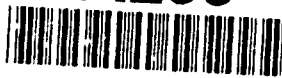


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Volume I: Technical

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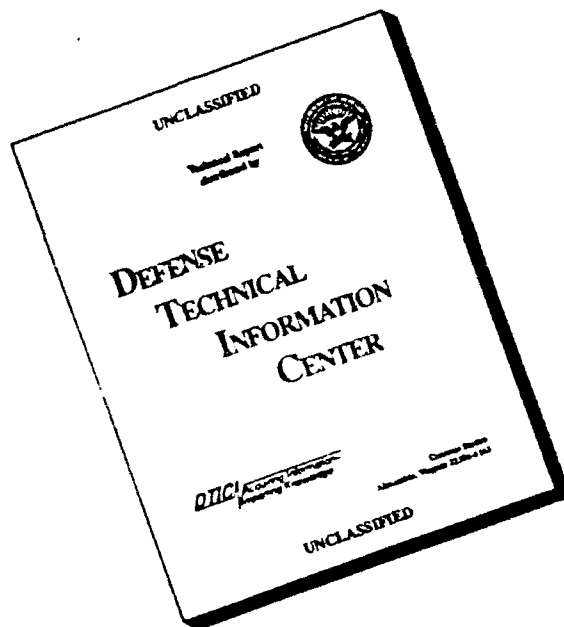
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**RECONSTRUCTION OF THE UNIFIED SOVIET
NATIONAL ECONOMIC BALANCE TABLES, 1970 - 1983:
A Replication and Evaluation of
Steinberg's Reconstruction Methodology**

Volume I: Technical

Michael W. Zelina

George E. Pugh

"The views, opinions, and findings contained in this report are those of the author(s) and should not be construed as an official Department of Defense position, policy, or decision, unless so designated by other official documentation".

**Final Report
Prepared under Contract No. MDA903-86-C-0028
For the Office of Net Assessment
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1.0 INTRODUCTION AND EXECUTIVE SUMMARY

This report summarizes DSA's replication and evaluation of the Dmitri Steinberg methodology for reconstructing the unified National Economic Balance (NEB) tables of the Soviet Union--which are used by Soviet economic planners to provide an integrated statistical representation of all of the material and financial resource flows in the Soviet economy. The study, which was funded under Contract No. MDA903-86-C-0028, was carried out with substantial consulting assistance from Dmitri Steinberg. Both the original Steinberg reconstruction effort and the present DSA study were sponsored by the DoD Office of Net Assessment, as part of a continuing effort to develop a better understanding of Soviet defense economics.

To provide an accurate and fully documented replication of Steinberg's methodology, special purpose software tools were developed which made it possible to accomplish the DSA version of the reconstruction in the context of a fully computerized and self-documenting process. As a consequence, the DSA version of the reconstruction is embodied in a well-documented computerized data base, which can serve as a foundation for a wide variety of future analyses of the Soviet economy.

This fully-computerized data base, which embodies the results of the DSA reconstruction, includes: 134 statistical source tables that are based entirely on published Soviet statistics; 55 intermediate working tables in time-series format which provide detailed estimates of almost all Soviet national economic accounts; together with a complete reconstructed set of the annual unified economic balance tables for the time period 1970-1983.

All of the tables include English language captions and data headings. The combined set of tables provides a convenient and well-structured data source containing a wealth of statistical information on the Soviet economy. Previously, much of this information was almost inaccessible because of the incomplete, and deliberately misleading, structure of the officially published Soviet statistics.

The overall findings of the study, together with a technical description of the reconstruction process and illustrative samples of the reconstructed tables, are included in Volume 1 of the report. The full set of reconstructed statistical tables are compiled separately in Volume 2 of this report.

1.1 STUDY OBJECTIVES

The present study had two major objectives:

- (1) To assess the basic validity of the concepts and methodology underlying the Steinberg reconstruction; and
- (2) To implement a more formal computerized version of the reconstruction that would:
 - (a) facilitate the completion of the reconstruction process;
 - (b) provide full documentation of all data sources and steps in the reconstruction; and

- (c) check the accuracy and reliability of the original Steinberg calculations, which had been accomplished, in part, by less formal manual methods.

1.2 BASIC POSTULATES OF THE STEINBERG RECONSTRUCTION

The Steinberg methodology for reconstructing the National Economic Balance (NEB) tables is founded on some basic assumptions concerning the origin of the extensive statistical data on the Soviet economy that is routinely published by the Soviet Central Statistical Administration in sources such as the annual statistical handbook *Narodnoye Khozyaystvo SSSR* (NK) and the monthly journal *Vestnik Statistiki*.

These basic assumptions, or postulates, of the methodology can be summarized as follows:

1. That the officially published economic statistics are all drawn from a common and internally consistent source of statistical data.
2. That these source data are, in fact, the same basic data that are used by high level Soviet planners to accomplish their centralized economic planning functions. So (although the data are published in a piecemeal form that is deliberately designed to be misleading) the original source tables follow a highly disciplined accounting format that is consistent with the planning principles outlined in the GOSPLAN planning manual.
3. That totality of the published data is sufficiently complete that it should be possible (by interpreting the published data in the context of the official planning procedures) to generate a reasonably complete and accurate reconstruction of the original planning tables.
4. That gaps revealed in such a reconstructed set of tables can provide important information concerning those portions of the economy, such as defense expenditures, that the Soviets have deliberately chosen to hide.

One of the central goals of Steinberg's pioneering reconstruction effort was to provide an initial reconstruction of the official planning tables--one that would be so compelling in its consistency with all of the officially published economic data that it would unambiguously validate these basic postulates of his reconstruction.

1.3 OVERVIEW OF STUDY FINDINGS

1.3.1 General

Based on our success in replicating the reconstruction methodology, it is our conclusion that Steinberg has largely succeeded in his central objective. The reconstruction methodology is uniformly logical and consistent. It is systematic and professional in its exploitation of the officially published source data. The vast majority of the reconstruction is derived directly or indirectly from the officially published statistical sources. Secondary sources and estimation

procedures are used only in situations where no way could be devised for deriving the required data entries from the official statistical sources.

Moreover, Steinberg has expended enormous effort to ensure (1) that his reconstruction is uniformly consistent with all of the officially published statistics, and (2) that all of the time series trends in his reconstruction are smooth and economically plausible.

It is worth emphasizing, however, that despite the effort that has been expended, the reconstruction is still subject to revision and improvement. During the course of the DSA study, Steinberg made numerous improvements in his estimation methods, and corrected a number of errors, both in his computations and in his interpretations of some of the published Soviet data. Although we believe that both the methodology and present reconstructions are basically sound, it would be unrealistic to expect that there are no remaining errors. Indeed, in the reconstruction of the financial flow data, there are still some obvious inconsistencies that have not yet been resolved.

Unfortunately, the quality of Steinberg's present documentation does not match the quality of his reconstruction. Much of his documentation was written long before the reconstruction was complete. As a result, it is often out of date; it tends to be general rather than specific; and it provides little detailed information on the actual derivation of specific entries in his tables. Moreover, since Steinberg typically used informal manual interpolation and estimation methods to fill in the gaps in his reconstruction, it is hard to duplicate these details of his reconstruction--and even more difficult to assess the reliability of these portions of the reconstruction.

The availability of a well-documented alternative version of the reconstruction, as developed by DSA, should therefore help to compensate for these limitations of the Steinberg documentation.

1.3.2 Assessment of the Steinberg Postulates.

Because of the central importance of Steinberg's basic postulates in assessing the value of his work, it is worth discussing the degree to which we feel he has been successful in validating each of his major postulates.

(1) A Common and Internally Consistent Data Source.

The first major postulate is that the officially published Soviet economic statistics are all derived from a common and internally consistent data source. We believe that Steinberg's success in creating a unified reconstructed economic data base that appears to be consistent with all of the officially published economic statistics, provides strong circumstantial evidence for the validity of this basic postulate.

But we feel that the details of the reconstruction provide even more compelling evidence. There are numerous examples in the reconstruction of cases in which data from several different tables are combined to produce accounting totals that match the official numbers that appeared in other published tables. We feel that the totality of such evidence of internal consistency, which appears throughout the reconstruction, provides powerful evidence supporting the validity of this basic postulate.

(2) Compatibility with Official Soviet Planning Procedures.

The second major postulate is that the published data are in fact derived from the central economic statistics that are used for the high level planning processes of the Soviet economy. We believe that Steinberg's success in using the principles from the GOSPLAN planning manuals to accomplish the reconstruction provides strong supporting evidence for the validity of this second postulate.

In the past, those who have attempted to interpret or analyze the Soviet economic data have found it to be ambiguous, confusing, and nearly impossible to interpret with any confidence. Based on this historical experience (and on our own experience in trying to interpret the data during the course of the reconstruction), we are confident that Steinberg could not have completed the reconstruction without relying on the accounting principles derived from the Soviet planning documents. We feel that this apparent compatibility of the reconstructed data with the officially published GOSPLAN planning procedures provides strong supporting evidence for the second postulate.

(3) Nearly Comprehensive Character of Published Data.

The third postulate is that the officially published economic data are sufficiently comprehensive (with the obvious exception of defense and other national security related expenditures) to support a reasonably complete and comprehensive reconstruction of the original planning tables. We believe that this postulate is also supported by Steinberg's success (and our success) in accomplishing such a reconstruction. On the other hand, our experience in the reconstruction process also demonstrates that there are substantial and important gaps in the published data that can only be filled through the use of estimation methods and/or by reference to secondary data sources. The requirement to utilize such techniques to accomplish important parts of the reconstruction tends to limit the accuracy that one can assign to those portions of the reconstructed tables.

(4) Usefulness of Gaps in Assessing Defense Expenditures.

The final postulate is that the reconstructed NEB tables would reveal important gaps in the published economic data that could provide new insight concerning the structure of Soviet defense expenditures. The reconstructed NEB tables do indeed exhibit gaps which appear to be of about the right magnitude to account for the Soviet defense programs. Moreover, the location of the gaps within the reconstructed accounts does indeed give useful insight on the Soviet methods for financing defense expenditures.

As has been claimed by knowledgeable Soviet emigres (and implied in some of the planning documents), it appears that the actual production of military end product equipment is not treated as a "productive" activity--so the "value added" associated with such production is not included in the GSP (gross social product). Instead, the income for persons engaged in end product defense production shows in the reconstructed tables as a cost for "State Supported" persons that is analogous to a welfare cost. The intermediate products and raw materials which are required for the defense production show up as a transfer from the "productive" to the "non-productive" portion of the Soviet economy.

1.3.3 Relationship between DSA and Steinberg Versions.

The DSA Analysis Methodology.

To permit a detailed and accurate evaluation of the Steinberg methodology, special purpose software tools were developed which allowed DSA analysts to replicate the reconstruction in the context of a self-documenting and fully-automated computation process. To carry out the reconstruction, the specific mathematical steps required to generate each table in the reconstruction are specified initially by the analyst--using a formal annotation language that is interpreted, and then *automatically executed*, by the computer to generate each table in the reconstruction. To provide a detailed audit trail for the reconstruction, these actual annotations (as specified by the analyst and executed by the computer) are explicitly displayed as an integral part of the final reconstructed tables.

Differences Between DSA and Steinberg Reconstructions.

Although both the DSA version and the original Steinberg version of the reconstruction are based on the same fundamental methodology, the resulting tables are not numerically identical.

In the original Steinberg reconstruction, the estimation of missing information was often accomplished by informal manual interpolation methods that could be refined (in a subsequent informal iterative process) as required to achieve a more accurate, or a more plausible, match to check sums that might be encountered at later stages in the reconstruction process. The DSA reconstruction, in contrast, utilized formal computerized methods of interpolation, which could not be so easily adjusted to match subsequent check sums.

As a consequence, in the DSA reconstruction, small economic accounts that were estimated as residuals sometimes exhibit a ragged and uneven trend that would seem implausible in any actual Soviet data. In contrast, such raggedness in the estimated residuals has typically been removed in the Steinberg reconstruction through an iterative "tuning" of his manual estimates for missing data.

Complementary Roles of the Two Reconstructions.

Steinberg's smoothing of such residual accounts was, of course, essential to meet his goal of providing a convincing demonstration that the published Soviet statistics are indeed compatible with an integrated set of National economic statistics that are both economically plausible and internally consistent.

But the smoothing process also had some unfortunate side effects. First, it made it difficult to replicate or verify Steinberg's specific numerical results. Second, it tended to hide or obscure the numerical uncertainties in his reconstruction. The availability of an alternative, unsmoothed and fully documented reconstruction thus tends to correct for these defects. And moreover, the differences between the two reconstructions provides useful insight concerning the estimation uncertainties within the reconstruction process.

1.3.4 Assessment of the Value of the Reconstructions.

Uncertainties.

Inevitably, because of the gaps (or missing data) in the published statistics, certain portions of the reconstruction had to be estimated--as residuals, and/or through the use of secondary data and interpolation methods. Obviously, such estimated portions of the reconstruction entail a degree of uncertainty, and are likely to be subject to improvement in the future as better methods of estimation are identified. In addition, even though the present reconstruction seems both logical and internally consistent, there is nevertheless a possibility that some of the specific assumptions of the Steinberg reconstruction will prove to be in error.

Enhanced Utility of the Published Statistics.

But despite these uncertainties, we believe that the reconstructed NEB tables can provide U.S. intelligence analysts with a powerful tool for increasing the usefulness of the published Soviet statistics. The logical interrelations--both among the published tables and between the published tables and the officially published Soviet planning procedures--that are revealed by the reconstruction should lend increased confidence to future interpretations of the Soviet statistical data.

1.4 ORGANIZATION OF THE REPORT.

The remainder of this report is organized as follows:

Section 2.0 Background and Summary. This section discusses the background and motivation for the project.

Section 3.0 The Soviet National Economic Balance. This section describes the purpose and structure of the Soviet National Economic Balance tables, and outlines the general methodology used to accomplish the reconstruction.

Section 4.0 The DSA Reconstruction. This section provides a detailed discussion of the structure of the computerized data base, and of procedures used by DSA to develop the data base and to accomplish the reconstruction of the Soviet National Economic Balance. Each component of the data base--source tables, working tables, and the unified economic balance matrix--is discussed separately.

Section 5.0 Assessment of the Steinberg Methodology. This section provides a detailed assessment of the Steinberg methodology by discussing the validity of the data and whether the methodology for reconstructing the Soviet National Economic Balance tables provides a consistent and coherent interpretation of published Soviet economic statistics.

2.0 BACKGROUND AND MOTIVATION FOR STUDY.

2.1 GENERAL.

Although extensive and detailed statistics on the status and evolution of the Soviet economy are officially published by the Soviet Central Statistical Administration in the annual handbook, *Narodnoye Khozyaystvo SSSR*, Western analysts have found the published data to be of little value in understanding the economics of Soviet defense expenditures. Indeed, it is generally believed that the official statistics are purposely published in a confusing, incomplete, and piecemeal form that is deliberately contrived to be misleading. As a result, most Western estimates of Soviet defense expenditures have been developed without much benefit from the information in the published statistics.

2.2 EVOLUTION OF A PERSPECTIVE ON SOVIET STATISTICS.

Early Western Analysis of Soviet Statistics.

The early Western analysis of Soviet statistics--particularly the influential work done by Abraham Becker during the early 1950s--identified numerous obvious inconsistencies in the published data. For example, the size of the officially published data on Soviet defense expenditures is far too small to account for the rapid growth in the Soviet defense sector.

Becker's analysis of Soviet statistics concluded that the data were deliberately published in a confusing and piecemeal fashion in order to deceive Western analysts in regard to the true performance of the Soviet economy. Thus, he concluded that Western intelligence should avoid reliance on the published statistics and should concentrate instead on other indicators of Soviet economic and military performance.

More Recent Developments.

However, subsequent analysis of Soviet statistics has provided evidence that the published statistics may nevertheless constitute an important source of information on the Soviet economy, and may provide valid indicators of Soviet economic performance.

The work done by William T. Lee, for example, established an apparently successful methodology for estimating Soviet military expenditures based on gaps or residuals in the published Soviet statistics. But Lee's work was limited to estimating the Soviet defense budget based on apparent gaps or residuals in the Soviet production statistics. Although Lee's work seemed to demonstrate the utility of Soviet economic statistics, his analysis did not provide a convincing or comprehensive interpretation of the published statistics.

The difficulty of deciphering the published Soviet economic statistics can be attributed, in part, to the fact that there has never been a comprehensive manual describing Soviet economic planning procedures. The published GOSPLAN planning manual not only leaves numerous important issues unanswered, but it totally omits any treatment of the military component of Soviet economic planning.

But in recent years, as a result of increasing contact between Soviet economic planners and Soviet academics, there has been an increased flow of

publications dealing with the official planning processes. As a result, a growing number of Western experts have expressed the belief that a more serious effort should be made to understand the published Soviet statistics.

The Ideas of Sergei Freidzon.

In about 1980, this view received rather strong support from Sergei Freidzon, a Soviet economist and emigre who had worked at a rather high level within the Soviet economic planning process. Freidzon strongly supported the basic validity of the published statistics. Indeed, he claimed that the officially published statistics are all drawn from a common integrated set of statistics that are actually used by the Soviets to support their high level planning processes. Moreover, he claimed that these official statistics are systematically structured in a way that faithfully reflects Soviet economic planning principles as outlined in the GOSPLAN manual.

Freidzon believed that the failure of the West to achieve a successful interpretation of the published Soviet statistics was a consequence of an incorrect assumption made by Western analysts--namely, that the end military product is included in production data for the GSP. It was Freidzon's contention that Soviet economic planners exclude value added for defense production from Soviet national income accounts. Thus, Freidzon claimed that the inability of Western analysts to explain the inconsistencies in published Soviet statistics was a result of their lack of familiarity with the structure of Soviet national economic accounts and Soviet planning procedures.

But Freidzon made some even stronger claims. It was his conviction that, although the Soviet statistics are published in a confusing and piecemeal form, the totality of the published statistics is remarkably complete--with the obvious exception of military expenditures that are systematically omitted from all published data. Thus, Freidzon claimed that one could use the official statistics (in combination with the published GOSPLAN procedures) to achieve a valid reconstruction of the original (NEB) planning data.

It was his conviction that the economic gaps revealed in such a reconstruction would provide accurate information concerning the basic structure of Soviet defense expenditures. Because he believed that military expenditures are systematically omitted from all published Soviet statistics (including the Soviet I-O tables), it was Freidzon's conviction that the completion of such a reconstruction of the original NEB planning tables was the only possible way to obtain a valid estimate of the Soviet defense budget.

Freidzon argued strongly that the completion of such a reconstruction should be a major objective of Western intelligence. Freidzon's basic ideas concerning the need for such a research effort are outlined in a 1981 report, "Estimating the Current and Long-run Limitations of the Soviet Defense Burden," which he prepared for the Office of Net Assessment (Contract MDA903-81-C-0206). But for a variety of reasons he was unable to secure the level of support he felt would be needed for such a project.

The Steinberg Reconstruction Effort.

Freidzon was assisted both in the preparation and the translation of his report by Dmitri Steinberg, a young political scientist from UCLA. Whereas

Freidzon's work had focused on the need for research on Soviet economic statistics (and on a general conceptual approach for such research), Steinberg became intensely interested in the specific procedures by which a reconstruction of the NEB could be accomplished.

With limited financial support from the Office of Net Assessment, Steinberg undertook a one-man exploratory study aimed at demonstrating the feasibility of such a reconstruction. Over a period of three years, Steinberg worked intensively on the reconstruction process--carefully reading the GOSPLAN planning procedures and related academic publications, revising his estimation methods, and progressing toward an essentially completed initial reconstruction. By the end of 1985, the Steinberg reconstruction effort had produced an impressive set of tables, representing almost all components of the Soviet economy--and including even a preliminary estimate of Soviet defense expenditures.

The Need for an Evaluation Study.

Although Steinberg's reconstruction results seemed generally plausible, there had been no independent review or analysis of the validity or reliability of his reconstruction methods. Moreover, it seemed difficult to obtain such a review from academic experts because of the incomplete state of documentation of the reconstruction process.

Because of the need to develop better estimation methods to fill gaps in the published Soviet statistics, Steinberg had repeatedly revised and improved his estimation methods and his reconstruction at a rate that precluded detailed documentation. Moreover, because of these continual revisions in the reconstruction process, numerous discrepancies developed between his conceptual documentation and the final reconstruction process.

Thus, although Steinberg's work seemed potentially important, there was a need for an independent review of his work to assess its validity and to provide the detailed documentation of the methodology that would be needed in order to make the results useful to the U.S. intelligence community.

Origin of the DSA Study.

During the latter part of the Steinberg research effort, DSA was engaged in a study for OSD Net Assessment concerning the uncertainties in the Western estimates of the Soviet defense burden, and the implications of the differences in the estimated burden with regard to Soviet military-economic flexibility. As a part of that study, DSA reviewed portions of Steinberg's early documentation as a possible source of insights on the uncertainties in the defense burden estimates.

Based on that review of Steinberg's preliminary documentation, DSA concluded that his work merited a careful technical review. A proposal was then made to the Office of Net Assessment to carry out the present study--with the objective of providing an independent review and assessment of the Steinberg methodology.

3.0 STRUCTURE OF THE SOVIET NATIONAL ECONOMIC BALANCE

3.1 PURPOSE OF THE SOVIET NATIONAL ECONOMIC BALANCE (NEB)

The Soviet National Economic Balance provides Soviet economic planners with an integrated set of tables which systematize data on the allocation of resources in the Soviet economy. Analysis of these tables by Soviet economic planners facilitates preparation of short and long-term plans for economic and social development by allowing Soviet planners to test the feasibility of achieving these plans. The NEB tables are constructed with a high level of detail describing all aspects of Soviet economic performance, including state-cooperative, collective, and private sector activities. By providing an intricate analysis of supply and demand of both material and financial resources in the Soviet economy, the NEB tables are critical for planning for growth in all sectors of the Soviet economy, for establishing feasible levels of consumption and investment, and for integrating the flow of material resources in the Soviet economy with available financial resources.

3.2 STRUCTURE OF THE SOVIET NEB TABLES

The Soviet National Economic Balance comprises three levels of data tables. At the lowest level, the NEB tables describe Soviet national economic accounts according to regional levels of economic performance for production and financial activities. At the intermediate level, the tables provide detailed analysis of the national economy for virtually all aspects of Soviet economic activity, including labor and capital resources, supply and demand for goods, financial flows, and military expenditures. The highest echelon of the Soviet National Economic Balance is represented by the Unified Economic Balance, which details the annual flow of material and financial resources in the Soviet economy. In this study, the lowest level regional NEB tables are not reconstructed, since the analysis is focused on understanding resource allocation for the national Soviet economy.

A successful reconstruction of the Soviet National Economic Balance depends upon (1) establishing the link between the published Soviet economic statistics and the intermediate level tables and (2) understanding how the intermediate level data are integrated into the unified economic balance (UEB). This relationship among NEB data sources is expressed as follows:

Published Statistics <= Intermediate Tables => UEB

The Steinberg methodology postulates that published Soviet economic statistics are taken directly from the intermediate level tables, and provide the key to reconstructing the Soviet National Economic Balance tables. These statistics are those published in the annual Soviet statistical handbook *Narodnoye Khozyaystvo SSSR* (NK), the CEMA annual statistical handbook, and the Soviet economic journal *Vestnik Statistiki*. As published, however, these statistics are only descriptive of particular Soviet economic accounts and levels of activity, and offer only a partial analysis of Soviet economic performance. Thus, while these published Soviet statistics are thought to be based on the highly comprehensive and integrated set of intermediate tables of Soviet national economic accounts, their publication in a deliberate piecemeal and unsystematic fashion conceals

information on the composite flow of material and financial resources in the Soviet economy. Integration of published Soviet statistics into the Soviet National Economic Balance tables is possible, however, with a proper understanding of Soviet economic planning procedures.

These intermediate tables, which contain detailed data on Soviet national economic accounts, are constructed in time-series format to allow Soviet planners to identify trends in different segments of the economy. The tables also provide a multisectoral analysis of Soviet national accounts. Only by accounting for all aspects of Soviet economic performance can Soviet national accounts be integrated in the form of the unified economic balance tables. The UEB integrates Soviet national accounts into a consistent and comprehensive set of data estimates which identify composite material, income and financial flows for a given year. The unified economic balance table is structured in matrix format similar to that of an input-output table. It is designed to trace the supply and demand of material resources at a multisectoral level and to define financial resource flows in terms of the distribution of revenues from the productive sectors of the economy to households, nonproductive service sectors, and the defense sector. In sum, the Soviet national economic accounts estimated in the intermediate level tables establish the flow of resources in the Soviet economy which the unified economic balance table integrates into a comprehensive account of Soviet material, national income, and financial balances.

The subsections below describe the structure of the unified economic balance table and how published Soviet economic statistics are utilized to construct that table.

3.3 THE UNIFIED ECONOMIC BALANCE: STRUCTURE AND PURPOSE

As mentioned previously, the unified economic balance table is similar in structure to a standard input-output table. However, the Soviet unified economic balance table differs from the standard input-output format in several respects. First, standard Leontief input-output models establish only resource and national income flows, whereas the Soviet unified economic balance integrates the flow of material resources and revenues into Soviet financial accounts. Only in this way can an assessment be made of the budgetary impact of Soviet economic performance. Secondly, the UEB is structured to reflect the Marxist principle that only the productive sectors of the economy contribute to material wealth; or, stated another way, generate value added. Thus, in accordance with this ideological principle, all nonproductive sectors of the economy--which include services and defense-related activities--are identified as end users which receive resources via transfers from the civilian productive sectors of the Soviet economy.

The Soviet Unified Economic Balance is designed to integrate three major economic accounting functions in the Soviet economic planning process--the Gross Social Product (GSP) Balance, the National Income Balance, and the Financial Balance. The GSP balance establishes the supply and demand for goods in the Soviet economy, while the national income balance defines the distribution of income. In the financial balance, revenues received by households, services, and the state budget are tallied against budgetary, credit, and household outlays. By integrating these three balances into a composite accounting structure, the unified economic balance allows Soviet planners to identify the flow of resources in the economy.

Figure 3.1 provides a general outline of the Soviet Unified Economic Balance, which is broken down into nine numbered sections. Eight of these sections define specific accounting functions--section 5 in the upper righthand corner of the matrix is undefined in Soviet national economic accounts. Sections 1, 2 and 3 estimate the supply and demand for goods as defined in the GSP balance. Within the GSP balance, sections 1 and 3 estimate the total supply of goods, where section 1 contains data on material outlays by sector and section 3 estimates value added, depreciation, supply charges and imports. Demand for intermediate goods is estimated in section 1. Section 2 defines the end-use resources available for consumption activities, investment, and foreign trade. This includes the resources used by households, civilian services, and the defense sector.

The national income balance identifies the flow of revenue generated in the productive sectors to the nonproductive sectors of the economy. Section 3 tallies the gross income generated by the civilian sectors of the economy. This income is distributed to the nonproductive sectors, which includes defense, in section 4.

Sections 6, 7, 8, and 9 identify financial flows in the Soviet unified economic balance table. The columns in section 6 estimate the revenues received by households, services, the state budget, credit organizations, and the foreign trade sector; the rows in section 6 identify the kinds of revenues--both financial and nonfinancial--received by these activities. Sections 7 and 8 contain data on types of outlays to production and nonproduction activities. Finally, section 9 provides the balance of all financial activities, indicating state budgetary deficits as well as the level of household savings.

The GSP, national income, and financial balances in the UEB table are integrated by the generation and flow of income and revenues from the productive sectors of the economy to the nonproductive sectors. Income produced in the civilian economic sectors provides the original source of value added which is distributed directly to the nonproductive sectors as payments for services made by enterprises and households. Indirect payments to the service sectors are made in the form of payments to the state budget and credit organizations from enterprises and households. These revenues collected by the State are then distributed according to policy objectives in the form of capital investment, social services, foreign trade, and defense-related activities. The unified economic balance serves to integrate the distribution of national income and financial resources as efficiently as possible, given the constraints of state policy objectives.

3.4 CONSTRUCTION OF THE UNIFIED ECONOMIC BALANCE TABLE

3.4.1 Introduction to Estimation Procedures and Reconstruction Documentation

The data contained in the eight sections of the Soviet Unified economic balance tables described in the preceding paragraphs are extracted from the intermediate-level NEB tables. In order to facilitate an understanding of how the unified economic balance table defines resource flows for the Soviet economy, a general description is provided below of the procedures used to estimate the data contained in each of the eight sections. In describing these estimation procedures, the basic concepts of the NEB reconstruction will be illuminated, and the relationship between the Soviet National Economic Balance tables and published Soviet economic statistics will be defined.

<u>PRODUCTION SECTORS</u>		<u>NONPRODUCTION SECTORS</u>	<u>REVENUES</u>
<u>PRODUCTION SECTORS</u>	Interindustry Flow of Resources (1)	Allocation of End Use Resources (2) - Consumption - Investment - Defense	Revenues (5) - Households - Credit - State Budget - Foreign Trade - Nonfinancial
	Value Added (3) - Production Sectors	Value Added (4) - Nonproduction Sectors - Defense	
	Outlays to Production Sectors (7)	Outlays to Nonproduction Sectors (8)	Financial Balance (9)
<u>WAGES & REVENUES</u>		<u>BUDGETARY, CREDIT, & HOUSEHOLD OUTLAYS</u>	

FIGURE 3-1 SOVIET UNIFIED ECONOMIC BALANCE TABLE

Reader acquaintance with the general estimation procedures required for the construction of the unified economic balance also provides a framework for understanding the DSA reconstruction of the Soviet National Economic Balance, which is described in Section 4.0 of the report. The NEB intermediate tables are referred to as working tables in the DSA reconstruction and are compiled in numerical order prefixed by the letters WT in the second volume of this report, titled *Tables*. A complete list of working tables accompanies volume II and can also be found in Appendix A in this volume. The published Soviet statistical tables used to construct the working tables are referred to as major source tables, of which lists can be found in both Appendix B of this volume and at the beginning of Volume II. This list compiles the major source tables in numerical order by a reference number prefixed by ST, gives the title of each table, and identifies each table by page number in a standard annual edition of the statistical publications. For example, the tables found in the *Narodnoye Khozyaystvo SSSR* (NK) are referenced to the 1980 edition of the publication (NK80). Tables which ceased being published prior to 1980 are referenced by the last year of publication; and tables which appeared for the first time after 1980 are referenced by their first year of publication.

The general description given below of the estimation procedures required to reconstruct each of the eight sections of the Soviet unified economic balance table is intended to provide the reader with an understanding of how published Soviet statistics are utilized to reconstruct the Soviet material and financial flows. The Soviet statistical source data identified in the discussion of these estimation procedures are referenced in parentheses by appropriate major source table number--e.g., (ST030). Likewise, the working tables which estimate particular accounts being discussed are referenced in brackets by an appropriate working table number--e.g., [WT030].

Also, where elaboration of certain estimation procedures or further discussion of the structure of particular accounts may be required, reference is made to the Steinberg documentation of the UEB reconstruction methodology, Reconstructing the Soviet National Economic Balance, 1965-1983: An Alternative Approach to Estimating Soviet Military Expenditures, Volume I. This reference is made in parentheses as (Steinberg, page no.).

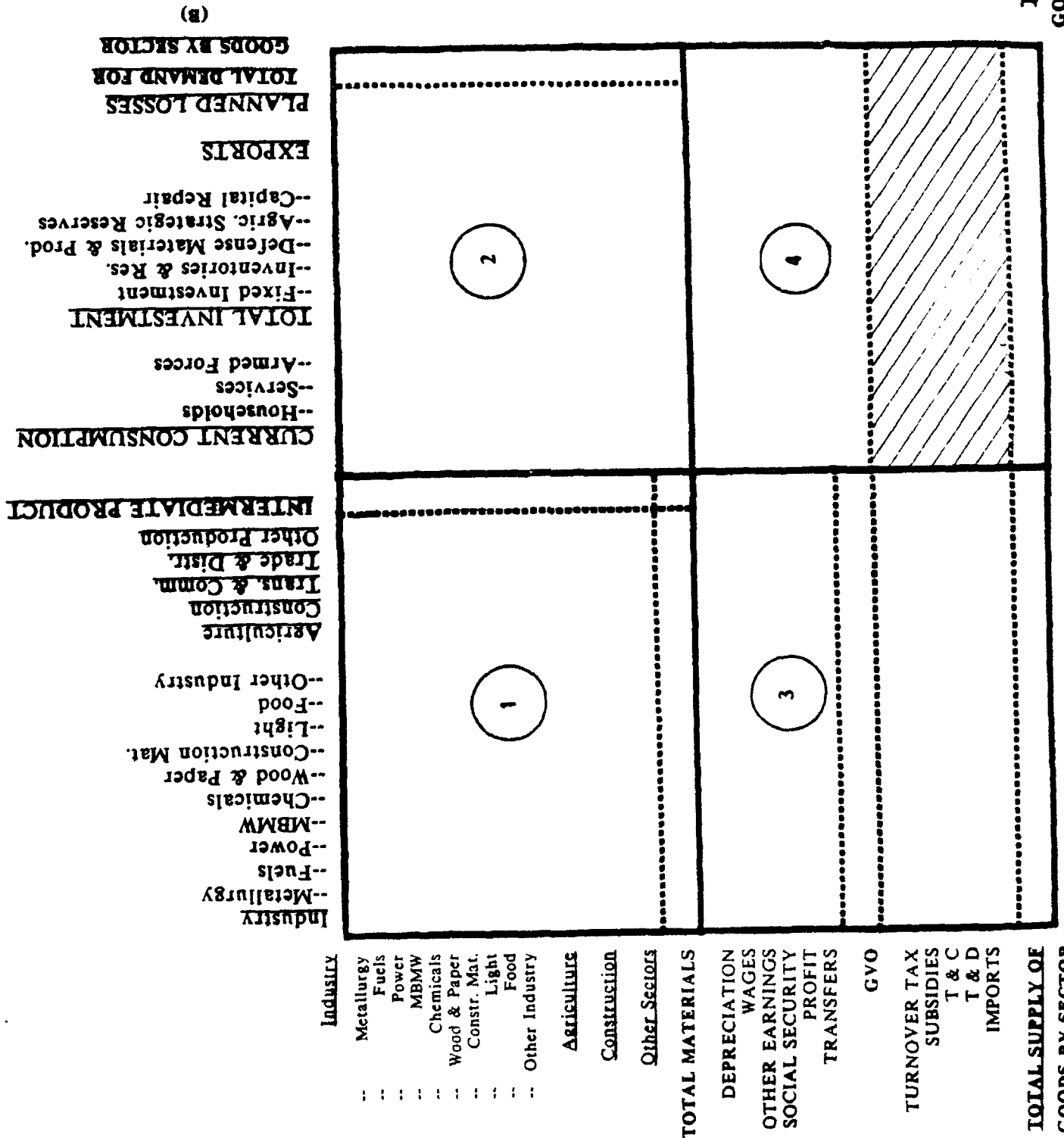
Since the following discussion of the estimation procedures is intended as an overview of the reconstruction of the Soviet unified economic balance, it is not exhaustive of all source tables or working tables used in the reconstruction. For a complete description of the reconstruction process, the reader is referred to Section 4.0 in this volume, Computerized Reconstruction of the Soviet National Economic Balance Tables, which describes the procedures used to annotate each account in all the working tables on a row-by-row basis according to the required data or arithmetic operation. By then referencing both the working tables and unified economic balance tables contained in volume II, the reader can analyze in detail the procedures and data used to reconstruct the Soviet National Economic Balance tables.

3.4.2 UEB Section One: Interindustry Resource Flow

Figure 3.2 provides a detailed breakdown of the column and row items for UEB sections 1 through 4 which, make up the material flow portion of the Soviet unified economic balance tables. The interindustry flow of goods in section 1 is identified for 15 major productive sectors of the Soviet economy, consisting of 10

FIGURE 3-2
MATERIAL FLOWS

TOTAL SUPPLY OF
GOODS AND SERVICES



industrial sectors and five nonindustrial sectors--agriculture, construction, transportation and communications, trade and distribution, and other production.

In order to define the interindustry flow of goods, published Soviet economic statistics are utilized to estimate total material outlays for each of the 15 sectors. Total material outlays for each sector are then broken down as inputs from other sectors, according to the structure of material outlays derived from the 1966 and 1972 Soviet input-output tables. Disaggregation of total material outlays for each sector provides in turn an estimate of the intermediate product in each sector.

Different procedures are used to estimate material outlays in the 10 industrial sectors and in the five nonindustrial sectors. Material outlays for the industrial sectors are estimated using the structure of industrial production outlays published in the NK (ST059). The method for estimating material outlays for the industrial sectors is outlined below in a 4-step procedure. The first objective is to derive an estimate of total production outlays in each sector. This is accomplished by estimating labor outlays in step 1 for each industrial sector; total production outlays for each industrial sector can then be derived in step 2 by dividing total labor outlays by the ratio between the labor outlays and total production outlays as published in the NK table (ST059). Depreciation for each sector is derived in step 3 by multiplying the estimate for total production outlays by the published ratio between depreciation and total production outlays. Once total production outlays, depreciation, and labor outlays for each industrial sector are estimated, material outlays can be derived as a residual as shown in step 4. [WT066, WT067, WT068]

$$\text{Total Production Outlays (TPO)} = \text{Labor Outlays (LAB)} + \text{Depreciation (DEP)} + \text{Materials (MAT)}$$

Procedure:

Step

- 1) $\text{LAB} = (\text{wages} \times \text{employment}) + \text{SS} + \text{OE}$
- 2) $\text{TPO} = \text{LAB} / (\text{LAB}/\text{TPO})$
- 3) $\text{DEP} = \text{TPO} \times (\text{DEP}/\text{TPO})$
- 4) $\text{MAT} = \text{TPO} - \text{DEP} - \text{LAB}$

Labor outlays for each industrial sector are estimated in step 1 using sectoral employment data given in the NK and industrial wage data published periodically in *Vestnik Statistiki*. Total labor outlays for each industrial sector include wages, social security payments (SS), and other earnings (OE) of workers. [WT031]

Estimates of material outlays for the five nonindustrial economic sectors--agriculture, construction, transportation and communications, trade and distribution, and other production--are derived from NK data on Gross Value of Output (GVO) in ST028, Produced National Income (PNI) in ST128, and depreciation (DEP) in ST053 for each of these sectors. Material outlays are the difference between the replacement fund (RF) for each sector and depreciation.

The replacement fund is the difference between GVO and PNI [WT005, WT013, WT014, WT019]. These relationships are summarized as follows:

$$1) (RF) = (GVO) - (PNI)$$

$$2) (MAT) = (RF) - (DEP)$$

For all 15 economic sectors, material outlays are broken down according to inputs from other sectors by deriving the structure of material outlays for each sector based on the structure of material outlays given in the 1966 and 1972 Soviet input-output tables [WT011, WT012, WT013]. In order to derive a structure of material outlays for each year in the 1970-1983 time-series, the structures defined in the 1966 and 1972 Soviet input-output tables were interpolated and extrapolated using a nonlinear procedure which assumes that the structure of material outlays for each sector changes slowly over time.

The data contained in the columns in section 1 of the UEB table (see Figure 3.2) are estimated by multiplying total material outlays in each sector by the structure of material outlays estimated for each year in the reconstruction series. Horizontal summation of the material inputs yields the total demand for resources in each sector--the intermediate product.

3.4.3 UEB Section Three: Production Sectors--Value Added, Surcharges, and Imports

Section 3 of the Soviet unified economic balance contains data on depreciation, income, and profit generated by each sector which, in conjunction with material costs estimated in section 1 of the UEB table, provides an estimate of the Gross Value of Output (GVO) of each productive sector in the Soviet economy. Total supply of goods for each sector is estimated in section 3 of the UEB by adding estimates of net turnover taxes, delivery charges, transportation and communications, trade and distribution, and imports to GVO for each productive sector. A general description of the estimation procedures for each row item in UEB section 3, as identified in Figure 3.2, is given below:

Depreciation [WT014, WT066, WT067, WT068]

Total depreciation for each of the 10 industrial sectors is estimated by multiplying total production outlays by the ratio of depreciation to total production outlays as given in the NK table on the structure of industrial production outlays described above.

Estimates of state-cooperative depreciation for the five nonindustrial economic sectors are given in the NKh (ST053). The depreciation data contained in the UEB table include an estimate of capital losses or the amount of unamortized writeoffs in each nonindustrial sector.

Wages [WT029, WT031, WT032]

The annual wage data for the productive sectors are estimated at factor cost based on published estimates of sectoral employment and average monthly wages per worker. Total state-cooperative employment in each of the industrial sectors is available through 1975 in *Vestnik Statistiki* (ST113). These values are extrapolated for the remaining years based on published estimates of annual increases in both

labor productivity and output by sector. Average monthly wages for the state-cooperative industrial sectors are available through 1983 in *Vestnik Statistiki* (ST114). The NKh publishes data on average monthly wages in the nonindustrial productive sectors (ST056) as well as employment data for the all state-cooperative sectors and collectives (ST093 and ST091, respectively). Total wage income in each productive sector is obtained by multiplying total employment by the average monthly wage increased by a factor of 12. Since the published wage statistics for each sector include wages received from profit as bonuses, profit wages are subtracted from total wages in each sector in order to derive an estimate of wages at factor cost. Estimates of profit wages can be derived from secondary Soviet sources and the NK table on industrial bonus funds (ST170).

Total factor cost wages for agriculture include wages received from private agriculture as well as from the state and collective farms. Total factor cost wages in industry include collective wages. Construction wages estimated for the state-cooperative sector include additional wages amounting to approximately 20 percent of wages published in the official statistics. The discrepancy between official wages and wages utilized by Soviet planners in constructing the national economic balance is noted in Soviet sources (Bass, 1980). The NEB estimate for construction wages also includes wages earned in collective construction.

Other Earnings

Other earnings include one-time bonuses received by workers and employee compensation for business expenses. This income is estimated at 2-3 percent of total wages received in each sector.

Social Security

Rates for social security deductions for each sector are documented in secondary Soviet sources. These deduction rates for all industrial sectors were increased in 1982 by approximately 40 percent. (Steinberg, p. 5-9)

Profit [WT033]

The NK regularly publishes data on net profit for the state-cooperative sectors (ST081), which can be used to derive total NEB profit for the industrial sectors. Because the NK data are extracted from financial accounts, profit earned in the state-cooperative sectors does not include profit earned in subsidiary production activities which Soviet planners consider in estimating NEB accounts. In order to estimate NEB profit for the industrial sectors, the financial profit given in the NK must be adjusted to account for this discrepancy by applying conversion coefficients published in secondary Soviet sources for each of the 10 industrial sectors (Belkin and Geronimus (1978)).

Total profit for the nonindustrial productive sectors is estimated as produced national income (PNI) (ST128) minus wages and net turnover tax. Wages are estimated independently according to the procedure described above; net turnover tax for each sector is estimated using NK data and secondary source data as described in the paragraph below. [WT019]

Transfers [WT066 WT067 WT068]

Transfers are the cost of nonproductive services utilized by productive enterprises. Total industrial transfers are estimated as a part of total industrial production outlays [WT066]. Transfer costs for individual industrial sectors are derived as a proportion to total industrial transfers.

Gross Value of Output (GVO) [WT005 WT037]

GVO in enterprise prices for all productive sectors is the sum of the material outlays, depreciation, wages, other earnings, social security payments, and profit. The estimates of GVO for total industry and for each of the five nonindustrial productive sectors are regularly published in the NK (ST028).

Turnover Tax and Subsidies [WT034]

Turnover tax is paid only by the industrial sectors, along with a small tax paid by trade and procurement services. Total turnover tax paid by industry is available in the NK (ST042), which is in turn broken down for the individual sectors according to data available in secondary Soviet sources (see CIA 1980 and Semenov [1983]). Net turnover tax is the difference between total turnover tax and state subsidies. Data on state subsidies by sector are available in Semenov (1983).

Delivery Charges--Transportation and Communications: and Trade and Distribution [WT046]

Gross value of output (GVO) for the transportation and communications sector and for the trade and distribution sector--which is regularly published in the NK (ST028)--is the sum of the delivery charges to the 10 industrial sectors and to agriculture. A structure of delivery charges, expressed as a ratio of the delivery charges in each industrial sector and in agriculture to total GVO for the transportation and communications and trade and distribution sectors, can be derived from the 1966 and 1972 Soviet input-output tables. In order to obtain a structure of delivery charges for the entire 1970-1983 period, these ratios were extrapolated and interpolated. The resulting ratios indicate that the structure of delivery charges changed very little in the 1970-1983 period. Delivery charges for each sector are derived by applying these ratios to the published annual estimates of GVO for the transportation and communications sector and for the trade and distribution sector.

Foreign Trade--Imports [WT017, WT018, WT070]

Estimates of imported goods aggregated by major economic sector are derived from the table on the structure of foreign trade found in the NK (ST072) which, utilized in conjunction with NK data on total exports and imports in gold ruble values (ST074), determines foreign trade activity for most major economic sectors. Data on exports and imports of construction materials, other production sectors (which includes repair of Soviet ships in foreign ports) and miscellaneous items--such as printed materials, films, and records--are available in the annual publication of the Soviet Ministry of Foreign Trade, *Vneshnaya Torgovlya SSSR*. This series provides a detailed account of traded civilian goods. The residuals found in the NK tables on foreign trade contain data on traded defense-related goods, which are primarily armaments for export and imported strategic materials. Estimation of these goods is possible by accounting for all civilian goods included in the foreign trade residual. (Steinberg, section 8.0)

Since the NEB accounts for exports and imports are in current domestic ruble values, the gold ruble estimates of traded goods are converted to domestic rubles by applying conversion coefficients obtained for each major economic sector. These export and import conversion coefficients are based on Western analysis of Soviet foreign trade trends and on data available in secondary Soviet sources.

In NEB accounts, Soviet planners treat imports as a component of supply, since imports increase the value of goods available for domestic use. For this reason, the value of imported goods is included in section 3 of the UE3 table.

Total Supply [WT006]

Total supply of goods by sector is obtained by summing the column values of GVO, turnover tax less subsidies, delivery costs, and imports.

3.4.4 UEB Section Two: Resources for End Use

The end use of material resources in the unified economic balance table is divided into four broad categories-- the intermediate product, current consumption, total investment, and exports. The total demand for resources also includes the planned production losses in the agriculture and construction sectors. In the UEB table, the structure of end-use resources differs from the structure of Soviet national income accounts because Soviet statistics define national income in terms of the consumption fund and the investment fund, as indicated in Figure 3.3-- whereas the unified economic balance defines resources in terms of current consumption of goods and total investment resources. Current consumption is defined as the consumption fund net of nonproductive depreciation, which is part of total investment. Total investment also contains the value of total repair and replacement of productive fixed capital, which lies outside of national income accounts. The structure and estimation procedures for each of the end use categories in the Soviet unified economic balance table are discussed separately below:

Intermediate Product

The procedure for estimating the intermediate product of each productive sector of the Soviet economy is described in Section 3.4.2, where the derived structure of material outlays for each of the 15 sectors yields estimates of the interindustry use of material resources. (Steinberg 4-1 - 4-9)

Current Consumption

Consumption of goods in the Soviet economy is divided into private and public sector outlays for materials and depreciation costs. Private outlays include household retail trade purchases, depreciation of residential housing, consumption-in-kind for privately produced agricultural and industrial goods, and utility payments. Public consumption consists of the material and depreciation outlays of both the service sectors and the armed forces.

The NK publishes data on national income which is disaggregated into the investment fund and the consumption fund (ST102). The consumption fund includes current consumption of materials by households, nonproductive services, and the armed forces--and includes depreciation of fixed capital in the service and defense sectors. Figure 3.4 outlines the structure of the Soviet consumption fund.

FIGURE 3-3
END USE RESOURCES

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**SOVIET UNIFIED ECONOMIC
BALANCE DEFINITION**

INTERMEDIATE PRODUCT
PLANNED LOSSES
CURRENT CONSUMPTION - Households - Services - Armed Forces
TOTAL FIXED INVESTMENT - Gross Fixed Investment - Inventories & Reserves - Defense Construction - Defense Materials & Agriculture Reserves - Capital Repair
EXPORTS

**SOVIET NATIONAL INCOME
DEFINITION**

INTERMEDIATE PRODUCT
PLANNED LOSSES
NATIONAL INCOME (A + B) A) Consumption Fund - Nonproductive Depreciation - Current Consumption
B) Investment Fund - Net Fixed Investment - Inventories & Reserves - Unfinished Construction - Defense Construction - Defense Materials & Agriculture Reserves
CAPITAL REPLACEMENT - Productive
CAPITAL REPAIR - Productive
EXPORTS

FIGURE 3-4
SOVIET CONSUMPTION FUND

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CAPITAL DEPRECIATION (5%)	Nonproductive Sectors (Rutgaizer)	
	Households (Housing)	
	Defense and Armed Forces	
CURRENT CONSUMPTION (A) (95%)	Households (B) (84%)	Purchases of Retail Goods (94%)
		Equals:
		1) Total Retail Trade Turnover (NKh) minus
		2) Retail Purchases - Intermediate Goods minus
		3) Commission Sales minus
		4) Retail Purchases - Organizations
		Consumption-in-Kind (5%)
		Utility Payments (1%)
	Nonproductive Sectors (10%) (C)	
	Armed Forces (A-B-C) (6%)	

The approximate share for the 1980 estimates is expressed in terms of its higher level aggregate. This percentage is given in parentheses. Current consumption is estimated as the difference between the total consumption fund and an estimate for capital depreciation in the nonproductive sectors. Current consumption for households and nonproductive services is estimated independently utilizing NK data on retail trade purchases (ST036) and secondary source data on consumption and service sector material outlays. An estimate of current consumption by armed forces personnel is derived as a residual of total consumption and the sum of household and nonproductive sector consumption. The procedures for estimating these accounts are described below:

Capital Depreciation. The cost of repair and replacement of capital and housing in the service and defense sectors is financed through the state budget, since these sectors have insufficient funds to maintain their own capital stock. Thus, the depreciation of fixed capital in these sectors is treated as part of the total consumption of resources made available by the productive sectors of the economy, as defined in the consumption fund. However, because nonproductive depreciation is not part of the current consumption of resources, it is included as part of total investment in the Soviet unified economic balance table. [WT014, WT015, WT016, WT063]

Nonproductive Sectors: The NK table on depreciation deductions excludes the value of capital depreciation in the service sectors. Secondary Soviet sources, however, provide data for the period ending in 1973 (Rutgaizer 1975). Estimates of total depreciation outlays for the other years in the 1970-1983 period are derived by extrapolating the ratio between depreciation and material outlays for the service sectors, taking into account the new depreciation rates which were introduced in 1975. (Steinberg, p. 4-16)

Housing: Secondary Soviet sources publish capital replacement and repair rates for the residential housing sector. By estimating the average annual amount of capital stock in the housing sector for both public and private dwellings, capital depreciation can be calculated by applying these repair and replacement rates (Steinberg, p. 4-18).

Defense and Armed Forces: The cost of fixed capital used in defense production is assumed to be concealed under depreciation funds found in the administration sector. Data on the amount of capital investment for machinery and equipment allocated to the administration sector appears to exceed the capital goods requirements of that sector. Machinery (such as office equipment and computer hardware) is procured in the administration sector through commissions for machinery and equipment financed by the state budget. Since investment for machinery and equipment comprises approximately 80 percent of total investment into the administration sector, it is assumed that 80 percent of depreciation in administration is the cost of capital for the defense sector. In addition, a small amount (equaling .2 to .3 billion rubles) is included in the estimate for depreciation in the defense sector to account for the value of depreciation of military buildings.

Current Consumption. As indicated in Figure 3.4, current consumption of goods consists of three components: household consumption; consumption of goods by the nonproductive sectors; and consumption by the armed forces. [WT063]

Household Consumption: Consumption of goods by households includes retail purchases, utility payments, food packages, consumption of privately produced goods, and items purchased at in-village markets. In order to estimate household current consumption, the NK table on retail trade turnover (ST036) by type of good is transformed into NEB format by restructuring the table according to retail goods produced in the major industrial sectors and in agriculture. This yields the total sale of retail goods, which exceeds current household consumption by the amount of intermediate producer goods purchased through retail trade, by commission sales of secondhand goods, and by retail sale of goods to public organizations.

Estimates of producer goods sold through retail trade are small, amounting to less than 2 billion rubles in 1983, most of which is the retail sale of construction materials. Total commission sales is mainly composed of the sale of used automobiles, which is estimated using data available in secondary Soviet sources. Other commission sales include the sale of secondhand goods such as radios, books, and apparel. Purchases of retail goods by institutional organizations are estimated using data available in Kharlamov (1982), Zaitseva and Morozov (1971) indicating the share of retail goods purchased by organizations in total retail trade turnover. Additional data provided by Kharlamov, Zaitseva and Moroz is utilized to divide total institutional purchases into those purchased by service and by productive organizations. Current household consumption of retail goods by private households is thus derived by subtracting the retail purchase of intermediate goods, commission sales and the retail sale of goods to organizations from the total volume of retail trade turnover, which is published in the NK (ST036). [WT048] (Steinberg, p. 4-21)

In addition to obtaining goods through retail sales, households also make payments for utilities and receive nonmonetary compensation, or consumption-in-kind. Household outlays for utilities are derived from secondary Soviet sources. In-kind consumption of goods includes all goods obtained through nonmonetary exchange--most of which are agricultural goods produced by private farms--and food packages received by collective workers in lieu of a monetary wage. The value of agricultural consumption-in-kind is derived by first estimating the net income of private agriculture and then subtracting the value of net financial revenues and investment-in-kind of private farmers [WT100]. The value of a small amount of consumption-in-kind found in private production is estimated using data available in Sorokin (1977). The value of food packages received by collective workers can be derived from secondary sources as well. (Steinberg, 4-26)

Nonproductive Sector Consumption: Consumption of goods by the nonproductive sectors of the economy is estimated in a two-step procedure. The objective of the first step is to estimate total material expenditures in the nonproductive sectors for the entire 1970-1983 period [WT052]. Until 1975, the NK published data on total consumption by these sectors (ST102), which yields an estimate of material expenditures by subtracting service sector capital depreciation. Total volume of material outlays for the remaining years is estimated as the sum of material outlays in the individual nonproductive sectors, which can be derived using the breakdown of material outlays for each of the service sectors provided by

Rutgaizer (1975) for the years 1970-1973. Material outlays by sector for 1974-1983 are estimated by utilizing NK data on total expenditures for the service sectors, which include materials as well as wages [WT050]. Calculation of wages in the service sectors yields an estimate of material outlays as a residual [WT032].

The second step of the estimation procedure is to derive a structure of material outlays which breaks down the productive inputs to the nonproductive sectors. This structure in percentage terms for 1970 is published in Rutgaizer (1975) both for household services and for the science and administration sectors combined. In order to derive a structure of material outlays for the entire time series, an analysis is made in the Steinberg reconstruction of changes in the structure of expenditures for particular groups of service sectors which are (1) education, culture, and health, (2) transportation and communications for services and households, (3) science, and (4) housing-communal and administration services. A complete discussion of this analysis is found in Steinberg, p. 4-27.

Armed Forces: The purpose of deriving a structure of material outlays for the nonproductive service sectors is to estimate the value of current consumption of goods in the nonproductive sectors. As indicated in Figure 3.4, goods consumed by the nonproductive service sectors account for approximately 10 percent of total current consumption (based on 1980 estimates); and households account for 84 percent of current consumption. The remaining 6 percent is current consumption by the armed forces derived as the difference between total current consumption and the sum of current consumption by households and the nonproductive service sectors. Most of the resources consumed by the armed forces are machine building and metal working, chemical and food products. Consumption by the armed forces of light industrial goods can be estimated to be approximately .9 billion rubles in 1972, which is extrapolated in the time series based on the growth of armed forces personnel in the period (Sorokin, 1977). Consumption of material resources by the military is assumed to be quite small for such sectors as construction materials, wood and paper, power, and agriculture. [WT063]

Total Investment

The total investment of resources in the Soviet unified economic balance is composed of the investment fund of national income accounts plus the depreciation of both productive and nonproductive capital. Total investment exhausts Soviet national income accounts net of current consumption and can be broken down into five major components--as indicated in Figure 3.5, which identifies these components in terms of their definition in Soviet national income accounts. Doing so facilitates an understanding of how the estimation of total investment in the Soviet unified economic balance corresponds with the published NK statistics for national income (ST102). The procedures for estimating each of these five components are detailed below:

Gross Fixed Investment [WT001]. Gross fixed investment (GFI) exceeds net fixed investment (NFI) by the value of uninstalled capital--which is composed of net additions of unfinished construction and investment writeoffs--and the value of replaced capital for both the productive and nonproductive sectors. The structure of Soviet investment accounts can be expressed as follows:

UEB TOTAL INVESTMENT

SOVIET NATIONAL INCOME ACCOUNTS

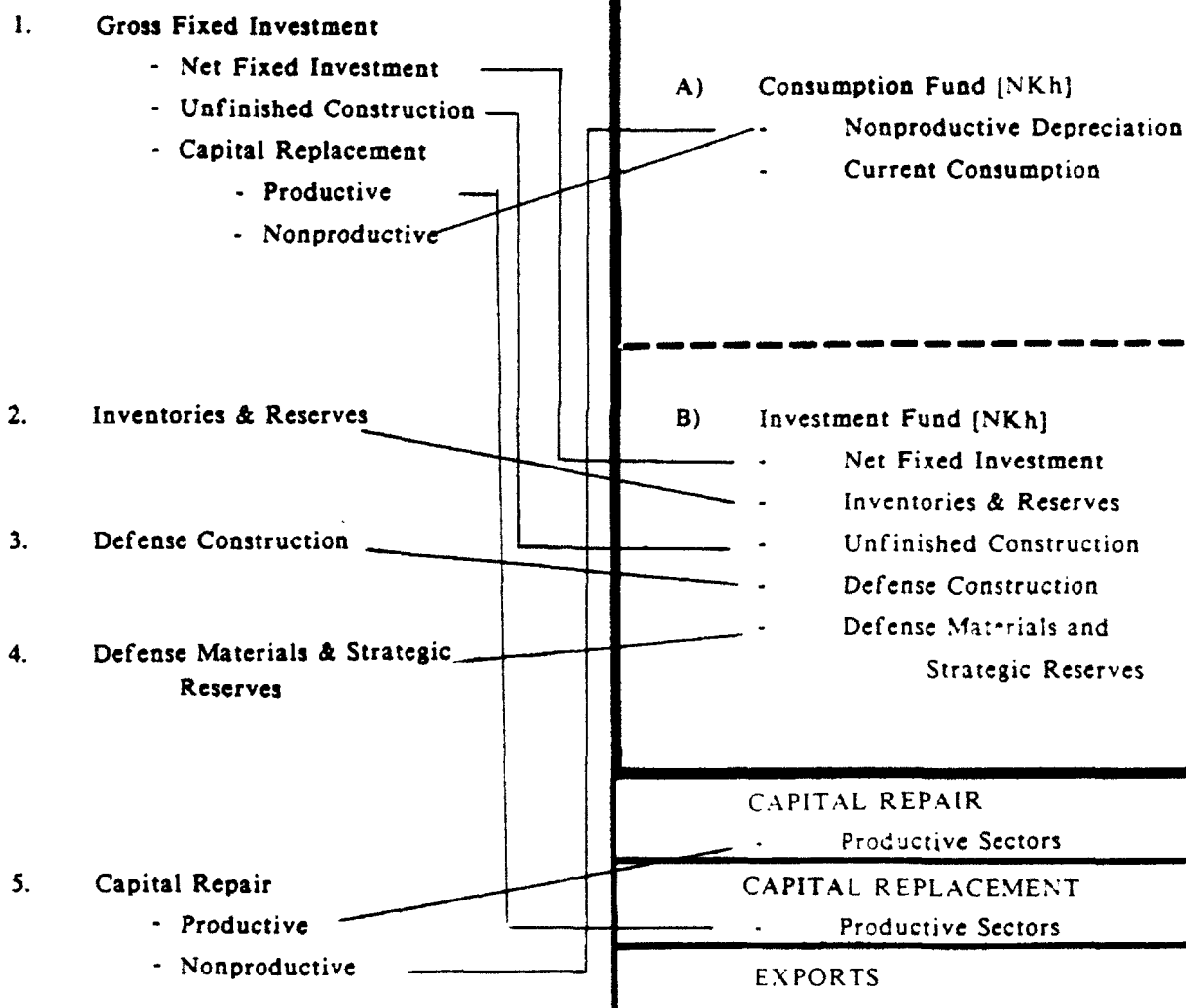


FIGURE 3-5

STRUCTURE OF UEB TOTAL INVESTMENT

GFI - UNINSTALLED CAPITAL - CAPITAL REPLACEMENT = NFI

Gross fixed investment is estimated as the sum of capital investment into construction works, investment into machinery and equipment (M & E), and other investment goods (which includes M & E commissions, agricultural capital, and light industrial capital goods). Capital investment into construction works is calculated as the difference between total construction GVO, the value of capital repair of buildings and installations, and the value of additions to unfinished production. Estimating capital repair in construction works is described below, while additions to unfinished production can be calculated using the NK table on the structure of inventories in the construction sector (ST165). Total investment into machinery and equipment is published in constant prices in the NK table on the structure of capital investment (ST038).

While construction works and M & E constitute well over 90 percent of the value of the gross fixed investment, a small amount of investment resources is allocated for financing commissions of machinery and equipment, for additions to agricultural fixed capital for gardening and livestock, and for purchasing hotel linens from light industrial enterprises. M & E commissions are the machinery and equipment purchased by budgetary organizations. Statistics on total commissions of M & E are estimated using data published by Rutgaizer (1975) on total additions to nonproductive capital. Additions to agricultural fixed capital in state and collective farms include the acquisition of new livestock and investment into gardening, which can be estimated using the NK data on investment into livestock and gardening by state and collective farms. Additions to fixed capital in private farming can be derived from secondary sources. The only capital goods supplied by the light industrial sectors is the value of linens purchased by hotels, which is very small--amounting to no more than .3 billion rubles in the observed period.

Uninstalled capital consists of unfinished construction and state-cooperative investment writeoffs. Total uninstalled capital is estimated as the difference between total capital investment and total additions to capital, both of which are published in constant prices in the NK (ST085 and ST090). The value of unfinished construction is derived separately as the sum of additions to unfinished construction in the state-cooperative sector, which is published in the NK tables on state-cooperative unfinished construction (ST043), and uninstalled capital in the collective and private sectors (ST085 and ST090). The difference between total uninstalled capital and unfinished construction is the amount of investment writeoffs incurred by the state-cooperative sector of the economy.

The value of replaced capital is the difference between total capital depreciation and the value of total capital repair. The procedures for estimating capital repair are described below in the section on capital repair.

Until 1976 the NK published data on net fixed investment, which provides a check on the independently estimated values of GFI, uninstalled capital, and capital replacement for the 1970-1975 period (ST102). Net fixed investment after 1975 is derived as a residual of the three components as outlined above.

Inventories and Reserves [WT026]. Total inventories in the Soviet economy consist of goods stockpiled to ensure a continuous supply of resources to serve both production and consumption requirements, while reserves are kept for emergency

purposes. Inventories and reserves serve both civilian and defense needs. Reserves consist of state reserves, which primarily serve civilian needs; and strategic reserves, which include industrial materials needed to meet primarily short-term defense production requirements and agricultural goods stockpiled for emergency purposes.

The annual increments to inventories and state reserves can be calculated separately by estimating the inventories and reserves in the state-cooperative, collective, and private sectors. Total state-cooperative inventories and reserves are published in the NK table on state-cooperative working assets (ST061). Collective inventories are derived in a two-step process. The first step utilizes the NK table on collective capital stock (ST046) to estimate the value of both total inventories and nonagricultural fixed capital. The second step is to subtract the value of nonagricultural fixed capital from this NK estimate in order to derive the value of inventories in the collective sector. This data on nonagricultural fixed capital in collectives can be found in Gusev (1982) and Tikhonov (1980).

Additions to inventories in the private sector are very small, amounting to less than one billion rubles in any given year in the 1970-1983 period. These inventories are acquisitions of new young livestock, which can be estimated by comparing total livestock in the collective and private agricultural sectors.

State reserves can be estimated separately by breaking down the estimate of state-cooperative reserves according to productive and commodity inventories found in the NK table on the structure of inventories and reserves (ST162). This table yields an estimate for both commodities and reserves. An estimate of commodity inventories is given in the NK table on trade inventories (ST025). Total state reserves can then be derived as a residual.

Estimation of strategic reserves for defense industrial production and agriculture is described below in the section for defense materials and agricultural strategic reserves. In brief, these reserves are estimated as a residual in the investment fund after accounting for all other components. (Steinberg, pp. 4-36 - 4-40)

Defense Construction [WT041]. Accounting for defense-related construction in the Soviet National Economic Balance is accomplished by examining published data on construction GVO in current prices; and published data on total investment into construction in constant prices. In doing so, a comparison of total investment in constant prices with capital investment in current prices reveals an unstable price index for 1970-1971 and 1982-1983. Capital investment in current prices is estimated by subtracting capital repair and unfinished production from construction GVO. The construction price index is defined as the ratio between investment in construction works in current and constant prices. This price index should be fairly stable in the 1970-1983 period, since no price changes in the construction sector are known to have occurred. However, the derived price index capital drops by more than five percent from 1971 to 1972, and increases by almost as much from 1981-1982, indicating that the construction GVO in current prices net of unfinished production and capital repair is too high to account for investment only; and most likely includes defense construction works which are not part of capital investment. [see WT041]

These high price indices for 1970-1971 and 1982-1983 can be attributed to changes in Soviet accounting procedures with regard to defense construction. If a

stable price trend is assumed for the entire time period, the investment residual in current prices is too large to account for both productive and nonproductive investment into construction works--which can be estimated in constant prices and converted to current prices using the assumed stable price index. Since investment into construction works by the productive and nonproductive sectors excludes defense construction, the residual found in current construction GVO accounts is assumed to be defense-related construction activity because data on defense installations cannot be found using published statistics on additions to fixed capital stock. However, for the years 1972 through 1981, conversion of productive and nonproductive investment from constant to current prices completely exhausts the residual component of construction GVO. The conclusion drawn from this analysis of Soviet statistics is that accounting methods were changed in those years to include defense construction under another component of construction GVO; namely, additions to unfinished production, which increased dramatically by five billion rubles in 1972. Estimates of the value of defense construction in the national economic balance fluctuated between 3 and 4.5 billion rubles in the 1970-1983 period.

Data on construction GVO and unfinished production are available in the NK tables on Gross Social Product (ST028) and on the structure of inventories in the construction sector (ST165), respectively. Capital repair of buildings and installations can be estimated using data available in Senchagov (1975). Repair of buildings and installations constitutes a little less than one-half the total capital repair bill in Soviet national accounts. [WT018]

Investment in construction works in constant prices is estimated as the difference between total investment and investment in machinery equipment published in the NK capital investment table (ST038), less investment in gardening activities, which is available in the NK table on state and collective agricultural investment (ST131). The resulting estimate for investment in construction assembly works can be broken down further into productive and nonproductive sector activities by utilizing the NK tables on the structure of capital investment in the state-cooperative sector (ST143) and the structure of capital investment in the collective sector (ST144). [WT020]

Defense Materials and Agricultural Strategic Reserves [WT027]. Defense materials and agricultural strategic reserves are estimated as a residual in the Soviet investment fund, which is published regularly in the NK table on national income (ST102). Figure 3.5 lists the five components of the investment fund. The estimation procedures of the first four components--net fixed investment, inventories and reserves, additions of unfinished construction, and defense construction--are described above.

This residual component of the investment fund comprises the materials used in defense industrial production and additions to strategic agricultural reserves. The supply of materials to defense enterprises includes all resources needed to ensure production, as well as intermediate goods. These supply resources include metallurgical products, fuels, power, wood products, and other nonmilitary industrial products. The total supply of materials for defense production in each major economic sector is estimated as a residual after accounting for all end-use accounts. Additions to strategic agricultural reserves are estimated as an end-use residual in the agricultural sector.

Capital Repair [WT016]. Total capital repair is estimated as the sum of capital repair in the productive and nonproductive sectors of the economy. The NK table on depreciation funds (ST053) provides data on the value of capital repair for all of the major productive sectors of the economy. Data on capital repair for the nonproductive sectors is obtained from several Soviet sources: the NK publishes capital repair data for communal services and for the transportation and communications sector; the State budgetary handbooks have capital repair data for education, culture, and health; capital repair for residential housing is estimated using published repair rates; and Senachgov (1975) provides capital repair estimates for the science sector. Capital repair is assumed to be very small for the administration sector, based on the estimate for depreciation in that sector. In each sector, capital repair is also estimated in terms of repair of construction works and machinery and equipment, using data available in Senchagov.

Foreign Trade--Exports. Section 3.4.3 above describes how foreign trade is estimated in domestic rubles in the Soviet National Economic Balance. The volume of exports for the major economic sectors, as well as for defense-related goods, is given in WT018; and a detailed discussion of the estimation procedures for foreign trade is given in Steinberg, section 8.

Planned Losses. Planned losses are registered only for the agricultural and construction sectors. Planned losses in agriculture reflect primarily the value of spoiled agricultural raw materials and losses of livestock, while planned losses in the construction sector consist of abandoned construction sites.

Total planned losses are estimated utilizing the NK tables on produced national income (ST128) and national income available for end use (ST102). The difference between produced national income and end-use national income equals total planned production losses plus the balance of foreign currency earnings estimated in domestic rubles [WT019]. Estimating the value of foreign trade in domestic rubles is described in section 3.4.2. While Soviet statistics do not reveal the size of agricultural losses, the value of abandoned construction sites can be assessed as being equal to the value of investment writeoffs in a given year. As described in the discussion above on estimating net fixed investment, total investment writeoffs equal the difference between total investment and net additions to capital, minus the value of additions to unfinished construction. Planned agricultural losses can thus be derived as a residual once construction losses are estimated. (Steinberg, p. 4-40)

3.4.5. UEB Section Four: Nonproduction Sectors--Value Added.

The nonproductive activities of the Soviet economy can be broken down into four major categories--households, services, the armed forces, and defense production. Services include education and culture, health services, housing, communal and everyday services, science, and administration. Value added for each of these major categories is the sum of depreciation, wages, social security payments, other earnings, and profit where earned. Household value added consists only of the depreciation of civilian residential housing, while all service sectors receive wages, other income, social security payments; and depreciate the value of fixed capital. Some service sectors earn profit (profit-seeking), while others are financed entirely by the state budget (budget-supported). In the armed forces, barracks, administrative buildings, and other constructions are depreciated.

Wages and social security payments are received by armed forces personnel. These personnel include all draftees, military officers and civilian employees; and a small number of KGB personnel whose employment is not registered as part of the state bureaucracy. Value added for defense production is estimated as the sum of the depreciation of defense industrial capital, and the wages and social security payments for defense industrial workers. No profit is earned by defense industrial enterprises, and hence all defense production is financed through the Soviet state budget.

The paragraphs below describe how value added is estimated for each of the four major nonproductive activities in the Soviet Unified Economic Balance.

Depreciation [WT014 WT051 WT063 WT069]

As indicated in section 3.4.4, depreciation of fixed capital stock in the nonproductive sectors of the Soviet economy is registered as part of the consumption fund in Soviet national income statistics. Section 3.4.4. describes how depreciation is calculated for the service sectors, residential housing, defense production, and the armed forces.

Wages [WT032 WT069]

Total wages for the nonproductive sectors include all wages earned by state-cooperative service sector employees plus the wages earned by collective workers engaged in nonproductive activities. State-cooperative wages are estimated using the NK data on the number of state-cooperative employees in each service sector (ST093) and the NK data on the average monthly wages for each service sector (ST056). Wages earned by collective service sector workers are calculated by first estimating the number of collective workers engaged in nonproductive activities [WT029] and then multiplying this estimate by the average monthly wage for collective employees published in the NK (ST091).

Wages earned by defense households are estimated as a residual. Defense households include all members of the armed forces, civilians employed by the armed forces, KGB personnel acting in a military capacity, and all defense production employees. The residual for defense household wages is derived as the difference between total monetary wages and monetary wages received by productive households and nonproductive civilian households [WT056]. Total monetary wages for the Soviet economy is the sum of monetary wages received by state-cooperative and collective households, one-time bonuses, and other earnings [WT049]. The monetary wages of productive households is the difference between total productive wages and nonmonetary wages [WT056]. These nonmonetary wages are food packages received by collective households, which are estimated to be approximately 6 percent of collective revenues (ST091).

Nonproductive monetary wages are derived from three sources:

- (1) Official state-cooperative wages [WT032]
- (2) Unofficial state-cooperative wages [WT051]
- (3) Collective wages [WT032]

Official state-cooperative wages are those wages received by employees of state-cooperative services. Unofficial state-cooperative wages for services are paid as part of State budgetary outlays for work performed outside normal service sector functions. These wages include royalties and payments for concert performances received by artists, and payments received by instructors and by medical personnel for military-related services. Unofficial service sector wages are estimated as the difference between total budgetary outlays for service sector wages and official state-cooperative service sector wages [WT050]. Estimation of wages received by collective service sector workers is described above.

Total wages for armed forces personnel consist of the allowances given to draftees and the wages of military officers, civilian employees, and KGB personnel serving in a military capacity. Western estimates put the size of the Soviet armed forces at 4-6 million (Collins 1985?). The Soviet military officers corps is estimated to be approximately 1.2 million in size, and officers' pay is approximately 30 percent higher than the average annual wage of the entire Soviet economy. Conscripts make up the difference in armed forces personnel and receive a monthly allowance of 10 rubles. Civilian employees of the armed forces are estimated to amount to .5 million in each year, while KGB personnel in military service amount to .3 million in a given year. The average annual wage for these nonmilitary personnel in the armed forces is assumed to be the same as that for the officers corps. [WT069]

Wages for defense production employees is the difference between the total wage residual for defense households and the wage estimate for armed forces personnel. [WT069] (Steinberg, p.10)

Other Earnings [WT032]

Other earnings received by service sector workers are treated the same as those received by productive workers. These earnings amount to 2-3 percent of wage income in each sector. [WT032]

Social Security [WT032 WT053]

Rates for social security deductions in the service sectors are given by Kovalkin (1977). These rates are standard for all years and amount to 5.5 percent of wage income. [WT032]

Soviet budgetary statistics reveal a gap between total social security payments to all economic sectors and the social security revenues received from civilian sectors of the economy (ST049). This gap represents the amount of social security payments allocated to the Soviet defense sector. [WT053]

Profit [WT033 WT051]

Among the nonproductive sectors of the Soviet economy, profit is earned only by certain civilian service sectors. Those civilian sectors which do not earn profit are scientific and administrative services, health services, and education. Profit earned in the nonproductive sectors of the economy is published in the NK table on net profit by sector (ST044). (Steinberg, p 6.1)

3.4.6 UEB Section 6: Revenues

Figure 3.6 provides a detailed breakdown of the financial flows portion of the Soviet unified economic balance table as shown in sections 6 through 9. The shaded area in the upper lefthand corner of the table comprises the material flows portion of the table for which the estimation procedures are described above. Section 6 estimates the total revenues, which include financial as well as nonfinancial receipts. Nonfinancial revenues in the Soviet unified economic balance table consist of in-kind consumption of agricultural products as well as food packages received by collective households. The estimation procedures for these revenues are described in Section 3.4.4 under current consumption. [WT063]

Financial revenues are those monetary revenues received by households, by the government (state budget), by financial institutions (credits), and by the foreign trade sector. The procedures for estimating these revenues are discussed below.

Household Revenues [WT049 WT056]

Total household revenues consist of (1) the monetary wage income of all workers, (2) income paid to households by the state in the form of pensions, bonds, stipends, lottery winnings, and other dividends, (3) interest earned on savings, and (4) income received through private transactions. Monetary wages earned by households are the sum of wages earned in the state-cooperative sector and in the collective sector, less nonmonetary income. Wages earned in the state-cooperative and collective sectors can be estimated from data contained in the NK tables on family budgets, ST082 and ST156. Nonmonetary income comprises the food packages received by collective households. [WT056]

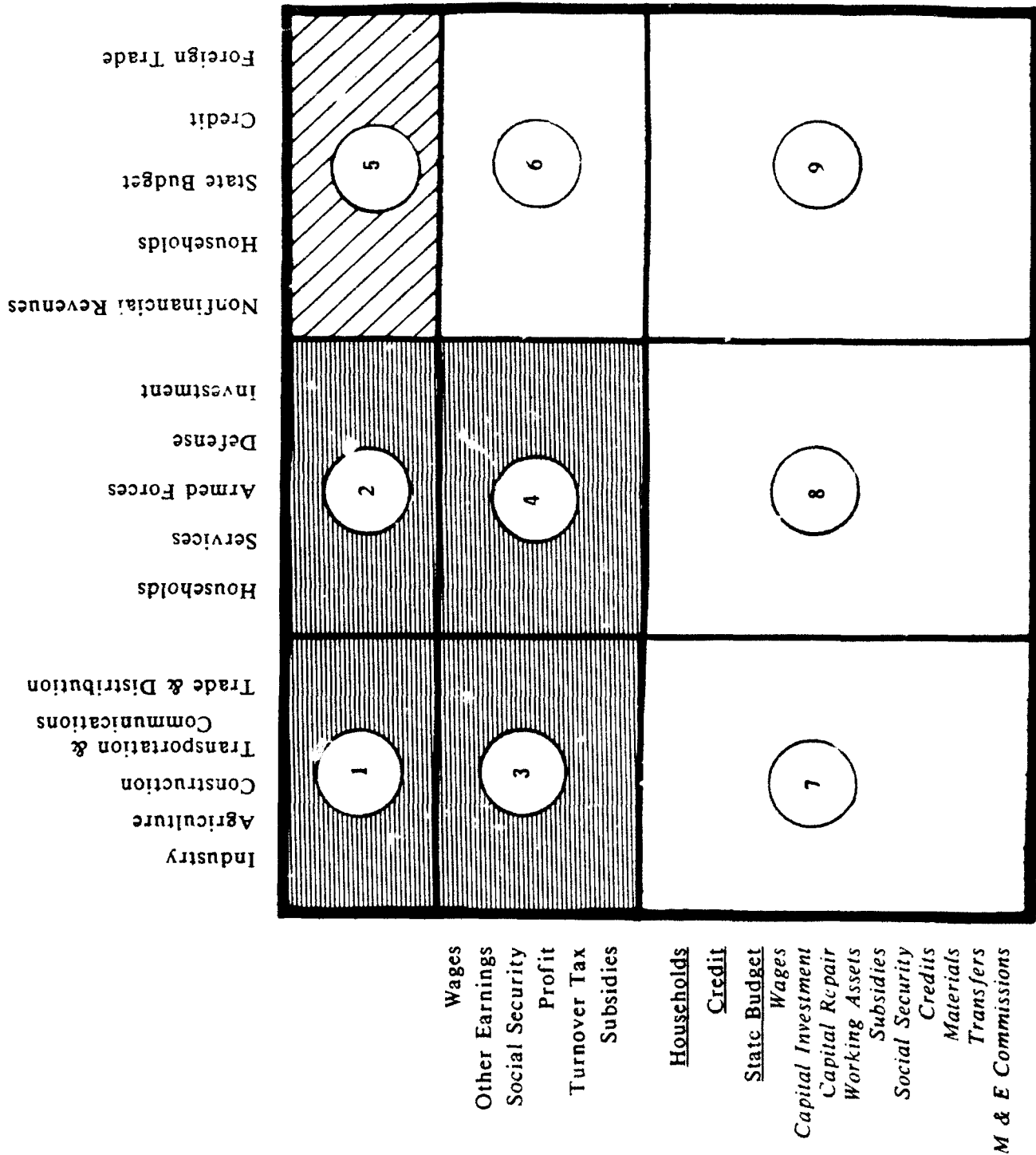
State payments from the budget and the social consumption fund to households consist mostly of pensions and stipends. Data on state-cooperative pensions and stipends is found in the NK table on social security payments (ST101), while data on collective payments are given in Mikul'skiy (1982). State payments to households also include annuities on bonds, lottery winnings, and payments on old bonds. These payments are small and can be found in secondary Soviet sources. [WT056]

Interest earnings are estimated to be 3 percent of organized household savings as published in the NK (ST100). Private monetary income is revenue received from village market sales of privately produced agricultural goods. The value of these sales can be estimated from the NK data on agricultural procurement (ST062). [WT056]

State Budgetary Revenues [WT053]

The Soviet government receives revenues from taxes on goods (turnover tax), payments from enterprise profits, taxes on household income, social security payments, local taxes, and foreign trade earnings. The NK table on the Soviet budget (ST049) contains data on revenues received from turnover taxes, profit, and social security payments. Local taxes include a forest tax, unused local funds turned over to the state, and other productive revenues for which data are available in the budgetary handbook published by the Soviet Ministry of Finance (ST145). Foreign trade earnings comprise the value of net imports plus the subsidies on exports and imports.

FIGURE 3-6
FINANCIAL FLOWS



Credit Revenues [WT053 WT054 WT061]

Credit revenues include all new deposits to state banks available for credit purposes. This includes additions to total household savings, payments from enterprise profit, and state budgetary payments. Total household savings are estimated in section 9 of the unified economic balance table as the difference between household revenues and household outlays. Credit revenues from profit paid by state enterprises are estimated using the NK table on the distribution of profit (ST095), and the credit revenues received from the state are the difference between total state budgetary revenues (ST054) and state budgetary outlays (ST049).

Foreign Trade Revenues [WT054]

Foreign trade revenues are the subsidies on imports and exports paid from the state budget. According to Semenov (1983), import subsidies can be estimated as the difference between total budgetary payments for subsidies and agricultural subsidies. Export subsidies are believed to be part of budgetary payments to the trade sector.

3.4.7 UEB Section 7: Outlays to Production Sectors

Outlays to the production sectors consist of state budgetary expenditures on capital goods and agricultural subsidies as well as household outlays on consumer goods. The amount of capital investment financed by the state budget is estimated as a residual after accounting for all other forms of financing capital investment [WT055 WT059]. Budgetary financing of state-cooperative working assets can be estimated from the NK tables on working assets (ST061) and on the financing of working assets (ST158) [WT058].

Household consumption of goods is estimated using NK data on retail trade turnover (ST036) as described in Section 3.4.4 above [WT048]. Agricultural subsidies are given in Semenov (1983) and can be found in table WT034.

3.4.8 UEB Section 8: Outlays to the Nonproduction Sectors

Outlays to the nonproduction sectors are the payments made (1) by households for services, taxes, and cooperative housing, (2) by credit institutions for financing capital goods, and (3) by the state for financing the budget-supported service sectors and the defense sector. The procedures for estimating all three types of outlays are described below:

Household Outlays

Household outlays include payments for services, transfers to the state budget, and investment in the cooperative housing sector. Household expenditures for services by sector can be estimated using data available in Rutgaizer (1975) and in the NK edition for 1975 [see WT051]. Households make transfers to the state budget in the form of income taxes, purchases of bonds and lottery tickets, and local and rent taxes. The NK publishes data on household income taxes as well as on the purchases of bonds (ST049). Data on household expenditures for lottery tickets and for local and rent taxes are published in the Gosbudzhet

handbook (ST145). Household investment in the cooperative housing sector is small and can be estimated based on total investment and capital repair in the housing sector [WT022 WT016]. [WT051] [WT056]

Credit Outlays

Credit outlays consist of long- and short-term credits issued to civilian enterprises for financing capital investment and working assets. Semenov (1983) publishes data on long-term credits issued for financing capital investment in both the state-cooperative sector and the collective sector. Credits issued for financing working assets are published regularly in the NK series (ST158). The interest payments on household savings are also issued as credit outlays made by financial institutions. [WT058 WT059]

State Budgetary Outlays

As shown in Figure 3-6, state budgetary payments made to households, the service sectors, and the defense sector can be itemized by type of outlay. These payments are described below:

Households: Households receive payments from the state budget in the form of direct transfers which include pensions and allowances, housing subsidies, and revenues received from bond annuities and lottery winnings. Budgetary outlays for pensions and allowances are published in the NK (ST033) as are outlays for housing subsidies (ST168). Income received from bonds and lotteries is available in the Gosbudzhet handbooks as previously mentioned.

Service Sectors: Payments to the budget-supported service sectors--education, culture and arts, health, science, and administration--include capital and current outlays as well as commissions for machinery and equipment (M & E commissions). Capital outlays for these sectors include capital investment and repair: capital investment in constant prices for the service sectors is published in the NK table on capital investment (ST052) and converted to current ruble prices using a derived price index [WT071]; the procedures for estimating capital repair for all sectors is described in Section 3.4.4 above. [WT016 WT032 WT055 WT063 WT071]

Current outlays for the budget-supported service sectors include wages, social security deductions, and outlays on food and other materials. Section 3.4.5 describes the procedures for estimating wages and social security deductions for all service sectors, where service sector outlays on food and other materials sectors are described in Section 3.4.4. [WT032 WT063]

Armed Forces and Defense: In the Soviet National Economic Balance, the entire cost of the defense sector--defense production, defense construction, and the armed forces--is financed by the Soviet state budget. Published Soviet budgetary statistics are useful only in regard to estimating the cost of social services for military personnel and households, social security payments made to defense personnel, and the cost of defense-related research and development (R & D). All other defense expenditures are estimated using published Soviet statistics on national income accounts as described earlier. Military social services, which include military pensions,

are financed through the social consumption fund (SCF) and are estimated to be approximately 7-8 percent of total expenditures (ST101). Likewise, defense-related R & D costs are financed through the budgetary outlays on science and can be estimated after accounting for outlays for basic research and civilian-related applied research [WT010]. Total budgetary outlays on science are published in the NK table on budgetary outlays (ST037), basic research is estimated to be approximately 10 percent of All-Union outlays on science as reported by Zhamin (1984), and budget-supported applied research for civilian purposes is assumed to be small, since most civilian research is performed by organizations which are self-financing (Steinberg 6-15). [WT055 WT069]

Section 8 of the unified economic balance table contains data on wages earned and the value of goods consumed by armed forces personnel, defense construction, and the current and capital outlays for defense production. Section 3.4.5 above describes how wages for armed forces personnel are estimated, while the procedures for estimating the consumption of goods by the armed forces is given in section 3.4.4 [WT069 WT063]. Section 3.4.4 also describes how defense construction is estimated from Soviet data on construction GVO and investment [WT041]. Current outlays for defense production include materials and wages. As described in section 3.4.5, materials used in the production of military products are estimated as a residual in the published data on the investment fund. Wages for defense industrial personnel are derived as the residual of total wages and civilian wages as described in section 3.4.5. The cost of capital goods for defense production is believed to be hidden in capital investment in the administration sector, given the large amount of machinery and equipment procured in this sector. As indicated in section 3.4.4, 80 percent of capital investment in the administration sector is believed to be for capital goods for defense production. [WT027 WT056 WT069]

UEB Section 9: Financial Balance

Section 9 of the unified economic balance table tabulates the difference between total revenues and outlays for households, the state budget, and credit institutions. Household revenues minus outlays yields an estimate for annual savings for Soviet households, which includes organized as well as unorganized savings. Budgetary and credit deficits and surpluses are calculated in the same manner.

4.0 COMPUTERIZED RECONSTRUCTION OF THE SOVIET NATIONAL ECONOMIC BALANCE TABLES

4.1 INTRODUCTION

The objectives of computerizing the Soviet National Economic (NEB) Balance are (1) to document the data sources and estimation procedures required to construct the NEB tables, and (2) to automate the generation of Unified Economic Balance tables for each year in the 1970-1983 period. By computerizing the Soviet National Economic Balance tables, the documentation of the data sources and estimation procedures provide an efficient way of assessing the validity and consistency of the data used to construct these tables. Since the data sources and estimation procedures documented in the reconstructed NEB tables are those prescribed in the Steinberg methodology, computerizing the reconstruction process also provides a convenient tool for making a qualitative assessment of the Steinberg methodology by facilitating a critical review of structure of the economic accounts defined in the NEB data base and of the procedures required to estimate those accounts. This assessment is given in Section 5.0.

This section is intended as a technical guide to the computerized Soviet National Economic Balance tables designed to assist the reader in understanding the structure of the data base and the procedures used to generate the tables. The first portion of this section describes in detail the hierarchy of statistical tables which make up the data base. The latter portion provides a technical discussion of the computerized procedures used to generate these tables.

4.2 STRUCTURE OF THE COMPUTERIZED SOVIET NEB DATA BASE

As outlined in Section 3.0, the Soviet National Economic Balance consists primarily of two sets of data tables which Soviet economic planners use to estimate the flow of resources in the Soviet national economy. The intermediate tables provide a coherent and consistent statistical set of tables from which the statistics published by the Central Statistical Administration and other Soviet organizations are taken. The higher level Unified Economic Balance tables serve the function of integrating the resource flows identified in the intermediate tables into a composite account of Soviet material and financial balances.

Since the published Soviet statistical tables are thought to be taken from the intermediate level NEB tables, our methodology for the NEB reconstruction requires us to identify the published statistical data as a third level of statistical tables. Consequently, the reconstructed Soviet National Economic Balance data base consists of three levels of statistical tables:

- (1) Source tables: the actual published Soviet statistical tables which are fully documented in the data base
- (2) Working tables: the annotated intermediate level tables which document data sources and estimation procedures
- (3) Unified economic balance tables: the tables in matrix format which are annotated to provide an audit trail of the data estimation procedures

The structure of the Soviet National Economic Balance data base is shown in Figure 4.1. Each of the three types of statistical tables is described below:

4.2.1 Source Tables

The source tables provide the primary data that are required to reconstruct the intermediate level working tables. In the data base, there are two types of statistical source tables--major and minor. The 134 major source tables in the data base are taken directly from the major Soviet statistical publications. As indicated in Figure 4.1, most of these tables (119) are taken from the Soviet economic statistical handbook, *Narodnoye Khozyaystvo SSSR*, which is published annually by Central Statistical Administration of the USSR. The other major source tables are taken from tables published in the monthly journal (8) *Vestnik Statistiki*, in the annual statistical handbook for the CEMA countries (6), and in the handbook of the Soviet Ministry of Finance (1), *Gosudarstvenniy Byudzhety SSSR i Byudzhety Soyuznykh Respublik*, which is published for each five-year plan period.

Each of the 134 major source tables is compiled in time-series format for the 1970-1983 period, and a complete list of the major source tables is found in Appendix A of this volume. The lefthand column in this list gives the alphanumeric code for each table followed by the table title. The column on the right lists the references to a standardized edition of the publication and the page numbers where the source table can be found. For example, the standardized edition of the *Narodnoye Khozyaystvo SSSR* handbook (NK) is the 1980 edition. References to prior editions of the NK in the list indicate that the table ceased being published after that year; likewise, references to NK editions published after 1980 indicate that the table began being published in that year. While most source tables required more than one edition of the statistical publications to be referenced in order to derive a complete time-series of data in the 1970-1983 period, the references in the List of Major Source Tables function as footnotes to facilitate reader verification of the data sources. Furthermore, since the source tables used in the NEB data base are not published as part of this report, the List of Major Source tables provides a convenient identification of the published Soviet statistical tables which the reader can reference for each year in the time-series.

As an example of how the source tables are constructed, Figure 4-2 shows source table ST028, GSP by Sector, as it is formatted in the NEB data base. The heading in the upper lefthand corner of the table identifies the source table by its alphanumeric code. The second line gives the translated table title and the third line cites the standardized references by page number. The lefthand column underneath the heading contains the translated names of the accounts listed in the published tables. The double-lettered codes to the immediate right of the account names serve to uniquely identify the accounts in the data base. For example, GSP for industry is identified by table number ST028 and by row AB. Thus, in the NEB data base the data published in the NK for the 1970-1983 period is referred to as ST028AB. Finally, the published statistics for GSP by sector are found in time-series format beginning in the first column to the immediate right of the row identifier column. These statistics are the actual data taken from the published statistical tables; in this case, the statistics for GSP published in the NK series.

While published data were available for a complete time-series in most of the major source tables, for some tables the data were not available for the entire series and had to be estimated for the omitted years by utilizing interpolation or extrapolation procedures. Another problem encountered with the published data is

FIGURE 4-1

STRUCTURE OF THE SOVIET NATIONAL ECONOMIC BALANCE DATA BASE

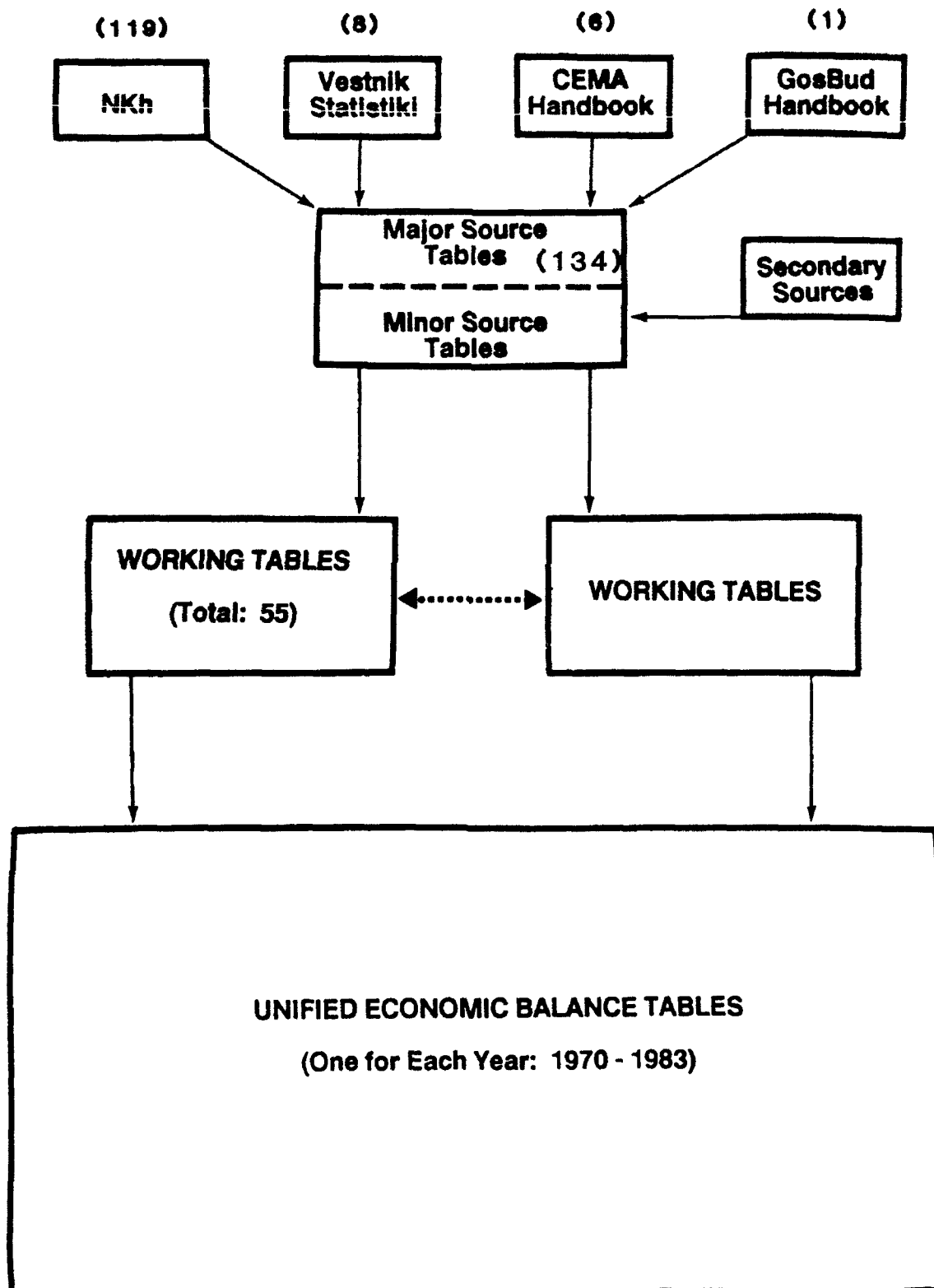


FIGURE 4-2
SOURCE TABLE: GSP BY SECTOR

TABLE NUMBER: ST028 page 1
TABLE TITLE: GSP By Sector
SOURCE: NREG, p.49.

Row	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
TOTAL GSP	643.50	685.30	717.40	770.90	816.70	862.60	903.90	949.60	995.70	1032.40	1078.50	1122.80	1236.00	1292.70
Industry	409.00	434.30	458.40	490.10	528.60	558.30	578.40	605.50	635.50	657.10	685.50	709.00	792.70	800.00
Agriculture	103.80	106.10	108.80	121.90	122.10	122.30	132.40	141.70	147.00	151.90	152.60	160.00	170.30	207.90
Transportation & Communications	25.70	27.70	29.50	31.70	34.10	36.70	38.60	41.10	43.80	45.20	47.60	49.80	55.20	58.00
Construction	67.60	74.70	77.40	80.90	86.40	91.70	96.20	98.20	99.60	101.10	103.40	106.40	115.10	119.30
Trade & Other	37.40	40.50	43.30	46.30	48.50	53.60	60.30	65.10	69.80	77.10	89.40	97.60	102.70	107.50

that quite frequently later editions of a publication revise previously published statistics, either because new data had subsequently become available or new estimation procedures had been adopted. To address the first problem, the source tables as compiled in the NEB data base used the most recently published data, when available. The latter problem posed greater difficulties but, fortunately, occurred infrequently. Since changes in the counting or estimation procedures were not always easy to infer from the published data, for the most part the source tables in the data base used the published data which seemed most consistent with other estimates in the data base.

The minor source tables serve to identify (1) data derived from secondary Soviet sources or (2) data estimated in the Steinberg analysis using procedures which could not be replicated in the computer data base. These tables are considered minor source tables because they contain data which augment statistics published in the primary sources. The secondary sources identified in the minor source tables include data published in Soviet monographs and in Soviet economic journals such as *Planovoye Khozyaystvo* and *Voprosy Ekonomiki*. The minor source tables also contain estimates made by the Central Intelligence Agency and the U.S. Department of Commerce. Finally, there are a very few instances in the reconstructed data base where the original estimates in the Steinberg methodology could not be replicated using the automated procedures designed to construct the computerized NEB data base. These are cases where qualitative analysis was required to make the estimates. Given project time constraints, the original Steinberg estimates for such data were entered into minor source tables rather than attempting a computerized replication.

The data contained in the minor source tables are by and large used to estimate accounts in the data base which are small in magnitude and bear only tangentially on the estimation of higher level accounts. Because the published estimates are in many cases not available for the entire 1970-1983 period, a complete time-series was derived by extrapolation. In some cases, the time-series for an estimate was based on a "best guess," given only partial information on the size of a particular account. Thus, the estimates contained in the minor source tables are subject to a some degree of uncertainty which may vary widely for any given account. The degree of uncertainty in these estimates can be decreased by comparing these estimates with other data in the reconstruction to ascertain whether these estimates seem to be of reasonable magnitude. The uncertainty in these minor accounts will be reduced as more data are published and as further research is conducted.

4.2.2 Working Tables

The intermediate level tables in the Soviet National Economic Balance are referred to as working tables in the reconstructed data base. The purpose of the working tables is to integrate the published data provided by the source tables into a viable reconstruction of Soviet national economic accounts. Since the Steinberg methodology examines the hypothesis that the published Soviet statistics are taken directly from the Soviet National Economic Balance tables, but are published in a confusing and piecemeal manner to conceal information on composite resource flows in the Soviet economy, the working tables serve to structure Soviet national economic accounts according to Soviet economic planning procedures in order to determine whether the published statistics can be interpreted in a manner which is consistent with these procedures. Thus, the data used to construct each working table are taken either directly from the source tables or from estimates made in

other working tables. These data are then used in each working table to estimate the accounts according to procedures defined in the Steinberg methodology. Section 4.3 below provides a separate discussion on how the working tables are generated and how the estimation procedures are defined in the computerized Soviet NEB data base.

As a whole, the working tables are a highly integrated set of tables which provide data on all aspects of Soviet economic activity. The high degree of interdependence among the tables is suggestive of the consistency of the published statistics. The tables indicating how the Soviet economic statistics can be interpreted to provide a broader and more cohesive structure to Soviet material and financial flows.

There are a total of 55 working tables in the DSA computer data base, each of which provides data on a particular economic activity. A complete list of these tables is given in Appendix A of this volume. Volume II of this report, *Tables*, contains a complete set of working tables compiled in numerical order. Working table WT050, Supporting Data on Education, Culture, Health, and Science, is shown in Figure 4-3 as an example of the basic structure of the working tables contained in the data base. As indicated by the circled numbers in Figure 4-3, the general format of the working tables consists of:

- (1) Table heading. The table heading lists the table number and table title on the first two lines. The second two lines list source tables and other working tables which provide the data required to generate the table.
- (2) Row titles. These are the names of the individual accounts defined in the original tables constructed by Steinberg. The working tables in the data base are structured in the same way as the tables presented in the Steinberg documentation.
- (3) Row identifiers. These alphabetized double-lettered codes serve the same function as the double-lettered codes used in the source tables. The codes make each row in a working table uniquely identifiable in the data base. For example, in Figure 4-3 total social security deductions for education, culture, and the arts is identified as WT050AB. Each working table account needs to be uniquely identified in the data base in order to access the data required to generate estimates within the same working table, in other working tables, and in the unified economic balance tables.
- (4) Annotation code. The annotation code, listed in the column third from the left, labeled "Source", specifies the estimation procedures required to generate the 1970-1983 time-series estimates for each account listed in the entire set of working tables. The annotation codes are defined in a standardized format to provide the computer readable instructions required to estimate each account in a working table. These instructions, which constitute the estimation procedures, identify both the sources of data and arithmetic operations required to estimate the accounts in the working tables. The estimation procedures defined by the annotation code are derived in part from the written Steinberg documentation and in part from detailed discussions with Steinberg himself as needed to clarify the written

WORKING TABLE: SUPPORTING DATA ON EDUCATION, CULTURE, HEALTH, & SCIENCE

TABLE NUMBER: W1050 page 1
TABLE NAME: Supporting Data on Education, Culture,
Health, & Science
SOURCE TABLES: S1033 S1037 S1041 S1101 S1122 S1251
WORKING TABLES: W1016 W1023 W1032

Row Title	Row Source	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
EDUCATION, CULTURE & ARTS	AA AB-AC	24.09	25.12	27.06	28.63	30.75	31.79	33.01	34.14	35.99	37.22	38.47	39.39	41.11	41.82
Social Security Deductions	AB AC-AS	0.59	0.62	0.66	0.73	0.75	0.79	0.81	0.84	0.89	0.92	0.97	0.99	1.01	1.02
Total Outlays w/o AB	AC ST101AB	23.50	24.50	26.40	27.90	30.00	31.00	32.20	33.50	35.10	36.30	37.50	38.40	40.10	40.80
a) Social Consumption Funds	AD ST101AB	18.78	19.90	21.20	22.80	24.30	25.10	26.50	27.70	29.10	30.20	31.60	32.50	34.00	34.70
b) Investment	AE AC-AG	4.80	4.60	4.40	4.10	3.90	3.70	3.50	3.30	3.10	2.90	2.70	2.50	2.30	2.10
--Investment	AF AC-AG	3.89	3.64	3.40	3.10	2.90	2.70	2.50	2.30	2.10	1.90	1.70	1.50	1.30	1.10
--Repair	AG AD-AN	0.91	0.94	1.04	1.04	1.11	1.16	1.27	1.36	1.39	1.44	1.45	1.50	1.56	1.61
EDUCATION	AH ST101AC-AC	19.28	20.06	21.72	23.26	24.94	25.51	26.49	27.47	28.73	29.51	30.27	31.05	32.53	33.02
Current Public Outlays	AI AH-AD	15.94	16.87	17.87	19.46	20.49	22.37	23.28	24.14	25.03	25.77	26.81	27.37	28.81	29.54
a) materials & wages	AJ AI-AK-AL	16.12	16.95	17.95	19.54	20.57	22.45	23.36	24.22	25.11	25.85	26.89	27.45	28.89	29.62
b) social security deductions	AK WT032AY	0.52	0.54	0.58	0.64	0.66	0.69	0.71	0.73	0.75	0.79	0.83	0.85	0.87	0.88
c) stipends	AL ST101AC	1.30	1.40	1.40	1.90	2.10	2.20	2.20	2.20	2.40	2.40	2.50	2.50	2.50	2.60
Investment & Repair	AM AE-AT	3.34	3.20	3.05	3.00	3.45	3.70	4.58	4.84	5.09	5.15	4.93	5.11	5.17	5.31
a) investment	AM AH-AD	2.66	2.48	2.30	3.02	3.62	3.83	3.63	3.82	4.05	4.07	3.84	3.99	4.00	4.10
b) capital repair	AO WT016AC-.75	0.68	0.72	0.75	0.78	0.83	0.87	0.90	0.92	1.04	1.08	1.09	1.13	1.17	1.21
CULTURE & ARTS	AP ST104AC-AS	3.63	3.62	4.02	3.91	4.31	4.31	4.95	5.29	5.68	5.87	6.26	6.36	6.56	6.87
Current Public Outlays	AQ AP-AT	2.17	2.12	2.67	2.61	3.06	3.50	3.78	4.23	4.67	4.92	5.29	5.57	5.83	5.97
a) materials & wages	AR AD-AS	2.10	2.33	2.59	2.52	2.97	3.40	3.68	4.12	4.55	4.79	5.15	5.43	5.49	5.73
b) social security deductions	AS WT032AO	0.07	0.08	0.08	0.09	0.09	0.10	0.10	0.11	0.12	0.13	0.14	0.14	0.14	0.14
Investment & Repair	AT AA-O	1.46	1.41	1.35	1.30	1.25	1.20	1.12	1.06	0.81	0.95	0.97	0.79	0.93	0.93
a) investment	AU AF-AM	1.23	1.17	1.10	1.04	0.97	0.91	0.80	0.72	0.46	0.59	0.61	0.41	0.54	0.39
b) repair	AV WT016AC-AD	0.23	0.24	0.25	0.26	0.28	0.29	0.32	0.34	0.35	0.36	0.36	0.36	0.39	0.40
HEALTH	AW WT016AC-AD	12.11	12.82	13.34	13.66	14.08	14.99	15.61	16.53	17.87	18.59	19.53	19.84	20.94	21.57
Social Security Deductions	AX WT032AU	0.31	0.32	0.34	0.36	0.38	0.39	0.41	0.43	0.47	0.49	0.53	0.54	0.56	0.57
Total Outlays w/o AT	AY ST1041AF	11.80	12.50	13.00	13.30	13.70	14.60	15.20	16.10	17.60	18.10	19.00	19.30	20.40	21.00
a) materials & wages	AZ ST101AD	10.00	10.50	10.80	11.60	12.00	12.90	13.70	14.50	15.50	16.20	17.20	17.80	18.60	19.20
b) investment & repair	BA AY-AZ	1.80	2.00	2.20	1.70	1.70	1.70	1.50	1.60	1.90	1.90	1.80	1.50	1.80	1.80
--investment	BB BA-BC	1.65	1.62	1.79	1.27	1.45	1.21	0.99	1.05	1.31	1.30	1.18	0.85	1.13	1.10
--repair	BC WT016AD	0.35	0.38	0.41	0.43	0.46	0.49	0.51	0.55	0.59	0.60	0.62	0.65	0.67	0.70
SOCIAL SECURITY & WELFARE	BD ST1041AG	22.80	24.60	26.90	28.50	30.30	34.60	36.70	38.20	40.30	42.30	45.60	48.30	51.30	55.10
a) pensions & allowances	BE ST1041AH-ST1041AI	22.30	24.20	26.20	27.70	29.40	33.60	35.60	37.10	39.10	41.00	44.30	46.70	49.70	53.20
--state social security	BF ST1033AH-ST1033AC	16.26	17.44	18.49	20.05	21.49	24.97	26.72	28.12	29.73	31.58	33.71	35.75	38.13	41.64
--state budget & other	BG BE-BF	6.04	6.76	7.51	7.65	7.91	8.63	8.88	8.98	9.37	9.42	10.59	10.95	11.57	11.74
b) current outlays	BH BD-BE	0.65	0.72	0.79	0.86	0.93	1.00	1.10	1.10	1.20	1.30	1.30	1.60	1.60	1.90
SCIENCE	BI BJ-BK	11.97	13.32	14.74	16.07	16.89	17.80	18.12	18.74	19.76	20.69	22.82	23.95	25.47	28.58
Social Security and Welfare	BJ WT032BC	0.27	0.32	0.34	0.37	0.39	0.40	0.42	0.44	0.46	0.49	0.52	0.55	0.57	0.58
Total Outlays w/o BJ	BK ST1041AE	11.70	13.00	14.40	15.70	16.50	17.40	17.70	18.30	19.30	20.20	22.30	23.40	24.90	28.00
a) materials & wages	BL BI-BO	10.44	11.95	13.26	14.28	14.65	15.91	16.15	16.55	17.40	18.15	19.94	20.83	21.97	26.01
--materials	BM BL-BM	6.76	7.51	8.08	7.25	7.10	8.20	8.19	8.19	8.54	8.69	9.91	10.34	11.06	11.52
--wages	BN WT032AZ	5.25	6.07	6.50	7.03	7.55	7.63	7.98	8.34	8.84	9.44	10.05	10.49	10.91	11.09
b) investment & repair	BO BP-BQ	1.31	1.37	1.48	1.79	2.24	1.89	1.97	2.19	2.36	2.54	2.86	3.12	3.50	3.97
--investment	BQ WT023AM	1.01	1.03	1.14	1.35	1.77	1.58	1.43	1.62	1.76	1.91	2.20	2.42	2.77	3.21
--capital repair	BQ WT016BF	0.30	0.34	0.38	0.44	0.47	0.51	0.54	0.57	0.60	0.63	0.66	0.70	0.73	0.76
Budget Outlays on Science	BS ST1037AF	6.42	6.92	7.30	7.50	7.90	7.89	7.90	8.19	8.78	9.28	9.95	10.71	11.55	12.54
--All-Union Budget	BS BS-BT	5.72	6.20	6.57	6.76	7.14	7.12	7.11	7.38	7.92	8.40	9.01	9.74	10.55	11.54
--All-Republic Budget	BT ST251AA	0.70	0.71	0.73	0.74	0.76	0.77	0.79	0.81	0.85	0.88	0.94	0.97	1.00	1.04
AI ST122AB	AI ST122AB														
AT AE-AM	AT AE-AM														
AM AH-AD	AM AH-AD														

	1961	1965	1974	1965	1983
1961					
1965					
1974					
1983					

documentation. The annotation codes prescribed in the working tables are designed to replicate as closely as possible the estimates contained in the tables constructed in the Steinberg documentation. A more detailed discussion of the annotation code and how each working table is generated using this code is provided in Section 4.3 below.

- (5) Time-series estimates. These are the 1970-1983 estimates generated for each account based on the procedures defined by the annotation codes described in (4).
- (6) Auxiliary annotation code. The auxiliary annotation code listed at the bottom of the main body of each working table is needed to accommodate changes in estimation procedures for particular accounts over the 1970-1983 period. The row identifiers to the left of the annotations indicate accounts in the main body of the table for which alternative estimation procedures are being applied. The year given to the right of the annotation code is the year in which the alternative estimation procedure prescribed by the auxiliary annotation code takes effect. In the example working table given in Figure 4-3, the second line of the auxiliary annotation code indicates that the annotation code required to estimate row AM--Investment & Repair--is ST122AC, which means that the data found in source table ST122, row AC defines this working table account beginning with the year 1975. These auxiliary annotations are defined in the same computer-readable format as the annotations listed in the main body of the working table. Thus, the computer program reads the auxiliary code and makes the appropriate changes for the specified row item beginning with the indicated year. If a working table requires more than one alternative annotation code to complete the estimates for the entire time-series, these additional codes are also listed as auxiliary annotations.
- (7) Extrapolation/interpolation procedures. These extrapolation/interpolation procedures are performed for specified accounts. Similar to the auxiliary annotation code, the lettered code indicates the accounts on which the extrapolation/interpolation procedures are to be performed. The years in which the estimates are either extrapolated or interpolated are the first two years listed in the column to the right of the double-lettered codes. The last two years indicate the period upon which the estimated trends are based. Only six working tables in the data base require the use of these procedures. (see WT029, WT041, WT050, WT051, WT053 and WT054)

4.2.3 Unified Economic Balance Tables

The unified economic balance tables represent the highest level of statistical tables in the Soviet National Economic Balance. Section 3.0 discusses in detail the structure and the purpose of the Soviet unified economic balance tables. To reiterate, the function of the unified economic balance tables is to integrate on an annual basis the Soviet economic activities estimated in the working tables in order to provide a composite account of material and financial resource flows. A major objective of this project was automate the generation of unified economic balance tables for each year in the 1970-1983 period. Because the unified economic balance

tabulates annual resource flows in the Soviet economy on a sector-by-sector and activity-by-activity basis, a manual reconstruction of unified economic balance tables for each of the 14 years would be a far too cumbersome task. To facilitate the production of this series of tables and to ensure the accurate transcription of the working table data, the computerized methodology was designed to automate the generation of unified economic balance tables by utilizing computer-readable code to specify the working table data required to fill out the rows and columns in all 14 unified economic balance tables.

In the computerized NEB data base, the unified balance tables are structured according to the format outlined in Section 3.0. This format is shown in Figure 3-2 for the materials flow portion of the unified economic balance table and in Figure 3-6 for the financial flows portion of the table. The estimation procedures described in Section 3.0 were designed to acquaint the reader with the structure of the Unified Economic Balance table and to establish the interrelationship among the source tables, the working tables, and the unified economic balance tables. There is a one-to-one correspondence between the working table data and the data contained in the unified economic balance tables. All data contained in the unified economic balance tables are generated in the working tables. The working tables and the unified economic balance tables, however, serve different purposes. Whereas the working tables are constructed in time-series format and provide data on individual facets of Soviet economic performance, the unified economic balance tables provide a comprehensive account of the Soviet economy by integrating the material and financial flows estimated in the working tables into a framework in which the consistency of the published Soviet data becomes apparent.

The computerized Soviet National Economic Balance data base contains 14 unified economic balance tables--one for each year in the 1970-1983 period, all of which can be found in Volume II of this report, *Tables*. As an example, Figure 4.4 displays the unified economic balance table for 1983 in which all the cells defined in the Soviet National Economic Balance contain numbers. As shown, rows 1-29 and columns 1-30 comprise the material flows portion of the tables, and correspond with row and column activities outlined individually in Section 3.4. Rows 31-45 and columns 31-35 correspond with the financial flow activities, which are also described in Section 3.4.

The annotation codes identifying the working table data needed to construct the 1983 table can be seen in Figure 4-5, which displays the unified economic balance template. This template of annotation codes is used to generate the series of UEB tables for each year in the 1970-1983 period. Like the working tables, the unified economic balance tables are generated by specifying the computer-readable annotation code for pertinent cells. The legend indicates the arithmetic operations contained in particular cells of the unified economic balance table.

As shown in the unified economic balance template, the table cells contain either (1) a zero for undefined activities, (2) arithmetic functions to define aggregate activities, or (3) an annotation code specifying the working table account pertaining to data defined by that cell. The annotation code used in the UEB tables is the same as that used in the working tables, except that the UEB annotation code only reads working table data; no new estimates are made in the UEB tables and no source table data are accessed.

DEMAND	INDUSTRY			Metall	Fuels	Power	MEMU	Chemical	Wood /Paper	Constr	Other	Light	Food	AGRIC.			CONSTRUCT			T & C			T & D			OTHER	INTER.
	1	2	3											4	5	6	7	8	9	10	11	12	13	14	15		
1 Industry	421.17	45.64	30.54	121.33	32.94	17.07	16.30	8.52	80.07	54.48	33.37	57.42	13.70	3.56	1.44	530.86											
2 --Metallurgy	66.98	30.82	0.30	28.31	2.09	0.44	2.44	2.03	0.00	0.47	0.00	6.44	0.33	0.00	0.00	73.75											
3 --Fuels	55.35	7.89	24.08	2.67	1.69	1.06	2.71	0.67	0.28	1.49	3.93	2.82	6.77	0.27	0.05	69.19											
4 --Power	16.55	2.87	2.33	3.59	2.92	0.71	1.19	0.36	0.74	1.04	0.08	0.72	1.93	0.31	0.05	19.64											
5 --Power	84.40	2.35	1.36	69.39	4.83	1.06	1.58	0.23	0.73	1.80	6.45	12.24	2.28	0.63	0.31	106.11											
6 --Chemicals	34.60	0.97	0.91	6.59	15.90	1.14	0.88	0.69	4.62	0.72	3.94	2.15	1.46	0.11	0.11	42.41											
7 --Wood & Paper	21.14	0.44	0.76	3.32	1.60	11.44	0.67	0.42	0.73	1.76	0.91	6.50	0.41	0.58	0.50	30.04											
8 --Construction Materials	9.48	0.00	0.00	1.45	0.50	0.31	6.56	0.39	0.00	0.47	0.35	25.52	0.00	0.17	0.00	35.72											
9 --Other Heavy	3.26	0.00	0.00	1.02	0.00	0.00	0.00	1.06	0.00	1.04	7.70	0.25	0.11	0.42	0.50	12.24											
10 --Light	60.51	0.30	0.00	2.58	1.70	0.91	0.27	0.76	72.46	1.55	0.51	0.68	0.41	0.31	0.12	82.54											
11 --Food	48.70	0.00	0.00	0.41	1.71	0.00	0.00	1.93	0.51	44.14	9.70	0.10	0.00	0.72	0.00	59.22											
12 Agriculture	68.43	0.00	0.00	0.00	0.00	0.00	0.00	4.61	11.89	51.93	46.41	0.00	0.00	0.34	0.00	115.18											
13 Construction	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00											
14 Other Production	2.60	1.34	0.00	0.37	0.00	0.78	0.00	0.00	0.00	0.11	0.27	0.06	0.00	0.06	0.09	3.08											
15 TOTAL MATERIAL OUTLAYS	492.20	46.98	30.54	121.70	32.94	17.05	16.30	13.13	91.96	106.52	80.25	57.48	13.70	3.96	1.53	649.12											
16 Depreciation	53.81	6.91	6.86	13.92	6.05	3.05	3.24	1.96	1.87	4.79	17.51	8.60	10.99	4.41	0.20	95.55											
17 Wages	85.89	5.64	5.28	36.40	4.39	6.18	5.17	3.92	8.95	7.77	79.20	38.65	19.23	16.14	4.27	243.58											
18 Other Earnings	2.48	0.17	0.16	1.09	0.13	0.19	0.15	0.11	0.27	0.15	0.45	0.85	0.53	0.47	0.13	4.91											
19 Social Security	9.31	0.70	0.69	4.34	0.59	0.49	0.35	0.31	0.95	0.68	3.47	2.33	1.55	1.22	0.31	18.19											
20 Profit	104.46	11.81	12.00	33.87	6.84	4.16	2.61	3.41	10.22	13.14	26.99	11.39	7.00	16.49	1.25	167.38											
21 Transfers	3.34	0.00	0.78	1.83	0.11	0.40	0.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.34											
22 GVO (w/o T.TAX)	751.49	72.21	56.31	213.15	51.05	32.52	28.04	22.84	114.22	133.05	207.90	119.30	58.00	42.69	7.69	1187.07											
23 Turnover Tax	107.50	0.00	16.59	20.61	0.50	0.40	0.30	2.00	23.30	42.00	0.00	0.00	0.00	0.00	0.00	107.50											
24 Subsidies/State Budget	4.20	0.00	0.00	2.20	2.00	0.00	0.00	0.00	0.00	0.00	58.60	0.00	0.00	0.00	0.00	58.60											
25 NET INCOME	317.18	18.32	13.90	100.34	14.56	12.02	8.80	9.75	43.69	63.74	168.71	53.22	28.31	34.32	5.96	603.70											
26 T & C Charge	53.73	6.18	35.90	7.22	2.64	4.71	11.46	0.08	2.48	4.90	2.46	0.00	0.00	0.00	0.00	0.00											
27 T & D Charge	33.95	0.92	1.16	0.00	3.97	3.00	1.10	0.00	0.33	5.41	17.26	0.00	0.00	0.00	0.97	0.00											
28 Imports	92.27	10.68	6.68	28.12	5.48	2.75	0.36	0.20	23.56	14.46	12.17	0.00	0.00	0.00	0.43	104.87											
29 TOTAL SUPPLY	1034.74	89.99	94.64	270.87	60.67	41.46	40.96	25.45	68.97	211.67	175.69	119.30	0.00	0.00	10.90	1340.63											
30 -----	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00											
31 Households	266.32	0.00	2.10	26.23	2.25	7.99	0.10	7.08	76.78	140.09	23.42	0.00	0.00	4.96	0.00	0.00											
32 Credits	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00											
33 State Budget	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	41.30	0.00	0.00	0.00	0.00	22.99											
34 -----wages	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00											
35 -----capital investment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00											
36 -----capital repair	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00											
37 -----working assets	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00											
38 -----subsidies	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	58.80	0.00	0.00	0.00	0.00	0.00											
39 -----social security	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00											
40 -----credits	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.50	0.00	0.00	0.00	0.00	0.00											
41 -----materials	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00											
42 -----food & uniforms	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00											
43 -----transfers to households	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00											
44 -----defense construction	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00											
45 -----R & E commissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00											
'6 -----	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00											
-----	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00											
Supporting Data	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00											

FIGURE 4~4
UNIFIED ECONOMIC BALANCE TABLE: 1983

DEMAND	PLANNED LOSS 18	TOTAL CONSUMP 19	House- holds 20	Services 21	Armed Forces 22	TOTAL INVEST 23	Fixed Invest 24	K-Repair 25	Inv/Resrv (+ Agric) 26	Defense Constr 27	Defense Prod 28	EXPORTS 29	TOTAL DEMAND 30	Nonfin. Revenues 31	Foreign Trade 32	Credits 33	Budget 34	State holds 35
1 Industry	0.00	319.58	66.32	35.39	17.87	85.54	61.50	24.04	0.00	0.00	0.00	51.83	987.81	0.00	0.00	0.00	0.00	0.00
2 Metallurgy	0.00	1.64	0.00	1.64	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.78	80.17	0.00	0.00	0.00	0.00	0.00
3 Fuel	0.00	6.02	2.10	3.11	0.73	0.00	0.00	0.00	0.00	0.00	0.00	18.23	93.44	3.00	0.00	0.00	0.00	0.00
4 Power	0.00	6.62	3.70	2.54	0.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	26.06	0.00	0.00	0.00	0.00	0.00
5 Mining	0.00	41.58	26.23	6.40	8.75	83.14	59.10	24.04	0.00	0.00	0.00	18.92	249.55	0.00	0.00	0.00	0.00	0.00
6 Chemicals	0.00	7.46	2.25	3.75	1.46	0.00	0.00	0.00	0.00	0.00	0.00	3.78	53.65	0.00	0.00	0.00	0.00	0.00
7 Wood & Paper	0.00	10.97	7.99	2.25	0.73	2.00	2.00	0.00	0.00	0.00	0.00	2.28	45.29	0.00	0.00	0.00	0.00	0.00
8 Construction Materials	0.00	1.40	0.10	0.94	0.36	0.00	0.00	0.00	0.00	0.00	0.00	0.10	37.22	0.00	0.00	0.00	0.00	0.00
9 Other Heavy	0.00	10.70	7.08	3.07	0.55	0.40	0.40	0.00	0.00	0.00	0.00	0.00	22.94	0.00	0.00	0.00	0.00	0.00
10 Light	0.00	82.39	76.78	4.15	1.46	0.00	0.00	0.00	0.00	0.00	0.00	2.10	167.43	0.00	0.00	0.00	0.00	0.00
11 Food	0.00	151.20	140.09	7.46	3.65	0.00	0.00	0.00	0.00	0.00	0.00	1.64	212.06	16.50	0.00	0.00	0.00	0.00
12 Agriculture	0.00	43.53	41.02	2.15	0.36	3.70	2.70	0.00	1.00	0.00	0.00	0.70	166.48	0.00	0.00	0.00	0.00	0.00
13 Construction	3.13	0.00	0.00	0.00	0.00	113.75	89.10	20.09	0.00	4.56	0.00	0.00	116.88	0.00	0.00	0.00	0.00	0.00
14 Other Production	0.00	5.08	4.48	0.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.42	8.58	1.10	0.00	0.00	0.00	0.00
15 TOTAL MATERIAL OUTLAYS	6.50	368.19	311.82	38.14	18.23	263.56	153.30	44.13	34.63	4.56	26.94	52.95	1340.32	0.00	0.00	0.00	0.00	0.00
16 Depreciation	0.00	0.00	8.82	12.92	0.20	0.00	0.00	0.00	0.00	0.00	2.17	0.00	119.66	0.00	0.00	0.00	0.00	323.52
17 Wages	0.00	0.00	0.00	45.16	6.24	0.00	0.00	0.00	0.00	0.00	23.13	0.00	337.91	17.60	0.00	0.00	2.20	0.00
18 Other Earnings	0.00	0.00	0.00	0.88	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.79	0.00	0.00	0.00	87.44	0.00
19 Social Security	0.00	0.00	0.00	0.00	0.44	0.00	0.00	0.00	0.00	0.00	2.60	0.00	26.63	0.00	0.00	0.00	26.40	0.00
20 Profit	0.00	0.00	0.00	18.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	185.82	0.00	0.00	0.00	106.60	0.00
21 Transfers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.34	0.00	0.00	0.00	0.00	0.00
22 GVO (w/o TAD)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1187.07	0.00	0.00	0.00	102.90	0.00
24 Subsidies/State Budget	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	107.50	0.00	0.00	0.00	0.00	0.00
25 NET INCOME	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	58.80	0.00	0.00	3.60	0.00	58.51
26 I & C Charge	0.00	0.00	0.00	87.68	6.68	0.00	0.00	0.00	0.00	0.00	25.73	0.00	723.79	0.00	0.00	0.00	0.00	0.00
27 I & C Charge	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	58.00	0.00	0.00	0.00	0.00	0.00
28 Imports	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	42.68	0.00	0.00	0.00	0.00	0.00
29 TOTAL SUPPLY	0.00	0.00	0.00	138.74	25.11	0.00	0.00	0.00	0.00	0.00	54.84	-51.92	104.87	0.00	0.00	0.00	0.00	0.00
30 -----	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1559.32	0.00	0.00	0.00	0.00	0.00
31 Households	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	107.50	0.00	0.00	0.00	0.00	0.00
32 Credits	0.00	0.00	0.00	46.00	0.00	2.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	30.15	0.00
33 State Budget	0.00	0.00	0.00	0.00	0.00	9.97	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	22.36	0.00	0.00
34 Wages	0.00	0.00	63.74	100.23	24.47	0.00	0.00	0.00	0.00	5.36	53.88	0.00	0.00	0.00	10.20	0.00	3.41	0.00
35 capital investment	0.00	0.00	0.00	45.02	6.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
36 capital repair	0.00	0.00	0.00	9.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
37 working assets	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
38 subsidies	0.00	0.00	3.42	3.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
39 social security	0.00	0.00	4.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.20	0.00	0.00	0.00
40 credits	0.00	0.00	2.89	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
41 materials	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
42 food & uniforms	0.00	0.00	0.00	25.18	13.12	0.00	0.00	0.00	0.00	0.00	26.94	0.00	0.00	0.00	0.00	0.00	0.00	0.00
43 transfers to households	0.00	0.00	0.00	11.61	5.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
44 defense construction	0.00	0.00	46.66	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
45 M & E commissions	0.00	0.00	0.00	5.40	0.00	0.00	0.00	0.00	0.00	4.56	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
46 -----	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
47 -----	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
48 Supporting Data	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	33.63	0.00	0.00	0.00	0.00	0.00	357.90	354.30	0.00	76

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FIGURE 4-4 (cont.)
UNIFIED ECONOMIC BALANCE TABLE: 1983

DEMAND		INDUSTRY		INDUSTRY																	OTHER PROD.		INTER. USE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524	525	526	527	528	529	530	531	532	533	534	535	536	537	538	539	540	541	542	543	544	545	546	547	548	549	550	551	552	553	554	555	556	557	558	559	560	561	562	563	564	565	566	567	568	569	570	571	572	573	574	575	576	577	578	579	580	581	582	583	584	585	586	587	588	589	590	591	592	593	594	595	596	597	598	599	600	601	602	603	604	605	606	607	608	609	610	611	612	613	614	615	616	617	618	619	620	621	622	623	624	625	626	627	628	629	630	631	632	633	634	635	636	637	638	639	640	641	642	643	644	645	646	647	648	649	650	651	652	653	654	655	656	657	658	659	660	661	662	663	664	665	666	667	668	669	670	671	672	673	674	675	676	677	678	679	680	681	682	683	684	685	686	687	688	689	690	691	692	693	694	695	696	697	698	699	700	701	702	703	704	705	706	707	708	709	710	711	712	713	714	715	716	717	718	719	720	721	722	723	724	725	726	727	728	729	730	731	732	733	734	735	736	737	738	739	740	741	742	743	744	745	746	747	748	749	750	751	752	753	754	755	756	757	758	759	760	761	762	763	764	765	766	767	768	769	770	771	772	773	774	775	776	777	778	779	780	781	782	783	784	785	786	787	788	789	790	791	792	793	794	795	796	797	798	799	800	801	802	803	804	805	806	807	808	809	810	811	812	813	814	815	816	817	818	819	820	821	822	823	824	825	826	827	828	829	830	831	832	833	834	835	836	837	838	839	840	841	842	843	844	845	846	847	848	849	850	851	852	853	854	855	856	857	858	859	860	861	862	863	864	865	866	867	868	869	870	871	872	873	874	875	876	877	878	879	880	881	882	883	884	885	886	887	888	889	890	891	892	893	894	895	896	897	898	899	900	901	902	903	904	905	906	907	908	909	910	911	912	913	914	915	916	917	918	919	920	921	922	923	924	925	926	927	928	929	930	931	932	933	934	935	936	937	938	939	940	941	942	943	944	945	946	947	948	949	950	951	952	953	954	955	956	957	958	959	960	961	962	963	964	965	966	967	968	969	970	971	972	973	974	975	976	977	978	979	980	981	982	983	984	985	986	987	988	989	990	991	992	993	994	995	996	997	998	999	1000	1001	1002	1003	1004	1005	1006	1007	1008	1009	1010	1011	1012	1013	1014	1015	1016	1017	1018	1019	1020	1021	1022	1023	1024	1025	1026	1027	1028	1029	1030	1031	1032	1033	1034	1035	1036	1037	1038	1039	1040	1041	1042	1043	1044	1045	1046	1047	1048	1049	1050	1051	1052	1053	1054	1055	1056	1057	1058	1059	1060	1061	1062	1063	1064	1065	1066	1067	1068	1069	1070	1071	1072	1073	1074	1075	1076	1077	1078	1079	1080	1081	1082	1083	1084	1085	1086	1087	1088	1089	1090	1091	1092	1093	1094	1095	1096	1097	1098	1099	1100	1101	1102	1103	1104	1105	1106	1107	1108	1109	1110	1111	1112	1113	1114	1115	1116	1117	1118	1119	1120	1121	1122	1123	1124	1125	1126	1127	1128	1129	1130	1131	1132	1133	1134	1135	1136	1137	1138	1139	1140	1141	1142	1143	1144	1145	1146	1147	1148	1149	1150	1151	1152	1153	1154	1155	1156	1157	1158	1159	1160	1161	1162	1163	1164	1165	1166	1167	1168	1169	1170	1171	1172	1173	1174	1175	1176	1177	1178	1179	1180	1181	1182	1183	1184	1185	1186	1187	1188	1189	1190	1191	1192	1193	1194	1195	1196	1197	1198	1199	1200	1201	1202	1203	1204	1205	1206	1207	1208	1209	1210	1211	1212	1213	1214	1215	1216	1217	1218	1219	1220	1221	1222	1223	1224	1225	1226	1227	1228	1229	1230	1231	1232	1233	1234	1235	1236	1237	1238	1239	1240	1241	1242	1243	1244	1245	1246	1247	1248	1249	1250	1251	1252	1253	1254	1255	1256	1257	1258	1259	1260	1261	1262	1263	1264	1265	1266	1267	1268	1269	1270	1271	1272	1273	1274	1275	1276	1277	1278	1279	1280	1281	1282	1283	1284	1285

UNIFIED ECONOMIC BALANCE TEMPLATE

DEMAND	PLANNED LOSS	TOTAL CONSUM	House- holds	Services	Armed Forces	TOTAL INVEST	Fixed Invest	K-Repair	Inv/Resv	Defense Prod	EXPORTS	TOTAL DEMAND	Monifan. Revenues	Foreign Trade	Credits	Budget	State holds
1 Industry	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
2 Metallurgy	0.00	J	0.00	WT063AM	0.00	K	0.00	0.00	0.00	0.00	WT018AR	M	0.00	0.00	0.00	0.00	0.00
3 Fuels	0.00	J	WT063AM	WT063AM	WT063AS	K	0.00	0.00	0.00	0.00	WT018AR	M	0.00	0.00	0.00	0.00	0.00
4 Power	0.00	J	WT063AM	WT063AM	WT063AS	K	0.00	0.00	0.00	0.00	WT018AR	M	0.00	0.00	0.00	0.00	0.00
5 Paper	0.00	J	WT063AM	WT063AM	WT063AS	K	0.00	0.00	0.00	0.00	WT018AR	M	0.00	0.00	0.00	0.00	0.00
6 Chemicals	0.00	J	WT063AM	WT063AM	WT063AS	K	0.00	0.00	0.00	0.00	WT018AR	M	0.00	0.00	0.00	0.00	0.00
7 Wood & Paper	0.00	J	WT063AM	WT063AM	WT063AS	K	0.00	0.00	0.00	0.00	WT018AR	M	0.00	0.00	0.00	0.00	0.00
8 Construction Materials	0.00	J	WT063AM	WT063AM	WT063AS	K	0.00	0.00	0.00	0.00	WT018AR	M	0.00	0.00	0.00	0.00	0.00
9 Other Heavy	0.00	J	WT063AM	WT063AM	WT063AS	K	0.00	0.00	0.00	0.00	WT018AR	M	0.00	0.00	0.00	0.00	0.00
10 Light	0.00	J	WT063AM	WT063AM	WT063AS	K	0.00	0.00	0.00	0.00	WT018AR	M	0.00	0.00	0.00	0.00	0.00
11 Food	0.00	J	WT063AM	WT063AM	WT063AS	K	0.00	0.00	0.00	0.00	WT018AR	M	0.00	0.00	0.00	0.00	0.00
12 Agriculture	0.00	J	WT063AM	WT063AM	WT063AS	K	0.00	0.00	0.00	0.00	WT018AR	M	0.00	0.00	0.00	0.00	0.00
13 Construction	0.00	J	WT063AM	WT063AM	WT063AS	K	0.00	0.00	0.00	0.00	WT018AR	M	0.00	0.00	0.00	0.00	0.00
14 Other Production	0.00	J	WT063AM	WT063AM	WT063AS	K	0.00	0.00	0.00	0.00	WT018AR	M	0.00	0.00	0.00	0.00	0.00
15 TOTAL MATERIAL OUTLAYS	0.00	J	WT063AM	WT063AM	WT063AS	K	0.00	0.00	0.00	0.00	WT018AR	M	0.00	0.00	0.00	0.00	0.00
16 Depreciation	0.00	J	WT063AM	WT063AM	WT063AS	K	0.00	0.00	0.00	0.00	WT018AR	M	0.00	0.00	0.00	0.00	0.00
17 Wages	0.00	J	WT063AM	WT063AM	WT063AS	K	0.00	0.00	0.00	0.00	WT018AR	M	0.00	0.00	0.00	0.00	0.00
18 Other Earnings	0.00	J	WT063AM	WT063AM	WT063AS	K	0.00	0.00	0.00	0.00	WT018AR	M	0.00	0.00	0.00	0.00	0.00
19 Social Security	0.00	J	WT063AM	WT063AM	WT063AS	K	0.00	0.00	0.00	0.00	WT018AR	M	0.00	0.00	0.00	0.00	0.00
20 Profit	0.00	J	WT063AM	WT063AM	WT063AS	K	0.00	0.00	0.00	0.00	WT018AR	M	0.00	0.00	0.00	0.00	0.00
21 Transfers	0.00	J	WT063AM	WT063AM	WT063AS	K	0.00	0.00	0.00	0.00	WT018AR	M	0.00	0.00	0.00	0.00	0.00
22 GVO (w/o T.I.A.)	0.00	J	WT063AM	WT063AM	WT063AS	K	0.00	0.00	0.00	0.00	WT018AR	M	0.00	0.00	0.00	0.00	0.00
23 Turnover Tax	0.00	J	WT063AM	WT063AM	WT063AS	K	0.00	0.00	0.00	0.00	WT018AR	M	0.00	0.00	0.00	0.00	0.00
24 Subsidies/State Budget	0.00	J	WT063AM	WT063AM	WT063AS	K	0.00	0.00	0.00	0.00	WT018AR	M	0.00	0.00	0.00	0.00	0.00
25 NET INCOME	0.00	J	WT063AM	WT063AM	WT063AS	K	0.00	0.00	0.00	0.00	WT018AR	M	0.00	0.00	0.00	0.00	0.00
26 T & C Charge	0.00	J	WT063AM	WT063AM	WT063AS	K	0.00	0.00	0.00	0.00	WT018AR	M	0.00	0.00	0.00	0.00	0.00
27 T & C Charge	0.00	J	WT063AM	WT063AM	WT063AS	K	0.00	0.00	0.00	0.00	WT018AR	M	0.00	0.00	0.00	0.00	0.00
28 Imports	0.00	J	WT063AM	WT063AM	WT063AS	K	0.00	0.00	0.00	0.00	WT018AR	M	0.00	0.00	0.00	0.00	0.00
29 TOTAL SUPPLY	0.00	J	WT063AM	WT063AM	WT063AS	K	0.00	0.00	0.00	0.00	WT018AR	M	0.00	0.00	0.00	0.00	0.00
30 -----	0.00	J	WT063AM	WT063AM	WT063AS	K	0.00	0.00	0.00	0.00	WT018AR	M	0.00	0.00	0.00	0.00	0.00
31 Households	0.00	J	WT063AM	WT063AM	WT063AS	K	0.00	0.00	0.00	0.00	WT018AR	M	0.00	0.00	0.00	0.00	0.00
32 Credits	0.00	J	WT063AM	WT063AM	WT063AS	K	0.00	0.00	0.00	0.00	WT018AR	M	0.00	0.00	0.00	0.00	0.00
33 State Budget	0.00	J	WT063AM	WT063AM	WT063AS	K	0.00	0.00	0.00	0.00	WT018AR	M	0.00	0.00	0.00	0.00	0.00
34 Wages	0.00	J	WT063AM	WT063AM	WT063AS	K	0.00	0.00	0.00	0.00	WT018AR	M	0.00	0.00	0.00	0.00	0.00
35 capital investment	0.00	J	WT063AM	WT063AM	WT063AS	K	0.00	0.00	0.00	0.00	WT018AR	M	0.00	0.00	0.00	0.00	0.00
36 capital repair	0.00	J	WT063AM	WT063AM	WT063AS	K	0.00	0.00	0.00	0.00	WT018AR	M	0.00	0.00	0.00	0.00	0.00
37 working assets	0.00	J	WT063AM	WT063AM	WT063AS	K	0.00	0.00	0.00	0.00	WT018AR	M	0.00	0.00	0.00	0.00	0.00
38 subsidies	0.00	J	WT063AM	WT063AM	WT063AS	K	0.00	0.00	0.00	0.00	WT018AR	M	0.00	0.00	0.00	0.00	0.00
39 social security	0.00	J	WT063AM	WT063AM	WT063AS	K	0.00	0.00	0.00	0.00	WT018AR	M	0.00	0.00	0.00	0.00	0.00
40 credits	0.00	J	WT063AM	WT063AM	WT063AS	K	0.00	0.00	0.00	0.00	WT018AR	M	0.00	0.00	0.00	0.00	0.00
41 materials	0.00	J	WT063AM	WT063AM	WT063AS	K	0.00	0.00	0.00	0.00	WT018AR	M	0.00	0.00	0.00	0.00	0.00
42 food & uniforms	0.00	J	WT063AM	WT063AM	WT063AS	K	0.00	0.00	0.00	0.00	WT018AR	M	0.00	0.00	0.00	0.00	0.00
43 transfers to households	0.00	J	WT063AM	WT063AM	WT063AS	K	0.00	0.00	0.00	0.00	WT018AR	M	0.00	0.00	0.00	0.00	0.00
44 defense construction	0.00	J	WT063AM	WT063AM	WT063AS	K	0.00	0.00	0.00	0.00	WT018AR	M	0.00	0.00	0.00	0.00	0.00
45 M & E commissions	0.00	J	WT063AM	WT063AM	WT063AS	K	0.00	0.00	0.00	0.00	WT018AR	M	0.00	0.00	0.00	0.00	0.00
46 -----	0.00	J	WT063AM	WT063AM	WT063AS	K	0.00	0.00	0.00	0.00	WT018AR	M	0.00	0.00	0.00	0.00	0.00
47 -----	0.00	J	WT063AM	WT063AM	WT063AS	K	0.00	0.00	0.00	0.00	WT018AR	M	0.00	0.00	0.00	0.00	0.00
48 Supporting Data	0.00	J	WT063AM	WT063AM	WT063AS	K	0.00	0.00	0.00	0.00	WT018AR	M	0.00	0.00	0.00	0.00	0.00

FIGURE 4-5 (cont.)
UNIFIED ECONOMIC BALANCE TEMPLATE

LEGEND:
UNIFIED ECONOMIC BALANCE TEMPLATE

A	sum [row(2) .. row(11)]
B	sum [col(2) .. col(11)]
C	row(1) + row(12) + row(13) + row(14)
D	col(1) + col(12) + col(13) + col(14) + col(15) + col(16)
E	sum [row(15) .. row(21)]
F	row(22) - row(21) - row(20) - row(19) - row(18) - row(16) - row(15)
G	row(22) - row(21) - row(19) - row(18) - row(17) - row(16) - row(15)
H	row(17) + row(18) + row(19) + row(20) + row(21) + row(23) + row(24)
I	row(22) + row(23) - row(24) + row(25) + row(27) + row(28)
J	sum [col(20) .. col(22)]
K	sum [col(24) .. col(28)]
L	row(1) + row(12) + row(13) + row(14) + row(48)
M	col(17) + col(18) + col(19) + col(23) + col(29)
N	sum [row(34) .. row(45)]
O	row(11) + row(14)
P	sum [row(16) .. row(32)] - sum [col(2) .. col(33)]
Q	row(57):col(34) + row(57):col(35)
R	sum [col(17) .. col(28)]
S	col(1) + col(12) + col(13) + col(14) + col(15) + col(16)
T	sum [row(16) .. row(33)] - sum [col(2) .. col(34)]

FIGURE 4-5 (cont.)

UNIFIED ECONOMIC BALANCE TEMPLATE

In order to demonstrate the consistency between the unified economic balance tables and the working tables, a number of key points or check sums in the UEB tables tie with data contained in the working tables. These check sums are as follows:

Total Supply: Row 29 in the UEB table indicates supply of production goods by sector. The totals for the individual sectors given in this row can be checked against the totals given in working table WT006. A comparison of the accounts in WT006 with the structure of the UEB table shows that supply by sector is calculated in the same manner

GVO for Industry: The cells in row 22 under columns 1 through 11 in the UEB table correspond with the estimates for GVO by industrial sector given in WT037.

Intermediate Product: Column 17, through row 15, lists the value of intermediate goods produced by each economic sector. These values can be compared with the estimate for the intermediate product given in working table WT011.

Total Consumption: Working table WT063 estimates the value of current consumption by sector. These estimates are contained in column 19 in rows 1 through 15 in the UEB table. As indicated in the UEB template, column 19 sums the data contained in columns 20, 21 and 22.

These check sums are calculated within the UEB tables to serve the dual purpose of (1) ensuring that the correct data from the pertinent working tables are being accessed in the UEB tables, and (2) cross-checking aggregate accounts calculated in the working tables. The most compelling evidence of the consistency of the published data is the comparability of the estimates for total supply and demand for resources--both in the aggregate and by individual sector in the unified economic balance table. Since the components of supply and demand in the data base are estimated independently, the comparability of those estimates indicates that the published data can be used to provide a coherent interpretation of Soviet resource flows. The estimates for supply and demand can be seen in row 29 and column 30, respectively, in the unified economic balance tables for each year in the 1970-1983 period. While the estimates for supply and demand in a given year do not demonstrate an exact fit due to the uncertainties inherent in some of the minor source table data, they are quite comparable for aggregate supply and demand and of a reasonable magnitude for the individual sectors to suggest consistency in the published data. Section 5.0 below discusses in detail how uncertainties in the secondary source data affect the aggregate and sectoral fits to the supply and demand accounts.

4.3 PROCEDURES FOR COMPUTERIZING THE SOVIET NEB DATA BASE

Computerizing the three levels of tables in the Soviet National Economic Balance data base--source tables, working tables, and unified economic balance tables--essentially followed a three step procedure, where (1) the annotation codes are prescribed for each working table, (2) the working tables are generated in a sequence to accommodate the interdependent relationships among the set of working tables, and (3) the unified economic balances tables are generated once all working tables are constructed. These three procedures are discussed individually in this section.

4.3.1 Annotation Code

All tables in the computerized Soviet NEB data base were created using a specially tailored version of an electronic spreadsheet software package. The hierarchical and interdependent nature of the data base tables was established by modifying the spreadsheet program to read prescribed annotation codes and to perform the required operations. In essence, the annotation code is the key to generating all 55 working tables and all 14 unified economic balance tables in the data base. This code provides computer-readable instructions in a standardized format defining the procedures required to estimate the accounts in the working tables and to identify the working table data needed to generate the unified economic balance tables. In the working tables, the annotation code specified for each row performs two major functions. One function is to identify the data sources needed to estimate the entries for the row. There are three possible sources of data for generating a working table: data given in the source tables, data contained in other working tables, and data contained within the same working table. The second major function of the annotation code is to define the arithmetic operations needed to estimate accounts in the working tables.

All source table data are prefixed by ST in the annotation code, followed by a number unique to each table. The List of Major Source Tables found in Appendix B of this volume identifies each of the major working tables by its alphanumeric annotation code. The complete references for the minor source table codes are found in Volume II of this report, *Tables*. Working tables are accessed by their alphanumeric annotation code, which contains the prefix WT followed by a unique number for each table. The row accounts in each working table are identified by the double-lettered row identifiers. As an example, Figure 4.1 shows that the annotation code for the account for social security deductions in the education sector would be WT050AK.

Data contained within a given working table are identified in the annotation code simply by a double-lettered row identifier code. The arithmetic operations required to estimate the working table accounts are denoted in the annotation code by the standard signs. These operations can be performed on all three sources of data identified above.

4.3.2 Working Table Sequence

Since some of the data required to generate the working tables are estimated in other working tables, the working tables in the Soviet NEB data base are generated in an certain order to accommodate this interdependent relationship. As a simple example, this requirement is shown in working tables WT029 and WT030, *Labor Force Trends* and *Labor Outlays of Production Sectors*, respectively--in order to estimate labor outlays for the production sectors in table WT030, the number of workers in each sector have to be estimated first in table WT029.

Figure 4-6 lists the sequence in which the working tables are generated in the Soviet NEB data base. It should be noted that the listed sequence does not constitute a unique order for generation of the working tables; some working tables and subsets of working tables are independent of the entire set and can be estimated at any given point. However, the sequence given in Figure 4-6 does lay out general requirements for constructing the working tables. Specifically, the working tables needed to estimate the supply of goods in the Soviet economy are

Figure 4-6
WORKING TABLE SEQUENCE

(asterisk indicates interdependent set of tables)

(1) SUPPLY

WT028 Demographic Trends
WT029 Civilian Labor Force
WT030 Labor Outlays - Production Sectors
WT031 Labor Outlays - Industrial Sectors
WT032 Labor Outlays - Nonproduction Sectors
WT017 Foreign Trade in Gold Rubles
WT018 Foreign Trade in Domestic Rubles
WT070 Export and Import Coefficients
WT040 Agricultural Productive Capital
WT020 Capital Investment in Constant Prices
WT021 Capital Investment in Production Sectors
WT022 Capital Investment in Nonproduction Sectors
WT023 Additions to Capital Stock in Constant Prices
WT014* Capital Depreciation
WT015* Capital Replacement
WT016* Capital Repair
WT044 Industrial Groups A and B
WT034 Turnover Tax and Other Financial Revenues
WT043 Structure of Industrial Purchaser's Prices
WT066 Industrial Production Outlays - Industry, Power, Fuel
WT067 Industrial Production Outlays - Metallurgy, Chemicals, MBMW
WT068* Industrial Production Outlays - Wood/Paper, Con. Mat., Light & Food
WT037* Industrial GVO in Constant and Current Prices
WT005* GSP and Replacement Fund
WT019* Produced National Income by Sector
WT033* Net Profit
WT043 Structure of Industrial Purchaser's Prices
WT012 Material Outlays of Heavy Industrial Sectors
WT013 Material Outlays of All Other Sectors
WT011 Total Material Outlays of Production Sectors
WT046 Transportation & Communication Charge by Sector
WT006 Supply of Goods by Sector

Figure 4-6

WORKING TABLE SEQUENCE

(asterisk indicates interdependent set of tables)

(2) DEMAND

WT064 Agricultural Productive Capital
WT041 Capital Construction - Constant and Current Prices
WT053 State Budgetary Revenues
WT047 Retail Trade of Goods by Sector
WT048 Retail Purchases by Households and Organizations
WT050 Supporting Data on Education, Culture, Health & Services
WT051 Outlays and Profit of Service Sectors
WT101 Defense Science
WT052 Material Outlays of Nonproductive Sectors
WT001 Net Investment by Sector
WT026 Balance of Inventories and Reserves
WT027 Additions of Inventories and Reserves
WT100 Agricultural Consumption-In-Kind
WT063 Consumption of Goods by Sector
WT002 Production and End Use of Goods (GSP Balance)

(3) FINANCIAL

WT061 Distribution of State Profit
WT071 Capital Investment in Current Prices
WT049* Unified Balance of Household Income and Outlays
WT056* Financial Balance of Household Income & Outlays
WT058 Financing Working Assets
WT059 Financing Capital Investment
WT069 ISSR Defense Budget
WT054 State Budgetary Outlays by Sector
WT055 Itemized State Budgetary Outlays

generated first in the data base, followed by the tables which estimate the demand for goods. The tables which provide data on financial flows are constructed last.

Note that, in the sequence, some working tables are generated as an interdependent subset. This indicates that certain rows or portions of a working table need to be estimated first in order to generate other tables in the sequence, which, in turn, provide data needed to complete the entire working table.

4.3.3 Generation of the Unified Economic Balance Tables

The final step in computerizing the Soviet National Economic Balance data base is the generation of a unified economic balance table for each year in the 1970-1983 period. This is accomplished after all of the working tables have been constructed. Of the 55 working tables constructed in the data base, only 32 are needed to generate the unified economic balance tables. As indicated in Section 4.2.3 above, the unified economic balance tables are produced using working table annotation codes to define the pertinent working table data needed to fill the row/column cells in the unified economic balance table. The use of working table annotation codes is readily apparent in Figure 4-4, which displays the unified economic balance template.

4.4 GUIDELINES FOR FURTHER ANALYSIS

By providing a detailed description of the structure and procedures used in the computerized Soviet National Economic Balance data base, the objective of this section of the report is to assist the analyst in undertaking a more comprehensive analysis of the structure of the data base and of the estimation procedures used to reconstruct the Soviet National Economic Balance tables. The estimation procedures described in Section 3.0 were intended to provide an overview of the reconstruction process, and to describe how the published Soviet statistics are used to reconstruct the Soviet Unified Economic Balance.

By being familiar with the tables in the Soviet NEB data base and how they are constructed, however, the reader can undertake a more detailed and rigorous analysis of the estimation procedures by using the annotations, codes to reference individually the working tables that were used to generate the unified economic balance tables. A suggested procedure for undertaking this kind of analysis is to work backward from an entry in the UEB table to the working table data defined in a particular cell of the unified economic balance table template (Figure 4-4). The working table data referenced in the unified economic balance template can be found in Volume II of this report, *Tables*. This in turn will identify all data sources and procedures used to estimate that cell, and will define an audit trail for that particular estimate.

5.0 ASSESSMENT OF THE STEINBERG METHODOLOGY

5.1 INTRODUCTION

A major objective of this study is to provide an independent assessment of the methodology developed by Steinberg for reconstructing the Soviet National Economic Balance tables. The process of computerizing the Soviet National Economic Balance provided the essential background experience for making this assessment. This process required careful study of the Soviet data sources and a thorough understanding of the estimation procedures in order to reconstruct the data base tables. Thus the reconstruction experience provides a background for our assessment of the data sources, estimation methods, and the postulates of the Steinberg methodology.

This section evaluates (1) how well the Soviet data sources are documented and utilized in the reconstruction, (2) whether the estimation procedures used to construct the Soviet NEB tables are viable, and (3) whether the postulates of the Steinberg methodology--as outlined in Section 2.0--are substantiated by the DSA computerized reconstruction of the Soviet National Economic Balance tables. The final subsections assess the treatment of defense expenditures in the Soviet National Economic Balance tables, summarize the conclusions of the DSA analysis, and provide recommendations for further research.

5.2 DATA SOURCES

The first step in reconstructing the Soviet National Economic Balance tables is to identify the sources of published Soviet statistic referenced in the Steinberg methodology. As indicated earlier, the primary sources of data for reconstructing the Soviet NEB tables are the statistics available in officially published sources, such as the *Narodnoye Khozyaystvo SSSR* series and the journal *Vestnik Statistiki*, and data published in secondary Soviet sources, such as monographs and articles in various journals. These data are tabulated in the NEB data base as major source tables and minor source tables, respectively. The sheer volume of the statistical data used in the NEB tables made the identification and compilation of the source tables a major task in the reconstruction effort.

The List of Major Source Tables shown in Appendix A of this volume identifies all of the sources of officially published Soviet economic statistics used to reconstruct the Soviet National Economic Balance tables. Our analysis of the methodology indicates that Steinberg's use of this data is consistent with the accounts listed in the Soviet publications and is accurately transcribed in Steinberg's version of the Soviet National Economic Balance tables.

For most of the accounts listed in the major source tables, a complete time-series of data was obtainable from the Soviet sources. In the few cases where a complete series of published data was not available, Steinberg analyzed trends in the available data to extrapolate or interpolate as needed. Another problem encountered with the officially published data is the change in accounting methods during the 1970-1983 period which resulted in multiple published estimates for the same accounts. This problem was encountered very infrequently and pertained only to small accounts. Steinberg's resolution was to use the data which appeared to be most consistent with other related accounts in the tables.

The secondary source data used in the reconstruction are identified in the minor source tables as described in section 4.2.1. For the most part, these secondary source data were used in the reconstruction to estimate accounts which were relatively small in size. Using a rough approximation, these sources appear to account for less than 10 percent of the estimates in the Soviet National Economic Balance tables. Steinberg was able to provide references for all of his sources; these references accompany the working tables compiled in Volume 2 of this study.

Since the references to secondary source data covered a broad spectrum of the Soviet economics literature, much of which was not available to DSA analysts, these references by and large could not be cross-checked in the DSA computerized reconstruction. Checking those sources which were available, however, indicated that the Steinberg references were correct.

The data derived from secondary sources sometimes included actual estimates or provided information which allowed estimation of an account based on other data available--e.g., a percentage share of a higher level account. Secondary sources rarely provided data for the entire 1970-1983 time-series. Therefore, interpolation or extrapolation procedures were used to provide a complete series. In some cases, a "best guess" of the size of a small account was made, given only fragmentary or circumstantial information. Some very small accounts in the NEB tables had to be estimated based on a "best guess."

The minor source tables also include data derived from the 1966 and 1972 Soviet input-output tables. The most critical data derived from the Soviet I-O tables was the structure of material outlays used to estimate the intermediate product (see section 3.4.2). In order to derive ratios for the entire time series, the ratios obtained from the 1966 and 1972 I-O tables were interpolated and extrapolated. Other data derived from the Soviet I-O tables include the structure of delivery charges by sector (see WT046).

Because the data contained in the minor source tables are by and large based on information which is incomplete for the entire time-series, they are subject to varying degrees of uncertainty. To some extent, these uncertainties can be reduced in the NEB tables by comparing the minor source table data with the published statistics to see whether they are of reasonable magnitude. Clearly, the precision of some of the minor source table data can be improved with further research or when additional information is published by Soviet agencies.

While the DSA reconstruction of the Soviet NEB tables indicates that the published Soviet statistics are internally consistent and provide a coherent interpretation of Soviet resource flows, a major task in reconstructing the Soviet NEB tables is the reconciliation of data obtained from secondary sources with the officially published statistics--as identified in the major source tables--in order to provide reasonable statistical fits. This occurs particularly when accounts in the working tables are estimated as residuals. The uncertainties in secondary source data used to derive these residuals often result in trends which are not plausible. In other instances, these residual estimates may not be completely compatible with accounts estimated elsewhere in the reconstruction. Section 5.4 below elaborates on how the Steinberg methodology demonstrates the consistency of the published Soviet statistics, and discusses instances in the reconstruction where uncertainties in the secondary source data result in unlikely statistical fits.

5.3 ESTIMATION PROCEDURES

The second step in reconstructing the Soviet NEB tables is to define the procedures required to estimate the economic accounts in the working tables. This inherently necessitated analyzing Soviet economic planning procedures in order to determine the structure of the Soviet national economic accounts. Since the DSA reconstruction replicated Steinberg's estimation procedures in the form of computer-readable annotation codes for each individual account in the working tables, a careful review was implicitly made of the structure of the economic accounts and of the viability of the estimation procedures.

Structuring the economic accounts defined in the working tables according to Soviet economic planning procedures resulted in a set of highly interdependent tables. While the DSA analysis of the Steinberg reconstruction methodology did not actually reference Soviet documents and manuals on economic planning procedures, the structure of the accounts in the Steinberg reconstruction appeared to be consistent with logical macroeconomic principles. More importantly, Steinberg's success in demonstrating that the published Soviet statistics provide a coherent interpretation of resource flows in the Soviet economy is strong evidence that Steinberg has correctly followed Soviet economic planning methods.

Defining annotation codes for all the working table accounts in the DSA data base provided an efficient method for analyzing the procedures prescribed by the Steinberg methodology for estimating the Soviet National Economic Balance tables. In general, the compatibility of the estimates made in the computerized DSA data base with the estimates made in the original Steinberg version of the Soviet NEB tables suggests that the computerized procedures for estimating the working table accounts are consistent with the Steinberg methodology.

Our analysis of the Steinberg methodology indicates that Steinberg's approach to estimating the NEB tables is analytically sound. As indicated in section 4.3 above, the working tables are generated sequentially to accommodate their interdependent relationships. Since much of the secondary source data had to be estimated based on fragmentary information, Steinberg used accounts estimated either in the same table or in other working tables to cross-check the secondary source data. Thus, given the uncertainties in the secondary source data, in many cases these data were adjusted to be consistent with other estimates in the working tables.

In order to ensure complete consistency among the estimates contained in all the working tables, Steinberg employed a manual iterative procedure to construct his working tables. He first followed a general sequence--similar to the one given in section 4.3--and then adjusted secondary source estimates contained in earlier tables to ensure consistency with estimates made later in the sequence. This iterative procedure was manual in the sense that Steinberg did not employ automated quantitative techniques to make his adjustments in the secondary source data, but rather exercised his personal judgment as to what adjustments ought to be made in the secondary source data in order to ensure compatibility.

A good example of this adjustment process is evident in the use of the structure of material outlays derived from the 1966 and 1972 Soviet input-output table. As already indicated, these ratios, which are used in the reconstructed NEB tables to estimate material outlays and consequently the intermediate product of the individual economic sectors, are derived in the DSA reconstructed tables by

interpolating and extrapolating the published ratios for the entire 1970-1983 time-series. The use of these mathematically-estimated ratios in the working tables resulted in discrepancies in balancing supply with demand for the 15 economic sectors identified in the reconstructed tables. More specifically, the estimates for material outlays and intermediate product for each of the 15 sectors in most years appeared to be either too high or too low to be consistent with other estimates in the working tables. Steinberg's solution to this problem was to adjust the ratios in the structure of material outlays in order to ensure statistical compatibility.

As a result of employing a manual iterative process, Steinberg's tables reflect a highly integrated and cohesive set of statistics. In a sense, Steinberg's tables are "fine tuned" to demonstrate total consistency among the economic accounts. While the estimates in the DSA data base are comparable to Steinberg's estimates, they do not reflect the same degree of consistency because the DSA tables were, for the most part, generated sequentially--in only a very few cases were the tables constructed iteratively to ensure complete compatibility of the major source table data and the secondary source data contained in the minor source tables.

Even without employing this iterative process, we were able to replicate most of Steinberg's estimates quite accurately. As a general rule, a high degree of accuracy was more obtainable in replicating aggregate accounts--i.e. total supply, total consumption, investment, defense expenditures-- than for the individual sectors of the economy. This is directly attributable to the fact that Soviet statistics are generally published more widely for economy-wide accounts than for the particular economic sectors.

An example of this problem is estimating for each of the 15 economic sectors the amount of materials intended for defense production. Row DR in working table WT002, shown in Figure 5-1, indicates that aggregate supply (row AA) as estimated in the Soviet NEB tables is very closely balanced against the components of aggregate demand (rows AB, AC, AF, AG, AH, AI, AM, AP). In fact, with the exception of the years 1972-1975, the residual difference between supply and demand is less than 1 billion rubles, and can be considered statistically insignificant.

The larger discrepancy, which was found for 1972-1975, can be traced directly to working table WT001, *Net Fixed Investment*, shown in Figure 5-2, because gross fixed investment is an end-use account listed in WT002, row BH. In table WT001, the estimate for capital replacement (row AJ) is not statistically consistent with the NK data on net fixed investment in row AA and the estimate for total fixed investment in row BH. In Steinberg's net fixed investment table, total fixed investment, capital replacement, and net fixed investment are all consistent. In other words, total fixed investment (BH) minus uninstalled capital (BA) equals additions to capital (AQ), and additions to capital minus total capital replacement (AJ) equals net fixed investment (AA). In the DSA table on net fixed investment (Figure 5-2), for the years 1972-1975, additions to capital minus capital replacement overestimates the published estimate for net fixed investment. This statistical discrepancy could be corrected by adjusting the estimate for capital replacement in working table WT016, or by adjusting the estimate for gross fixed investment which is estimated from data obtained from three different working tables, WT041, WT020, and WT071. Making these adjustments to ensure statistical consistency with the NK published data for net fixed investment in the years 1972-

FIGURE 5-1
WORKING TABLE: GSP BALANCE

TABLE NUMBER: W1002 page 1
TABLE TITLE: Production and End Use of Goods (GSP Balance)
SOURCE TABLES:
WORKING TABLES: W1001 W1006 W1011 W1016 W1018 W1019 W1026 W1027 W1063

Row Title	Row Source	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
TOTAL SUPPLY	AA W1006AA	660.04	702.21	750.20	791.79	830.55	889.46	929.40	974.11	1023.51	1061.91	1110.36	1157.25	1280.60	1340.46
Intermediate Product	AB W1011AA	321.83	344.43	366.24	391.04	417.06	445.70	460.48	481.81	502.18	519.40	538.87	553.13	623.83	649.06
Current Consumption	AC W1003AP	190.55	201.31	212.99	223.54	235.97	249.93	262.45	274.31	288.74	303.54	324.32	342.93	395.25	368.19
A) Civilian	AD AC AE	180.87	191.80	203.16	213.85	225.03	239.68	250.31	262.10	273.80	287.95	304.76	320.61	334.34	346.91
B) Defense	AE W1003AP-W1003AI	9.68	9.51	9.83	9.69	10.94	10.25	12.14	12.23	14.94	15.59	19.56	22.32	20.91	21.28
Fixed Investment	AF W1001BM	81.30	88.00	93.70	98.50	105.42	113.31	116.67	120.88	127.46	129.64	135.42	139.60	166.09	150.43
Capital Repair	AG W1016AA	19.06	21.05	22.73	24.87	26.95	27.28	28.00	30.94	32.90	34.92	36.74	39.20	41.55	44.13
Aggricultural Planned Losses	AH W1019OC-W1001BC	1.69	1.74	3.42	1.74	1.63	3.07	1.47	0.58	2.44	2.51	2.89	2.70	2.29	3.37
TOTAL INVESTMENTS	AI W1027AI	19.13	18.97	13.43	20.09	17.58	14.03	19.90	19.13	18.67	19.21	20.24	20.12	36.33	38.19
A) Inventories	AI W1027AI	12.22	13.56	7.74	12.53	13.17	11.04	12.88	12.54	10.46	14.30	18.05	14.65	34.88	32.76
b) State Reserves	AK W1028AP	1.68	0.39	1.48	3.66	0.38	-0.32	3.22	3.29	4.90	1.92	-0.70	2.05	-2.39	0.87
c) Defense Construction	AL W1027AD	5.03	5.02	4.01	3.90	4.03	3.29	3.80	3.30	3.31	2.99	2.89	3.42	3.84	4.56
Investment Residual	AM W1027AF	9.61	8.48	8.75	14.91	13.48	15.76	15.16	18.72	22.11	20.34	17.43	21.69	25.78	27.94
a) Strategic Agricul. Reserves	AM W1027AF	-0.70	-1.90	-3.50	0.90	1.30	0.50	-0.60	2.40	1.60	1.00	-0.30	1.90	0.60	1.00
b) Defense Production	AO W101AB	10.31	10.38	12.25	14.01	12.18	15.26	15.76	16.32	20.51	19.34	17.73	19.79	25.18	26.94
Exports	AP W101AB	18.43	18.64	17.49	20.54	24.27	22.43	24.38	27.61	29.61	32.25	34.24	37.69	49.26	52.95
POWER	AQ W1006AJ	11.54	12.04	14.21	14.97	15.64	16.50	16.69	19.20	19.78	20.45	20.88	21.53	29.60	30.06
Intermediate Product	AR W1011AG	9.28	9.73	10.35	10.95	11.48	12.53	12.96	13.45	14.18	14.74	15.36	15.80	18.90	19.45
Consumption	AS W1003AF	2.36	2.53	2.84	3.06	3.29	3.59	3.95	4.16	4.48	4.71	5.06	5.31	6.08	6.42
Exports	AT W101BMOP-.03	0.07	0.08	0.08	0.10	0.13	0.15	0.17	0.19	0.21	0.27	0.28	0.34	0.50	0.55
Defense Production	AU AA+Q	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FUELS	AV W1006AM	34.05	37.88	40.33	42.44	44.87	47.32	50.74	52.57	55.80	58.19	61.65	64.20	69.26	72.95
Intermediate Product	AW W1011AE	29.06	30.20	33.33	34.82	36.76	38.99	40.74	43.36	44.68	46.69	48.26	49.34	66.94	69.19
Consumption	AX W1003AP	3.27	3.35	3.58	3.43	6.01	6.14	4.48	4.59	4.90	5.05	5.31	5.61	5.87	6.02
Inventories	AY AA+Q	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Exports	AZ W101BMOP-A1	2.27	2.58	2.51	3.38	4.09	4.76	5.60	6.23	6.78	8.68	9.03	11.13	16.02	17.68
Defense Production	BA AA+Q	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RETAILING	BB W1006AS	41.49	44.29	46.75	49.58	52.38	56.57	58.86	60.31	63.14	63.51	65.34	66.98	86.24	89.90
Intermediate Product	BC W1011AC	34.87	38.82	41.10	43.46	46.28	49.94	51.11	52.98	55.44	57.50	59.26	60.94	71.11	73.75
Consumption	BD W1003AP	0.64	0.70	0.81	0.87	0.95	0.98	1.06	1.13	1.22	1.30	1.41	1.50	1.60	1.64
Inventories	BE AA+Q	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Exports	BF W101BM	3.84	3.48	3.39	3.51	3.96	2.75	2.81	2.69	2.61	2.78	3.28	3.06	4.39	4.78
Defense Production	BG AA+Q	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL DEMAND	BH W1006AB	108.31	115.06	127.04	133.31	147.99	162.46	171.16	182.48	200.05	212.69	223.58	236.29	254.20	270.87
Intermediate Product	BI W1011AI	44.52	48.58	53.07	57.03	62.45	68.31	71.04	74.84	79.40	83.98	88.37	92.10	101.88	106.11
Fixed Investment	BJ W1001BJ	25.30	26.87	23.80	30.17	32.40	35.62	37.44	39.13	42.87	44.44	47.24	49.46	54.22	59.10
Capital Repair	BK W1016AC	10.01	11.26	12.28	13.58	14.76	13.67	11.68	16.08	17.28	18.36	19.35	20.85	22.28	24.04
Consumption	BL W1003AP-W1003BA	14.28	15.86	17.88	19.49	21.78	23.06	25.16	26.66	29.21	30.84	34.82	38.94	39.08	41.38
Investment Reserves	BM AA+Q	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Exports	BN W101BC1	4.75	4.73	5.23	6.73	7.49	7.73	8.97	10.69	12.87	12.65	13.29	13.70	17.65	18.92
Defense Production	BO AA+Q	0.64	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

FIGURE 5-1 (cont.)
WORKING TABLE: GSP BALANCE

TABLE NUMBER: W1000, page 2
TABLE TITLE: Production and End Use of Goods (GSP Balance)
SOURCE TABLES: W1001 W1006 W1011 W1016 W1018 W1019 W1026 W1027 W1043

Row Title	Row Source	Year	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
CHEMICALS	BP W1006AM	...	26.99	28.55	29.77	33.01	36.50	39.64	40.81	44.26	45.46	46.03	50.42	52.54	56.03	60.67
Intermediate Product	BP W1011AM	...	21.49	22.47	23.44	25.24	26.76	28.87	29.80	31.49	32.43	33.28	35.09	36.20	40.24	42.40
Consumption	BP W1003AM	...	2.42	3.01	3.36	3.64	4.04	4.22	4.60	4.92	5.32	5.67	6.25	6.79	6.89	7.46
Inventories	BP W1004AM	...	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Exports	BP W1010AM	...	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Defense Production	BP W1011AM	...	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WOOD & PAPER	BP W1006AM	...	22.45	23.91	24.78	25.47	27.06	28.29	28.94	30.06	30.66	30.93	32.11	33.48	40.77	41.46
Intermediate Product	BP W1011AM	...	16.47	17.75	17.96	18.51	19.58	20.82	21.29	22.01	22.54	23.19	23.92	24.64	28.94	30.05
Fixed Investment	BP W1003AM	...	1.00	1.10	1.20	1.20	1.30	1.30	1.40	1.50	1.60	1.70	1.80	1.80	1.90	2.00
Consumption	BP W1004AM	...	4.58	4.95	5.36	5.78	6.27	6.75	6.99	7.47	8.00	8.43	9.43	10.31	10.47	10.97
Inventories & Reserves	BP W1005AM	...	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Exports	BP W1010AM	...	1.13	1.17	1.17	1.21	1.43	1.30	1.42	1.62	1.61	1.74	2.03	1.88	2.12	2.28
Defense Production	BP W1011AM	...	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CONSTRUCTION MATERIALS	BP W1006AM	...	20.58	22.04	23.26	24.77	26.48	28.16	29.08	30.94	32.64	32.39	33.40	34.06	39.48	40.97
Intermediate Product	BP W1011AM	...	21.18	23.04	23.51	24.37	25.88	27.50	27.61	28.13	29.18	29.43	30.15	30.76	34.35	35.71
Consumption	BP W1003AM	...	0.68	0.69	0.75	0.79	0.84	0.86	0.94	0.93	1.07	1.12	1.25	1.34	1.36	1.40
Inventories & Reserves	BP W1004AM	...	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Exports	BP W1010AM	...	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Defense Production	BP W1011AM	...	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OTHER HEAVY INDUSTRY	BP W1006AM	...	12.99	15.34	15.93	18.09	19.13	21.49	23.35	21.08	22.07	24.11	27.43	28.16	28.76	25.33
Intermediate Product	BP W1011AM	...	4.53	5.32	6.08	6.71	7.29	7.92	8.56	8.90	9.23	9.97	10.65	10.98	11.54	12.26
Consumption	BP W1003AM	...	5.55	5.20	5.68	5.87	6.28	6.67	7.65	8.07	9.37	10.55	11.64	11.81	10.79	10.70
Inventories	BP W1004AM	...	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Exports	BP W1010AM	...	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Defense Production	BP W1011AM	...	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LIGHT INDUSTRY	BP W1006AM	...	88.70	94.82	99.47	108.69	113.59	118.95	125.35	131.71	134.97	140.11	148.16	154.90	165.79	168.96
Intermediate Product	BP W1011AM	...	44.27	47.37	48.76	55.34	57.92	61.09	63.47	64.35	67.76	70.01	71.80	73.86	81.60	82.55
Consumption	BP W1003AM	...	42.64	45.01	47.46	49.33	51.85	55.92	58.95	62.29	64.80	68.55	74.22	79.71	81.12	82.39
Fixed Investment	BP W1004AM	...	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Inventories	BP W1010AM	...	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Exports	BP W1011AM	...	1.66	1.81	1.80	1.72	1.80	1.75	1.73	2.09	1.78	1.71	1.77	2.11	2.48	2.10
Defense Production	BP W1011AM	...	121.49	128.10	130.48	137.61	147.78	155.95	157.69	166.14	174.67	181.43	194.37	193.98	202.45	211.60
Intermediate Product	BP W1011AM	...	32.58	35.04	37.39	38.99	41.98	44.49	45.20	47.52	48.58	50.77	52.12	52.41	56.31	59.24
Consumption	BP W1003AM	...	62.59	67.64	72.49	77.04	81.79	87.84	91.64	95.91	100.00	104.00	108.00	112.00	116.00	120.00
Inventories	BP W1010AM	...	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Exports	BP W1011AM	...	2.40	2.26	1.90	1.40	1.40	1.30	1.20	1.20	1.20	1.20	0.60	0.60	0.70	0.70
Defense Production	BP W1011AM	...	97.85	100.28	109.53	117.13	116.53	116.17	125.58	131.33	136.57	141.92	166.72	155.92	163.61	175.49
Intermediate Product	BP W1011AM	...	59.72	64.82	69.43	73.87	78.63	83.26	86.44	90.51	92.99	97.00	101.61	103.33	109.14	115.18
Consumption	BP W1003AM	...	27.62	28.56	28.81	29.72	30.36	31.34	30.97	32.69	34.05	35.51	35.86	37.14	40.43	43.34
Fixed Investment	BP W1004AM	...	1.60	1.80	1.50	1.40	1.80	1.50	1.40	2.30	2.80	2.40	2.65	2.40	2.70	2.70
Inventories	BP W1010AM	...	27.77	4.32	2.16	4.44	3.32	0.94	4.94	3.68	3.38	4.82	2.65	4.98	5.48	6.97
Exports	BP W1011AM	...	0.77	1.30	0.55	1.06	2.25	1.50	0.84	1.13	0.68	1.19	1.26	1.50	1.30	1.44
Defense Production	BP W1011AM	...	1.69	2.17	3.42	1.74	1.63	3.07	1.47	0.58	2.44	2.51	2.89	2.70	2.29	3.37
Planned Losses	BP W1011AM	...	1.88	0.39	1.68	3.66	0.38	0.32	3.22	3.29	4.90	1.92	0.70	2.05	2.39	0.87
State Reserves	BP W1011AM	...	1.90	1.90	3.50	0.90	1.30	0.50	0.60	2.40	1.60	1.00	0.30	1.90	0.60	1.00
Strategic Agricul. Reserves	BP W1006AM	...	67.60	74.70	77.40	80.90	86.40	91.70	94.20	96.70	99.60	101.10	103.40	106.40	115.10	119.30
CONSTRUCTION	BP W1006AM	...	53.20	58.03	62.08	65.63	69.72	74.69	75.33	77.85	79.99	80.80	83.78	85.44	87.97	92.23
Fixed Investment	BP W1003AM	...	9.05	9.79	10.44	11.28	12.19	13.61	14.12	14.86	15.72	16.56	17.38	18.36	19.27	20.09
Capital Repair	BP W1004AM	...	5.03	5.02	4.01	3.90	4.03	3.29	3.80	3.50	3.31	2.90	2.89	3.42	3.46	4.50
Defense Construction	BP W1005AM	...	1.12	2.50	5.16	4.53	5.16	4.18	6.03	5.27	4.82	4.43	2.63	8.58	5.78	3.64

FIGURE 5-1 (cont.)
WORKING TABLE: GSP BALANCE

TABLE NUMBER: WT002 page 3
TABLE TITLE: Production and End Use of Goods (GSP Balance)
SOURCE TABLES:
WORKING TABLES: WT001 WT006 WT011 WT016 WT019 WT026 WT027 WT063

Row Title	Row Source	Year	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
OTHER SECTORS	DM WT006CL		4.60	4.97	5.28	5.83	6.16	6.64	6.95	7.52	8.10	8.54	8.90	8.91	10.27	10.89
Intermediate Product	DM WT011AY		1.70	1.74	1.78	1.84	1.92	2.05	2.11	2.19	2.25	2.33	2.37	2.43	2.96	3.08
Consumption	DO WT063CH		2.14	2.27	2.40	2.54	2.68	2.86	2.99	3.19	3.41	3.76	3.92	4.08	4.69	5.08
Inventories	DP AA*0		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Exports	DM WT018CD		0.19	0.17	0.13	0.19	0.27	0.23	0.29	0.27	0.27	0.21	0.31	0.28	0.47	0.42
RESIDUAL	DR AA-AB-AC-AF-AG-AH-AI-AM-AP		-0.74	-0.84	-2.83	-3.44	-3.81	-2.05	-0.09	-0.11	-0.60	-0.10	-0.21	-0.19	-0.22	-0.20

FIGURE 5-2
WORKING TABLE: NET FIXED INVESTMENT

TABLE NUMBER: W1001 page 1
TABLE TITLE: Net Fixed Investment
SOURCE TABLES: S1043 S1085 S1090 S1102 S1248 S1252
WORKING TABLES: W1015 W1020 W1021 W1041

Row Title	Row Source	Year	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
TOTAL FFI	AA S1102AQ		51.10	53.70	55.20	60.20	62.00	61.20	59.85	59.85	64.74	61.76	72.02	67.78	71.49	76.77
A) Production	AB S1102AM		32.10	33.50	34.70	39.00	40.90	38.80	39.17	37.64	42.93	39.44	47.34	42.69	41.98	51.33
..construction	AC AS-AL		22.34	25.63	27.86	31.96	33.62	34.75	32.51	32.94	35.50	34.52	39.49	37.07	34.50	41.56
..M & E	AD AT-AM		8.91	8.16	9.29	9.54	9.32	1.56	4.36	2.52	4.63	2.51	5.45	3.22	4.08	7.07
B) Non-Production	AE AU		1.60	1.80	1.50	1.30	1.80	2.40	2.30	2.20	2.80	2.40	2.40	2.40	1.60	2.70
..agriculture	AF AA-AB		19.00	20.20	20.50	21.20	21.10	22.40	20.67	22.19	21.81	22.32	24.68	25.09	29.51	25.44
..construction	AG AA-AD		17.47	17.49	17.84	18.97	18.80	20.63	19.66	20.28	20.03	20.11	22.23	22.37	26.71	21.70
..M & E	AH AA-AY AP		1.22	1.36	1.40	1.73	2.16	0.70	0.81	1.71	1.58	1.91	2.15	2.42	2.40	3.34
..light industry	AJ AL		0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.30	0.30	0.30	0.40	0.40
TOTAL REPLACEMENT	AK W1015AA		23.39	26.41	27.17	30.37	32.94	42.69	40.08	49.31	53.38	57.44	61.66	65.55	70.26	75.53
A) Production	AL W1015AD		18.42	21.08	21.52	24.29	26.25	34.57	37.31	40.28	43.75	47.29	50.69	54.39	58.26	62.96
..construction	AM W1015AE		5.40	6.00	6.30	7.00	7.80	8.70	9.40	10.20	11.10	12.00	12.90	13.60	14.50	15.60
..M & E	AN AK-AL		13.02	15.08	15.22	17.29	18.45	25.87	27.91	30.08	32.65	35.29	37.79	40.79	43.76	47.36
B) Non-Production	AO AK-AK		4.97	5.33	5.65	6.28	6.69	8.12	8.77	9.03	9.63	10.15	10.97	11.16	12.00	12.57
..construction	AD W1015AM		3.32	3.76	3.95	4.37	4.53	5.22	5.80	6.10	6.39	6.58	6.97	7.37	7.69	8.02
..M & E	AP AM-AD		1.65	1.57	1.72	1.91	2.16	2.90	2.97	2.93	3.24	3.57	4.00	3.79	4.31	4.55
ADDITIONS TO CAPITAL	AO BH-BA		75.33	81.05	85.26	94.28	98.82	106.04	105.93	109.16	118.12	119.20	133.68	133.33	141.75	152.50
PRODUCTION	AR BS-BG BC		51.47	56.68	60.17	67.09	70.99	76.38	76.48	77.94	86.68	86.73	98.03	97.08	100.24	114.29
a) construction	AS BT-BG BD		27.94	31.63	34.16	38.96	41.42	43.45	41.91	43.14	46.60	46.52	52.39	50.67	50.80	57.16
b) M & E	AT BU-BE		21.93	23.24	24.51	26.83	27.77	31.43	32.27	32.60	37.28	37.80	43.24	44.01	47.64	54.43
c) Agric. Capital	AV BU-BD		1.40	1.80	1.50	1.30	1.80	1.50	2.30	2.20	2.80	2.40	2.40	2.40	1.60	2.70
NONPRODUCTION	AW BU-BF		23.86	24.38	25.09	27.18	27.83	29.65	29.44	31.22	31.44	32.47	35.65	36.25	41.51	38.01
a) construction	AX BU		20.79	21.25	21.77	23.34	23.33	25.85	25.44	26.34	28.42	28.69	29.20	29.74	34.40	29.72
b) M & E investment	AY BU-BF		1.00	1.10	1.20	1.20	1.50	1.30	1.40	1.50	1.40	1.70	1.70	1.80	1.90	2.00
c) M & E commission	AZ BU-BF		5.97	6.94	8.52	4.22	6.59	7.27	10.75	11.72	7.18	10.44	1.74	6.27	4.34	4.13
d) light industry	BA BU-BG		4.36	5.95	7.92	2.40	5.04	5.81	8.39	9.20	7.38	7.99	1.99	3.41	0.80	1.00
UNINSTALLED CAPITAL	BB BU-BF		3.89	4.63	6.22	2.32	4.22	4.65	6.69	7.90	5.48	6.39	1.99	2.71	3.40	2.60
Unfinished Construction	BC BU-BF		2.39	2.84	3.86	1.44	2.59	2.77	3.90	4.50	3.11	3.54	1.47	1.83	1.03	1.58
a) Production	BD BU-BE		1.50	1.79	2.37	0.89	1.62	1.88	2.79	3.39	2.37	2.85	0.45	1.24	1.37	1.22
..construction	BE BU-BE		0.47	1.32	1.70	0.08	0.82	0.94	1.70	1.30	1.70	1.40	0.10	0.70	2.40	3.60
..M & E	BF BU-BD		1.61	0.99	0.59	1.81	1.55	1.66	2.34	2.52	2.14	2.45	2.83	2.86	3.55	3.13
b) Nonproductive	BG BU-BD		81.30	88.00	93.78	98.50	105.42	113.31	110.67	120.88	127.44	129.64	135.42	139.60	146.09	156.43
Investment Writeoffs	BH BU-BJ-BH		53.20	58.03	62.08	65.43	69.72	74.69	75.33	77.85	79.99	80.80	83.78	85.44	87.97	92.23
TOTAL FIXED INVESTMENT	BI W1041AG (W1041AJ-W1041AP)		25.30	26.87	28.80	30.17	32.40	35.62	37.44	39.13	42.87	44.44	47.24	49.66	54.22	59.10
a) construction	BJ BU-BL		25.30	26.80	28.80	31.10	34.10	37.10	40.70	43.00	46.60	48.30	50.80	53.40	55.00	59.70
b) M & E investment	BK W1020AC		1.00	1.01	1.00	0.97	0.95	0.96	0.92	0.91	0.92	0.92	0.93	0.93	0.97	0.99
..in constant prices	BL W1071AB		2.80	3.10	2.90	2.70	3.30	3.00	3.90	3.90	4.60	4.40	4.40	4.50	3.90	5.10
c) other investment	BM BU-AT-AZ		24.33	25.70	26.79	27.26	28.65	30.61	31.14	32.52	33.14	34.07	35.55	36.95	38.91	41.61
Nonproductive Investment	BN BU-BP-BR		21.26	22.57	23.47	23.42	24.15	26.81	27.16	27.68	28.12	28.29	29.10	30.44	31.80	33.32
a) construction	BO W1041AI		1.87	1.83	1.92	2.44	3.00	2.30	2.58	2.44	3.22	3.78	4.45	4.81	4.81	5.89
b) M & E investment	BP BU-BL		1.77	1.81	1.92	2.52	3.16	2.40	2.59	3.45	3.50	4.11	4.79	4.74	4.96	5.95
..in constant prices	BQ W1020AU		1.20	1.30	1.40	1.40	1.50	1.50	1.60	1.70	1.80	2.00	2.00	2.10	2.30	2.40
c) other investment	BR BU-AT-AZ															

FIGURE 5-2 (cont.)
WORKING TABLE: NET FIXED INVESTMENT

TABLE NUMBER: W1001 page 2
TABLE TITLE: Net fixed investment
SOURCE TABLES: ST043 ST085 ST090 ST102 ST248 ST252
WORKING TABLES: W1015 W1020 W1021 W1041

Row Title	Row Source	Year	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
Productive Investment	B5 BA-BM	...	56.97	62.30	66.99	71.23	76.76	82.69	85.53	88.36	94.32	95.56	99.87	102.65	107.18	114.82
a) Construction	B1 B1-BD	...	31.94	35.46	38.61	42.21	45.57	47.88	48.17	50.17	51.87	52.51	54.68	55.00	54.17	58.91
b) R & E Investment	BU B1-BP	...	23.43	25.04	26.86	27.72	29.39	33.31	35.06	35.99	39.85	40.65	42.79	43.25	49.41	53.21
c) Other Investment	BV B5-B1-BU	...	1.48	1.80	1.50	1.30	1.80	1.50	2.30	2.20	2.80	2.40	2.40	2.48	1.60	2.70
***I collect./private	BW ST043AB	...	3.88	5.38	7.35	1.91	4.55	5.01	7.40	8.40	6.50	7.40	1.30	2.90	0.90	0.90
***productive Investment	BX ST085AC-ST085AD	...	9.20	9.90	10.50	11.30	11.90	12.50	12.70	13.00	13.30	13.50	13.50	14.10	14.10	15.20
***I-Instal. K	BY ST085AA-ST090AA	...	6.20	7.30	8.90	4.30	6.70	7.30	10.90	11.80	9.60	10.50	1.70	6.20	4.30	4.10
***Unfinished Construction	BZ (ST043AB/WT041AC)*(BX-ST090AC)	...	4.61	6.26	8.28	2.45	5.12	5.63	8.51	9.26	7.38	8.04	1.07	3.37	0.79	0.99
***Diff. (AB-AJ)-AA	CA (AB-AJ)-AA	...	0.84	0.94	2.89	3.51	3.88	2.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
B1-BG	CB B1-BG	...	51.59	57.04	61.69	63.82	68.17	73.03	72.97	75.33	77.83	78.35	80.95	82.58	84.42	89.10
AA AQ-AJ	AA AQ-AJ	1976														
AB AR-AX	AB AR-AX	1976														
BG (WT041B1-WT041AC)*2.0	BG (WT041B1-WT041AC)*2.0	1970														
BG (WT041B1-WT041AC)	BG (WT041B1-WT041AC)	1971														
B1 WT041AC	B1 WT041AC	1972														
B1 WT041AC (WT041AJ-WT041AP)	B1 WT041AC (WT041AJ-WT041AP)	1982														

NOTE: Row BG (1970-1971)---there is discrepancy for investment writeoffs

1975 is a good illustration of how an iterative estimation procedure is sometimes needed to generate consistency in the working table data.

Total defense materials are estimated in table WT027 as a residual in the investment fund. In table WT002, total defense materials are given in row AL. In order to estimate the amount of defense materials produced in each economic sector, this total estimate must be apportioned to these sectors according to (1) *a priori* assumptions about sectors in which these materials are most likely to be produced--i.e., MBMW, and (2) the balance of other end-use resources for each sector. The latter requirement is more problematic because it suggests that the estimates for the production of defense materials in each sector must be consistent with total supply for each sector and other end use categories--i.e., intermediate product, consumption exports, inventories, etc. The most uncertain end-use account is probably the intermediate product for each sector because of the ratios for the structure of material outlays were derived (see above). These ratios could be adjusted to derive an estimate for defense production as a residual in the MBMW sector (row BO) which needs to be consistent with (1) the balance of supply and other end use components in that sector, and (2) total defense materials as given in row AL and as estimated for other sectors of the economy.

This very detailed example is intended to show how iterative procedures are used in the Steinberg methodology to derive a completely consistent set of estimates in the working tables. Although the production of defense materials was not derived for the individual sectors in WT002 because these procedures were not used to estimate our tables, our analysis indicates that such a process may not be entirely necessary to achieve a reasonable reconstruction of Soviet material and financial flows based on officially published Soviet statistics. Indeed, Steinberg's process of fine-tuning his estimates yields results which are still consistent with the published statistics. This process of fine tuning would very likely be necessary for reconstructing national economic accounts in any country, since the published statistics for a country are unlikely to yield the close fits demonstrated in Steinberg's reconstruction.

5.4 VALIDATION OF THE RECONSTRUCTION POSTULATES

Since the Steinberg methodology for reconstructing the Soviet National Economic Balance tables is founded on some basic assumptions or postulates regarding the function of Soviet statistics in Soviet economic planning processes, an appropriate gauge of Steinberg's success in reconstructing the Soviet economic planning tables is the extent to which these postulates are validated by the reconstruction process. The sections below provide our assessment of the validity of the four postulates outlined in Section 1.0 in terms of how well they are substantiated in the DSA computerized reconstruction of the Soviet National Economic Balance tables.

5.4.1 Postulate 1: That the officially published Soviet economic statistics are all drawn from a common and internally consistent set of statistical tables.

In general, the tables which estimate material flows in the Soviet National Economic Balance show a much higher degree of internal consistency than do the tables which comprise financial flows. The financial flows portion of the unified economic balance table attempts to serve the purpose of integrating the supply and demand for goods defined by material flows into the published Soviet financial

statistics. For this reason, Soviet financial flows play a relatively minor role in the Soviet National Economic Balance tables. Steinberg's original analysis focused almost exclusively on defining the flow of goods in the Soviet economy, while financial flows were examined as time and funding allowed. Thus, the DSA assessment of the Steinberg methodology is based primarily on his success in reconstructing the flow of material resources in the Soviet economy.

There are a number of instances in the Soviet National Economic Balance tables where the consistency of the published data is demonstrated. However, the most compelling evidence for the internal consistency of the published Soviet statistics can be found in the working tables which estimate aggregate supply and aggregate demand, and the working tables which identify the flow of resources to the Soviet defense sector. As shown in Figure 5-1, the accounts representing aggregate supply activities are quite accurately equilibrated with the aggregate demand activities, and--as shown in Figure 4-6--the working tables estimating the components of supply are calculated separately from the the tables calculating demand activities. A close examination of those tables reveals that separate source tables were used to estimate those two sets of tables, and indicates that the components of demand were estimated independently from the components of supply--i.e., the aggregate demand activities were not estimated in a residual process.

More powerful evidence that the published statistics are internally consistent with a common set of planning tables is the comparability of the estimates for defense-related activities. Approximately 80 percent of the total defense budget estimated in the Soviet National Economic Balance is calculated as a residual in the working tables. If the NEB tables have been successfully reconstructed using the published Soviet statistics to identify the flow of goods among all sectors of the Soviet economy, then the residuals or statistical gaps which estimate defense-related activities must be consistent with other activities estimated in the NEB tables. Specifically, defense labor in the reconstructed tables is estimated as a residual in working table WT028 (row AU) using published statistics on Soviet demographic trends. Analysis of published Soviet statistics on labor and wages in the production sectors does not yield an estimate of a wage bill for defense production (see WT030 and WT031). However, a comparison of total wage income in the economy with the wages received by production and nonproduction households reveals a gap which is believed to be the wage income of defense households. This gap is estimated in working table WT056, row AG, using published statistics entirely different than those used to estimate the table on demographic trends. After making some assumptions about wage rates in the armed forces and defense industrial sector, a wage bill can be calculated for the defense labor residual found in table WT028. Our analysis indicates that the wage gap identified in table WT056 is quite comparable to the wage bill calculated for the defense labor gap found in table WT028.

While examination of the working tables reveals that secondary source data--which is subject to varying degrees of uncertainty--is used in conjunction with the officially published Soviet statistics to derive a consistent set of data tables, Steinberg's apparent success in reconstructing Soviet resource flows, which demonstrate the degree of internal consistency described above, provides strong evidence that the published Soviet statistics are indeed drawn from a common set of statistical tables.

5.4.2 **Postulate 2:** That published Soviet economic statistics can be used to reconstruct the Soviet National Economic Balance tables which are used for Soviet economic planning purposes.

The Steinberg analysis attempts to show not only that published Soviet statistics represent a common and internally consistent set of tables, but also that these tables are used for Soviet economic planning purposes. Steinberg's approach to developing a reconstruction methodology was to utilize the principles of Soviet economic planning to provide an interpretation of the published statistics on Soviet economic performance which would reconstruct the tables used by Soviet economic planners.

The role of the Soviet National Economic Balance tables in the Soviet economic planning process is documented in Soviet literature--Belkin and Ivantor (1983), for example, discuss the role of the NEB in improving the work of Soviet economic planning agencies.

The extent to which Steinberg is successful in reconstructing a set of tables based on Soviet economic planning procedures which are used for economic planning purposes can be assessed in terms of (1) the coherency of the interpretation of Soviet resource flows as identified in the reconstructed Soviet National Economic Balance tables and (2) whether the material and financial flows identified in the Soviet National Economic Balance tables are sufficiently comprehensive in both scope and detail to be utilized as an effective tool for Soviet economic planning purposes.

The high degree of consistency found in the reconstructed Soviet National Economic Balance tables suggests that Steinberg would not have been able to accomplish such a reconstruction without having correctly followed Soviet economic planning procedures. The Soviet statistics as published lack the coherency evident in the NEB tables. Reconstructing these planning tables and interpreting the published Soviet statistics in a way which provides a coherent interpretation of resource flows in the Soviet economy would not have been possible had Steinberg incorrectly identified Soviet economic planning principles and inappropriately applied them to reconstructing the Soviet NEB tables.

The reconstructed Soviet National Economic Balance tables provide data on all aspects of Soviet economic performance. A composite account of Soviet material and financial resource flows is given in unified economic balance tables. These tables are composite in the sense that they provide a detailed breakdown of the components of supply and demand by sector for the flow of material resources. The financial flows portion of the unified economic balance tables also provides a fairly detailed analysis of financial revenues and financial outlays, although--as mentioned above--Steinberg's analysis of Soviet financial flows is less comprehensive than his analysis of material flows.

While the unified economic balance table reveals the scope of the data contained in the Soviet National Economic Balance, the working tables provide more detailed accounts of Soviet resource flows. The degree of detail evident in the working tables would be required for Soviet economic planning purposes in order to assess the impact of policies on all segments of the economy

5.4.3 **Postulate 3:** That the officially published Soviet statistics are sufficiently comprehensive to support a reasonably complete reconstruction of Soviet economic planning tables.

Even a cursory analysis of Soviet statistics--as published in the NK and other statistical publications--indicates that the Soviet statistics are published in a piecemeal and confusing fashion. One obvious omission in the published statistics is the lack of information on resource flows to the defense sector and to other sensitive areas of the economy.

Due to these inconsistencies and omissions in the published Soviet statistics, Western analysts historically have not been able to interpret the published data in a manner which would provide a comprehensive account of resource flows in the Soviet economy. Steinberg's success in undertaking this kind of analysis can be attributed to two factors:

- (1) The use of Soviet economic planning procedures to reconstruct a set of tables which establishes the interrelationships among the published Soviet statistical tables.
- (2) The use of data found in secondary sources and/or estimation procedures to either augment the officially published statistics or to accommodate omissions in the published statistics.

Obviously, Steinberg's success in reconstructing a consistent set of tables in the form of the Soviet National Economic Balance, based on statistics published by the Soviet Central Statistical Administration and other agencies, is an indication that the statistics as published are sufficiently comprehensive to support this kind of reconstruction. Indeed, one of the merits of the Steinberg methodology is that it indicates how the numerous seemingly disparate tables published in the NK series and in the journal *Vestnik Statistiki* are interrelated and can be used to provide a comprehensive account of Soviet resource flows.

However, the statistics published in the NK series, or in *Vestnik Statistiki* alone, are not sufficient to successfully reconstruct the Soviet National Economic Balance tables. There are substantial and important omissions in the published statistical tables which require the use of data published in secondary sources--as defined above in section 5.2--or estimation procedures such as extrapolation or interpolation of the published statistics. The problems associated with the incorporation of secondary source data in the reconstruction using an iterative fitting process are discussed in detail in section 5.3. As indicated, while most of the secondary source data pertain to accounts which are relatively small in magnitude, these data are sufficiently used in instances--i.e. for deriving the structure of material outlays--where the precision of the resulting estimates is limited.

A complete reconstruction of the Soviet National Economic Balance tables would not have been possible without the use of secondary source data. However, a major contribution of the Steinberg methodology is that his almost exhaustive research of the Soviet economics literature to fill the omissions in the published statistical tables has provided a logical and coherent interpretation of their significance in the Soviet economic planning process. More research is obviously necessary to reduce the uncertainties in the secondary source data and to make them more compatible with the officially published statistics.

5.4.4 **Postulate 4:** That a reconstruction of the Soviet National Economic Balance tables will reveal significant gaps in published economic data which provide new insight regarding the structure of Soviet defense expenditures.

The reconstruction of the Soviet National Economic Balance reveals significant gaps in the published Soviet statistics which are believed to be related to defense activities. Indeed, the lack of data in the published statistics on defense expenditures logically suggests that a composite account of resource flows would estimate the flow of goods to the defense sector. Steinberg's reconstruction of the Soviet National Economic Balance reveals five major gaps in the Soviet statistics which identify defense expenditures. These five are:

- Investment Gap
- Consumption Gap
- Wage Gap
- Labor Gap
- Depreciation Gap

As previously indicated, these gaps account for approximately 80 percent of the total defense budget in the Soviet National Economic Balance, the other expenditures being derived from the published state budgetary statistics for defense R & D costs and social services.

The extent to which Steinberg has successfully identified the flow of resources to the defense sector in the Soviet National Economic Balance can be assessed using two criteria:

- (1) Whether the existence of statistical gaps in the reconstructed Soviet National Economic Balance is verified by the DSA analysis of the reconstruction process.
- (2) Whether the major statistical gaps identified in the reconstruction are plausible and reflect reasonable magnitudes to account for defense-related activities.

All five of the gaps were successfully replicated in the DSA reconstruction of the Soviet NEB table; the procedures for estimating these gaps are described in section 3.0 of this report. The discussion below identifies the location of each gap in the working tables and evaluates the five major gaps in terms of the criteria outlined above.

Investment Gap. The investment gap identifies the materials used in the production of weapons and other defense-related goods, and can be found in WT027AH. The DSA estimate of the investment gap was quite comparable to the estimate given in Steinberg's own analysis. Since the investment gap is derived as a residual of the investment fund published in the NK (ST102), the year-to-year differences between the DSA estimate and Steinberg's estimate can be attributed to cumulative differences in the other accounts found in the investment fund--net fixed investment, unfinished construction, defense construction, and inventories and reserves.

Obviously, the extent to which Steinberg has correctly identified the flow of investment goods to the defense sector depends on how accurately he has estimated these other four accounts. In general, most of these accounts can be derived directly from published NK data. As indicated earlier, net fixed investment is given in the NK for the years 1970-1975, while the other years in the time-series can be reasonably well estimated using working table data (see WT001). Unfinished construction is estimated using NK data in WT041BC. In table WT026, most of the additions to inventories and reserves are accounted for in NK data (see ST061).

Defense construction is also estimated based on published Soviet data and interpolated for some years in the 1970-1983 time-series.

To address the second evaluation criterion posed above, given the high degree of certainty in data used to estimate the investment gap, this estimate for the amount of materials needed for defense production seems to be quite reasonable. Indeed, the structure of the national income accounts indicates that this gap reflects the production of defense materials, since all other productive resource flows are accounted for in the NEB tables.

Consumption Gap. The value of goods consumed by defense households is estimated as a residual of total current consumption after accounting for the goods consumed by civilian households and services. This estimate can be found in working table WT063, row AI. The DSA analysis confirmed the existence of a gap in the consumption data which was of comparable magnitude to the gap identified in Steinberg's tables.

The total consumption fund is published regularly in the NK (ST102). Likewise, the value of materials used for nonproductive services is available in the same table through 1975, and can be estimated reasonably well for the other years. Household consumption is derived from the NK data on the structure of retail trade (ST097). The residual estimate of armed forces consumption thus appears to be plausible and consistent with the published data on the consumption of goods.

Wage Gap. Steinberg's estimate of a wage gap provides compelling evidence that the value added for defense production lies outside the income received by workers employed in the productive sectors of the economy. Hence, the value added for defense production is not included in the estimate for Soviet Gross Social Product (GSP).

The wage gap is calculated as a residual of the total wages received by households and those wages received by workers employed in the production and service sectors. The DSA analysis successfully replicated Steinberg's estimate of the wage gap in table WT056, row AG. While the data sources for estimating these accounts are for the most part derived from the major source tables, some smaller accounts (e.g., nonmonetary earnings) are derived from secondary sources and may warrant further research to confirm their accuracy.

Labor Gap. The labor gap estimates the size of the armed forces and defense industrial personnel. This gap, which is found in table WT028, row AU, is actually part of a residual found for the estimates of Soviet population. This residual is derived as the difference between the published Soviet data on total population (ST030) and estimates of all accounted persons--the official labor force, pensioners and the disabled, students, and dependents. Defense labor is derived by

subtracting the estimated number of unemployed persons and an estimate for the Soviet prison population from the residual for the unaccounted population.

In sum, Steinberg's estimate of the defense labor gap is derived from Soviet statistics on demographic trends and not from the published statistics on employment. A comparison of Steinberg's estimates for the civilian labor force by sector with the estimates published by the U.S. Department of Commerce reveals similarities for most sectors. However, the most significant difference is found in the comparison of the estimates for individuals employed in private agriculture. Steinberg's estimate is consistently lower than the Department of Commerce estimate by approximately 6-7 million workers. This is because Steinberg's estimate includes full-time employees only. The Department of Commerce estimate is based on labor inputs to private agriculture, and our analysis of this estimate indicates that many individuals are double-counted in this estimate as part-time employees.

The DSA analysis was successful in replicating the labor gap. While secondary source data were used to derive the residual--e.g., to estimate the number of unemployed and the prison population--which seemed fairly reliable, Steinberg's construction of these accounts appears to be logical. Indeed, there does not appear to be *a priori* grounds for believing that defense labor is included as part of the unaccounted population. However, as indicated in section 5.4.1 above, the evidence that the wages received by defense households are not included in the published data on employment and wages for the production sectors is sufficient reason for assuming that defense labor is included in the residual for unaccounted persons estimated in table WT028.

Depreciation Gap. The depreciation gap estimates the depreciation of fixed capital in the defense sector. Steinberg's analysis indicates a relatively large amount of investment in machinery and equipment in the administration sector (see WT022AX), which would appear to be too large for the capital requirement of that sector. In addition, the yearly depreciation in the administration sector also observed to be disproportionately large to the requirements of the sector (see WT014CA). Based on these observations and an analysis of Soviet fixed capital stock by sector, Steinberg concludes that approximately 80 percent of both depreciation and investment is for the repair, replacement, and new additions to fixed capital stock in the defense industrial sector.

Although the DSA reconstruction of the Soviet NEB data base did not include an analysis of fixed capital stock by sector, our estimates for capital investment and depreciation in the administration sector--WT022AX and WT014CA, respectively--confirm Steinberg's observations. The depreciation gap is actually the discrepancy between expected capital outlays in the administration sector and the actual estimates. Steinberg's conclusion that a large portion of capital depreciation and investment in this sector is defense-related appears to be based on circumstantial evidence. However, this observation is consistent with other findings in the Soviet National Economic Balance tables, which indicate that defense production is treated as a nonproductive activity lying outside Soviet GSP.

5.5 ASSESSMENT OF DEFENSE EXPENDITURES

The five statistical gaps account for approximately 80 percent of the defense budget estimated in the Soviet National Economic Balance tables. The remaining 20 percent includes military construction, the cost of military research and development programs, social security payments, and the value of social services provided to military households. The estimation procedure for military construction can be found in section 3.4.5, while section 3.4.8 describes how the remaining three accounts are estimated using the published statistics on the Soviet state budget. All of these accounts were successfully replicated in the DSA reconstruction and appeared to be consistent with other NEB estimates. Moreover, the defense budget estimated in table WT069 is quite similar to the defense budget estimated by Steinberg, both for the total budget and for the individual row accounts.

A major reason for Steinberg's undertaking a reconstruction of the Soviet National Economic Balance tables was to explore the hypothesis put forth by Sergei Freidzon that the Soviet end military product is excluded from Soviet production statistics, and thus is treated as a nonproductive activity supported solely by the state budget. Our analysis of the Soviet NEB tables certainly does not disprove the Freidzon hypothesis regarding defense value added. Rather, the correspondence between the defense labor residual and the wage residual provides strong evidence that defense value added is not included in Soviet GSP.

As described in the paragraphs above, the DSA reconstruction of the Soviet NEB tables validates the existence of the statistical gaps which strongly indicate that (1) value added for defense production is not included in Soviet GSP, as evidenced by both the labor gap and the wage gap, and (2) the material resources needed for defense production appear in Soviet national income statistics as a transfer from the production sectors of the economy to the nonproduction sectors (investment gap).

Finally, Steinberg's analysis of published Soviet financial statistics seems to indicate that Soviet military expenditures are financed by running budgetary deficits. As indicated earlier, our reconstruction of the financial flows tables indicates a lesser degree of consistency in the financial statistics than in the national income statistics. Further analysis of Soviet financial flows is required in order to assess the full extent to which Soviet defense spending is responsible for Soviet budgetary deficits.

5.6 CONCLUSIONS AND RECOMMENDATIONS

The DSA analysis of the Steinberg methodology resulted in the complete set of reconstructed working tables and unified economic balance tables compiled in Volume II of this study. In reconstructing these tables, all data sources and estimation procedures used to generate the tables were critically reviewed. Our assessment of the Steinberg methodology indicates that:

- (1) Steinberg has been highly successful in utilizing Soviet economic planning procedures to reconstruct Soviet resource flows in the form of the Soviet National Economic Balance tables based on the openly published Soviet economic statistics.

- (2) Additional research is needed to integrate fully the supply and demand for goods (material flows) with the published Soviet financial statistics (financial flows).
- (3) The uncertainties inherent in the source data contained in secondary sources make difficult the reconstruction of a *totally* consistent set of Soviet National Economic Balance tables without the aid of quantitative techniques to automate a statistical fitting process.

The reconstruction methodology itself is an evolving process--since the inception of this study Steinberg has made numerous changes in his estimates as new data appear or as existing estimation procedures are improved. However, the basic postulates have remained unchanged. The DSA analysis indicates that Steinberg's approach to the reconstruction process constitutes an important contribution to U.S. intelligence analysis of Soviet resource flows in general, and Soviet defense expenditures in particular. Indeed, a logical progression of this study would be to attempt a reconciliation of U.S. intelligence estimates with those contained in the Steinberg analysis.

APPENDIX A

LIST OF WORKING TABLES

WT001	Net Investment by Sector
WT002	Production and End Use of Goods (GSP Balance)
WT005	GSP and Replacement Fund
WT006	Supply of Goods by Sector
WT012	Material Outlays of Heavy Industrial Sectors
WT013	Material Outlays of All Other Sectors
WT014	Capital Depreciation
WT015	Capital Replacement
WT016	Capital Repair
WT017	Foreign Trade in Gold Rubles
WT018	Foreign Trade in Domestic Rubles
WT019	Produced National Income by Sector
WT020	Capital Investment in Constant Prices
WT021	Capital Investment in Production Sectors
WT022	Capital Investment in Nonproduction Sectors
WT023	Additions to Capital Stock in Constant Prices
WT026	Balance of Inventories and Reserves
WT027	Additions of Inventories and Reserves
WT028	Demographic Trends
WT029	Civilian Labor Force
WT030	Labor Outlays - Production Sectors
WT031	Labor Outlays - Industrial Sectors
WT032	Labor Outlays - Nonproduction Sectors
WT033	Net Profit
WT034	Turnover Tax and Other Financial Revenues
WT037	Industrial GVO in Constant and Current Prices
WT040	Agricultural Productive Capital
WT041	Capital Construction - Constant and Current Prices
WT043	Structure of Industrial Purchaser's Prices
WT044	Industrial Groups A and B
WT046	Transportation & Communication and Trade and Distribution Charge by Sector
WT047	Retail Trade of Goods by Sector
WT048	Retail Purchases by Households and Organizations

- WT049 Unified Balance of Household Income and Outlays
- WT050 Supporting Data on Education, Culture,
Health, & Services
- WT051 Outlays and Profit of Service Sectors
- WT052 Material Outlays of Nonproduction Sectors
- WT053 State Budgetary Revenues
- WT054 State Budgetary Outlays by Sector
- WT055 Itemized State Budgetary Outlays
- WT056 Financial Balance of Household Income & Outlays
- WT058 Financing Working Assets
- WT059 Financing Capital Investment
- WT061 Distribution of State Profit
- WT063 Consumption of Goods by Sector
- WT064 Agricultural Productive Capital
- WT066 Industrial Production Outlays - Industry, Power, Fuel
- WT067 Industrial Production Outlays - Metallurgy, Chemicals, MBMW
- WT068 Industrial Production Outlays - Wood & Paper, Construction Materials,
Light & Food Industries
- WT069 USSR Defense Budget
- WT070 Export and Import Coefficients
- WT071 Capital Investment in Current Prices
- WT100 Agricultural Consumption-In-Kind
- WT101 Defense Science

APPENDIX B

LIST OF MAJOR SOURCE TABLES

<u>Legend</u>	NK	<u>Narodnoye Khozyaystvo SSSR</u>
	VS	<u>Vestnik Statistiki</u>
	CM	CEMA Statistical Handbook
	GOSBUD	<u>Gosudarstvenniy Budzhet SSSR:</u> <u>Soyuznykh Respublik (1976 and 1982)</u>
<u>Table #</u>	<u>Title</u>	<u>Source</u>
ST001	National Income (PNI) by Sector	CM83, p. 41
ST002	State Investment: Production and Nonproduction Sectors	CM83, p. 137
ST003	State-Cooperative and Collective GSP	CM83, p. 62
ST006	Productive and Nonproductive Labor by Sector	CM83, p. 382
ST009	Capital Investment: Major Sectors	CM83, p. 144
ST010	Structure of Capital Investment by Sector	CM83, p. 153
ST011	Structure of Fixed Capital (in percent)	NK72, p. 64
ST012	Structure of Fixed Capital: Profit Seeking Sectors	NK72, p. 63
ST014	Industrial and Agricultural Supply	NK73, p. 16
ST016	Structure of Fixed Capital: Budgetary Sectors	NK73, p. 61
ST019	Industrial GVO w/o Turnover Tax	NK80, p.123
ST020	Passenger Transportation by Factor Cost	NK74, p. 473
ST021	Structure of Fixed Capital	NK74, p. 82
ST022	Industrial Labor by Sector	NK74, p. 188
ST023	Depreciation Deductions in Industry	NK74, p. 207
ST025	Retail Trade Inventories	K80, p. 433
ST026	Structure of Industrial Prices	NK77, p.145
ST027	Population According to Types of Income	NK79, p. 9
ST028	GSP by Sector	NK80, p. 49
ST029	Number of Newborn	NK79, p. 31
ST030	USSR Population	NK80, p. 7
ST031	Construction Price Index	NK80, p. 352
ST032	Trade Inventories	NK80, p. 433

<u>Table #</u>	<u>Title</u>	<u>Source</u>
ST033	Social Security Budgets	NK80, p. 527
ST034	Industrial GVO by Sector: Growth Rates	NK80, p. 128
ST035	Industrial GVO by Sector: Percent of Total	NK80, p. 128
ST036	Structure of Retail Trade	NK80, p. 429
ST037	State Budgetary Outlays (Education)	NK80, p. 525
ST038	Structure of Capital Investment in Constant Prices	NK80, p. 334
ST039	Gardening	NK80, p. 235
ST040	Retail Trade Turnover: State-Cooperative, and Ex-Village Markets	NK80, p. 424
ST041	Outlays on Services	NK80, p. 524
ST042	Financial Accumulations	NK80, p. 503
ST043	Value of Unfinished Construction by Branch of Industry	NK80, p. 345
ST044	Net Profit by Sector	NK80, p. 503
ST045	All-Union and All-Republic Budgets	NK80, p. 525
ST046	Capital Stock of Collectives	NK80, p. 213
ST047	Installation and Liquidation Rates	NK80, p. 147
ST048	Agricultural Production: Growth Rates for State, Collective, and Private Sectors	NK80, p. 205
ST049	State Budget	NK80, p. 522
ST050	State Farms	NK80, p. 271
ST051	Number of Students	NK80, p. 455
ST052	Capital Investment by Sector	NK80, p. 336
ST053	Depreciation Funds	NK80, p. 521
ST054	Structure of Capital Investment: State- Cooperative Production (%)	NK80, p. 335
ST055	Trade Outlays	NK80, p. 434
ST056	Average Monthly State-Cooperative Wages by Sector	NK80, p. 364
ST057	Bonus Funds	NK80, p. 518
ST058	Industrial Groups A&B	NK80, p. 124
ST059	Industrial Production Outlays	NK80, p. 153

<u>Table #</u>	<u>Title</u>	<u>Source</u>
ST060	Agricultural Production (GVO -- 1973 prices)	NK80, p. 201
ST061	Working Assets	NK80, p. 510
ST062	Agricultural Procurement	NK80, p. 211
ST063	Value of Construction Work	NK80, p. 346
ST065	Profit in Trade	NK80, p. 508
ST066	Capital of State Farms	NK80, p. 214
ST067	Production of Consumer Goods	NK80, p. 191
ST068	Livestock (Total of all Farms)	NK80, p. 245
ST069	Profit in the Transportation and Communications Sector	NK80, p. 507
ST070	MBMW Products	NK80, p. 164
ST071	Structure of Agricultural Fixed Capital	NK80, p. 213
ST072	Structure of Foreign Trade	NK80, p. 540
ST073	Industrial Profitability by Sector	NK80, p. 506
ST074	Foreign Trade Turnover in Gold Rubles	NK80, p. 537
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ST076	Credits Issued to Cooperatives and Collectives	NK80, p. 532
ST078	Issued Credits by Economic Sector	NK80, p. 528
ST079	Everyday Services in Constant Prices	NK80, p. 451
ST080	Agricultural Investment	NK80, p. 145
ST081	Industrial Profit by Sector	NK80, p. 505
ST082	Industrial Fixed Capital by Sector	NK80, p. 145
ST083	Productive and Nonproductive Labor	NK80, p. 356
ST084	Capital Investment into Industry	NK80, p. 338
ST085	Capital Investment -- State-Cooperative, Collective, and Private	NK80, p. 333
ST086	Capital of State Farms and Joint Ventures	NK80, p. 282
ST087	Family Budget of Workers and Service Personnel	NK80, p. 383
ST089	Higher Education	NK80, p. 483
ST091	Collectives (Employees, GVO, Capital, Income and Wages)	NK80, p. 254
ST092	State Housing Investment	NK80, p. 391

<u>Table #</u>	<u>Title</u>	<u>Source</u>
ST093	State-Cooperative Employees by Sector	NK80, p. 357
ST094	GVO for Communications	NK80, p. 322
ST095	Distribution of Profit	NK80, p. 504
ST096	Machinery and Equipment Production	NK80, p. 167
ST097	Retail Trade Turnover	NK80, p. 421
ST098	Growth of Capital-Labor Ratio	NK80, p. 145
ST099	Pensioners	NK80, p. 411
ST100	Households Savings	NK80, p. 408
ST101	Social Security Payments	NK80, p. 381
ST102	Consumption and Investment	NK80, p. 380 NK75, p. 505-506
ST103	Pre-School Children	NK80, p. 410
ST104	Industrial Materials Outlays	NK83, p. 149
ST105	State Capital Investment	NK83, p. 355
ST106	Production Outlays in Collectives	NK82, p. 261
ST108	Capital Installation by Economic Branch	NK82, p. 329
ST109	Fishing Collectives	NK83, p. 282
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ST114	Industrial Labor	VS76(8), p. 87
ST115	Installation of Industrial Capital	VS79(2), p. 76
ST120	Financing Working Assets	VS12(84), p. 74
ST122	Outlays on Education	VS82(12), p. 74
ST123	Total Employees and Workers	VS82(8), p. 77
ST125	Structure of Trade Inventories	NK80, p.517
ST126	Cost Structure of Retail Trade	NK80, p. 436
ST127	Cost Structure of Food Service Sector	NK80, p. 436
ST128	National Income	NK80, p. 379
ST129	Structure and Growth of the Production of the Means of Production	NK80, p. 124
ST130	Structure of the Production of Consumer Goods	NK80, p. 125

<u>Table #</u>	<u>Title</u>	<u>Source</u>
ST131	Agricultural Investment	NK80, p. 342
ST132	Construction Labor	NK80, p. 351
ST133	Number of Men and Women	NK80, p. 8
ST134	Average Annual State-Cooperative Female Workers	NK80, p. 361
ST135	Female Workers in Collectives by Percent	NK83, p. 392
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ST137	Women in Higher and Special Education	VS83(1), p. 74
ST138	Sources of Female Support	VS77(1)
ST139	Labor Productivity Index by Industrial Sector	NK80, p. 136
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ST159	Structure of Bonus Funds	NK80, p. 518
ST160	Structure of Industrial Bonus Funds	NK80, p. 519
ST162	Structure of Inventories	NK80, p. 513
ST163	Structure of Inventories in Industry	NK80, p. 514
ST165	Structure of Inventories in Construction	NK80, p. 516
ST167	Working Assets and Inventories by Sector	NK80, p. 510
ST168	Payments from Social Consumption Fund	NK80, p. 381
ST170	Bonus Wages by Sector	NK80, p. 517
ST171	Budgetary Outlays on Social-Cultural Measures and Science	NK80, p. 525

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