2.512	16.688	2.120	16.344
1963	-23.693	-43.351	-3.474	-15.370	-5.390	-49.468	2.966	-64.911	6.377
1964	38.813	32.470	-34.653	7.488	-29.451	39.820	-41.427	97.639	-60.382
1965	4.276	16.530	44.260	25.010	25.302	16.761	69.853	13.020	123.684
1966	7.571	-5.448	15.332	-8.453	16.319	-4.190	21.943	-8.751	9.216
1967	-6.745	-16.180	-5.595	-21.651	-6.247	-13.297	-4.105	-13.259	-8.797
1968	-11.950	-3.432	-10.871	-4.143	-14.522	-2.488	-5.993	-2.090	-13.189
1969	30.357	18.588	6.730	22.067	5.535	15.051	4.110	21.683	11.111
1970	-0.274	20.406	11.755	15.733	4.882	21.056	8.983	28.043	14.286
1971	8.242	3.138	11.270	-7.905	5.687	7.381	18.438	7.842	19.643
1972	-17.259	-8.398	3.849	-15.358	0.149	-5.141	8.059	-8.814	10.448
1973	48.466	3.046	-6.437	-1.569	-6.716	3.313	-5.932	9.827	-12.162
1974	-5.165	3.000	4.656	3.280	2.080	2.261	6.126	6.087	14.615
1975	-26.362	-19.016	4.791	-14.292	3.448	-21.671	6.961	-15.555	12.081
1976	31.953	8.001	-23.638	0.000	-20.152	8.767	-34.127	25.051	-9.581
1977	8.744	8.991	15.187	21.529	0.247	5.899	13.735	7.234	20.530
1978	4.330	4.175	2.017	2.341	4.203	-5.588	-3.814	4.884	3.297
1979	-32.806	-2.469	.	.	.	.	.	.	.
1980	.								

FIG. 5.1: USSR Grain Harvest and Socialist and Private Swine Inventories, 1946-1979.
(Varied Scales)

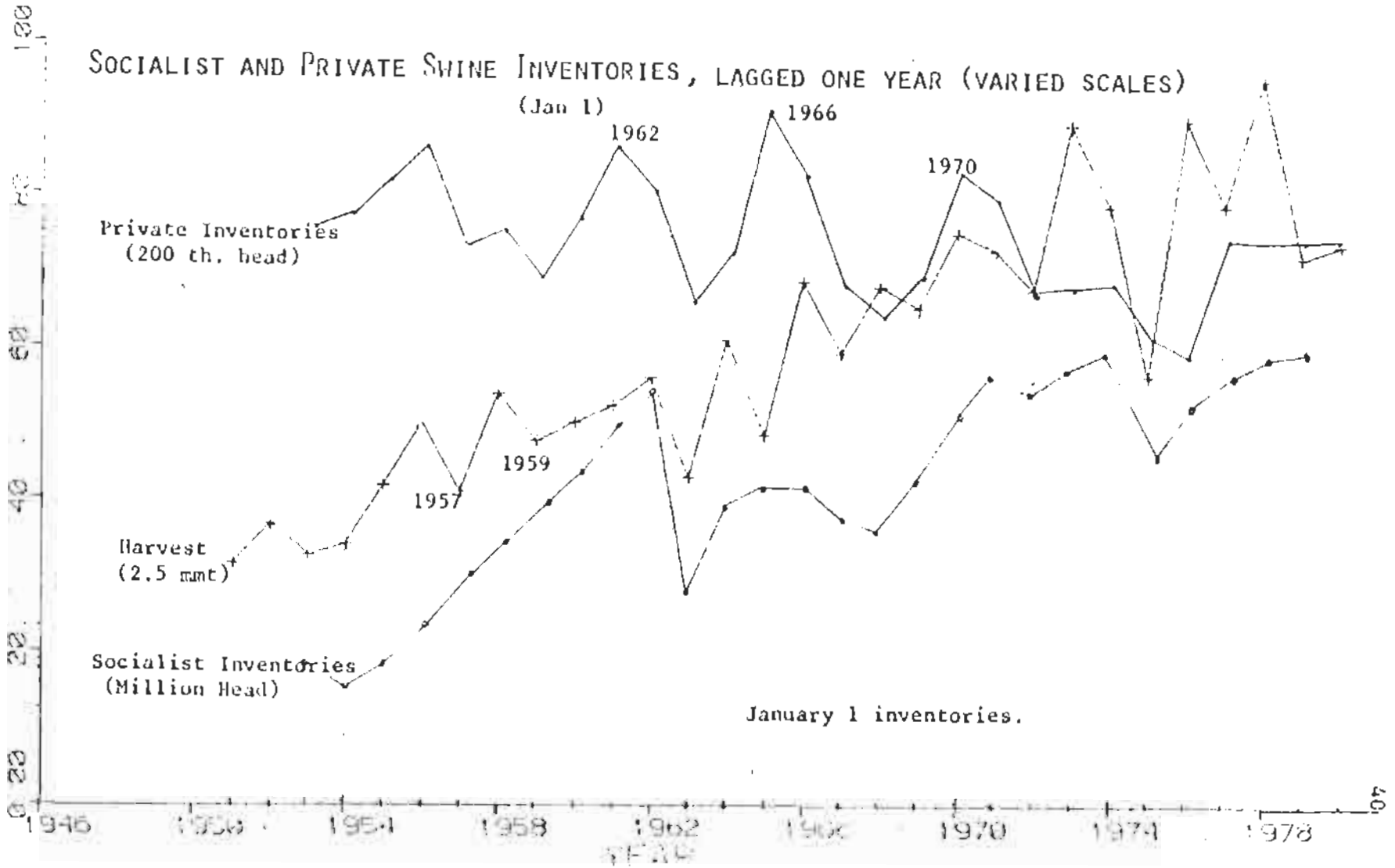
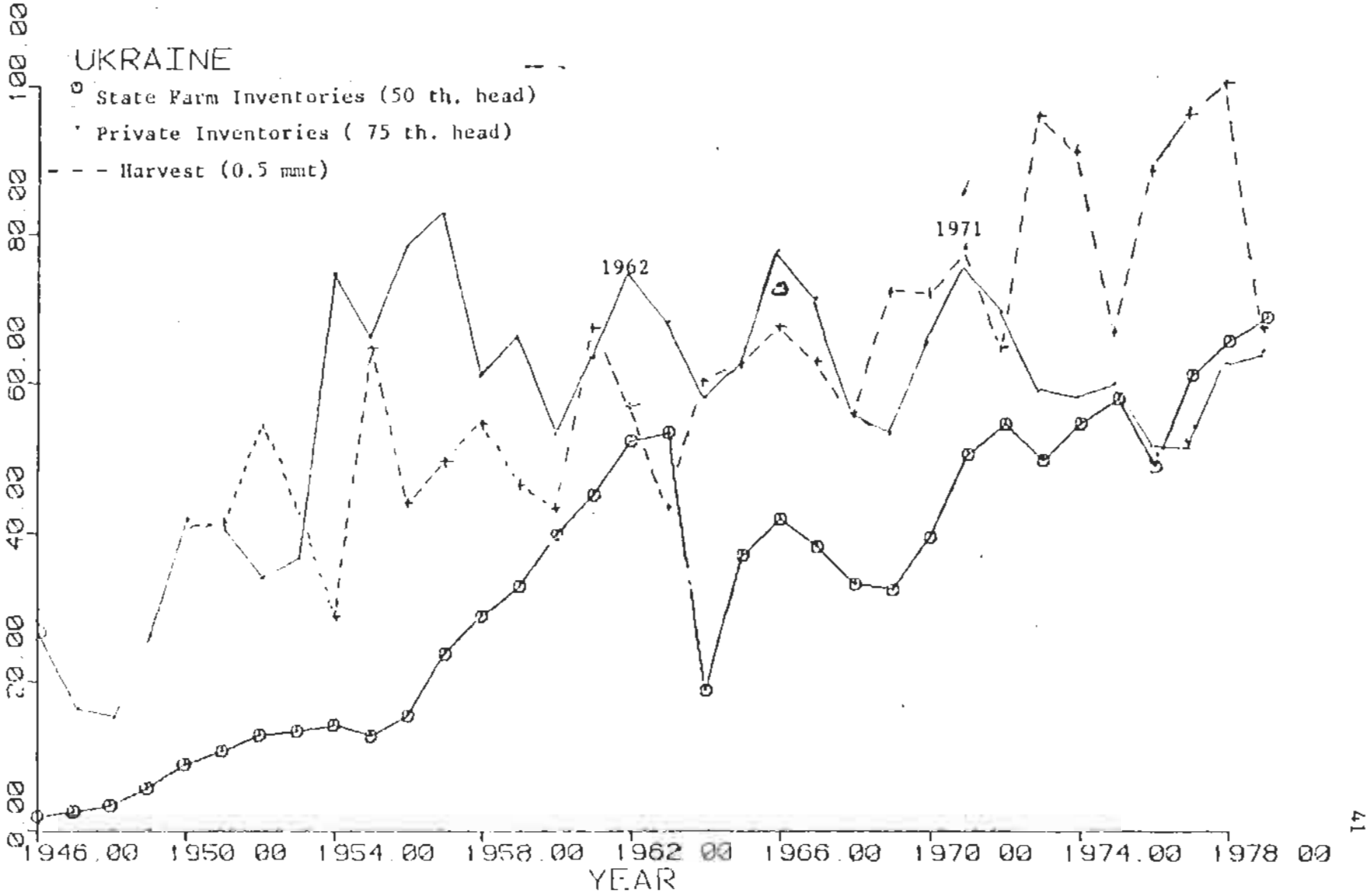


FIG. 5.2: Ukrainian Grain Harvest, and Private and State Farm Swine Inventories, 1947-79
(Varied Scales)



1954-56. Whereas it has not been so for socialist inventories, harvest failures seem to have been immediately reflected in diminished numbers of private swine by January 1 of the year following the failure. The liquidation phase then lasts one or two years (except 1966-68 and 1971-76 in Soviet data only).

Private inventory reduction without accompanying Socialist reductions occurred with the harvest failures of 1957, 1959, 1971, and 1974. Sometimes private swine reductions have occurred before socialist one[1] The 1971 USSR reduction, the 1974 "stand-still" of private inventories, and the 1962 decline, as well as 1962 and 1971 Ukrainian liquidations, all presaged declines in socialist inventories in the following years: 1963, 1972, and 1975. (See Fig 5.1 & 2 and Table 5.2). There were all years associated with either two consecutive years decline in inventory or a decline following three years modest harvest increase with too rapid increase of swine inventories (1963).

Private swine liquidation did not accompany the 1965 harvest decline, but was delayed, like the socialist until 1966, which was rather a better harvest year; but this year was the beginning of the 1966/67-69 planned reduction of animal inventories.

In short, situations of greater feed stress are often accompanied by declines of only private swine inventories. This may be because of (1) Priority allocation of feed to socialist livestock in times of feed stress, or (2) a greater net transfer of private feeder animals to socialist farms (or smaller net inflow into private inventories), perhaps partly because of the incentive for socialist farms to maintain January 1 inventories, year-to-year (explained above in Section 2). (3) Increased private slaughter for sale to take advantage of high price on the collective farm markets.

By past example, given the standstill of private inventories in 1979 and 1980 one would on all counts have expected a year-to-year decline

of socialist swine inventories by January 1, 1981. However, from accounts in Ekonomicheskayo gazeta (#51, 1980), November 1, 1980 inventories on state and collective farms were 1/2 million, or 1% above levels of the previous year. Delays in reduction of swine inventories in the face of two bad harvests reflect either a return to the inventory policies of the 1950s (discussed in Section 7 below) or possibly a new strategy of delaying slaughter a few months. The latter has the effect of smoothing out annual consumption data; it may also contribute to improvement in the seasonal problem of excessive peak production in fall months (Section 3). Another possibility is that the socialist farms during late 1980 significantly slowed transfers of feeder pigs to private hands; this would show up on significantly reduced private inventories on January 1, 1981.

Private versus Socialist Cattle

In USSR data, private holdings of cattle were at peaks in the post-war period in 1958 and 1967 and between these dates have under gone changes due to policy. There was a slight increase in private cattle numbers after a 1976 low. Especially large annual reductions of private cattle inventories have accompanied collective farm reductions (there have not been state farm reductions) whenever there have been a year-to-year reduction in inventories on all farms (1963, 1968 and 1969, 1976). In 1967 and 1975 a large reduction of private cattle inventories preceded collective farm and total farm liquidation by one year.

Socialist Inventory Adjustment by Category of Farm During Times of Harvest Stress

Given data available in Proiz vodstvo prod. it is possible to ascertain inventories separately for sovkhozy, collective farms, other state farms, and slaughter-house and procurement pens, as well as private inventories

(See Appendix Table Index).

In periods of swine inventory reductions (1963, 1966-68, 1972, 1975) the reduction of USSR sovkhoz and collective inventories have been essentially similar in percentage terms. This is true also of the Ukraine (Table 5.2). "Other state enterprises" experiences less then half the decline of sovkhozy in 1963, but more than sovkhozy in 1966, 1967 and 1968, and in the 1972 and 1973 reductions. Private reductions, as noted above, usually are spread out, so that after liquidation in years prior to socialist liquidation, percentage reductions are then smaller.

In cattle inventories there have been less frequent reductions, for all farms as a whole only in 1963, 1968 and 1969, and 1976. At no time have there been reductions of cattle inventories on state farms (since 1955) (Although there have been reductions on "other state enterprises" during 1965, 1967, 1973, and 1975). Reductions on collective farms and private farms together explain total inventory liquidation in all these years.

Slaughter-House Inventories

The variable "slaughter-house and procurement pen" inventories for all type of animal can be broken out of the "other state enterprises" category using the sources Proizvodstvo prod. and Chislenost' skota. Were the series more complete it could be an interesting variable for examining the effect of incentives that farms maintain inventories themselves on January 1 to obtain bonuses for any above-plan sales of meat. Preliminary examination of these data indicate thatit is hard for TsSU to estimate them accurately. Later revisions of earlier estimates are large.

FIG. 5.3: Soviet Swine Inventories by Category of Farm (Varied Scales)

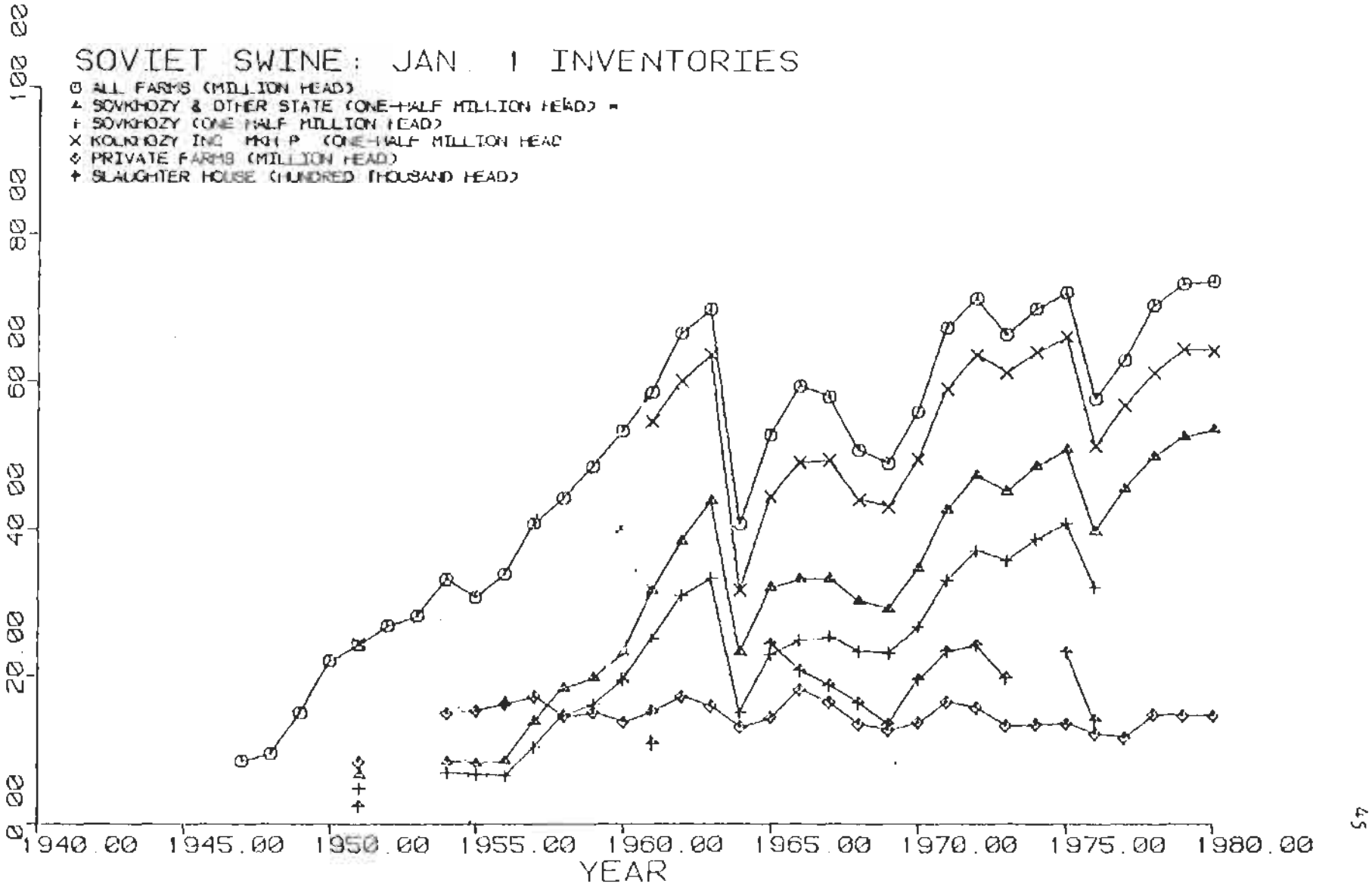


FIG. 5.4: Soviet Cattle Inventories by Category of Farm (Varied Scales)

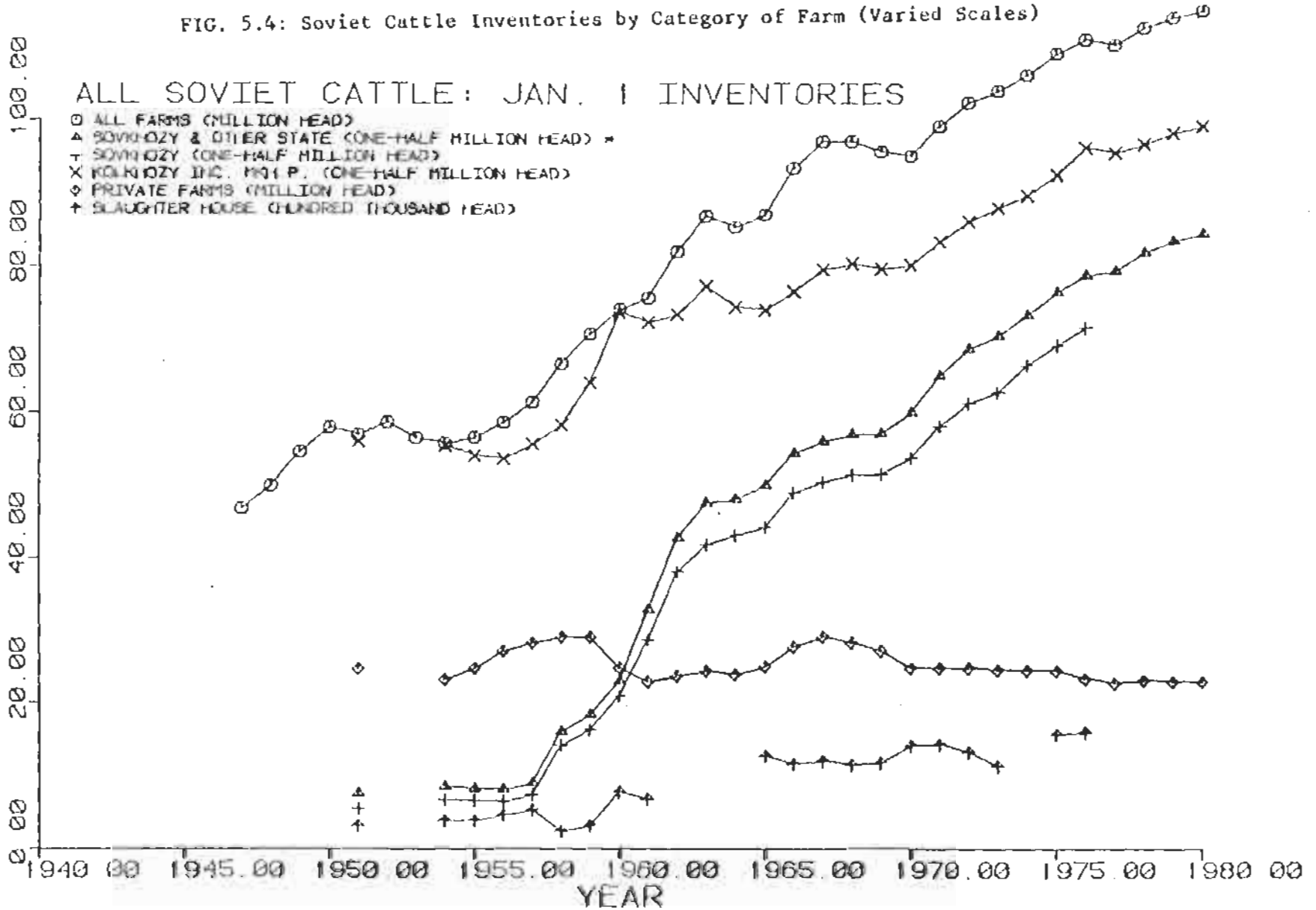


FIG. 5.5: Soviet Cow Inventories by Category of Farm (Varied Scales)

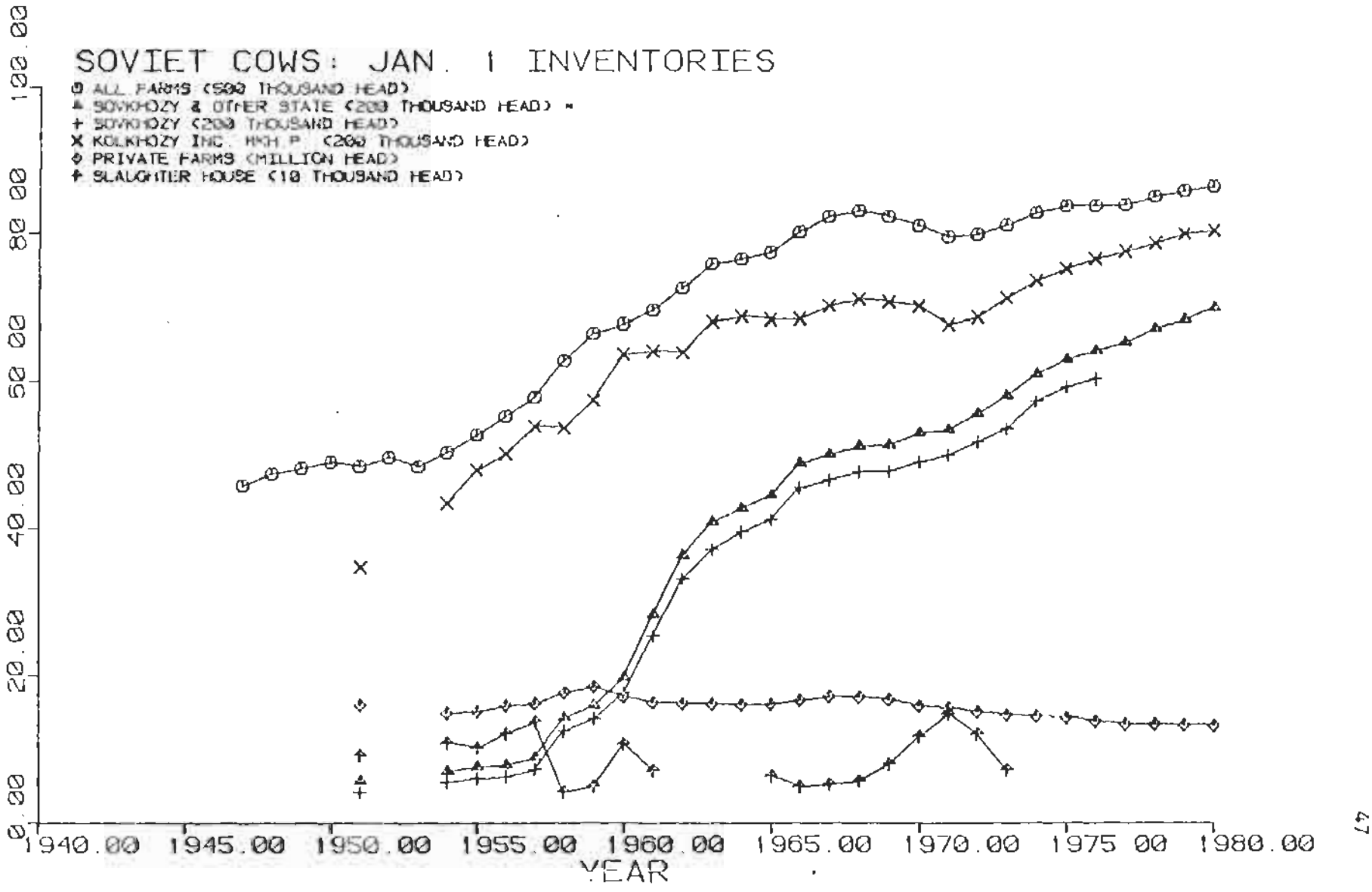
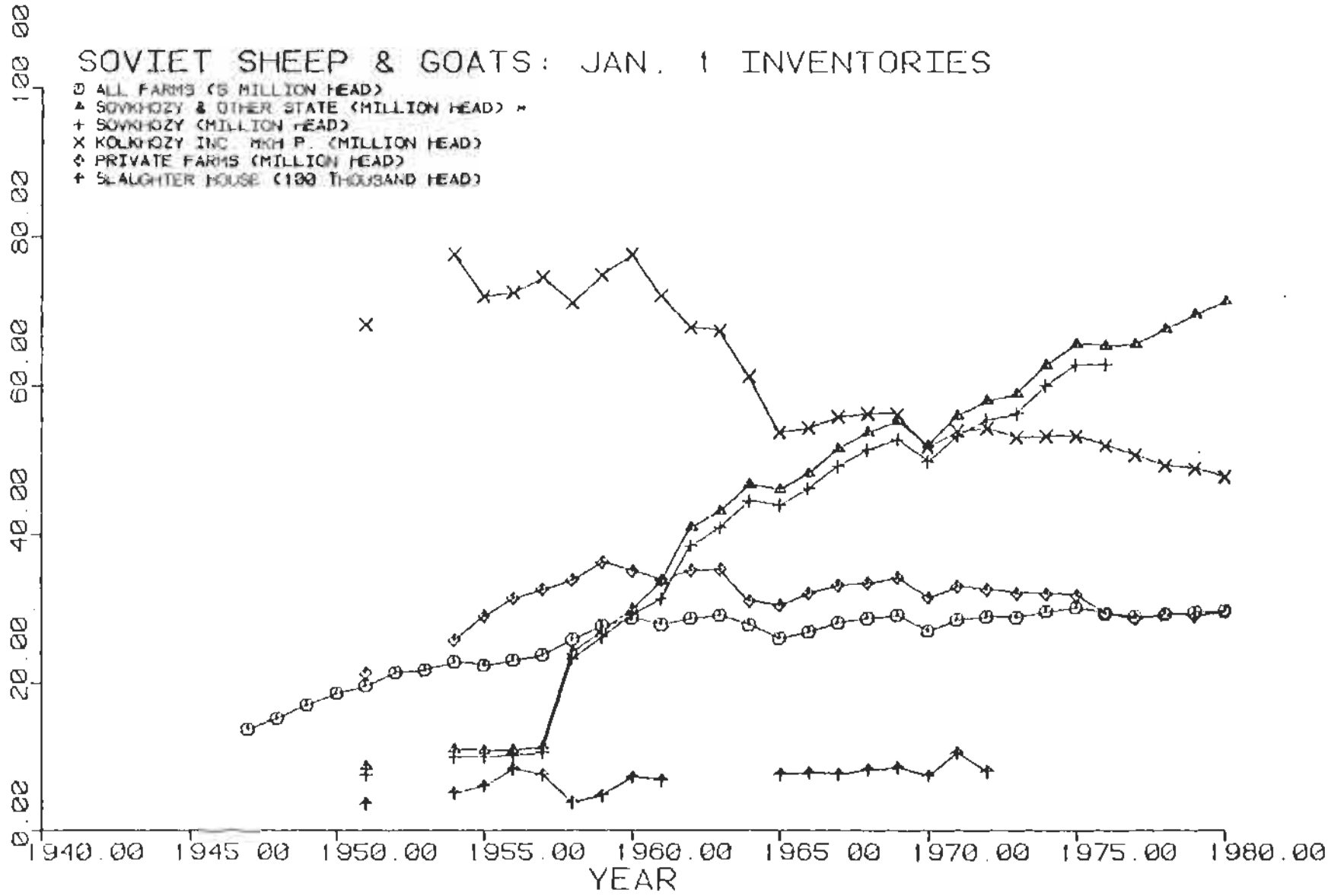


FIG 5.5: Soviet Sheep and Goat Inventories by Category of Farm (Varied Scales)



Section 6: Soviet Livestock Production Variation in Distress Periods, by Type of Product, and by Category of Farm

This section examines time series for livestock production and inventory, relating changes to crude measures of variation in feed available. Several observations emerge. One is that there is a very consistent and handy rule of thumb that pork production declines by approximately the same percentage reduction as inventories in the previous year. Cattle liquidation, unlike swine liquidation adds much to current meat production; thus the effect on meat production depends upon the composition of the inventory liquidation. An examination of response in "harvest failure episodes" shows that the Soviets now tend to delay bovine slaughter until after year-end. This tends to smooth out annual meat production series. Milk production, however, tends to fall in the same year as the harvest.

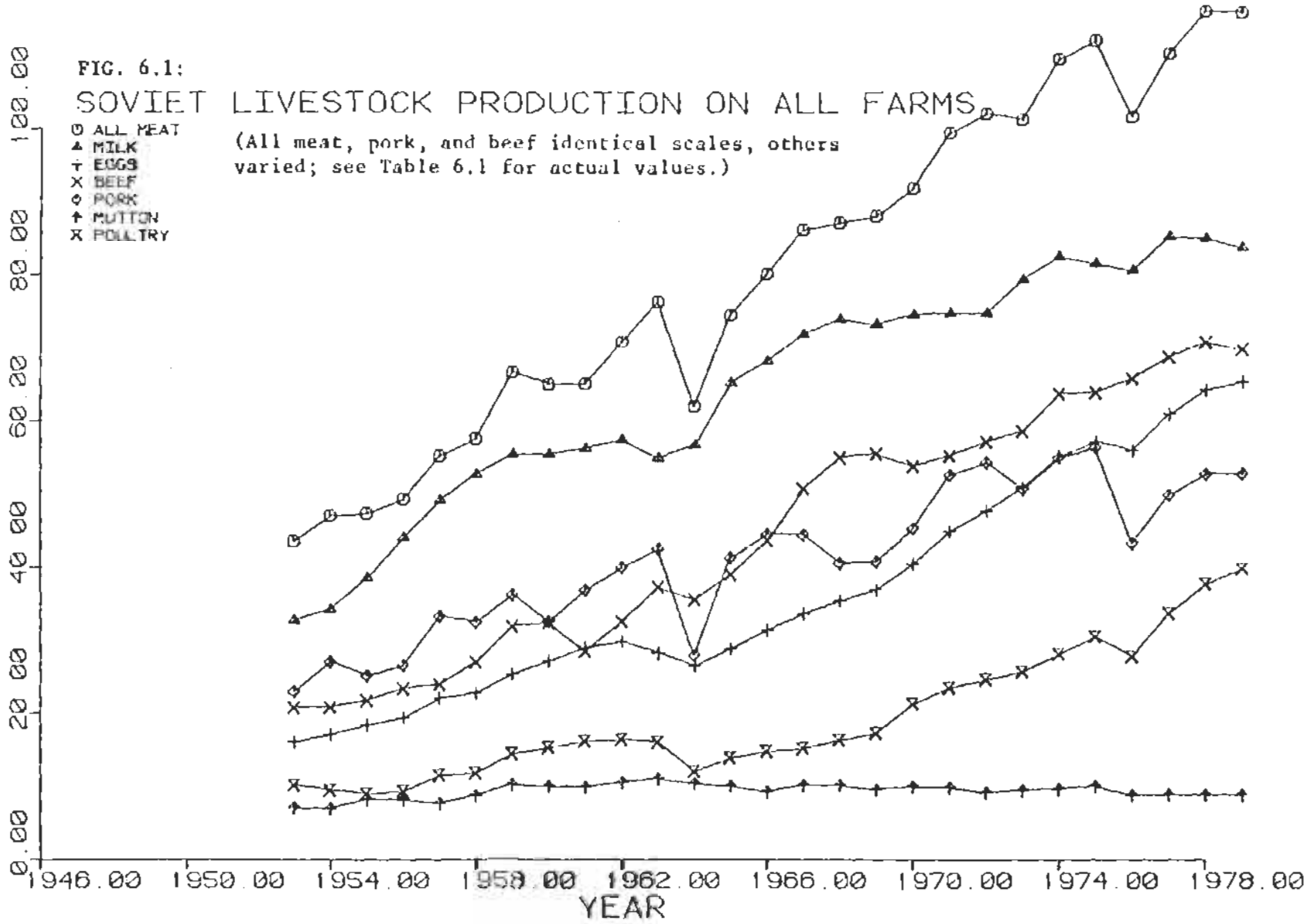
A study of harvest-failure episodes also reveals the aggregate grain harvest to be too clumsy to reflect acurately feed stress. Besides omitting non-grain feed, it is too aggregative geographically. (This is shown here by looking at Ukrainian, as well as USSR data.)

Because of the inadequacy of harvest data to always indicate the degree of feed-stress, other indicators with predictive value are of interest. These exist in production data for private farms, which like inventory changes, have preceded socialist changes.

Within socialist production, svokhoz production of pork and beef has declined more in years following harvest failure, reflecting a lack of grain for finishing, an activity in which sovkhozes are relatively more specialized. On the other hand, sovkhoz production of poultry meat and eggs has seemed more impervious to grain shortage than collective farms's production.

FIG. 6.1:

SOVIET LIVESTOCK PRODUCTION ON ALL FARMS



Soviet Livestock Production in Comparative Perspective

As Figure 6.1 indicates, the USSR has experienced sizeable growth of livestock production since the early 1950s. Since 1967, beef production has consistently exceded pork production, by 1977 the USSR's per capita consumption of beef and veal ranked third in all of Eastern and Western Europe, after only France and Belgium (Appendix tables). All the same, although Soviet production of other meats has also risen, it ranks low in this category, and in all Europe for 1975-77 was only twenty-first of twenty-five countries. By United Nations estimates, making due allowance for differences in definition of carcas weight and problems concerning the utilization of milk, by 1977 the USSR had exceded the European average in per capita consumption of animal-source (including dairy) protein and approached 71% of the American Level (FAO, 1977; Gray, 1980).

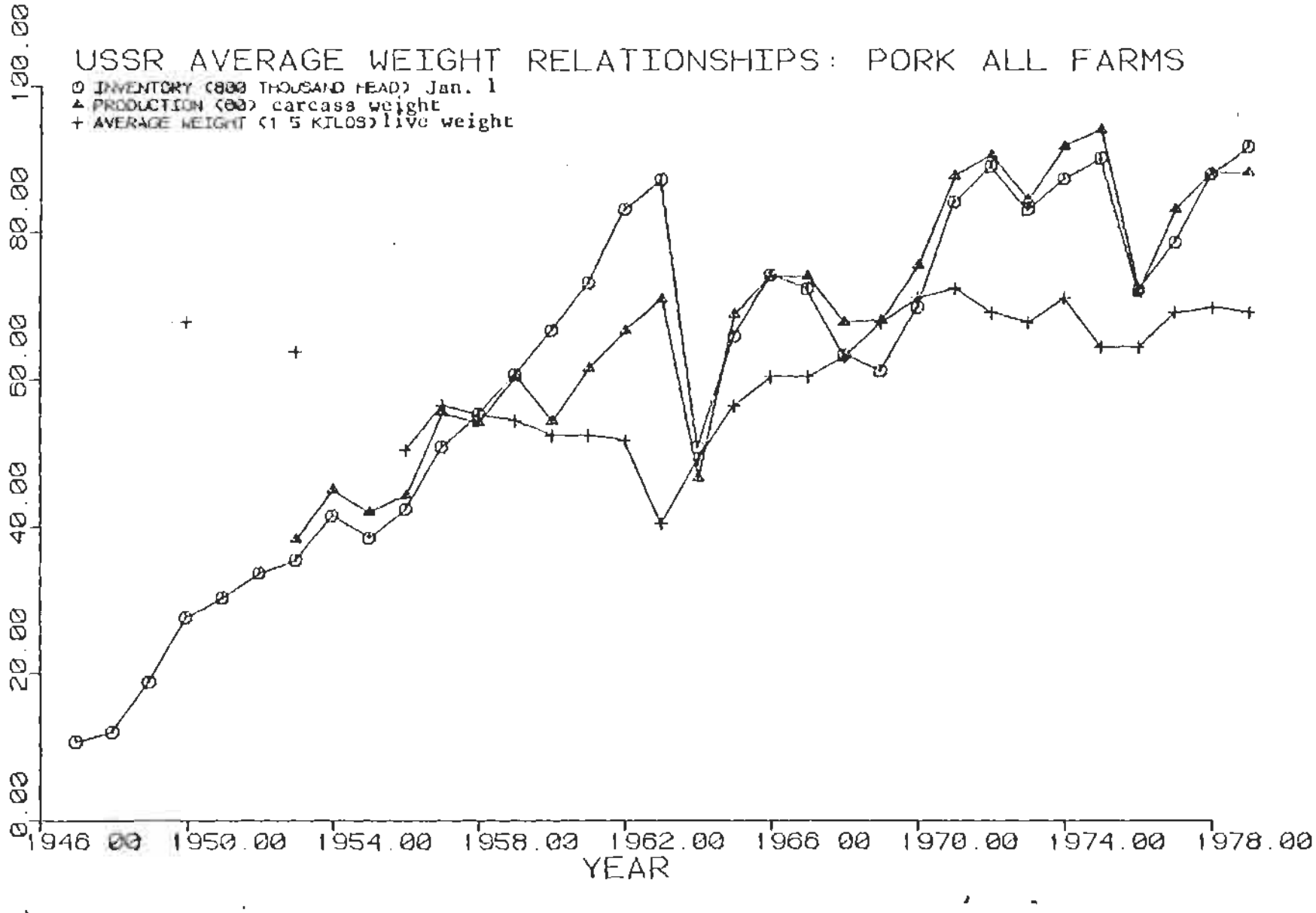
Still, as indicated by Figure 6.1, Soviet livestock production has had its ups and downs. Of interest here is the historical response by type of product to feed stress periods following poor harvest. Of interest later in this section is the variation of response by type of farm. The next section consider long run and short run relationships between inventories and meat production.

Relationship Between Inventory and Production Changes

For individual types of livestock product there are of course significant correlations between changes in inventories and concurrent and subsequent changes in production in the short run. In the long run, other influences of management and technology (including feeding intensity) influence the ratios of production to inventory.

For pork and swine there is a particularly striking short-run relationship (illustrated in Figure 6.2) in which the percentage change in production

FIG. 6.2: USSR Swine Inventories and Pork Production on All Farms



is closely related to change over the previous year in inventories. This is particularly true after periods of distress slaughter, the exact relationship depending upon feed availability in the year following distress slaughter. This same relationship does not hold nearly as closely for cattle.

The long run relationship of pork production and swine numbers depends upon the policy of feed intensity. Figure 6.2 shows that in recent years there has been more intense feedering of swine.

Another observation to be made from the examination of feed stress episodes, below, is that the immediate elasticity of meat production with respect to swine liquidation, as it appears in annual data, is only a fraction of that for bovine liquidation (For 1963,0.15 vs. 3.5). This must be at least partly because the short reproductive cycle of swine means the actual amount of killing and resultant slaughter associated with year-to-year inventory changes is less than that required to reduce cattle numbers quickly.

A consequence is that the immediate increase of aggregate meat supply as a result of distress slaughter depends upon the composition of that slaughter by type of animal. Studies which look only at aggregate livestock units as the capital stock variable will find a poor correlation of it with both feed and meat production change. This is because the Soviet response-particularly with regard to poultry and cattle inventory slaughter - has changed in successive harvest failure episodes.

Harvest Failure Episodes: Differential Response of Production

Figure 6.1 and Tables 6.1 and 6.2 show that for the Soviet Union as a whole the impact of poor grain harvests has been reflected differently in the production of different products. Over time, the patterns have changed. This may have to do partly with the inappropriateness of grain harvest as a proxy for feed which is in fact heterogeneous with respect to the needs of

Table 6.1: SOVIET LIVESTOCK PRODUCTION ON ALL FARMS

YEAR	All Meat	Milk	Eggs	Beef	Pork	Mutton	Poultry
1953	5822	365	161	2090	2305	714	513
1954	6281	382	172	2091	2715	709	480
1955	6322	430	185	2181	2527	826	455
1956	6598	491	195	2348	2666	829	475
1957	7374	547	223	2407	3344	777	584
1958	7700	587	230	2715	3264	885	600
1959	8916	617	256	3217	3641	1048	729
1960	8682	617	274	3252	3276	1019	766
1961	8700	626	293	2864	3704	1006	813
1962	9462	639	301	3277	4011	1062	822
1963	10195	612	295	3741	4267	1119	802
1964	8287	632	267	3571	2813	1052	606
1965	9956	726	291	3917	4143	1013	696
1966	10704	760	317	4377	4465	933	745
1967	11515	799	335	5081	4456	1028	764
1968	11648	823	357	5513	4079	1029	817
1969	11770	815	372	5569	4094	969	866
1970	12278	830	407	5393	4543	1002	1071
1971	13272	832	451	5536	5277	996	1183
1972	13633	822	479	5722	5445	923	1237
1973	13527	883	512	5873	5081	954	1295
1974	14620	918	554	6384	5515	974	1420
1975	14968	908	574	6408	5651	1014	1539
1976	13583	897	562	6600	4343	900	1400
1977	14722	949	612	6900	5000	900	1700
1978	15501	947	645	7100	5300	900	1900
1979	15481	933	656	7000	5300	900	2000

Thousand tons, except eggs which are billion units. Meat is Soviet carcass weight discussed in Gray (1979b).

Table 6.2:ONE YEAR PERCENT DIFFERENCE: SOVIET LIVESTOCK PRODUCTION ON ALL FARMS

YEAR	All Meat	Milk	Eggs	Beef	Pork	Mutton	Poultry
1953	.	.	.	.	.	.	.
1954	7.884	4.6575	6.8323	0.048	17.787	-0.700	-6.433
1955	0.653	12.5654	7.5581	4.304	-6.924	16.502	-5.208
1956	4.366	14.1860	5.4054	7.657	5.501	0.363	4.396
1957	11.761	11.4053	14.3590	2.513	25.431	-6.273	22.947
1958	4.421	7.3126	3.1390	12.796	-2.392	13.900	2.740
1959	15.792	5.1107	11.3043	18.490	11.550	18.418	21.500
1960	-2.624	C.0000	7.0313	1.088	-10.025	-2.767	5.075
1961	0.207	1.4587	6.9343	-11.931	13.065	-1.276	6.136
1962	8.759	2.0767	2.7304	14.420	8.288	5.567	1.107
1963	7.747	-4.2254	-5.3156	14.159	6.382	5.367	-2.433
1964	-18.715	3.2680	-6.3158	-4.544	-34.075	-5.987	-24.439
1965	20.140	14.8734	8.9888	9.689	47.280	-3.707	14.851
1966	7.513	4.6832	8.9347	11.744	7.772	-7.897	7.040
1967	7.577	5.1316	6.9401	16.084	-0.202	10.182	2.550
1968	1.155	3.0038	5.3097	8.502	-8.461	0.097	6.937
1969	1.047	-0.9721	4.2017	1.016	0.368	-5.831	5.998
1970	4.316	1.8405	9.4086	-3.160	10.967	3.406	23.672
1971	8.096	0.2410	10.8108	2.652	16.157	-0.599	10.458
1972	2.720	C.0000	6.2084	3.360	3.184	-7.329	4.565
1973	-0.778	6.1258	6.8894	2.639	-6.685	3.359	4.689
1974	8.080	3.9638	8.2031	8.701	8.542	2.096	9.653
1975	2.380	-1.0893	3.6101	0.376	2.466	4.107	8.380
1976	-9.253	-1.2115	-2.0906	2.996	-23.146	-11.243	-9.032
1977	8.385	5.7971	8.8968	4.545	15.128	0.000	21.429
1978	5.291	-0.2107	5.3922	2.899	6.000	0.000	11.765
1979	-0.129	-1.6784	1.7054	-1.408	0.000	0.000	5.263

animals, and which is over-aggregated geographically. However there also appear to be policy and systematic structural change affecting these differentials; the possibility of the latter is of interest here. Years when feed expenditure declines accompany harvest failure are most interest.

The year 1957 resulted in a decline of private swine inventories and of only private pork production in 1958.

The harvest of the year 1959 resulted in no negative impact on production that same year; and a 4% increase in total animal units as well (swine by 10%). Pork production did fall (10%) the following year (1960 harvest was not at trend) as did mutton. In 1960 milk and beef production hardly changed (See Section 7 for a special discussion of this important 2-year period.)

The harvest of 1963 (23% below both trend and the previous year) impacted milk, eggs and poultry immediately. In addition a 10% reduction of animal units in 1963 resulted in short-term 8% increase in meat production in 1963. Its composition was as follows: cattle, other than cows fell 3.9%, and beef increased by 14% over the previous year; swine numbers fell by 42% and pork production rose only 6%. (In the early 60's pork exceeded beef production by about 15%).

The 1963 harvest failure had even greater impact in 1964, when despite a 40% larger, above-trend harvest, less total feed was fed to fewer animals. Pork and beef production fell 34% and 4.5% in 1964, poultry products fell more and milk production remained depressed. Swine inventories recovered 60% of their loss, and cattle other than cows regained 85%.

The 1963 decrease in swine inventories was thus met by a reduction of the same magnitude, in percentage terms in pork production the following year (42%/34%).

The harvest of 1965, though 18% below trend was accompanied by a 35% increase in concentrates fed and a 20% increase in all meat. This is a case

of aggregation error, for this grain failure occured largely in the non-European part of the RSFSR. The Ukraine, for example, enjoyed a 4% increase over a very good 1964 grain harvest. Thus the short fall, elsewhere did not effect the major livestock zones.

1977 was another year like 1965, though milder; did not cause a reduction of concentrates fed animals,and the harvest decline for the whole USSR was not matched in the Ukraine which experienced a 9% increase in grain harvested, over the previous record 1976.

1967 was another year of excessive geographic aggregation in the total grain harvest series. Though a year of mild harvest decline, accompanied by a small reduction in pork production, 1967 had been preceded by a 3% reduction of USSR swine numbers during 1966. Much of this decline occured in the Ukraine (over 5% of Ukrainian inventories), concurrent with the 1966 harvest which in the Ukraine was not bumper, but was the second of two years of only modest increases. 1966 probably marked the beginning of a conscious policy of swine intensification (Section 8).

1969, the next year of mild deviation from trend in total grain harvest was accompanied by sizeable increases of concentrates fed all animals. The only reduction was in milk production - this was associated with a policy of reducing cow numbers. Actual reductions had occurred in 1968 and in 1967 for cattle other than cows, and swine. (See Section 8). 1970 saw the result of 1969 14% reduction in cow numbers: a 3% fall in beef production. (Per Section 8 this reduction was not to be associated with feed stress: the average weight of slaughtered animals increased during the whole period).

1972, a year of modest USSR harvest decline (6% below trend and 7% annual decline) represented a 17% decline for the Ukraine, a 7% decline of swine numbers and slower growth of other livestock inventories. In 1972 itself, only mutton production fell, though the growth of milk production

was halted. In the subsequent year, 1973, there was the expected decrease of pork production (a 6.7% decrease, again aproximately equaling the 1972 decline in swine numbers. Unlike ten years before, and reflecting the growing importance of the state sector (below) in poultry production, the 1972 feed situation did not result in the reduction of eggs or poultry meat in either 1972 or 1973.

The harvest failure of 1975 was the greatest in the post-Stalin period in terms of both percentage annual decline and deviation from trend. However, its only immediate effect on production (in terms of decline in any one product) was on milk production, in 1975. Unlike 1963, cattle inventories were not reduced in 1975, though cow herd growth was kept to zero which must have contributed to the small (0.4%) growth of beef in 1975. Average slaughter weights in 1975 fell, as did milk yield per cow. Swine and poultry inventories did fall and (January 1, 1976 inventories by 20% and 7%), and 1976 saw the results.

In 1976 there was reduction of production of every major category of livestock product except beef. (Pork production fell 23%, approximating the prior 20% decline in numbers.) Beef production in 1976 was maintained, despite slightly less slaughter weight, by a strategy that differed from that of 1963/64. Distress slaughter of cattle which occurred in 1963 and 1964, which had not occurred in 1975 was delayed until 1976 and was concentrated in the early months of 1976. (The number of cattle other than cows decreased by about 1% during 1976; a figure Section 3 shows extra-ordinary decline during January of 1976.)

Possibly partly as a consequence of the delay of slaughter of cattle (but due also perhaps to a number of other factors, including the very good 1976 crop) compared to 1963/64, the decline in all meat production in calendar 1976 (9%) was not as great as that which occured on the wake of the 1963 distress

slaughter (19%). Another basic difference which allowed this result is that in 1975 more intensely fed Soviet animals were in much better shape than in 1963, not having undergone the period of extensive growth of 1956-63.

Yet another difference lessening the severity of decline of average all meat production as a consequence of the 1975 harvest was the poultry industry. Production declined only 9% in 1976 vs. 24% in 1964 following 1963's harvest failure. The 1978 and 1979 saw very rapid expansion of production. This tendency to favor poultry production over swine production became a trend; there was not reduction of poultry production in 1980 following the 1979 poor harvest.

Although the harvest was about equal to that of record 1978, 1979 harvest decline was still substantial, 15% below trend. In addition, though a 25% annual decrease for the USSR as a whole, the harvest declined more (33%) in the livestock-important Ukraine. (It was 23% below a 1950-79 linear trend for Ukraine grain harvests.)

It is thus remarkable that in 1979 itself there was no reduction of one major type of livestock (except horses). This event is reminescent of behavior in 1959; it has been accompanied,as was true in 1959/60,by declining milk yields and slaughter weights for both swine and cattle in 1979 and 1980. Stress was also indicated by reduction of feed units per standard cow unit of inventory in 1979 (following a similar decline in 1978, despit 1978's bumper grain crop).

The issues of extensive vs. intensive livestock production are discussed below in Section 7.

Differential Response to Feed Stress of Livestock Production by Category of Farm

It is also of some interest to describe, to the extent available data allows, the differential time series variation of production from

private and socialists farms and further, by type within the socialist category, particularly in times of feed-stress. Then, combined with the trends in the composition of livestock production by category of farm, an idea of differential impact may give some indication of the "effective demand" in feed stress periods for feed impacts versus reduced production and incomplete utilization of capacity of livestock facilities. There follow observations on differential response by category of farm illustrated by Figures 6.3 and 6.8. (Fourteen tables containing the raw data for these figures are contained in the Appendix.)

This investigation originates partially from speculation in market economies that "industrialized" livestock production has different elasticity to feed price than traditional organization of production. Particularly, that large-scale hog facilities are not capable of as much flexibility in increasing or decreasing production as are small producers (Bogda, 1978; Arsdall, 1978).

Unfortunately time series data on the large "industrial" complexes themselves are fragmentary. (Gray, 1979). Some inference can be drawn from comparing sovkhoz with collective farm data, since specialized farms are generally in the sovkhoz sector. Examination of these data show sovkhoz production of both pork and beef to decline more than collective farm production (the comparison is actually with the all socialist farm category in the tables) in years following harvest failure. Recovery the next year is more rapid. The explanation would seem to be that finishing operations, heavily concentrated in the sovkhoz sector, have reduced activities due to shortage of grain, painfull though it might be in terms of unused capacity.

The picture is somewhat different regarding egg and poultry production on state versus other types of farms. Since 1964 there has been no reduction of socialist production of these items; in stress periods (1972 and 1975) state

farm production has increased more rapidly than the inclusive socialist farm category, as it has in other years. This picture of emerging harvest failure priority for poultry production based upon industrial production is reinforced by Republic data for 1975 inventory changes in Moldovia, which is known for industrial poultry production. During 1975, which USSR poultry numbers declined, Moldovian poultry inventories expanded by 11% (Proizvodstvo Prod., 1976, p. 106).

Figures 6.2 - 6.8 indicate the movements in private versus socialist production. Private production, like inventories are more variable. Private production for beef and pork decreases have often resulted from feed-stress a year or two earlier. (Interestingly, however, private beef production did not decline in 1975 immediately with the harvest as did socialist production.)

FIGURE 6.3

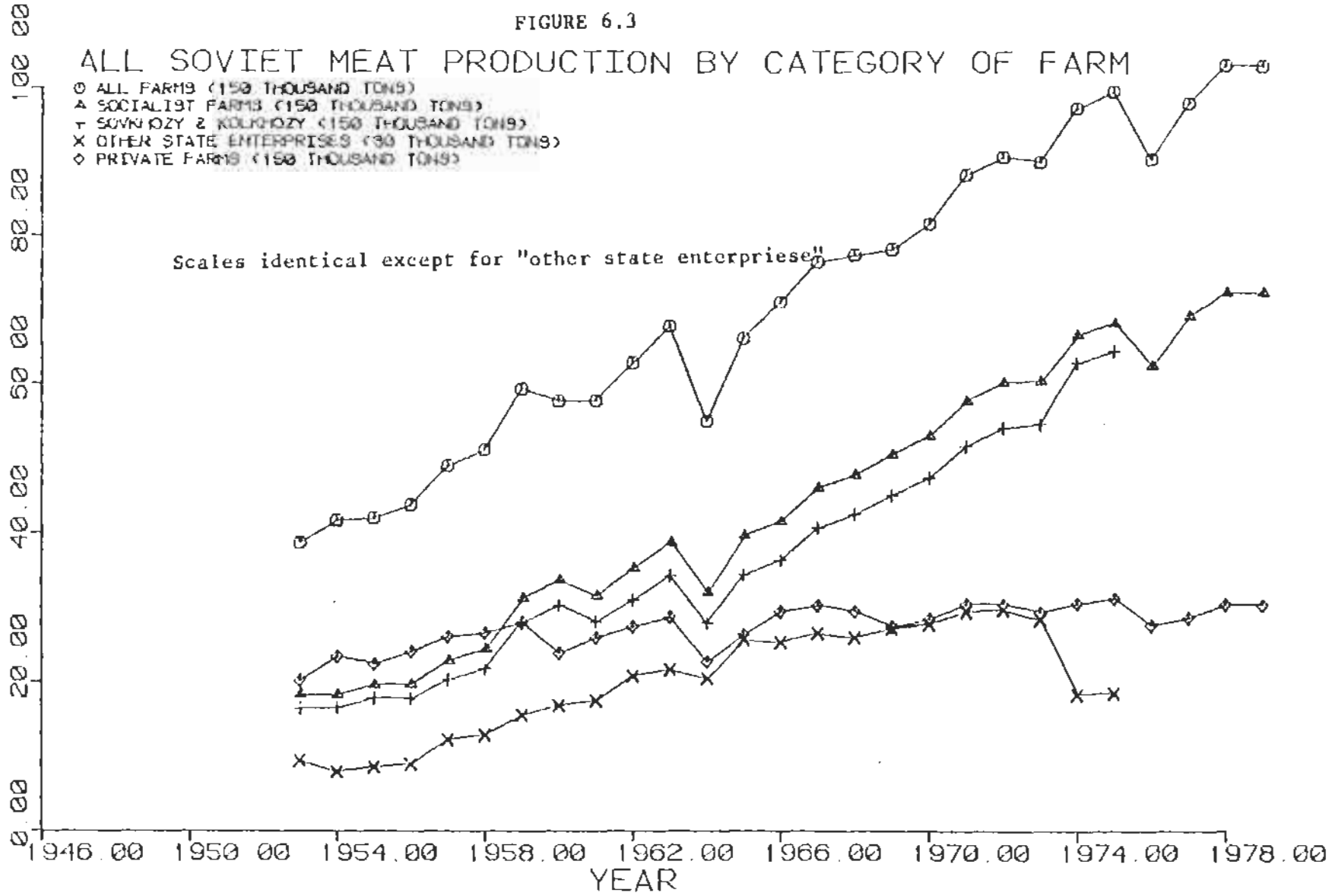
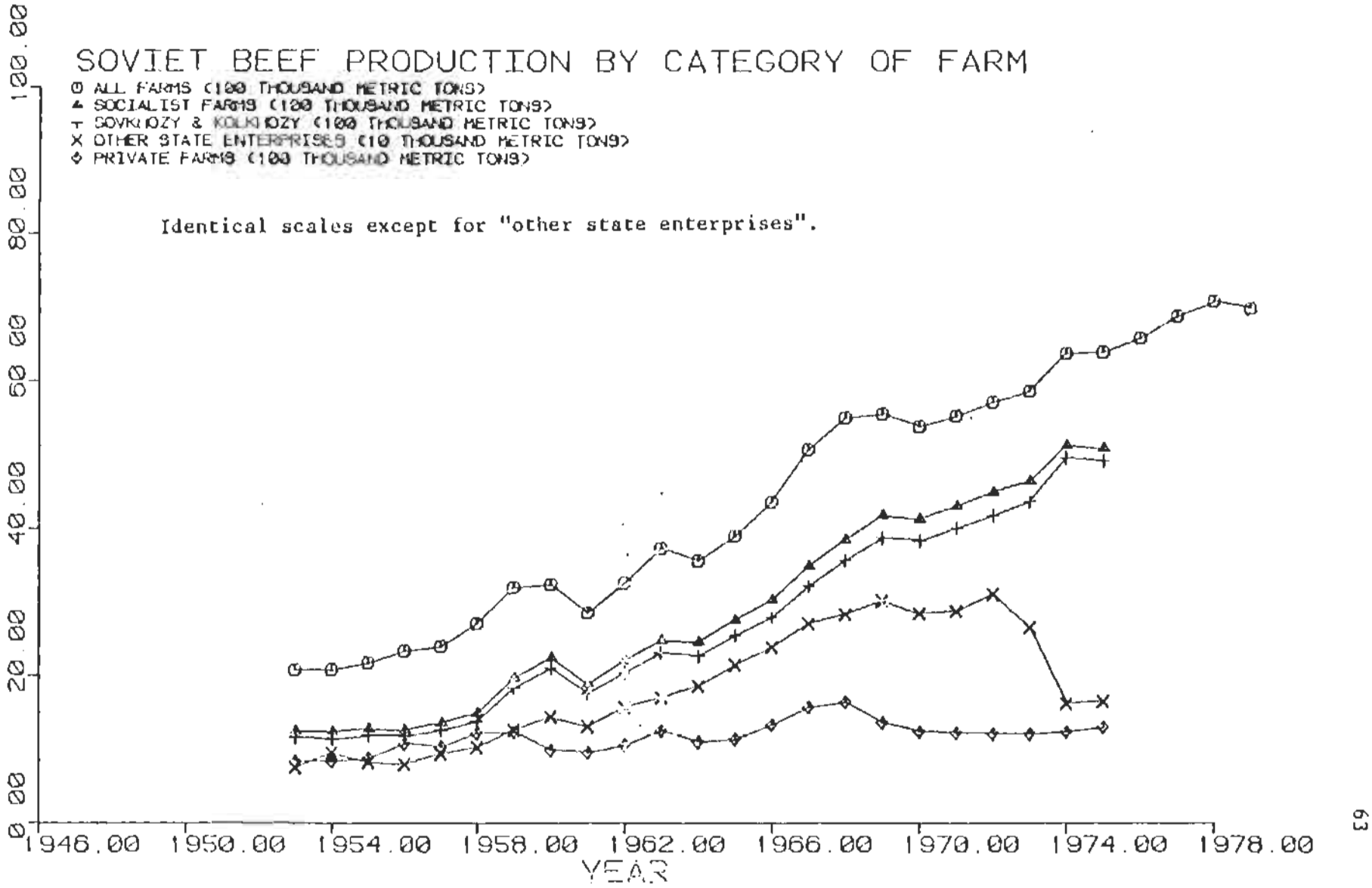

ALL SOVIET MEAT PRODUCTION BY CATEGORY OF FARM
⊙ ALL FARMS (150 THOUSAND TONS)
△ SOCIALIST FARMS (150 THOUSAND TONS)
+ SOVKHOZY & KOLKHOZY (150 THOUSAND TONS)
X OTHER STATE ENTERPRISES (30 THOUSAND TONS)
◇ PRIVATE FARMS (150 THOUSAND TONS)
Scales identical except for "other state enterprises"
0.00
20.00
40.00
60.00
80.00
100.00
1946.00
1950.00
1954.00
1958.00
1962.00
1966.00
1970.00
1974.00
1978.00
YEAR

FIGURE 6.4


SOVIET BEEF PRODUCTION BY CATEGORY OF FARM
ALL FARMS (100 THOUSAND METRIC TONS)
SOCIALIST FARMS (100 THOUSAND METRIC TONS)
SOVKHOZY & KOLKHOZY (100 THOUSAND METRIC TONS)
OTHER STATE ENTERPRISES (10 THOUSAND METRIC TONS)
PRIVATE FARMS (100 THOUSAND METRIC TONS)
Identical scales except for "other state enterprises".
100.00
80.00
60.00
40.00
20.00
0.00
1946.00
1950.00
1954.00
1958.00
1962.00
1966.00
1970.00
1974.00
1978.00
YEAR

FIGURES 6.5

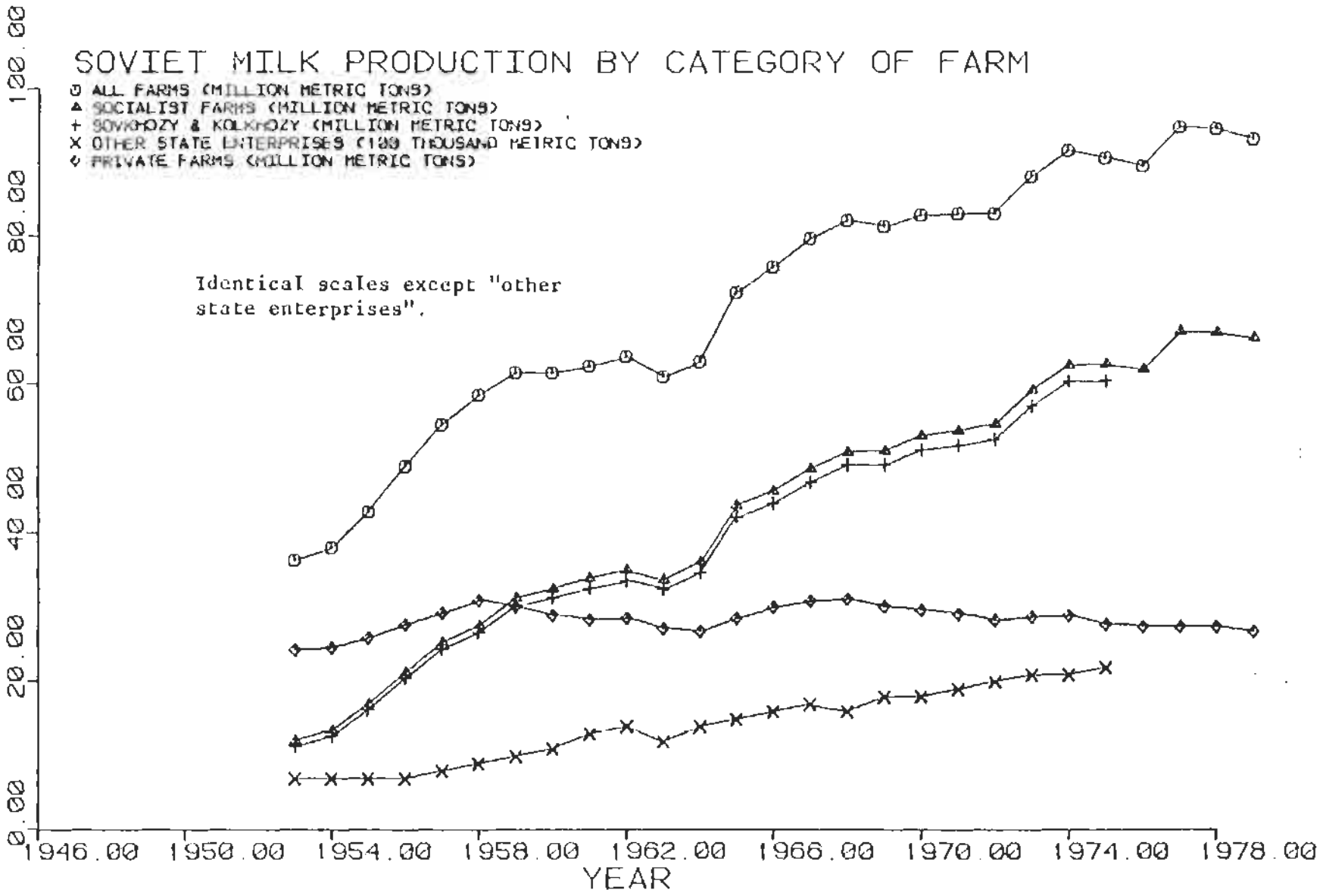

SOVIET MILK PRODUCTION BY CATEGORY OF FARM
ALL FARMS (MILLION METRIC TONS)
SOCIALIST FARMS (MILLION METRIC TONS)
SOVKHOZY & KOLKHOZY (MILLION METRIC TONS)
OTHER STATE ENTERPRISES (100 THOUSAND METRIC TONS)
PRIVATE FARMS (MILLION METRIC TONS)
Identical scales except "other state enterprises".
0.00
20.00
40.00
60.00
80.00
100.00
1946.00
1950.00
1954.00
1958.00
1962.00
1966.00
1970.00
1974.00
1978.00
YEAR

FIGURE 6.6

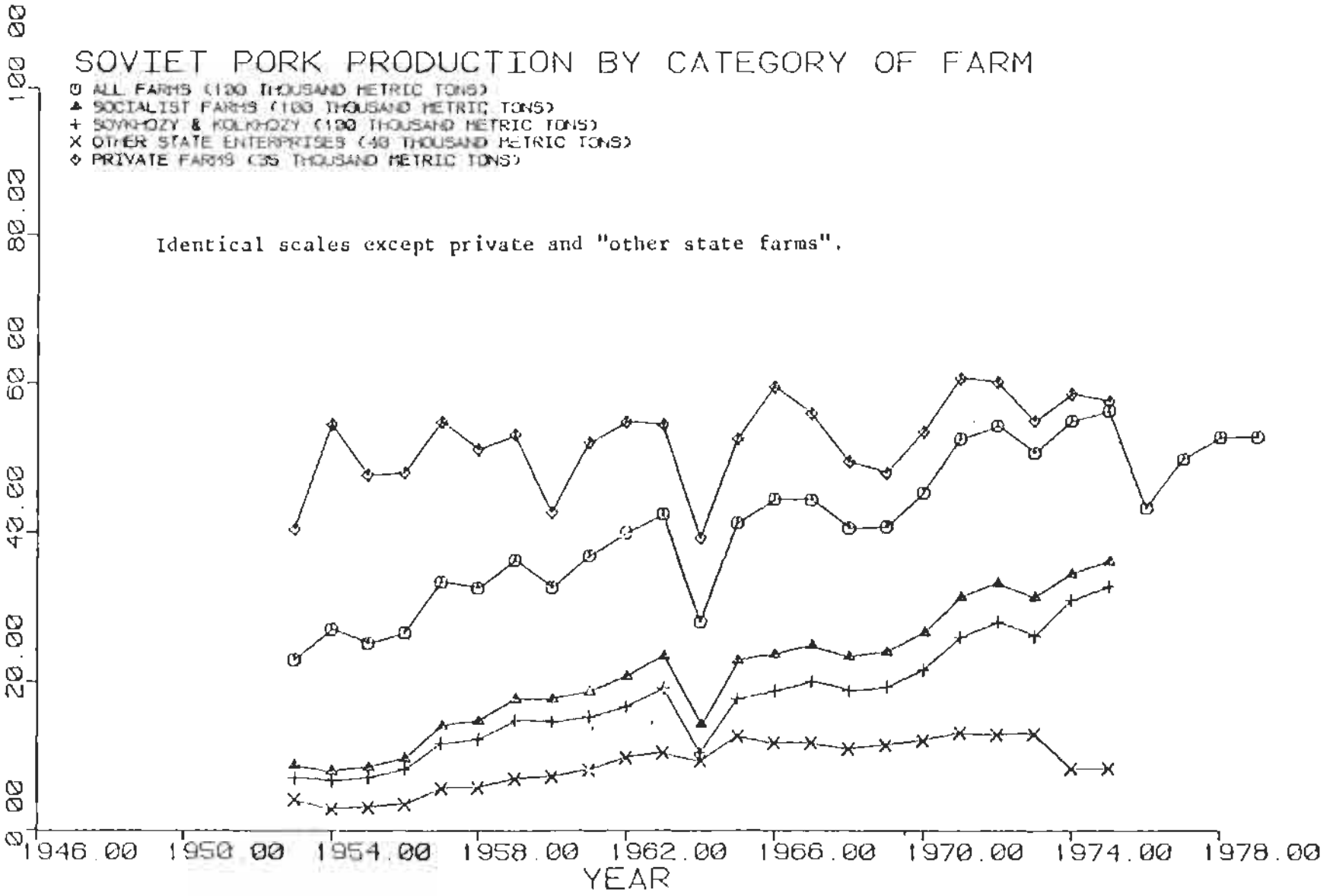
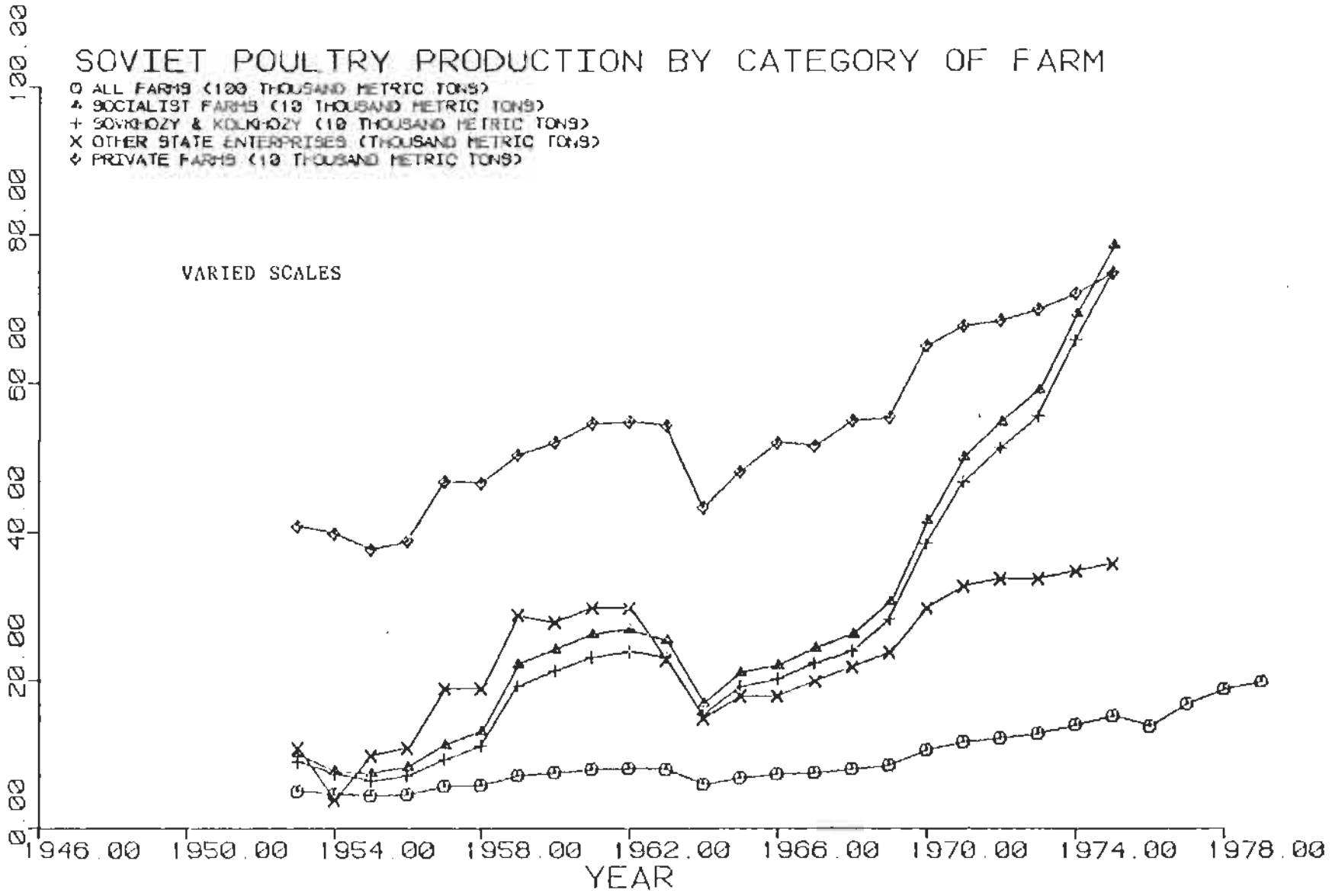
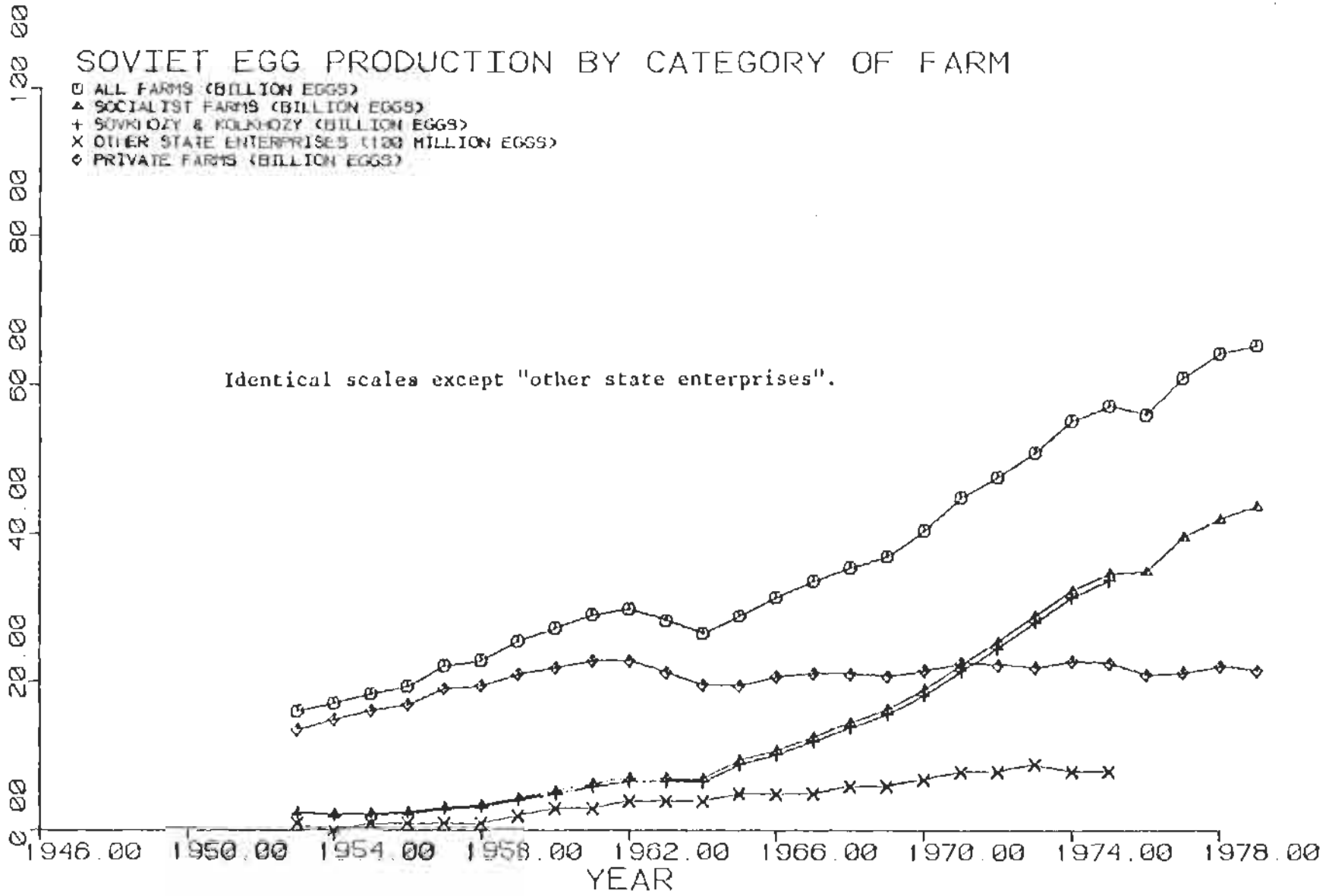

SOVIET PORK PRODUCTION BY CATEGORY OF FARM
ALL FARMS (100 THOUSAND METRIC TONS)
SOCIALIST FARMS (100 THOUSAND METRIC TONS)
SOVKHOZY & KOLKHOZY (100 THOUSAND METRIC TONS)
OTHER STATE ENTERPRISES (40 THOUSAND METRIC TONS)
PRIVATE FARMS (35 THOUSAND METRIC TONS)
Identical scales except private and "other state farms".
0.00
20.00
40.00
60.00
80.00
100.00
1946.00
1950.00
1954.00
1958.00
1962.00
1966.00
1970.00
1974.00
1978.00
YEAR

FIGURE 68


SOVIET POULTRY PRODUCTION BY CATEGORY OF FARM
O ALL FARMS (100 THOUSAND METRIC TONS)
Δ SOCIALIST FARMS (10 THOUSAND METRIC TONS)
+ SOVKHOZY & KOLKHOZY (10 THOUSAND METRIC TONS)
X OTHER STATE ENTERPRISES (THOUSAND METRIC TONS)
◇ PRIVATE FARMS (10 THOUSAND METRIC TONS)
VARIED SCALES
0.00
20.00
40.00
60.00
80.00
100.00
1946.00
1950.00
1954.00
1958.00
1962.00
1966.00
1970.00
1974.00
1978.00
YEAR

FIGURES 6.9


SOVIET EGG PRODUCTION BY CATEGORY OF FARM
ALL FARMS (BILLION EGGS)
SOCIALIST FARMS (BILLION EGGS)
SOVKHOZY & KOLKHOZY (BILLION EGGS)
OTHER STATE ENTERPRISES (100 MILLION EGGS)
PRIVATE FARMS (BILLION EGGS)
Identical scales except "other state enterprises".
0.00
20.00
40.00
60.00
80.00
100.00
1946.00
1950.00
1954.00
1958.00
1962.00
1966.00
1970.00
1974.00
1978.00
YEAR

Section 7: Extensive and Intensive Livestock Production: "Has the Soviet Union Too Many Animals?"

Summary

This section examines data on beef and pork production, and swine and cattle inventories and their relationships, linked by indicators of average slaughter weights and milk yields. Time series reveal two distinct periods of Soviet livestock management: one of "extensiveness" or reliance upon large relatively unwavering numbers of animals relative to the feed base, and one of intensive feeding. Two periods in the late fifties-- 1957 and 1959/60 -- appear to be periods of mistaken retention of inventories in the face of considerable feed-stress. Private inventory and production behave differently than do socialist series. The period of intensive feeding began after the disastrous 1963 harvest failure, the ouster of Khruschev, and the March 1965 Party Plenum on agriculture.

Some of the Soviet literature on feed intensity is examined.

Interestingly, it appears that some of the same indicators of extensive livestock management which occurred in the late 1950s are reappearing in the late 1970s and in 1980.

Extensive and Intensive Livestock Management

In this report extensive livestock management is taken to mean a realtively high number of animals compared to feed resources. It corresponds in measurable indices to lower ration of non-brood to brood animals, low ratios of meat production to average inventories during a year, and low average slaughter weights. Such a system with a low ratio of feed fed per animal might also have a low ratio of feed used per unit of livestock production - or it might not, partly dependent upon how feed and output are measured.

On the other hand, intensive livestock management is taken to mean a relatively low number of animals compared to feed. It corresponds in measurable indices to a higher ratio of non-brood animals to brood animals, high ratios of production to inventories, and high average slaughter weights. Such a system, which will generally expend more feed per animal in any given time period, may or may not have a low ratio of feed used per unit of production, again depending upon how feed and output are measured.

Figures 7.2 and 7.2 illustrate Soviet swine intensity over the years, and Figure 7.3 illustrates Soviet beef intensity. These figures show production per head and average slaughter weight, compared to the United States, but attention here is directed principally to the comparison of the Soviet indices over time. For both type of animal the greatest degree of extensive management occured in the early 1960s; average weight for swine had fallen continuously and for cattle, farily continuously since about 1957-59.

Roughly speaking, a period of increasing extensiveness in Soviet livestock management can be identified to have occurred in between 1957 and 1963. There began a period of increased intensiveness, after about 1965 or 1966.

FIGURE 7.1

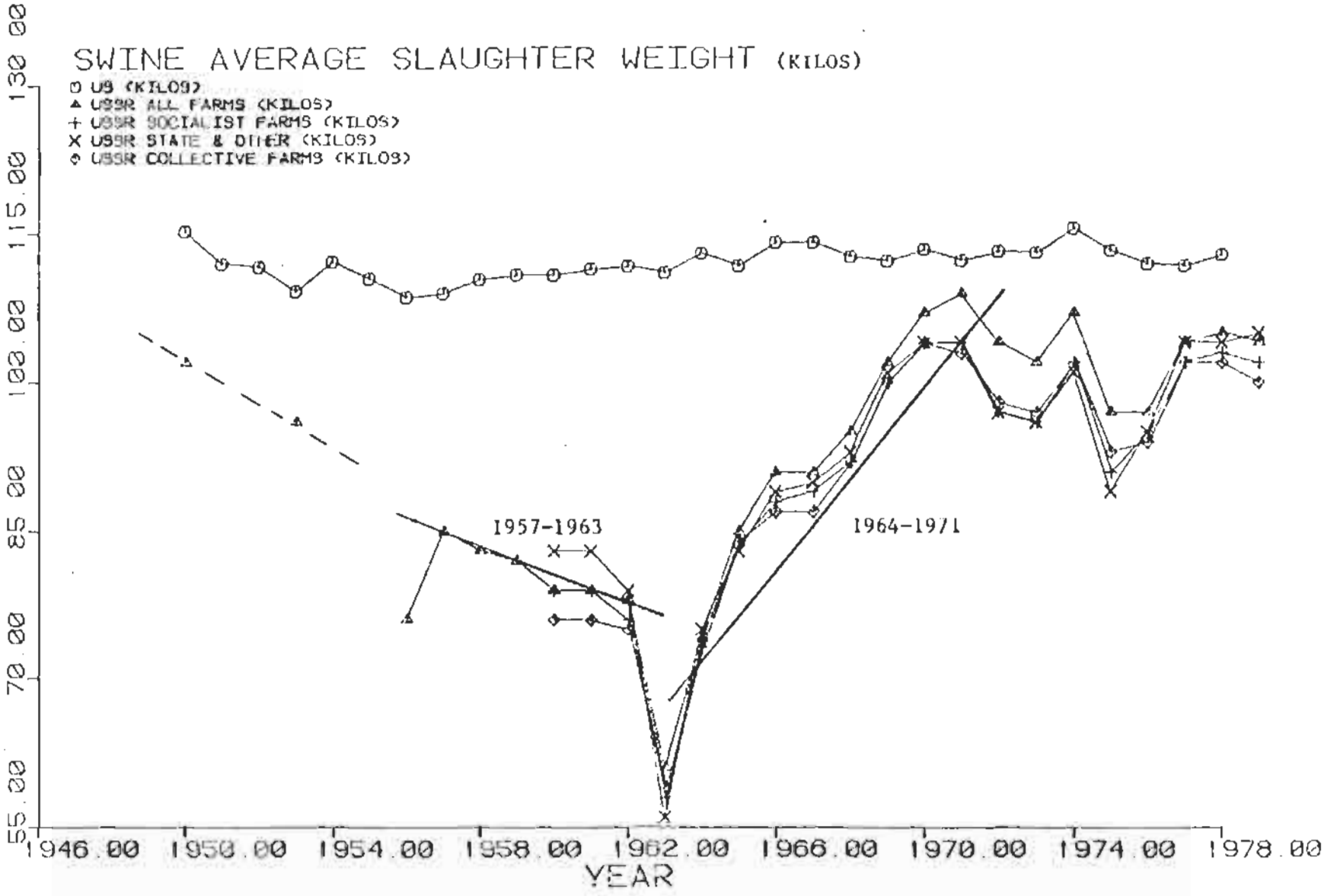

SWINE AVERAGE SLAUGHTER WEIGHT (KILOS)
US (KILOS)
USSR ALL FARMS (KILOS)
USSR SOCIALIST FARMS (KILOS)
USSR STATE & OTHER (KILOS)
USSR COLLECTIVE FARMS (KILOS)
1957-1963
1964-1971
55.00
70.00
85.00
100.00
115.00
130.00
1946.00
1950.00
1954.00
1958.00
1962.00
1966.00
1970.00
1974.00
1978.00
YEAR

FIGURE 7.2

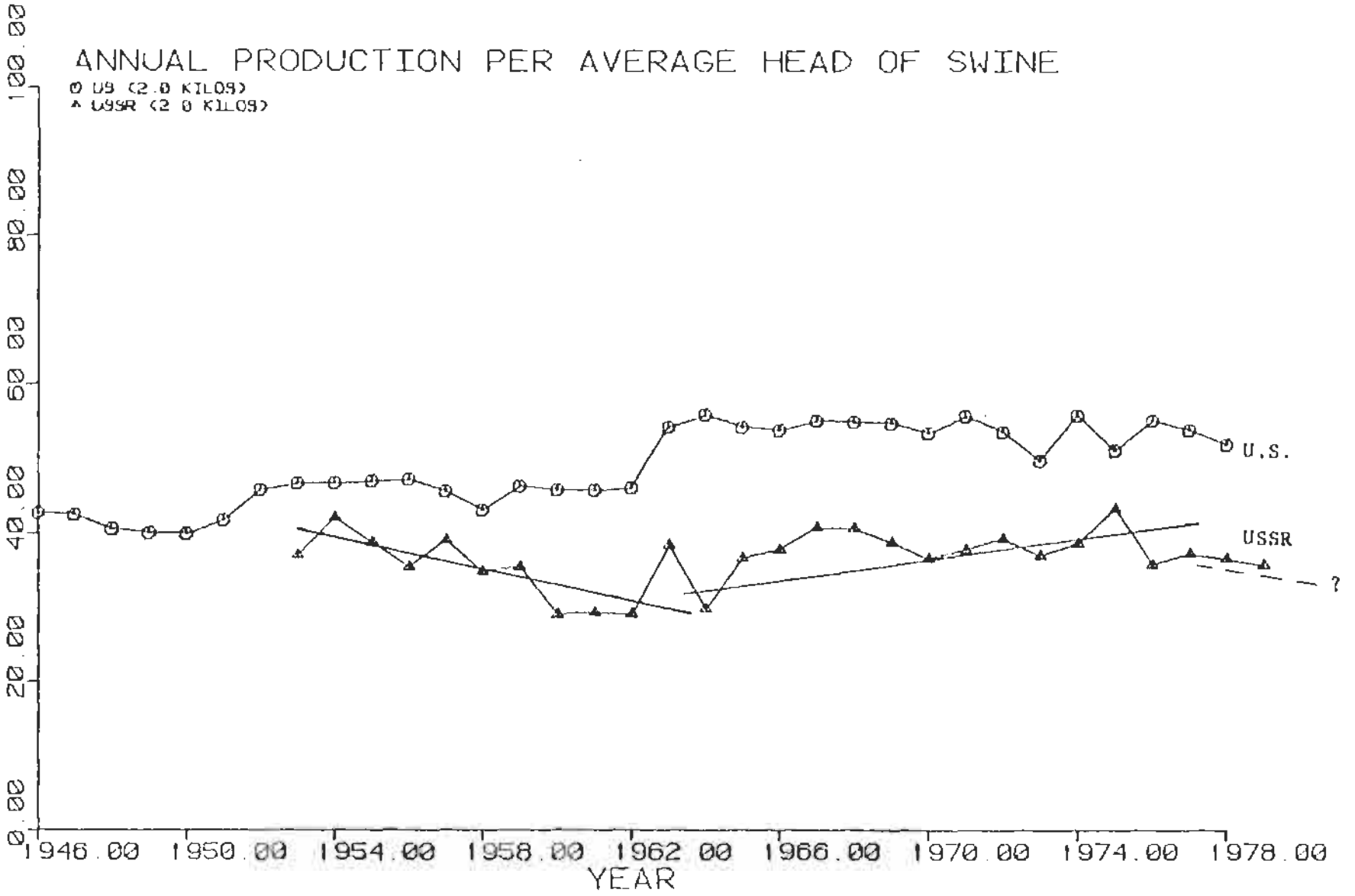
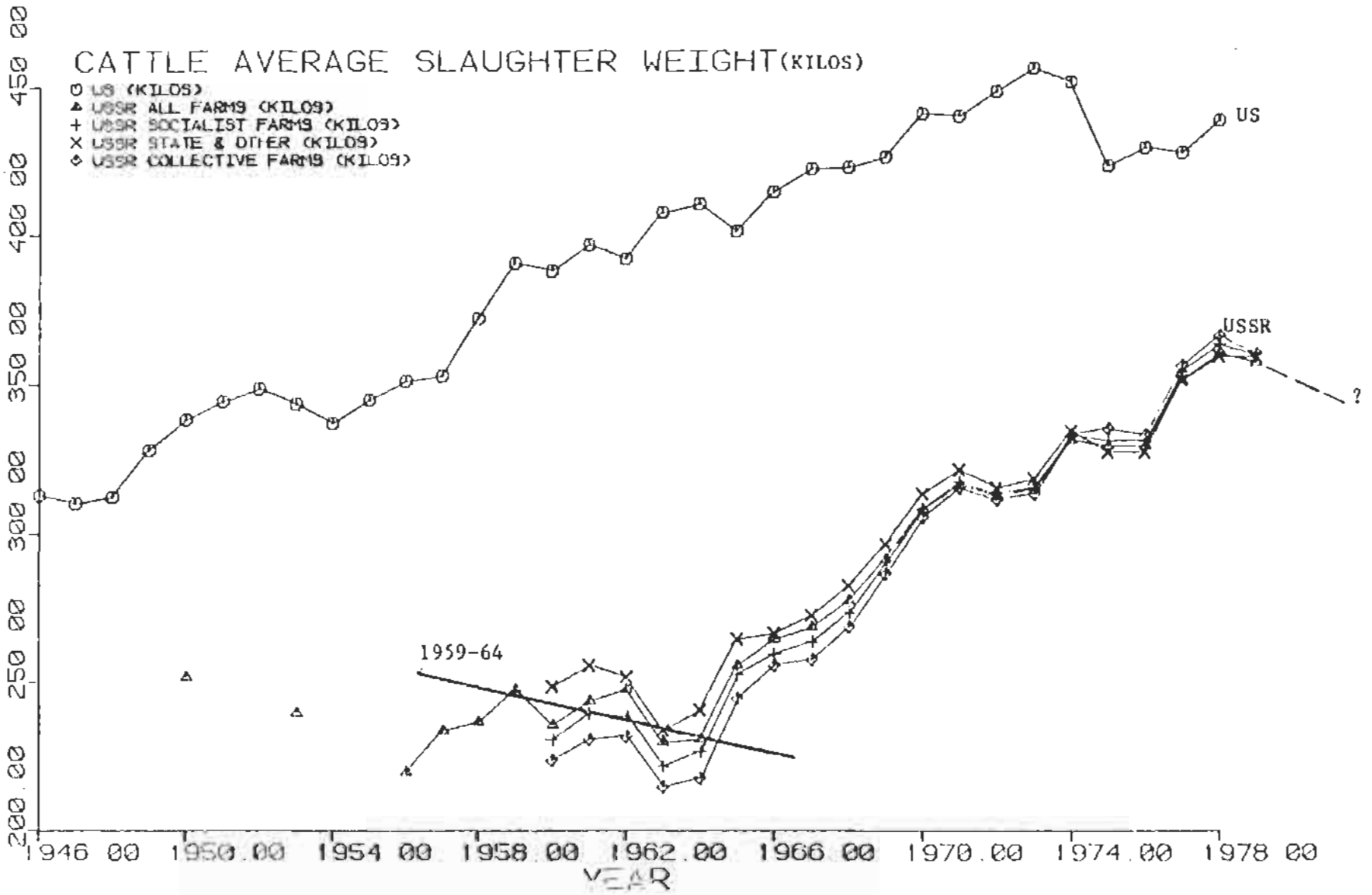

ANNUAL PRODUCTION PER AVERAGE HEAD OF SWINE
@ US (2.0 KILOS)
^ USSR (2.0 KILOS)
100.00
80.00
60.00
40.00
20.00
0.00
1946.00
1950.00
1954.00
1958.00
1962.00
1966.00
1970.00
1974.00
1978.00
YEAR
U.S.
USSR
?

FIGURE 7.3

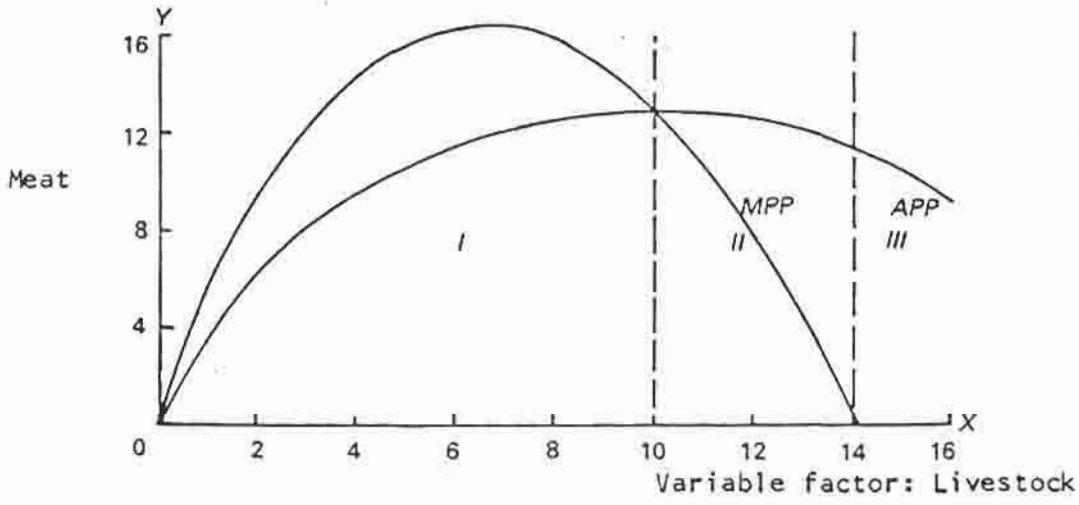

CATTLE AVERAGE SLAUGHTER WEIGHT(KILOS)
US (KILOS)
USSR ALL FARMS (KILOS)
USSR SOCIALIST FARMS (KILOS)
USSR STATE & OTHER (KILOS)
USSR COLLECTIVE FARMS (KILOS)
US
USSR
?
1959-64
200.00
250.00
300.00
350.00
400.00
450.00
1946.00
1950.00
1954.00
1958.00
1962.00
1966.00
1970.00
1974.00
1978.00
YEAR

Has the Soviet Union Kept Too Many Underfed Animals?

A focal question posed in the proposal for this study was "Has the USSR maintained an inventory system that is too extensive?" This question was posed in the context of asking whether a planning system that might avoid the wild downward sprialing "price-liquidation" of the market system might err too far in the other direction.

Presumedly, there would be "too many animals" for a given feed base (i.e., excessive intensivity) were fewer animals able to produce more meat, or more value of meat (entering quality). (This would be a sufficient condition; more technically, the determination of whether livestock numbers are excessive requires prices; that the value of the marginal product of inventories be less than the margined resource (including feed) cost of maintaining them.)

FIGURE 7.4



THE CLASSICAL PRODUCTION FUNCTION AND THE THREE STAGES OF PRODUCTION

Fixed factor: Feed

Intermediate micro economic theory presents a simple way of thinking about this problem. Figure 7.4 depcits the stylized marginal-average product variant of a production function relationship involving one variable factor against the background of a fixed factor(s). To concentrate on the inventory decision, we can interpret the variable factor in this case to be livestock inventories and the fixed (for themoment) factor to be feed resources. Figure 7.4 illustrates that in a general production relationship it is possible to use too much of the variable factor (i.e., maintain too many livestock) so that less production is associated with more animals (given fixed feed) and could be "more with less." This zone "of irrationality", III in Figure 7.4, exists independent of prices. Production is also irrational if there are too few animals, so that feed is overproduced. (Zone II.) Inventories can also be non-optimal, even though the marginal products of both livestock and feed are positive (in Zone II) if their marginal product, are not "in line" with input prices.

In a rather rare Soviet publication, Meiendorf (1976) uses the above diagram in reference to the question of the optimal size of the Soviet livestock herd. There are several problems in applying the model for a definitve empirical answer to the question of whether the Soviets have retained too many livestock, in the sense that could have produced more meat with fewer.

Among agricultural economists there seems a sense that such situations do exist, without any apparent analytical literature that they do. For instance there is a general sense that areas of traditional animal husbandry in Africa are "overgrazed" and "over populated". As a tangential result of some empirical work done by Clayton (1980) it appears that the Soviet livestock inventory may be "large" relative to some international comparisons.

One way to use Figure 7.4 would be to say that if increases in inventory ever resulted in decreases in meat, this is irrational. The problem is that

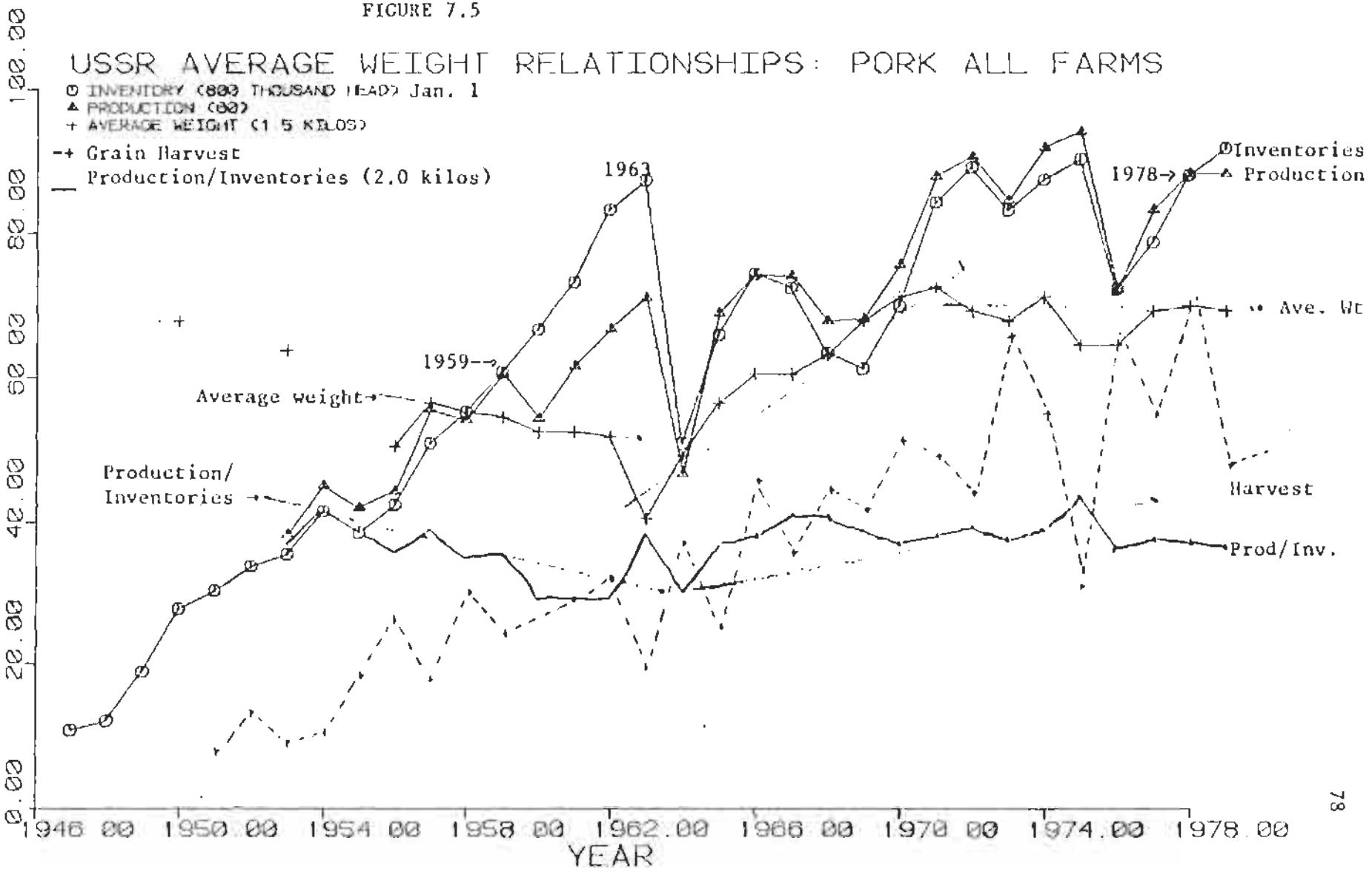
Figure 7.4 is too static. Meat is only one of two joint products; meat and the inventory-capital stock itself. U.S. time series reveal many years in which annual time series show decreases in production accompanied by increases in inventory, but also increase in production a year later. The approach taken below to argue that Soviets livestock management was "too extensive" prior to 1965-66 because of the following: (1) Production and inventory changes are examined over several years time; (2) the Soviet literature itself has argued the case.

An Examination of Swine and Cattle Time Series in the Khruschev and Brezhnev Periods: Inventories, Production, and Slaughter Weights.

Pork

Examination of time series of Soviet and American swine inventories, pork production, and average slaughter weight reveals two conclusions: (1) The Soviet swine inventory-pork production relationship seems to be existed in two distinct forms. The first is the period 1957-1963 when pork production became increasing extensive. The end of this period, and the beginning of an intensive period came sometime after the 1963 harvest debacle decimated swine numbers and set up the ouster of Khruschev in 1964. Beginning in 1977 or 1978 some of the same former extensive patterns have again begun to emerge. (2) The period of extensive production is related to a tendency of Soviet socialist (state and collective) farms to be slow to liquidate inventories. This slowness , relative to Soviet private livestock holdings and to American patterns, is exhibited in the relationship of swine inventory accumulation and liquidation to changes in pork production. While it cannot be claimed absolutely that in periods of extensive production, Soviet swine herds have had "negative marginal product", there is evidence of this, reflected also in Soviet discussions of the need for more intensive production, for reasons of cost and feed efficiency, especially when the cost of feed

FIGURE 7.5


USSR AVERAGE WEIGHT RELATIONSHIPS: PORK ALL FARMS
INVENTORY (000 THOUSAND HEAD) Jan. 1
PRODUCTION (000)
AVERAGE WEIGHT (1.5 KILOS)
Grain Harvest
Production/Inventories (2.0 kilos)
1963
1978→
Inventories
Production
Ave. Wt
1959→
Average weight→
Production/
Inventories →
Harvest
Prod/Inv.
100.00
80.00
60.00
40.00
20.00
0.00
1946.00
1950.00
1954.00
1958.00
1962.00
1966.00
1970.00
1974.00
1978.00
YEAR

is considered.

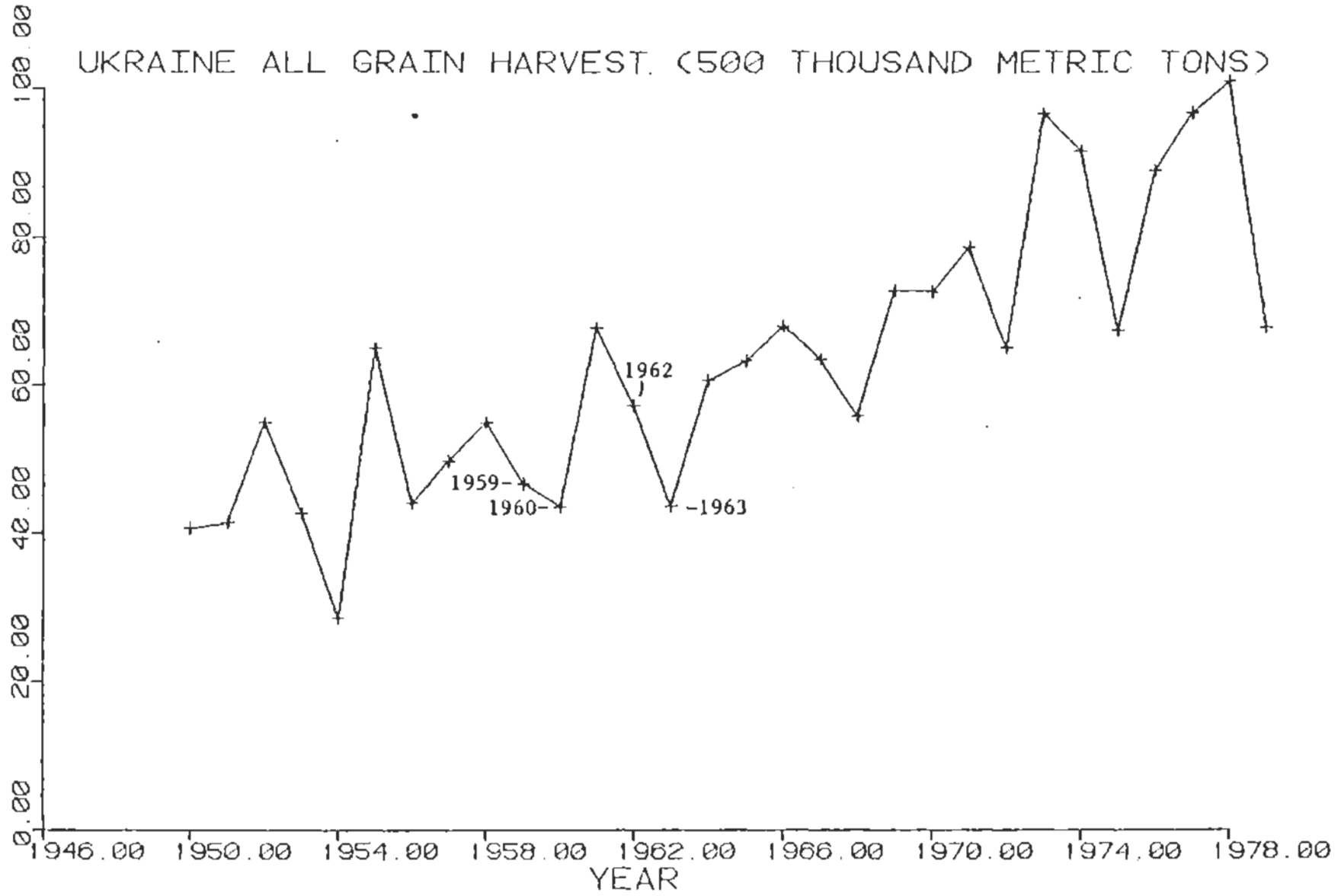
Swine

Figure 7.5, "USSR Average Weight Relationships", depcits several indices. First, available data for average slaughter weight for swine show an almost monotonic decline from 1957 to 61 kilgrams in 1963, followed by a not quite as monotonic increase in average slaughter weight to levels of over one hundred kilos; weight has never since regressed to 1956-63 levels. Secondly, inventories on "all farms" grow more rapidly than production, steadily with almost the same increment per year from 1955 to 1962. At the same time, not only does production increase more slowly, but it changes at varying rates, sometimes decreasing.

Several individual years should be singled out for examination for a phenomenon that can be compared for Soviet socialist and private farms, and the U.S. swine industry. Figure 7.5 shows two instances before 1963 in which several successive years of inventory growth finally culminate in decline of production. These declines in production are associated with disappointing harvests for the USSR as a whole, in 1957 and 1960; the decision to not liquidate inventories in these years, but rather to continue their normal growth leads to the continued decline of average slaughter weights and production per head of inventory until 1963. Each year, 1957 and 1960 represents a year of decision in which it was determined to take the swine industry further in the direction of extensive production, possibly into the irrational zone.

If it can be argued that inventories became too large, resulting in decreased production (the irrational zone of production, III) in 1958 and 1960, a year illustrating the other side of the coin may be 1968. In 1968 inventory reductions were followed in 1969 by increases in production. This happened for both the Ukraine and USSR for all categories of socialist farms for

FIGURES 7.6


UKRAINE ALL GRAIN HARVEST. (500 THOUSAND METRIC TONS)
100.00
80.00
60.00
40.00
20.00
0.00
1946.00
1950.00
1954.00
1958.00
1962.00
1966.00
1970.00
1974.00
1978.00
YEAR
1962
1959-
1960-
-1963

which data is available (though not for private farms).

Differences in inventory response to poor harvest by category of farm is best illustrated using detailed Ukrainian data for swine.

Ukrainian Collective Farms and State Farms, like the USSR All-farm category, show a continuous monotonic increase in inventories in the period 1955-63, including 1958 and 1960 when there were reductions in pork production. Private inventories behaved differently (Figures 7.7-7.10; See appendix for tabled values.)

As Figure 7.6 indicates, the Ukraine experiences two episodes of two consecutive years of harvest decline (1959 & 1960 and 1962 & 1963). In the second year of the first episode there was a response by the collective farms not through liquidation, but through attenuation of growth. In the first year (1962) of the second episode of consecutive harvest decline there was also attenuation of growth of swine inventories on both Ukrainian state and collective farms. The response to harvest failure reflected in data for private swine was however much more immediate in the form of actual inventory reduction in the first years of each episode (1959 and 1962). Private inventories thus suffered a 15% loss in 1962 and a 23% loss for 1962 and 1963 combined, while both state and collective farms suffered only a reduction in growth in 1962, then during 1963 inventory reductions of 52% for collective, and 76% for state farms.

U.S. Comparisons for Swine

In U.S. swine industry time series beginning in 1970, instances of production decreases accompanying inventory increases are common, although those of the Soviet variety are totally non-existant. Years in which U.S. pork production has declined are always associated with inventory liquidation; the production decrease is either preceded (22 years) or/and accompanied

FIGURE 7.7

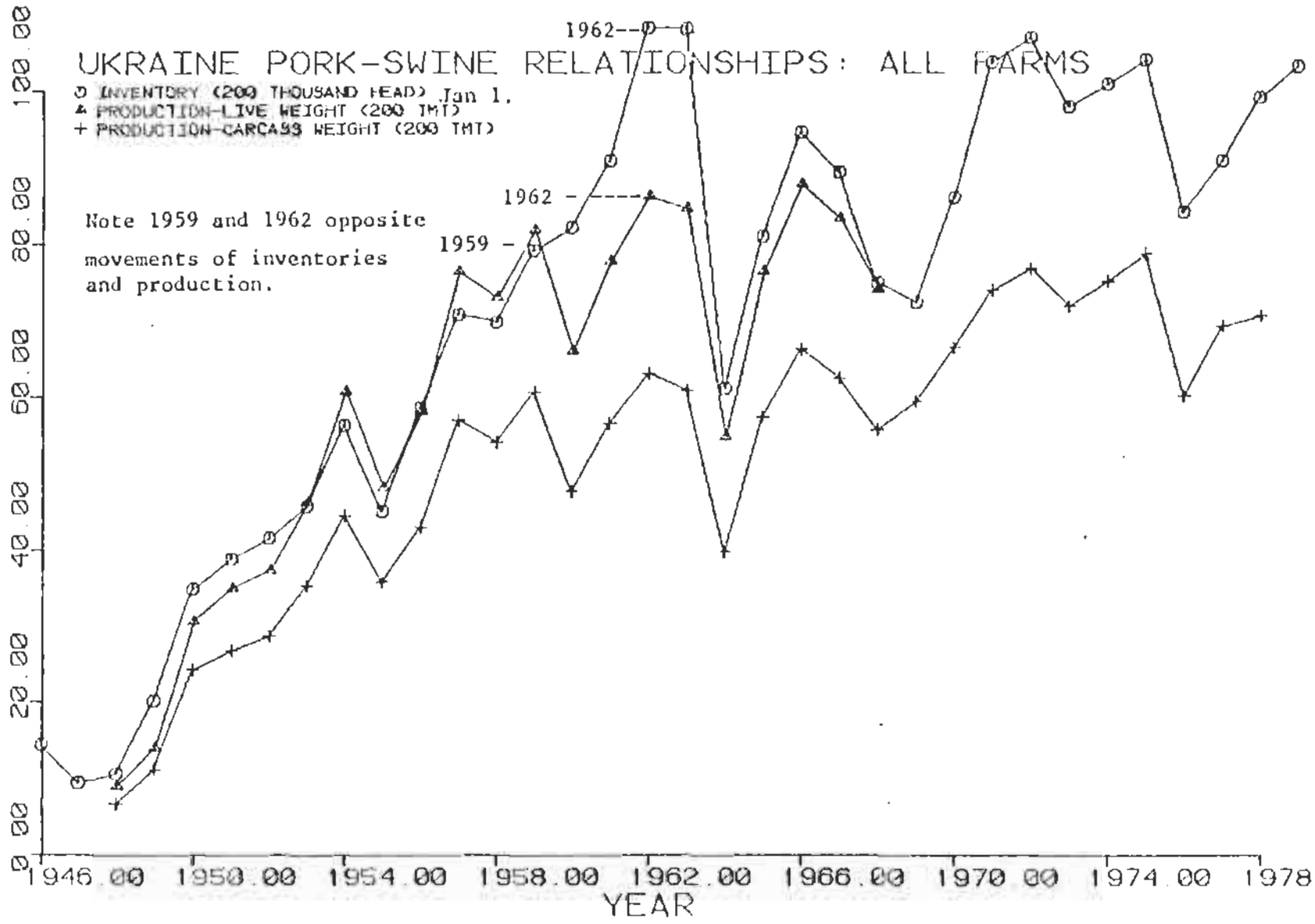

UKRAINE PORK-SWINE RELATIONSHIPS: ALL FARMS
INVENTORY (200 THOUSAND HEAD) Jan 1.
PRODUCTION-LIVE WEIGHT (200 TMT)
PRODUCTION-CARCASS WEIGHT (200 TMT)
1962--
1962 -
1959 -
Note 1959 and 1962 opposite movements of inventories and production.
0.00
20.00
40.00
60.00
80.00
100.00
1946.00
1950.00
1954.00
1958.00
1962.00
1966.00
1970.00
1974.00
1978.00
YEAR

FIGURE 7.8

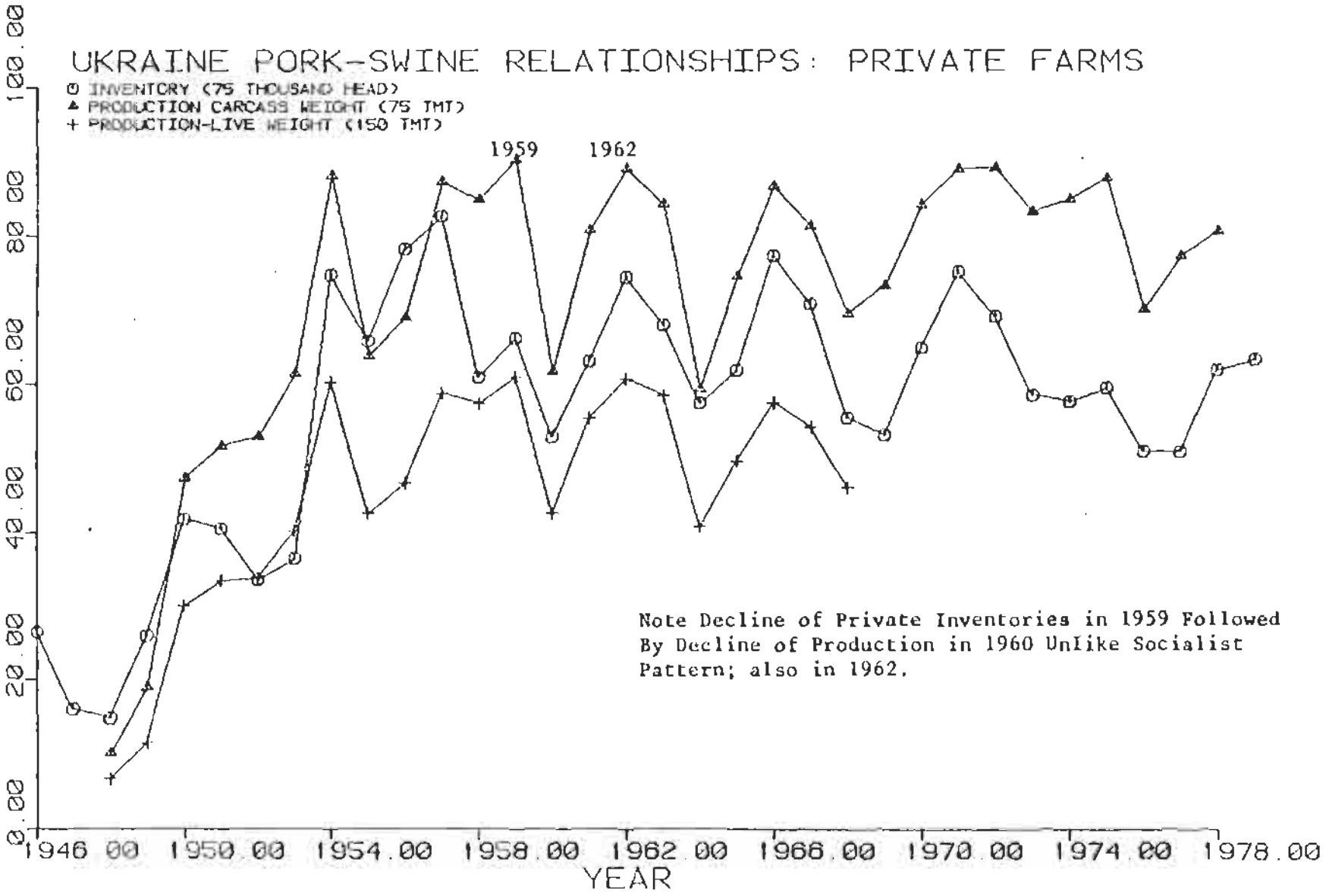
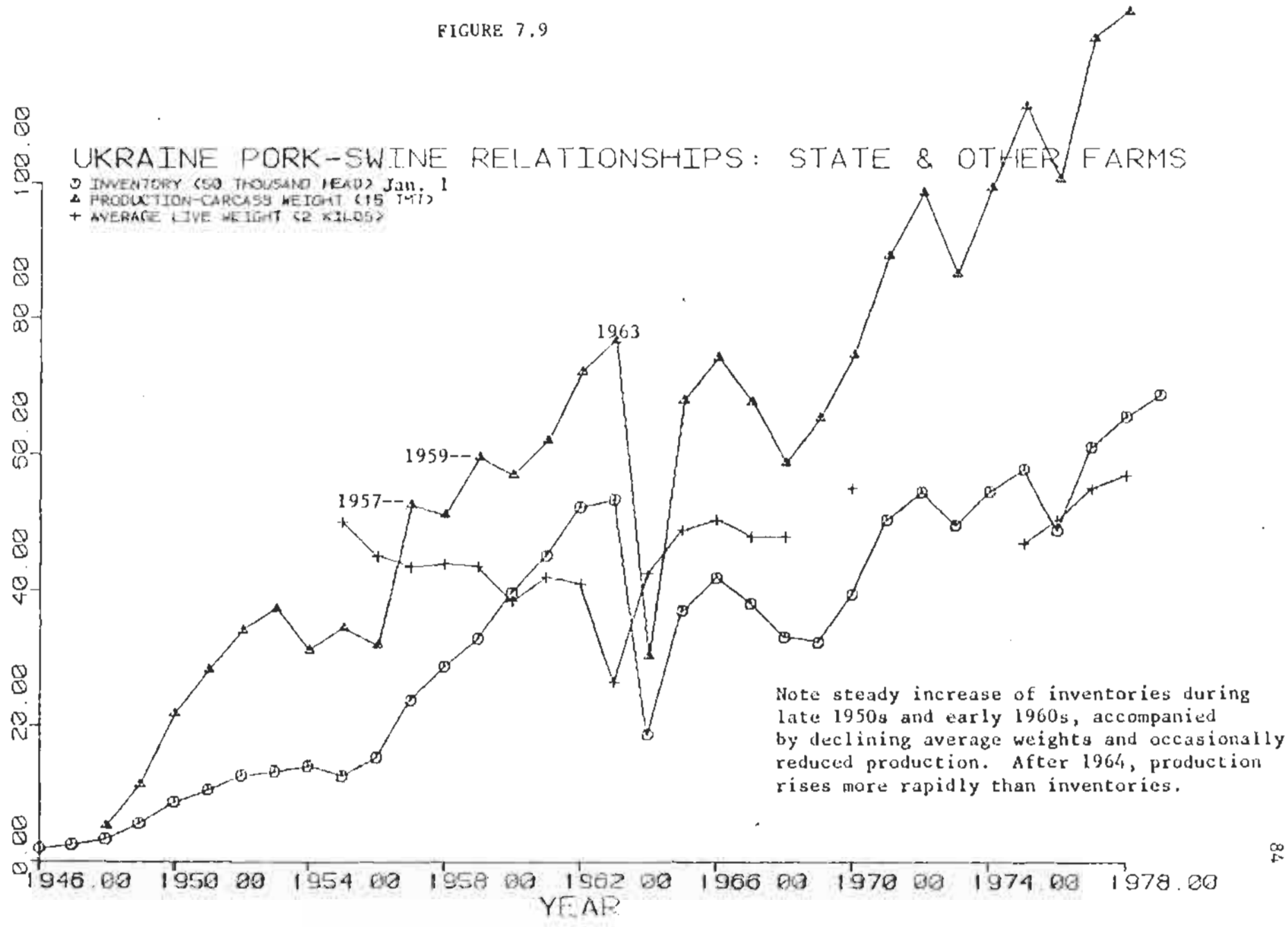

UKRAINE PORK-SWINE RELATIONSHIPS: PRIVATE FARMS
INVENTORY (75 THOUSAND HEAD)
PRODUCTION CARCASS WEIGHT (75 TMT)
PRODUCTION-LIVE WEIGHT (150 TMT)
1959
1962
100.00
80.00
60.00
40.00
20.00
0.00
1946.00
1950.00
1954.00
1958.00
1962.00
1966.00
1970.00
1974.00
1978.00
YEAR
Note Decline of Private Inventories in 1959 Followed By Decline of Production in 1960 Unlike Socialist Pattern; also in 1962.

FIGURE 7.9



Note steady increase of inventories during late 1950s and early 1960s, accompanied by declining average weights and occasionally reduced production. After 1964, production rises more rapidly than inventories.

FIGURE 7.10

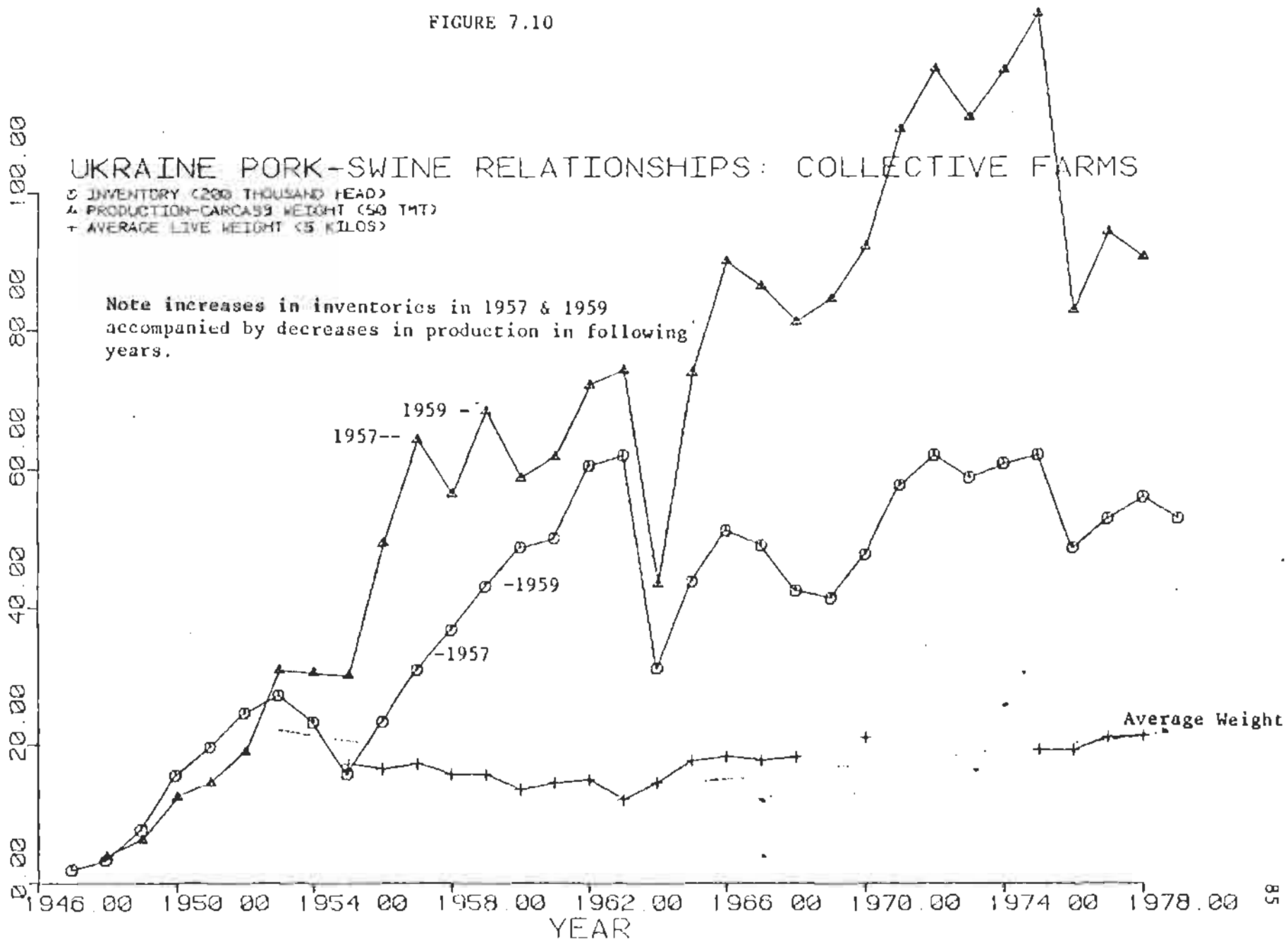
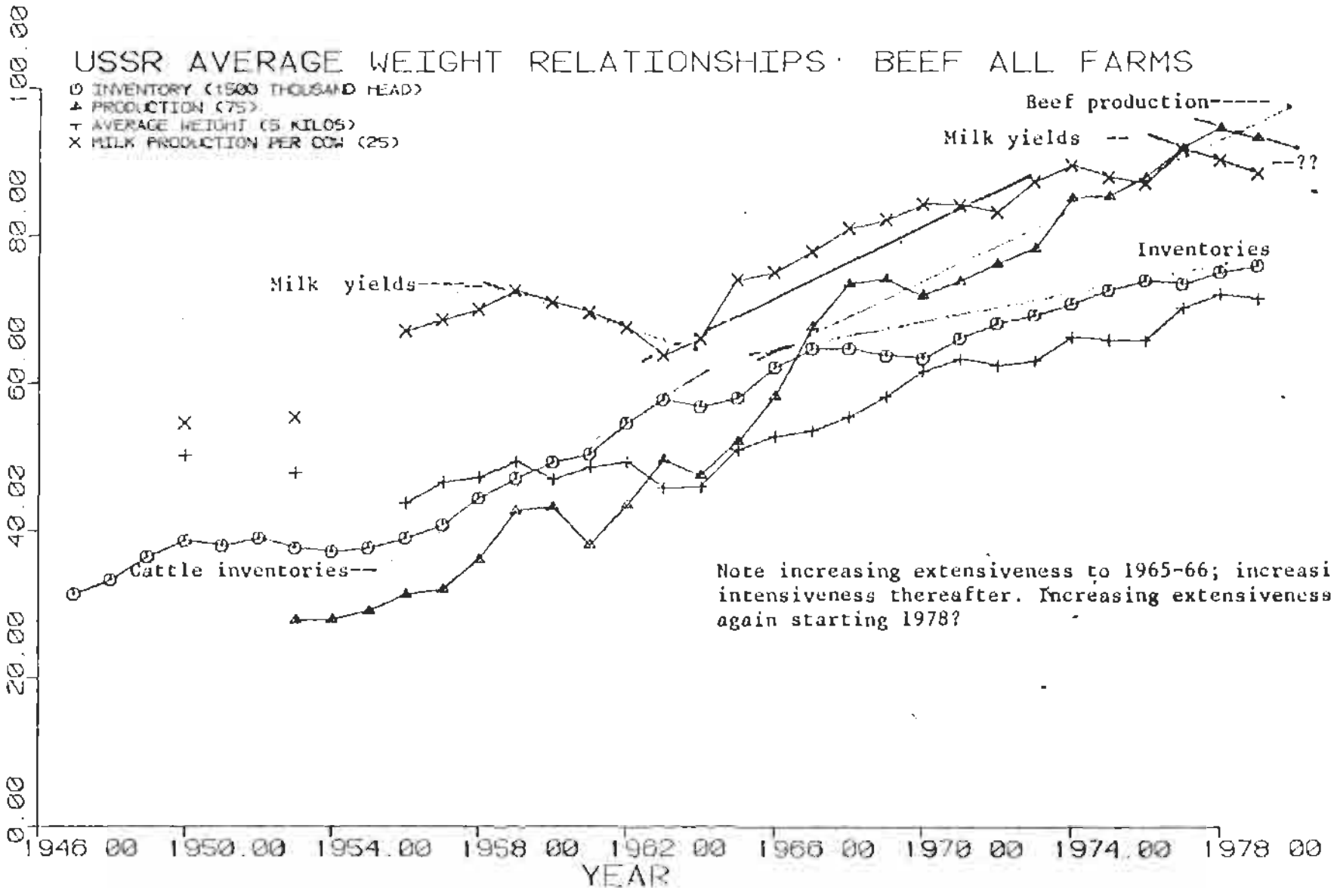

UKRAINE PORK-SWINE RELATIONSHIPS: COLLECTIVE FARMS
○ INVENTORY (200 THOUSAND HEAD)
△ PRODUCTION-CARCASS WEIGHT (50 TMT)
+ AVERAGE LIVE WEIGHT (5 KILOS)
Note increases in inventories in 1957 & 1959 accompanied by decreases in production in following years.
1959 -
1957--
-1959
-1957
Average Weight
100.00
80.00
60.00
40.00
20.00
0.00
1946.00
1950.00
1954.00
1958.00
1962.00
1966.00
1970.00
1974.00
1978.00
YEAR

FIGURE 7.11


USSR AVERAGE WEIGHT RELATIONSHIPS: BEEF ALL FARMS
INVENTORY (1500 THOUSAND HEAD)
PRODUCTION (75)
AVERAGE WEIGHT (5 KILOS)
MILK PRODUCTION PER COW (25)
Beef production-----
Milk yields --
--??
Inventories
Milk yields-----
Cattle inventories--
Note increasing extensiveness to 1965-66; increasing intensiveness thereafter. Increasing extensiveness again starting 1978?
100.00
80.00
60.00
40.00
20.00
0.00
1946 00
1950.00
1954.00
1958 00
1962 00
1966 00
1970 00
1974.00
1978 00
YEAR

(4/12 years) by a year of inventory reduction. (See Appendix Tables and Figures.) In no instance did reduction in pork production occur unaccompanied by liquidation. In fact, long periods of uninterupted swine inventory accumulation have beenrare in the U.S., and cannot rival in length the Soviet eight-year accumulation in 1956-63. The longest periods in the U.S. were six years in 1902-1907 and five in the 1890s the next longest such period, four years, has occurred recently,beginning in 1976.

USSR Cattle Relationships: Production, Inventories, Average Slaughter Weights, and Milk Yields

Figure 7.11 shows the same sort of trends among the various indices for Soviet cattle as are shown in Figure 7.5 for swine. Cattle numbers on all farms grew monotonically from the mid-1950s to 1963. This growth of inventory was accompanied by a constant decrease in milk yields per cow in the period 1959-63, and a (non-constant) decline of average slaughter weight from 1959 to 1963 and 1964. Production decreased substantially in one period, 1960-61, during which inventories maintained continued growth.

Without elaborate comparison, U.S. data for cattle inventories, beef and veal production, and average slaughter weights are produced in figures and tables in the Appendix (See Appendix Index).

The Change from Extensive to Intensive Livestock Management

The case that events of 1959-60 did actually represent a move into the "irrational zone III" of Figure 7.4 is that these were years which saw production fall accompanied by declines in average slaughter rates. Although inventories increased, several subsequent years, until the "crash" in 1963, saw depressed slaughter weights and lower ratios of meat production to inventories.

The episode of growing extensiveness of the late 1950s and early 1960s can be related to Khruschev's May 1957 speech in which he goaded Soviet producers to overtake the U.S. in three to four years. (Medvedev, 1976.) The pressure of this goal led to a variety of undersirable actions by local decision makers, including in some instances, the slaughter of breeding stock for short run achievement. These actions must have reinforced the tendency of the time for central participation in production decisions, and reinforced planned inventory targets. That growth in socialist inventories was so unwavering and inflexible - whereas the private sector acted somewhat as a buffer - seems again proof of the nonoptimality of this policy of extensiveness. This hypothesis is supported by a number of Soviet sources as well.

In each of the years 1966, 1967, 1968 and 1969 there were reductions in USSR level data of either cattle or swine, or both. 1965 and 1967 were each years of harvest decline (18% and 6% below trend), but a feature of the liquidations of these years is that inventory reductions were accompanied by increases, not decreases in average weights for both swine and cattle. A new era had obviously arrived.

A number of events mark the turn; the disastrous year, 1963, led to Khruschev's ouster. If there were a tendency to return to earlier inventory policies, the 1965 harvest put an end to them. The March 1965 Party Plenum on Agriculture brought new policies including an official move away from

central determination of production (including inventory) targets, a new interest in quality of agricutlural goods, vastly larger investment in provision of off-farm inputs. The creation of the Soviet mixed feed industry is commonly dated to 1965.

The agricultural economics literature of the era gives some idea of the technical calculations that went into the change (e.g. Kutikov, 1963; second edition 1971). Kutikov (1971, p. 166) argued the advantage of marketing cattle at 18 months at 400 kilos or 24 months at 500 kilos, rather than the "traditional" two years at 240-250 kg. Although composite colorific feed use per kilo increases at these higher weights, the cost of the type of feed that can be used declines. Also (p. 156), some advantage of greater dressing percentage of carcasses (including slaughter fat in the Soviet definition of uboinyi ves could be gained; See Gray 1979).

In discussing swine, Kutikov presented data (1963, p. 247) to the effect that swine should be fed to no less than 100-110 kilos for acceptable cost, and the cost reduction prevailed up to 120-130 kg. According to Kutikov (1963, p. 247), while feed units per kilo of gain of live weight increase with heavier animals, the amount of feed per gain in terms of Soviet carcass weight decreases. Also, according to Kutikov, one consideration in calculating the true feed conversion for pork was the substantial expenditure of feed to maintain sows; the lighter pigs are marketed, the greater is the percentage (30-35%) for this maintenance.

So altogether, Soviet agricultural economics in the years at the end of Khruschev's reign seemed to turn to broader effectiveness measures cost statistics in determination of optimal intensity of livestock managment. There is a difference between this and reliance upon the optimization of simplistic feed conversion coefficients. The latter do not consider either cost of units of feed, which is really heterogeneous, or of quality of meat.

It is also of interest that these writings of Kutikov's which appear to be among the first on the subject, originate in the Ukraine, and the Ukrain data appears to lead the aggregate USSR data in the advent of planned decline of swine numbers (1966 versus 1967).

Reappearance of a Tendency Toward Extensiveness?

It is too early to tell if in the late 1970s and early 1980s there is a reversion to the inventory retention policies of twenty years before. There are some indications that there may be, and as more 1980 data becomes available, it bears watching. Conditions, with two consecutive harvest failures in 1979 and 1980, do resemble those of 1959 and 1960. A difference is that livestock are much better fed now than 20 years ago, and average slaughter weights are higher (swine 25%). These indications (refer to Figures 7.5-7.11) of increase extensiveness and possibly change in policy exist:

(1) Milk yields per cow have declined in three consecutive years: 1978, 1979, and 1980. (The last for state and collective farms along from Ekonomicheskaya gazeta, monthly reports throughout 1980.)

(2) The average weight for cattle sold to the state for slaughter fell in 1979 and it has for state and collective cattle in 1980.

(3) These reductions in animal productivity caused a reduction in beef production in 1979 (Figure 7.11) and beef production on state and collective farms in 1980 (Ekon. gaz.). Growth of cattle inventories accompanied this decline in beef and milk production in the socialist sector in 1979, and apparently also in 1980.

(4) Regarding swine, there have also been indications of growing extensiveness. In USSR data, 1978 increases in swine inventories on all farms were followed by a 1979 stand-still of pork production and decline of

average weights (Figure 7.5). The same occured in Ukrainian data; 1977 inventories increased and 1978 production decreased, as weights stood still.

(5) The Soviet press has carried articles which appear to be a part of a current debate about livestock intensiveness. On January 16, 1980 a husbandry specialist (Iaganshin) wrote complaining about directives requiring growth of inventories. He made two points, among others: (1) Central authorities were again violating the farmer edict against interference in local creation of the profin plan by giving orders for the increase of cow numbers. (2) These orders are wrong, at least in the short run until the feed base and other complementary investments are built up. For instance, (apparently in his raion) in 1979, milk production would have risen 155 tons on the basis of greater herd size, except that an overall decline in yields caused total production to decline 188 tons. He mentions an estimate that insufficient culling of the 4% of cows which become non-productive monthly costs 97 thousand rubles per year.

Another article in Pravda (Smetanin) in May 1980 critized the increase in livestock in the current tenth five year plan, and the drop in a number of indices of productivity.

It is certain that reversals in extensive livestock management and productivity were occuring prior to the U.S. January 4 embargo announcement, but it is interesting to speculate that continued failure of inventory reductions to occur in 1980 represented central authorities disinclination to bend before the embargo - even if rational economics had indicated it even before January 1980.

Section 8: Thoughts on the Welfare Implications of Planned Soviet and US Market Livestock Inventory Cycles

Although the livestock cycle is commonly regarded as a source of market failure, a search of the literature has revealed no western attempt to measure social welfare loss of the cycle, like existing measurements of the welfare-loss of monopoly. No such analysis of the cycle is made here, either. Western agricultural economists, including livestock economists, generally point to increased production costs as a demonstrable result of the fact that producers face uncertain output prices. Approached from another point of view, it would seem possible to quantify the welfare loss of large variations in meat supply from the consumption side. I.e., given diminishing marginal utility, the same amount of meat would provide less utility if provided unevenly over time, than if provided at a constant rate.

It is fairly obvious from the discussion of Section 4 that the Soviet system has not experienced any periods of multi-year self-induced liquidation of inventories, such as occur in the U.S. Thus meat supply and prices have not varied for the "cobwebb model" reasons.

However, whereas prices may be more certain for the Soviet producer of meat, supplies of feed are not: as a consequence, although inventories may not have declined for long periods, average weights have. Inventory reduction may well have been a preferred response to these situations of tight reserves of feedstuffs; before collosal one-year liquidations did finally occur. Flexible prices of feed and output and feeders, may have helped in these situations. Fixed prices in the face of variable climatic factors have other disadvantages as well. With variable climate, regional supplies of feed and feeder animals change: prices could signal

the need for more interregional trade in livestock intermediate products (feed and feeder animals) to adjust to this. (See Gray, 1979.) The ill consequences of the lack of seasonally varied prices for livestock products has already been mentioned.

A crude attempt to examine the question of compensating supply of competing meats for beef in the U.S. cycles has been made and the results are shown in Table 8.1. Similar correlations of trend deviations for various Soviet livestock products are presented in Table 8.2. We think of flexible prices as providing an incentive for partial substitution in production of goods which can substitute for each other in consumption. Table 8.1 shows that meat imports do rise when beef production is in the low part of its cycle; pork and poultry deviations from trend are also negatively correlated with the beef cycle, if non-significantly in this crude trend approach. The interesting thing is that for the Soviet Union there are also negative correlations among types of meat and livestock products (including milk and eggs). Interestingly, the only significant negative correlations are betwen poultry and eggs on one hand, and mutton and milk production on the other.

TABLE 8.2

UNITED STATES CORRELATIONS OF TREND DEVIATIONS OF COMPETING LIVESTOCK PRODUCTS

CORRELATION COEFFICIENTS / PROB > |R| UNDER HO:RHO=0 / N = 32

	BFANDVLR Beef & Veal	POULTRYR Poultry	PORKR Pork	MUTTONR Mutton	NETMR Net Imports - All Meat
BFANDVLR	1.00000	-0.09685	-0.06284	0.08829	-0.50329
RESIDUALS	0.0000	0.5980	0.7326	0.6309	0.0033
POULTRYR	-0.09685	1.00000	0.20737	-0.30040	0.31381
RESIDUALS	0.5980	0.0000	0.2548	0.0948	0.0803
PORKR	-0.06284	0.20737	1.00000	0.23206	0.52322
RESIDUALS	0.7326	0.2548	0.0000	0.2012	0.0021
MUTTONR	0.08829	-0.30040	0.23206	1.00000	0.26640
RESIDUALS	0.6309	0.0948	0.2012	0.0000	0.1405
NETMR	-0.50329	0.31381	0.52322	0.26640	1.00000
RESIDUALS	0.0033	0.0803	0.0021	0.1405	0.0000

TABLE 8.1

USSR CORRELATIONS OF TREND DEVIATIONS OF COMPETING LIVESTOCK PRODUCTS

CORRELATION COEFFICIENTS / PROB > |R| UNDER HO:RHO=0 / N = 27

	EGGALR EGGS	AMTALR ALL MEAT	MLKALR MILK	BEFALR BEEF	PRKALR PORK	MUTALR MUTTON	PTYALR POULTRY
EGGALR	1.00000	0.29594	-0.42211	-0.02315	0.07494	-0.53858	0.92914
RESIDUALS	0.0000	0.1339	0.0283	0.9088	0.7103	0.0038	0.0001
AMTALR	0.29594	1.00000	0.30732	0.38773	0.85328	0.14898	0.26266
RESIDUALS	0.1339	0.0000	0.1189	0.0457	0.0001	0.4583	0.1856
MLKALR	-0.42211	0.30732	1.00000	0.20411	0.37144	0.50526	-0.50046
RESIDUALS	0.0283	0.1189	0.0000	0.3072	0.0564	0.0072	0.0079
BEFALR	-0.02315	0.38773	0.20411	1.00000	-0.02833	-0.19433	-0.12087
RESIDUALS	0.9088	0.0457	0.3072	0.0000	0.8884	0.3314	0.5481
PRKALR	0.07494	0.85328	0.37144	-0.02833	1.00000	0.26082	0.06142
RESIDUALS	0.7103	0.0001	0.0564	0.8884	0.0000	0.1888	0.7609
MUTALR	-0.53858	0.14898	0.50526	-0.19433	0.26082	1.00000	-0.44716
RESIDUALS	0.0038	0.4583	0.0072	0.3314	0.1888	0.0000	0.0194
PTYALR	0.92914	0.26266	-0.50046	-0.12087	0.06142	-0.44716	1.00000
RESIDUALS	0.0001	0.1856	0.0079	0.5481	0.7609	0.0194	0.0000

Residuals are about linear trend: USSR - 1953-1978; USA - 1947-78.

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Table A1

SOVIET LIVESTOCK INVENTORIES

	YEAR	COWS	OTHERCAT	HOGS	SOWS	SH&GTS	POULTRY	AUNITS
1	1946	22.9	24.7	10.6	.	70.0	131.7	61.234
2	1947	23.0	24.0	8.7	.	69.3	.	.
3	1948	23.8	26.3	9.7	.	76.8	.	.
4	1949	24.2	30.6	15.2	.	85.6	.	.
5	1950	24.6	33.5	22.2	.	93.6	.	.
6	1951	24.3	32.8	24.4	.	99.0	456.2	84.124
7	1952	24.9	33.9	27.1	.	107.6	.	.
8	1953	24.3	32.3	28.5	.	109.9	.	.
9	1954	25.2	30.6	33.3	.	115.5	400.4	88.408
10	1955	26.4	30.3	30.9	.	113.0	.	.
11	1956	27.7	31.1	34.0	.	116.2	.	.
12	1957	29.0	32.4	40.8	.	119.8	432.1	93.702
13	1958	31.4	35.4	44.3	.	130.1	449.7	99.834
14	1959	33.3	37.5	48.7	.	139.2	482.8	105.486
15	1960	33.9	40.3	53.4	42.2	144.0	514.3	109.786
16	1961	34.8	41.0	58.7	47.0	140.3	515.6	111.252
17	1962	36.3	45.8	66.7	.	144.5	542.6	118.492
18	1963	38.0	49.0	70.0	.	146.4	550.4	123.148
19	1964	38.3	47.1	40.9	.	139.6	449.1	110.272
20	1965	38.8	48.3	52.8	.	130.6	456.2	113.704
21	1966	39.3	54.1	59.6	41.1	135.3	490.7	120.984
22	1967	40.2	56.9	58.0	38.1	141.0	516.3	124.166
23	1968	40.4	56.8	50.9	33.6	143.9	528.4	122.708
24	1969	40.1	55.6	49.0	33.0	146.2	546.9	121.718
25	1970	39.4	55.8	56.1	36.2	135.8	590.3	122.596
26	1971	39.8	59.4	67.5	40.4	143.4	652.7	130.484
27	1972	40.0	62.4	71.4	40.2	145.3	686.5	134.420
28	1973	40.6	63.4	66.6	39.5	144.7	700.0	134.190
29	1974	41.4	64.9	70.0	40.3	148.5	747.7	137.944
30	1975	41.9	67.2	72.3	40.2	151.2	792.4	141.678
31	1976	41.9	69.1	57.9	37.1	147.1	734.4	136.528
32	1977	42.0	68.3	63.1	37.6	145.3	796.0	138.360
33	1978	42.6	70.1	70.5	40.4	146.6	882.3	143.916
34	1979	43.0	71.1	73.5	43.0	148.1	946.9	147.158
35	1980	43.3	71.8	73.9	.	149.4	980.9	148.708

Million head. All categories of farm. Aggregate animal units achieved using these weights: cows, 1; cattle other than cows, 0.6; sheep and goats, 0.1; swine, 0.3; poultry, 0.02; horses (not shown), 1.0. Cows on feed are excluded in the cow category after 1966 and added to other cattle; for a series including cows on feed in cow numbers to 1971 see Sel'skoe Khoziaistvo SSSR, 1971 and Chistlennost' Skota. Data elsewhere for cows by category of farm include cows on feed through 1971. All categories of farm includes slaughter house and government procurement system inventories.

Table A2:

CHANGES IN LIVESTOCK INVENTORIES ON ALL SOVIET FARMS (%)

YEAR	P11	P21	P12	P22	P13	P23	P14	P24	P15	P25	P16	P26	P17	P27
	Cows		Other Cattle		Hogs		Sows		Sheep & Goats		Poultry		Animal Units	
1946	0.4367	3.9301	-2.8340	6.4777	-17.925	-8.491	.	.	-1.0000	9.714	.	.	.	.
1947	3.4783	5.2174	9.5833	27.5000	11.494	74.713	.	.	10.8225	23.521	.	.	.	.
1948	1.6807	3.3613	16.3498	27.3764	56.701	128.866	.	.	11.4583	21.875	.	.	.	.
1949	1.6529	0.4132	9.4771	7.1895	46.053	60.526	.	.	9.3458	15.654	.	.	.	.
1950	-1.2195	1.2195	-2.0896	1.1940	9.910	22.072	.	.	5.7692	14.957	.	.	.	.
1951	2.4691	0.0000	3.3537	-1.5244	11.066	16.803	.	.	8.6869	11.010	.	.	.	.
1952	-2.4096	1.2048	-4.7198	-9.7345	5.166	22.878	.	.	2.1375	7.342	.	.	.	.
1953	3.7037	8.6420	-5.2632	-6.1920	16.842	8.421	.	.	5.0955	2.821	.	.	.	.
1954	4.7619	9.9206	-0.9804	1.6340	-7.207	2.102	.	.	-2.1645	0.606	.	.	.	.
1955	4.9242	9.8485	2.6403	6.9307	10.032	32.039	.	.	2.8319	6.018	.	.	.	.
1956	4.6931	13.3574	4.1801	13.8264	20.000	30.294	.	.	3.0981	11.962	.	.	.	.
1957	8.2759	14.8276	9.2593	15.7407	8.578	19.363	.	.	8.5977	16.194	4.073	11.733	6.544	12.5760
1958	6.0510	7.9618	5.9322	13.8418	9.932	20.542	.	.	6.9946	10.684	7.360	14.365	5.661	9.9685
1959	1.8018	4.5045	7.4667	9.3333	9.651	20.534	.	.	3.4483	0.790	6.524	6.794	4.076	5.4661
1960	2.6549	7.0796	1.7370	13.6476	9.925	24.906	11.374	.	-2.5694	0.347	0.253	5.503	1.335	7.9300
1961	4.3103	9.1954	11.7073	19.5122	13.629	19.250	.	.	2.9936	4.348	5.237	6.749	6.508	10.6928
1962	4.6832	5.5096	6.9869	2.8384	4.948	-38.681	.	.	1.3149	-3.391	1.438	-17.232	3.929	-6.9372
1963	0.7895	2.1053	-3.8776	-1.4286	-41.571	-24.571	.	.	-4.6448	-10.792	-18.405	-17.115	-10.456	-7.6688
1964	1.3055	2.6110	2.5478	14.8620	29.095	45.721	.	.	-6.4470	-3.080	1.581	9.263	3.112	9.7142
1965	1.2887	3.6082	12.0083	17.8054	12.879	9.848	.	.	3.5988	7.963	7.562	13.174	6.403	9.2011
1966	2.2901	2.7990	5.1756	4.9908	-2.685	-14.597	-7.299	-18.248	4.2129	6.356	5.217	7.683	2.630	1.4250
1967	0.4975	-0.2488	-0.1757	-2.2847	-12.241	-15.517	-11.811	-13.386	2.0567	3.688	2.344	5.927	-1.174	-1.9716
1968	-0.7426	-2.4752	-2.1127	-1.7606	-3.733	10.216	-1.786	7.738	1.5983	-5.629	3.501	11.715	-0.807	-0.0913
1969	-1.7456	-0.7481	0.3597	6.8345	14.490	37.755	9.697	22.424	-7.1135	-1.915	7.936	19.345	0.721	7.2019
1970	1.0152	1.5228	6.4516	11.8280	20.321	27.273	11.602	11.050	5.5965	6.996	10.571	16.297	6.434	9.6447
1971	0.5025	2.0101	5.0505	6.7340	5.778	-1.333	-0.495	-2.228	1.3250	0.907	5.178	7.247	3.016	2.8402
1972	1.5000	3.5000	1.6026	4.0064	-6.723	-1.961	-1.741	0.249	-0.4129	2.202	1.966	8.915	-0.171	2.6216
1973	1.9704	3.2020	2.3659	5.9937	5.105	8.559	2.025	1.772	2.6261	4.492	6.814	13.200	2.798	5.5801
1974	1.2077	1.2077	3.5439	6.4715	3.286	-17.286	-0.248	-7.940	1.8182	-0.943	5.978	-1.779	2.707	-1.0265
1975	0.0000	0.2387	2.8274	1.6369	-19.917	-12.725	-7.711	-6.468	-2.7116	-3.902	-7.320	0.454	-3.635	-2.3419
1976	0.2387	1.6706	-1.1577	1.4472	8.981	21.762	1.348	8.895	-1.2237	-0.340	8.388	20.139	1.342	5.4113
1977	1.4286	2.3810	2.6354	4.0996	11.727	16.482	7.447	14.362	0.8947	1.927	10.842	18.957	4.016	6.3588
1978	0.9390	1.6432	1.4265	2.4251	4.255	4.823	6.436	.	1.0232	1.910	7.322	11.175	2.253	3.3297
1979	0.6977	.	0.9845	.	0.544	.	.	.	0.8778	.	3.591	.	1.053	.

First Colum for each type of livestock is percent change during the year; second column is percent change over named year and following year. See previous table.

Table A3

FEED EXPENDITURE

YEAR / COLUMNS	ALL FARMS (1)	(2)	(3)	(4)	(5)	(6)	STATE AND COLLECTIVE (7)	(8)	(9)	(10)	(11)	(12)	SOURCES (13)	(14)
2FEDX1953	353				1223	138	221			820		157	HX61	HX61
2FEDX1958	472				1625	157	317			1116		187	HX61	HX61
2FEDX1959	528				1931	179	383			1379		210	HX61	HX61
2FEDX1960	537				1946	175	376			1439		205	HX61	HX61
2FEDX1961	593	3278	2673	232	2022	175	422	2090	1913	1464	255		HX	CX71
2FEDX1962	614	3499	2719	223			433	2328	1905	1450	242		HX64	CX71
2FEDX1963	523	3329	2431	206			356	2308	1707	1265	225		HX64	CX71
2FEDX1964	482	3472	2398	203			336	2386	1672	1232	216		HX64	CX71
2FEDX1965	653	3734	2785	225			464	2518	1930	1458	237		HX68	CX71
2FEDX1966	705	4076	2893	226			501	2693	1977	1465	237		HX68	CX71
2FEDX1967	751	4168	2950	229			537	2743	2020	1504	241		HX68	CX71
2FEDX1968	803	4141	3031	238			589	2759	2113	1589	252		HX69	CX71
2FEDX1969	895	3997	3072	242			679	2673	2179	1672	258		HX69	CX71
2FEDX1970	1032	3997	3282	248			788	2689	2347	1837	261		HX75	CX71
2FEDX1971	1097	4051	3445	248			837	2718	2460	1945	-1		HX75	CX71
2FEDX1973	1170	4096	3662	256			922	2798	2696	2162	264		HX75	CX71
2FEDX1974	1279	4050	3870	263			1035		2926				HX75	HX75
2FEDX1975	1189	3867	3685	251			959		2779				HX79	HX79
2FEDX1976	1174	3836	3653	255			965		2804				HX76	HX78
2FEDX1977	1430	3900	4030	273			1189		3131				HX78	HX78
2FEDX1978	1459	3795	4096	269			1210		3174				HX79	HX79
2FEDX1979	1466	3661	4032	261			1215		3124				HX79	HX79

FOOTNOTES

1. COLUMNS 1-6 REPRESENT "ALL FARMS", COLUMNS 7-12 REPRESENT "STATE AND COLLECTIVE FARMS", COLUMNS 13 AND 14 REPRESENT SOURCES FOR "ALL FARMS" AND "STATE AND COLLECTIVE FARMS" RESPECTIVELY. LISTED BELOW ARE THE INDIVIDUAL COLUMN HEADINGS AND UNITS:
   (1) AND (7) CONCENTRATE, NATURAL UNITS
   (2) AND (8) PASTURE, NATURAL UNITS
   (3) AND (9) ALL FEEDS, FEED UNITS
   (4) FEED PER ANIMAL, FEED UNITS--CENTNER UNITS
   (5) FEED EXCLUDING PASTURE, FEED UNITS
   (6) EXPENDITURE PER ANIMAL, FEED UNITS, CENTNERS
   (10) ALL FEED EXCLUDING PASTURE, FEED UNITS
   (11) ALL FEED PER ANIMAL, FEED UNITS, CENTNERS
   (12) ALL FEED EXCLUDING PASTURE PER ANIMAL, FEED UNITS, CENTNERS
2. UNITS = MILLION METRIC TONS, MMT, EXCEPT WHERE NOTED. CENTNER UNITS = 100 KILOS. NOTE: LAST DIGIT IS TO THE RIGHT OF THE DECIMAL POINT.
   EX: READ 2FEDX1953 35.3, 122.3, ETC.

(7) & (9) ARE SOVKHOZ & KOLKHOZ, AND ALSO MXP (SO NOTED IN HX75 ON; CX71 ASSUMABLE), "OTHER STATE" NOT NECESSARILY INCLUDED.

CONCENTRATES EXPENDED IN SOCIALIST SECTOR NOT CONTAINED IN HX AFTER 1973. AS A RESULT COL. (7) FOR 1974 ON IS ESTIMATED AS A SHARE OF TOTAL FEED UNITS IN COL. (9) USING THE RATIO OF CONCENTRATES IN ALL FEED [illegible] ON ALL FARMS × 1.01. HX CONTAINS GREATER DETAIL ON TYPES OF FEED THAN IS REPRODUCED HERE. FOR GREATEST DETAIL BY FEED TYPE (NOT NORMS, BUT HIST. RESULT) SEE NALICHIE I RASKHOD KORMOV & STRUKTURA ZATRAT. TABLES FROM N.RAS. ARE REPRODUCED IN THIS REPORT & GIVE AVERAGE CONVERSIONS FOR NATURAL UNITS TO FEED EQUIVALENTS FOR 14 SUBCLASSES OF FEED OVER A NUMBER OF YEARS.

ALTERNATIVE SOURCE						
3FOXAL1965	162	1519	328	310	628	232ALLCATHG65

Table A4

Feed equivalents contained per average unit of fourteen subclasses of feed in 1965-73: (Range and Average.)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
1965	.9957	.3238	.4481	-	.2341	.1897	.2977	.1843	.1798	.0981	.3529	.1373	.7143	.1875
1966	.9900	.3211	.4428	-	.2276	.1880	.2966	.1532	.1787	.0956	.3455	.1366	.7143	.1901
1967	.9851	.3191	.4380	-	.2293	.1874	.3019	.1550	.1769	.0971	.3390	.1362	.6667	.1914
1968	.9798	.3185	.4411	-	.2268	.1859	.2977	.1531	.1765	.0979	.3492	.1343	.6667	.1899
1969	.9779	.3202	.4400	-	.2278	.1849	.2917	.1514	.1766	.0997	.3485	.1393	.6000	.1897
1970	.9784	.3227	.4413	-	.2251	.1853	.2991	.1478	.1770	.0973	.3478	.1388	.6000	.1897
1971	.9833	.3186	.4410	.3284	.2230	.1837	.2973	.1467	.1758	.0990	.3433	.1389	.5714	.1895
1972	.9763	.3140	.4383	.3348	.2222	.1847	.3000	.1424	.1778	.0905	.3437	.1373	.6000	.1885
1973	.9707	.3137	.4395	.3286	.2204	.1845	.2991	.1397	.1770	.0916	.3385	.1369	.6000	.1909
MAX	.9957	.3239	.4481	.3348	.2341	.1897	.3019	.1843	.1798	.0997	.3529	.1393	.7143	.1914
MIN	.9707	.3137	.4380	.3284	.2204	.1837	.2917	.1397	.1758	.0905	.3385	.1343	.5714	.1875
AVE	.9819	.3191	.4411	.33165	.2262	.1860	.2979	.1526	.1773	.0963	.3454	.1372	.6370	.1897

Ave. feed unit value

Col.

(1) Concentrate feed
(2) Roughage (grubye), including
(3) hay (sena)
(4) haylage (senazh)
(5) straw (soloma)
(6) Silage (silos)
(7) Potatoes
(8) Feed beets & melons (incl. s. beet)
(9) Summer green feed
(10) By-products of food industry (beet pulp, mash, etc.)
(11) Whole milk
(12) "Obrat," buttermilk (pakhta), whey (syvorotka)
(13) Meat and fish meal
(14) Pasture

SOURCE: Calculated from Nalichie i Raskhod Kormov v Kolkhozakh i Sovkhozakh v 1973 Godu (Moscow, 1974), pp. 6-7.

Table A5

Ratio of Ubойnyi ves (Soviet Carcass Weight) to Live Weight of Animals Sold for Slaughter, by USSR and Republic

	CATTLE 1970				SWINE 1970			
	All Farms	State Farms	Collective Farms	Priv. Farms	All Farms	State Farms	Collective Farms	Priv. Farms
USSR	.5986	.5969	.6007	.5929	.7768	.7661	.7727	.7734
RSFSR	.5944	.5927	.5909	.5897	.7727	.7705	.7701	.7705
Ukraine	.6007	.6051	.5979	.5969	.7647	.7712	.7614	.7692
Belorussia	.6090	.6097	.6092	.6080	.7870	.7850	.7978	.7833
Uzbekistan	.6009	.6013	.6000	.6027	.7526	.7525	.7471	.7474
Kazakhstan	.5955	.5976	.5981	.5929	.7500	.7570	.7660	.7445
Georgia	.5714	.5707	.5730	.5749	.7143	.7215	.7273	.7231
Azerbaijan	.5662	.5614	.5661	.5633	.7292	.7228	.7241	.7258
Lithuania	.6294	.6286	.6266	.6270	.7876	.7850	.7917	.7910
Moldavia	.6137	.6113	.6117	.6118	.7778	.7785	.7778	.7778
Latvia	.6241	.6228	.6231	.6239	.7788	.7745	.7778	.7770
Kirghizia	.6008	.5993	.6030	.5991	.7822	.7845	.7821	.7798
Tadzhikistan	.6041	.6065	.6059	.6012	.7374	.7411	.7416	.7396
Armenia	.5677	.5650	.5632	.5698	.7159	.7176	.7188	.7170
Turkmenistan	.6016	.6031	.6055	.6047	.7386	.7297	.7349	.7333
Estonia	.6414	.6388	.6397	.6401	.8205	.8208	.8155	.8121

Source: Calculated from Proizvodstva Produktov Zhivotnovodstva (M, 1971), pp. 56 & 58.

Note: "All Farms" & "State Farms" are indicated to include feedlots (otkorm).

Table A6

Ratio of Uboinyi ves (Soviet Carcass Weight) to Live Weight of Animals Sold for Slaughter in 1975, by USSR and Republic

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
CATTLE							
USSR	.5872	.5961	.5869	.5847	.5906	.5898	.5920
RSFSR	.5822	.5842	.5828	.5814	.5855	.5798	.5820
Ukraine	.5901	.5904	.5909	.5903	.5897	.5941	.5907
Belorussia	.5859	.5878	.5842	.5833	.5890	.5843	.5863
Uzbekistan	.6128	.6138	.6151	.6138	.6154	.6160	.6145
Kazakhistan	.5737	.5759	.5723	.5741	.5806	.5705	.5739
Georgia	.5779	.5748	.5734	.5760	.5762	.5753	.5759
Azerbaijan	.5720	.5714	.5702	.5721	.5729	.5742	.5749
Lithuania	.6243	.6257	.6247	.6247	.6244	.6257	.6235
Moldavia	.6328	.6328	.6312	.6327	.6333	.6325	.6329
Latvia	.6437	.6426	.6440	.6435	.6441	.6441	.6434
Kirghizia	.5889	.6067	.6340	.5882	.5874	.5891	.5907
Tadzhikistan	.6121	.6074	.6080	.6078	.6102	.6087	.6071
Armenia	.5907	.5901	.5911	.5890	.5899	.5930	.5905
Turkmenistan	.6119	.6123	.6104	.6095	.6136	.6130	.6130
Estonia	.6038	.6335	.6323	.6323	.6314	.6314	.6314
SWINE							
USSR	.7475	.7529	.7556	.7439	.7500	.7520	.7540
RSFSR	.7396	.7439	.7356	.7439	.7273	.7417	.7333
Ukraine	.7524	.7667	.7712	.7590	.7439	.7556	.7500
Belorussia	.7850	.7841	.7826	.7841	.7907	.7863	.7852
Uzbekistan	.7419	.7363	.7391	.7356	.7262	.7570	.7570
Kazakhistan	.7143	.7206	.7101	.7206	.7258	.7194	.7299
Georgia	.7188	.7143	.7162	.7143	.7091	.7231	.7188
Azerbaijan	.7191	.7200	.7273	.7297	.7188	.7212	.7196
Lithuania	.7736	.7742	.7857	.7813	.7778	.7820	.7744
Moldavia	.7708	.7717	.7719	.7717	.7674	.7739	.7672
Latvia	.7879	.7889	.7912	.7889	.7865	.7899	.7899
Kirghizia	.7723	.8947	.9877	.7733	.7746	.7761	.7778
Tadzhikistan	.7396	.7416	.7447	.7439	.7412	.7415	.7431
Armenia	.7188	.7179	.7234	.7246	.7143	.7182	.7248
Turkmenistan	.7353	.7327	.7297	.7312	.7292	.7364	.7364
Estonia	.7885	.7938	.7857	.7857	.7917	.7881	.7881

Columns

(1) All Farms
(2) Socialist
(3) State
(4) Sovkhozy
(5) Collective Farms
(6) Private - Population
(7) Private - Kolkhozniki

NOTES: "All Farm" category includes feedlot (otkorm); the second & third columns are noted to exclude gain on state farms of skotoprom system.

Source: Calculated from Proizvodstva produktov zhivo (M, 1976), pp. 66-70.

Fig A1

Distribution of Shares of Monthly Total Meat Production for the US and USSR, 1977

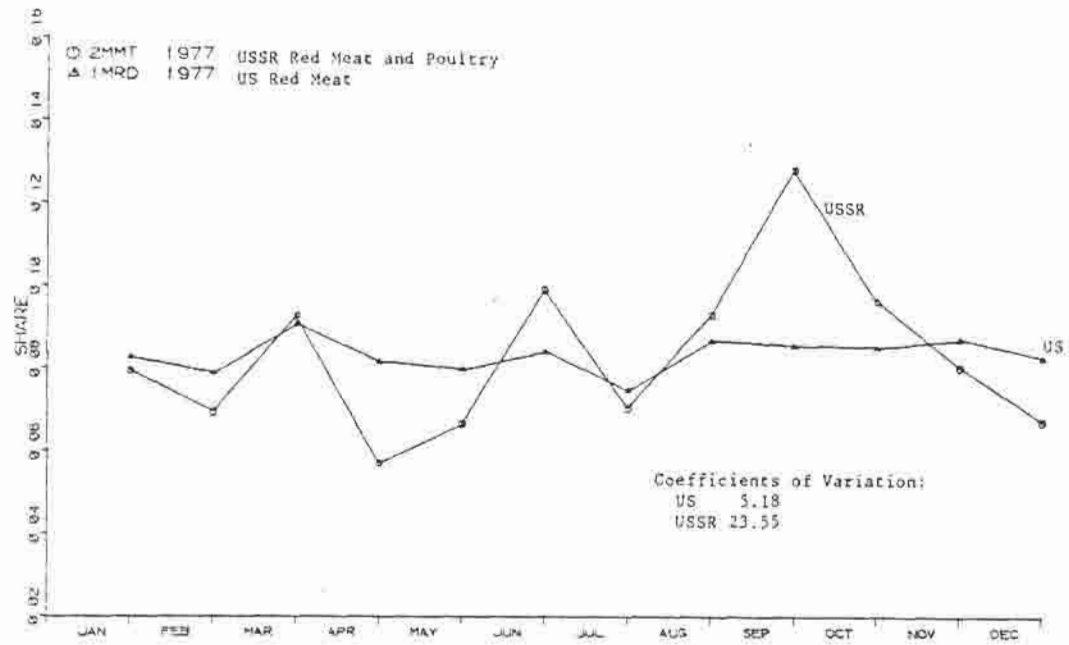


Fig A2

Monthly Distribution of Shares of Pork Production in the USSR in 1975 (Distress Year) and US in 1975 and 1977.

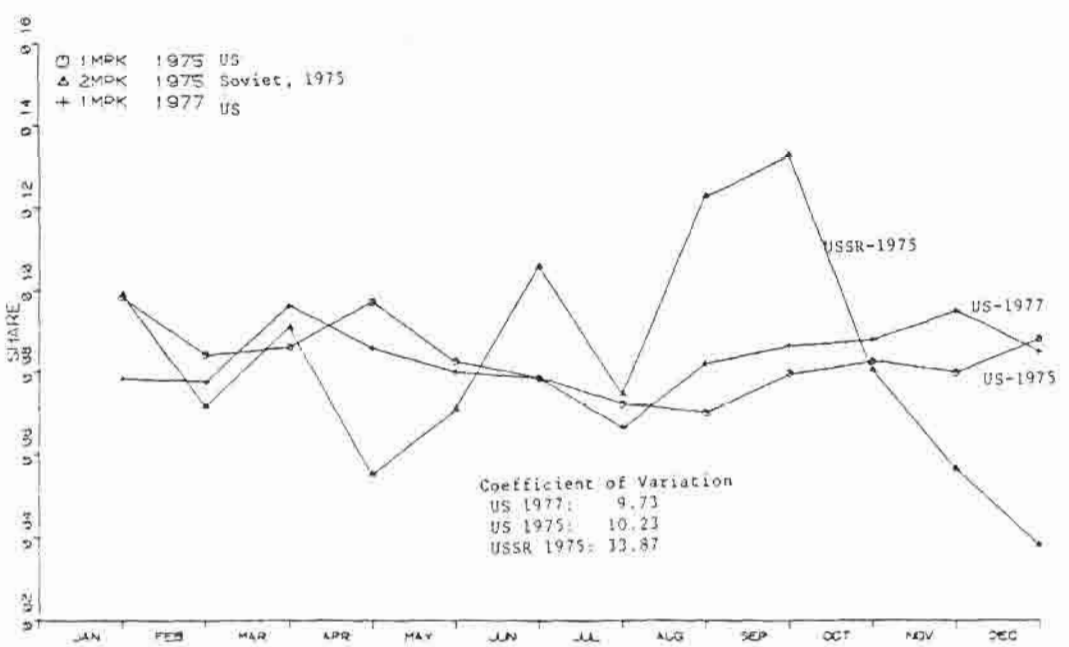
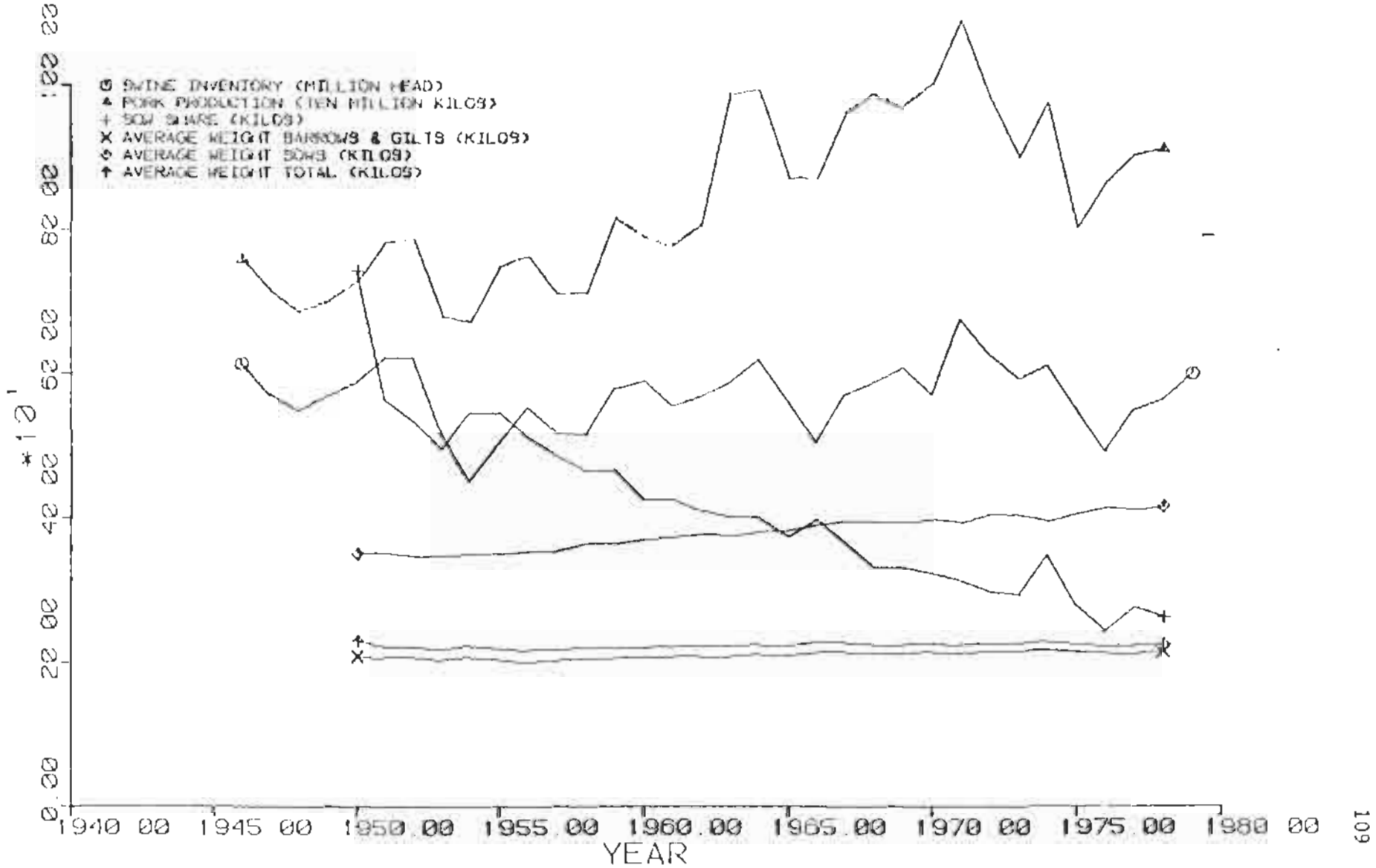


Figure A3: United States Swine Inventory and Pork Production with Average Weights



Figures A4: United States Cattle Inventories, Production & Average Weights