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ECONOMIC INTELLIGENCE REPORT

COST AND PRODUCTIVITY OF LABOR ON THE RAILROADS OF THE USSR 1950-60

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COST AND PRODUCTIVITY OF LABOR ON THE RAILROADS OF THE USSR 1950-60

CIA/RR 141

(ORR Project 43.1951)

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FOREWORD

Since 1950 the railroads of the USSR have demonstrated a growing capability to handle significant increases in the volume of traffic and at the same time to reduce the cost of transportation to the consumer and the carrier, to increase net revenues from operations, and to increase the earnings of employees. Additions to the labor force on the railroads have been rather small compared with the increases in the volume of traffic. The increased productivity of labor may be attributed to investment in modernization of plant and equipment as well as to more advanced technology and skill of workers.

This report discusses the number of employees on the railroads of the USSR and the productivity of labor, rates of pay, and total cost of labor in relation to the total cost of operation and to revenues. It analyzes the relationship between the cost of labor of railroad employees and the cost of the total labor force employed by the state.

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COST AND PRODUCTIVITY OF LABOR ON THE RAILROADS OF THE USSR*
1950-60

Summary and Conclusions

The total cost of labor in the Ministry of Railroad Transport of the USSR (Ministerstvo Putey Soobshcheniya -- MPS) is estimated to have been about 36 billion rubles** in 1957, an increase of more than 8 billion rubles above the estimate for 1950. By 1960 the annual cost of labor on the railroads of the USSR probably will reach about 37 billion rubles. Continuous gains in the productivity of labor, however, have contributed to a reduction in the cost of labor per traffic kilometer*** of 36 percent since 1950. At the same time, both the average annual earnings per employee and the net operating revenue have increased.

Total annual earnings of the labor force on the railroads of the USSR represented an estimated 8.6 percent of the earnings of the total state-employed labor force in 1950, declined to 6.9 percent by 1957, and should decrease to 5.6 percent by 1960. This trend is a result of a relative decrease in the size of the labor force on the railroads as well as of a relative increase in the average annual earnings of the remainder of the state-employed labor force. Projection of the present trend indicates that by 1960 the estimated average annual earnings of the Soviet railroad labor force may be slightly less than the national average for the total state-employed labor force.

Operating labor costs now constitute an estimated 45 percent of the total operating costs of Soviet railroads. The estimated cost of labor per unit of traffic has diminished substantially while traffic has increased. Therefore, based on the present rate structure, the margin between total costs and total revenue may be expected to widen. Gross operating revenue in 1956 is estimated to have been 37.3 percent more than total operating costs, and by 1960, assuming the present rate structure is maintained, it should be about 84 percent more than the total operating costs. This operating surplus could be passed on to the

* The estimates and conclusions contained in this report represent the best judgment of ORR as of 1 July 1958.

** The official rate of exchange is 4 rubles to US $1, which is not necessarily an accurate reflection of the dollar value.

*** Traffic-kilometers are the simple addition of freight ton-kilometers and passenger-kilometers.

consumers of rail transport in the form of decreased rates or could be used to offset the heavy capital investment which has been necessary to produce the decreased operating expenses. As yet, there is no indication of Soviet intentions on the disposition of this estimated surplus, although under the Soviet system the entire surplus could be allocated to other parts of the economy.

The MPS, with a total labor force of about 3.4 million in 1957, employs about 6.6 percent of the total state-employed labor force of the USSR. By 1960, in spite of a considerable increase in traffic, it is estimated that the labor force of the MPS will decrease to about 3.3 million, or about 5.7 percent of the total state-employed labor force. Increasing productivity of labor, as a consequence of modernizing equipment and of improving technology, is responsible for decreasing requirements for labor, regardless of increasing traffic. Soviet data on the productivity of labor, as well as on average earnings, are based on the category of operating employees.* Productivity of labor of the Soviet railroad labor force has increased from 403,000 traffic-kilometers per operating employee in 1950 to about 683,000 traffic-kilometers per operating employee in 1957. By 1960, dieselization and electrification, together with other technological improvements, should make possible an increase to about 934,000 traffic-kilometers per operating employee.

Since 1955 the USSR has obtained a greater increase in productivity from its railroad labor force than that obtained in the total state-employed labor force. If the Soviet railroads maintain the same rate of increase in productivity of labor as that attained in 1955, 1956, and 1957, by 1960 they will overfulfill the goals planned for productivity of railroad labor by a very wide margin.

In comparison with US railroads, Soviet use of railroad labor appears wasteful, and productivity is low. If the Soviet and US railroad labor

* The term employees in this report means all wage earners and salaried personnel (rabochiy i sluzhashchiy -- translated literally as "workers and employees" from Soviet texts). The terms operating and nonoperating denote Soviet categories for which no precise definition is available. Usage, however, indicates that operating includes all employees of line functions directly engaged in the production of freight- or passenger-kilometers, including the administrative and clerical personnel necessary to these functions.

The remaining personnel of the MPS referred to as nonoperating would then presumably include headquarters personnel, both in Moscow and in the various railroad administrations (planning, records, legal, political, and the like); hospital and resort personnel; and employees of related production and construction enterprises, as well as employees of training establishments and publishing houses.

forces are placed on a comparable basis, the US employs about 1 worker per equivalent unit of traffic to 2 workers in the USSR because the productivity of the Soviet railroad employee is only about 56 percent of his US counterpart. Great gains in productivity of labor may be expected on the Soviet railroads during the next 15 years, however, as the system is converted progressively to diesel and electric motive power. The railroads of the US, now are virtually completely dieselized, whereas the railroads of the USSR still handle about 80 percent of the traffic with steam traction.

The average annual earnings of the labor force on the railroads of the USSR are about 6.5 percent higher than the average for the state-employed labor force. In the US, by comparison, railroad employees earn about 24.6 percent more than the average for the nonagricultural labor force.

I. Introduction.

Railroads, the principal means of transportation in the USSR, have had, and must expect, ever-increasing demands for their services. Because future demands for civilian labor in the USSR are expected to increase more rapidly than the supply, the demands of increased traffic on the railroads must be met primarily by increased productivity of labor, unless, of course, Soviet authorities adopt other policies or measures to increase the allocation of labor to the MPS.

Before 1950, Soviet authorities achieved increased productivity of labor by limited investment in modernization and by the substitution of improved operational techniques for those in general use -- a procedure referred to by the USSR as "utilization of internal reserves." By 1950, however, this means of increasing productivity had largely been exhausted.

From 1950 to 1955 the USSR turned its attention to modernization and improvement of the existing plant and facilities -- such as improved signaling, better communications, larger freight cars, double tracking, and more efficient handling equipment for both freight and passenger service. On some lines, dieselization and electrification also were introduced. These large capital expenditures increased productivity of labor to the extent that the railroad sector was able to support the growing Soviet economy and at the same time to decrease its proportionate share of the expanding labor force.

Beginning in 1956, Soviet railroads initiated a dynamic shift to diesel and electric traction while expanding the types of modernization already under way. The favorable effects of this program of modernization on the productivity of the labor force are being demonstrated significantly and may be expected to continue.

II. Size of the Labor Force on the Railroads of the USSR.

A. Total Labor Force on the Railroads, 1950-57.*

The labor force of the MPS has grown from about 3 million employees in 1950 to more than 3.4 million in 1957 (approximately 6.6 percent of the total state-employed labor force of the USSR) but may be expected to decline to about 3.3 million in 1960. Total employment in the MPS may be divided into approximately 2 million operating employees and 1.4 million nonoperating employees.

A comparison of employment by function within the operating sector of the industry in 1950 and in 1954 indicates no significant shifts in relative employment, but with an increasing use of diesel and electric traction, the relative percentage of employees in locomotive service probably will decline, while the percentage of other employees, especially those in traffic management, commercial service, and passenger service, may increase.

The percentage of women employed in rail transport in the USSR has increased significantly. In 1937, women represented only 17.5 percent of total employment in the MPS, but in 1956 they represented 33.5 percent 1/** compared with 5.5 percent of the labor force on US railroads. Women employed in rail transport in the USSR are engaged generally in all types of activities except extra heavy or hazardous work, being especially important as station attendants, engineers, economists, planners, bookkeepers, and statisticians.

B. Comparison of the Labor Force on the Railroads of the US and the USSR.***

The labor force on the railroads of the US, with somewhat more than 1 million employees, is only about one-half the size of its counterpart in the USSR.**** Total employment on Class I railroads in the US has decreased from 1,221,000 in 1950 to 1,042,000 in 1956, and it is estimated that this trend will continue for the next few years. 2/ The

* See Tables 1 through 4, Appendix A.

[redacted] 50X1

*** See Table 5, Appendix A.

**** See V, C, p. 13, below.

estimated comparable labor force on the railroads in the USSR has increased from 2,013,000 in 1950 to 2,281,000 in 1956, although it is estimated that the number may decline slightly within the next few years.

The US employs an average of 0.5 man for technical maintenance per kilometer of railroad, and the USSR employs 1.4 men. In the US, complements of 111,000 men maintain a large locomotive inventory, and Soviet railroads employ 216,900 men to maintain a comparable number of locomotives. Another sharp difference occurs in the number of administrative and managerial personnel employed on railroads in the two countries. In the US, which has a significantly larger operating length of railroads, administrative and managerial personnel include 183,000 men, or an average of 0.6 man per kilometer of line. In the USSR, such personnel number approximately 260,000, or an average of 2.3 men per kilometer of line. 3/

The growth of the labor force on the railroads of the USSR has resulted from the rapidly increasing demands placed on rail transport by the Soviet economy. Increased productivity of labor, however, is making it possible to decrease the number of workers employed in relation to the total labor force employed by the state. In the US, where highways, inland waterways, and pipelines play a much more important role, the size of the railroad labor force has decreased. Had it not been for the increased productivity of labor by the railroad labor force of the USSR, the disparity in the relative size of the labor forces of the US and the USSR undoubtedly would be even greater.

III. Rates of Pay for the Labor Force on the Railroads of the USSR.*

The average annual earnings of the labor force on the railroads of the USSR have increased moderately from an estimate of 8,640 rubles in 1950 to an estimate of 9,422 rubles in 1956, or an increase of about 9 percent. The average earnings of the labor force on the railroads of the USSR, therefore, were about 6.5 percent better than were the average earnings of 8,850 rubles for employees in the state-employed labor force in 1956. The relative earning position of railroad employees in the USSR has been declining, however, because their average earnings in 1950 were 13.7 percent above the estimated national average for the entire state-employed labor force.

There is a considerable range in the annual earnings of various railroad personnel. Some locomotive engineers, for example, may earn as much as 3,000 rubles per month, 4/ but unskilled laborers draw as little as 300 rubles per month. Also, the average annual earnings of operating personnel are estimated to exceed those of nonoperating personnel by about 2 percent.

* See Tables 6 through 11, Appendix A, and Figure 1, following p. 6.

A. Manner of Computing Rates of Pay.

The forms used for employee compensation on the railroads of the USSR do not differ essentially from those used in the rest of Soviet industry. Railroad workers and employees are paid mainly on the basis of units of output, or piecework. Fixed wages are paid only where working conditions make it impossible to set definite quotas. 5/ In addition to wages paid for basic time and piecework, workers also receive various kinds of premiums and bonuses.

1. Salaries. 6/

Managerial and engineering and technical employees are paid on the basis of a formal salary system (sistema dolzhnostnykh okladov). Under this system, monthly salaries are set in accordance with standard lists of positions (tables of organization established by the MPS and approved by the State Table of Organizations Commission, attached to the Ministry of Finance). These salary scales differ widely according to occupation and area. The table of organization approved for each enterprise or division usually provides a minimum and maximum rate for each salaried position, and the director is allowed to fix the salaries of individuals within this range on the basis of merit. Persons having special qualifications or experience may be paid "personal salaries" in excess of the regular salaries fixed for their jobs, such payments requiring specific sanction from the Ministry or Council of Ministers of the union-republic.

2. Wages. 7/

The basic determinant of the wage for a railroad employee in the USSR is the labor grade in which his job is classified and the rate of pay fixed for that grade. The jobs are grouped into grades on the basis of standard job descriptions in manuals (tarifnokvalifikatsionnyy spravochnik) issued by the MPS. Monthly wage rates are established according to the category to which the divisions and laboratories belong. These wages do not include bonuses for the fulfillment and overfulfillment of a plan or additional pay for work in hardship areas. Tariff rates and wages on the Far Eastern Railroad and on the Kirov-Kotlas sector of the Pechora Railroad are 20 percent higher for laborers and engineering and technical employees and 10 percent higher for salaried employees, and on the Karaganda Railroad the wages are 10 percent higher for all employees. On the Kozhva-Vorkuta sector of the Pechora Railroad the wages are 50 percent higher for all employees than are the wages on the Far Eastern Railroad; on the Krugobaykal'sk sector of the East Siberian Railroad, wages are 30 percent higher for laborers and engineering and technical employees and 20 percent higher for other employees; and on the South Sakhalin Railroad, wages are 50 percent higher. 8/

Figure 1

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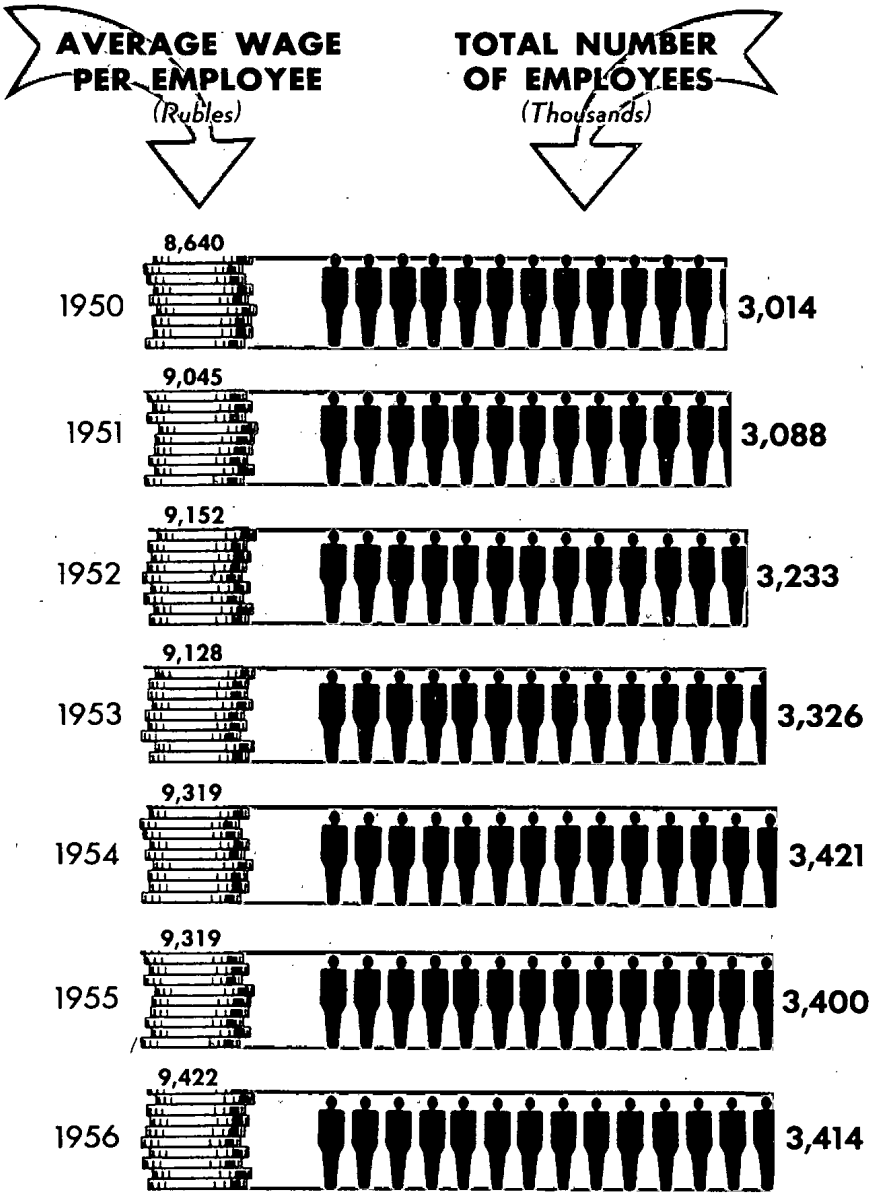
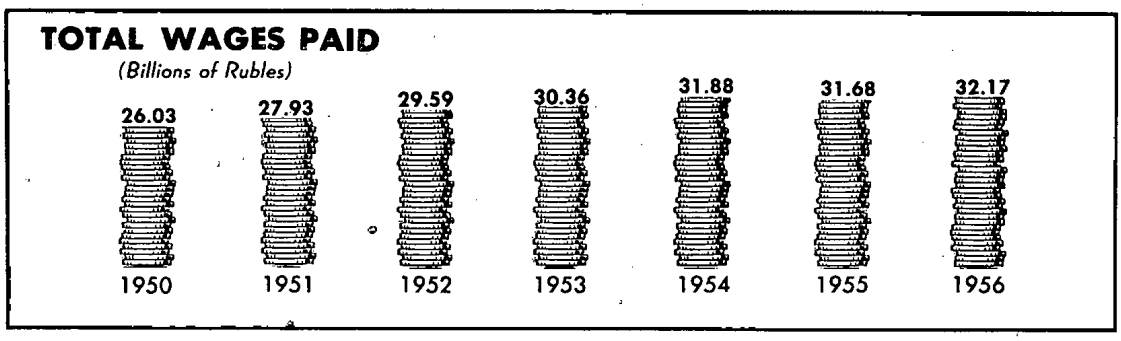
USSR
RAILROAD EMPLOYEES AND WAGES
1950-56





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The unions allegedly have the right to control wage rates and to ensure proper and timely payment. This so-called "control" is exercised through commissions on wage rates made up of from 3 to 21 workers. These commissions are headed by a member of the trade union committee. 9/ Actual control of wage rates is believed to rest with the Party and the chiefs of enterprises.

a. Piece Rates.

Payment for all jobs on the MPS for which standards of production can be established is on the basis of piece rates. A work norm (norma vyrabotki) is determined for each such job.

After the norm for a given job is set, the piece rate for the job is determined by dividing the norm (expressed in units per hour or per day) into the appropriate wage rate (base rate) for the labor grade in which the job is classified. For example, if the norm for a locomotive engineer is 500 kilometers (km) per day and his basic wage rate is 100 rubles per day, the applicable piece rate is 0.2 ruble per kilometer. This method is known as the straight piece rate system (pryama sdel'naya sistema).

Pieceworkers also may be paid in accordance with the progressive piece rate system (sdel'no-progressivnaya sistema). As part of a general wage reform, 10/ however, some railroads have taken preliminary steps to replace this system with a system of the straight piece rate plus a bonus. If a worker raises his production a certain percentage above his norm, his pay scale is increased in proportion to his above-norm production. A movement to eliminate the progressive rate system apparently has been triggered by many inequities which have developed in earnings. For example, establishment of norms at too low a level resulted in an artificial increase in the level of fulfilling norms and in considerable overpayment in the progressive wage supplements. 11/

b. Time Rates.

In the USSR, flat hourly or daily rates are paid to production and service workers whose jobs do not permit the establishment of norms. Janitors, storekeepers, guards, and electrical maintenance men are examples of the types of employees in this category. Bonuses for these employees are based on fulfillment and overfulfillment of the monthly production plan for their depot, shop, or installation.

c. Bonuses, Premiums, and Other Compensation.

In addition to basic wages or salaries, railroad employees paid by the hour, day, or month receive bonuses for fulfillment and overfulfillment of the monthly production plans for their station, depot, or installation. For managerial and engineering and technical employees, bonuses are contingent on simultaneous fulfillment of the plan for reducing production costs. Additional bonuses are paid also for reductions in cost above the plan, improvements in the quality of production, reduction in the idle time of machines and rolling stock, and savings in fuel and raw materials above the plan.

Pieceworkers also have the opportunity of earning additional bonuses. Crews of freight trains, for example, receive bonuses when their trains exceed the normal weight, in proportion to the distance covered and the tonnage carried. Such bonuses often amount to as much as one-half to three-quarters of the ordinary wages paid for the trip. Crews receive bonuses for running trains on time and in good repair. On passenger trains, such bonuses amount to 60 percent of the ordinary wages, and on freight trains to 20 percent. For long trips which entail spending several days on the train, the worker is paid a bonus equaling 3 percent of the monthly earnings for every day spent in transit.

Under the progressive piece-rate system, railroad employees assigned to stations for switching or making and breaking up trains (signalmen, switchmen, and inspectors) receive, depending on the job, 1.5 to 2 times the basic wage for 10 percent overfulfillment. Overfulfillment above 10 percent is paid at double or triple the rate, depending on the extent of overfulfillment. Bonuses for long-time service, paid monthly, range from 5 to 30 percent of the basic wage. For engine crews these bonuses may reach 75 percent. 12/

All employees may receive various kinds of premiums for meritorious performance. These premiums may be paid from the "enterprise fund," a fund derived from the profits of the enterprise and made available to the enterprise director for specific purposes, including the payment of premiums to workers. Other sources for the payment of premiums are the fund at the disposal of the Minister and sums provided by special order of the Council of Ministers in recognition of outstanding performance. Organizations declared the winners in socialist competition are awarded substantial prizes which are distributed to employees in accordance with ministerial regulations.

Finally, employees receive extra compensation for overtime, night work, training new employees, inventions and improvements, and other activities for which compensation is not provided in the basic wage and salary scales. Total bonuses paid to railroad employees amount to more than a billion rubles annually. 13/

3. Fringe Benefits.

a. Hospitalization.

Large numbers of hospitals, sanitariums, and laboratories are maintained by the state. 14/ The railroads employ about 22,000 doctors and auxiliary medical personnel estimated at 64,000. In 1951 the government allocated 1.62 billion rubles for the protection of the health of railroad employees. 15/ About 2.5 billion rubles are appropriated each year to cover health and life insurance for railroad employees. Funds are subscribed entirely by the railroad enterprises but are administered by the unions. 16/

b. Housing.

Most housing for railroad employees consists of flats in multistoried buildings. The more privileged groups, including many locomotive engineers, occupy private cottages bought with long-term state credits. Union committees participate in the distribution of new flats.

In spite of much lip service paid to the housing program for railroad employees, and even favoritism shown them in comparison with other Soviet workers, 17/ some employees continue to occupy makeshift accommodations, such as old 2-axle freight cars (see Figure 2*). 18/ Substantial progress is being made, however, as reflected by the fact that over 3 million square meters of new housing -- nearly 100,000 dwelling units -- were supplied to railroaders under both the Fourth and Fifth Five Year Plans. 19/ In the original Sixth Five Year Plan (1956-60), 6.5 million square meters of floorspace -- about 200,000 dwelling units -- were to be built for railroad employees. 20/ No revision of this plan has been announced. In 1956, funds allocated for this purpose amounted to 1.375 billion rubles. 21/

c. Other Benefits.

Paid vacations vary from 2 to 4 weeks, depending on the job. The railroad unions operate about 42 resorts throughout the USSR, which apparently are used by about 7 percent of the employees. 22/ Nurseries, kindergartens, camps, and clubs also are available for the children of railroad employees, as well as clubs and libraries operated by the state for the employees themselves.

* Following p. 10.

B. Effect of Wages on the Status of Employees.

1. Comparison with Employees in Other Soviet Industries.

The average annual earnings of Soviet railroad employees have been somewhat higher than the average for other state employees during 1950-56. Railroad employees received about 1,000 rubles more than the national average in 1950, although their estimated average annual earnings in 1956 were only about 550 rubles more than the national average. The narrowing of this differential has not yet been significant enough to affect seriously the attractiveness of the railroad industry as a career, but continuation of this trend may cause a serious shortage in the labor supply available for the railroads in the future.

2. Comparison with Employees on US Railroads.

The average annual earnings of US railroad employees increased 34.9 percent from 1950 to 1956, and during the same period the average annual earnings of Soviet railroad employees increased only 9 percent. During those years, the Soviet price index declined while the cost of living in the US increased.

In 1950 the average Soviet railroad employee earning 8,640 rubles (compared with the US railroad employee earning $3,785) could buy only 22 percent of the goods and services that his US counterpart was able to purchase.* Taking into account decreases in Soviet prices and increases in the cost of living in the US and assuming an 8 to 1 ruble-dollar ratio for 1956, the Soviet railroad employee still was able to buy only 23 percent of the consumer goods and services that the US railroad employee could buy.

IV. Total Cost of Labor on the Railroads of the USSR, 1950-60.**

The total cost of labor on Soviet railroads, including social insurance, merit awards, and all other fringe benefits, is estimated to have been about 36.2 billion rubles in 1957 compared with 28.6 billion rubles in 1950. By 1960 this cost should be approximately 37.4 billion rubles.

Continuous gains in productivity of labor, along with controlled and slight increases in pay, have made possible a reduction in unit labor cost estimated to be 30.7 percent since 1950 and have contributed

* Based on a calculated ruble-dollar ratio of 10.4 to 1 for consumer goods and services in 1950. 23/

** See Tables 12 through 14, Appendix A.

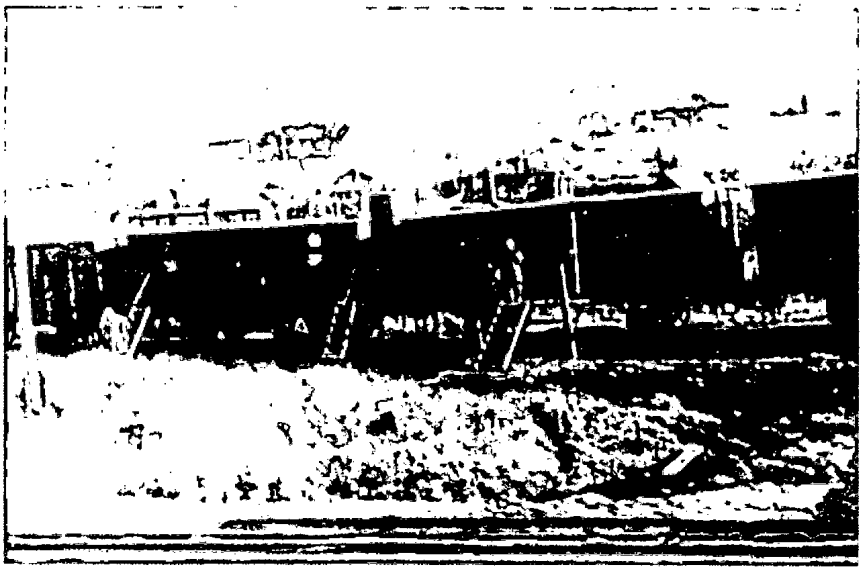

Figure 2. USSR: Converted Two-Axle Freight Car Used as Living Quarters

to greater net operating income and to an accompanying increase in average annual earnings.

In the absence of a figure for the total cost of the state-employed labor force, the relationship between total money earnings* of the railroad labor force and of the total state-employed labor force has been analyzed. In 1957 the railroad labor force is estimated to have earned approximately 33.13 billion rubles, or 6.9 percent of the 484.5 billion rubles computed as earned by the total state-employed labor force. In 1950, however, the money earnings of the railroad labor force represented 8.6 percent of the earnings of the total state-employed labor force. Moreover, the earnings of 33.78 billion rubles estimated for the railroad labor force for 1960 probably will represent only about 5.6 percent of the earnings of the total state-employed labor force.

The trend toward a decline in the earnings of the labor force on the railroads of the USSR results both from the smaller share of total employment by the railroads and from the trend for the average annual earnings in the nation to increase more rapidly than those of the railroad labor force. By 1960, if present trends continue, the average annual earnings of railroad employees may be even less than the average earnings of the total state-employed labor force.

V. Productivity of Labor on the Railroads of the USSR.**

A. Quantitative Measure of Productivity, 1950-56.

Data on the productivity of labor on the railroads on the USSR are published in terms of traffic-kilometers per operating employee. In these terms the productivity of labor for 1956 was 53.1 percent more than that in 1950, whereas employment was up only 15.6 percent for the same period. By 1960 an additional increase of 51.4 percent in the productivity of labor above that of 1956 is forecast, but operating employment may decrease by about 4 percent. Overfulfillment of the plan for productivity of labor for 1956 and the first half of 1957 indicates a strong possibility that the planned increase in employment may not be necessary unless planned traffic demands are greatly exceeded. The fact that the plan for reduction of the average length of freight haul probably will not be fulfilled makes it likely, however, that the planned quota of traffic-kilometers for 1957-60 will be exceeded to some extent. Soviet planners apparently anticipate that only 85 percent of the total increase in traffic kilometers will come from increases in productivity

* Money earnings, as referred to in this report, constitute wages and salaries including additional payment for overfulfillment of norms and represent over 90 percent of all payments to labor on the railroads.

** See Tables 15 through 18, and Figure 3, following p. 12.

of labor, 24/ indicating at least some necessary gain in total employment. Estimated productivity of labor on the railroads of the USSR for 1950-60 is shown in Table 15.*

The gains made in 1955, as shown in Table 15, were at a rate considerably higher than necessary to accomplish the increase in productivity of labor planned by 1960. This performance suggests that the program for modernizing the railroads, particularly dieselization and electrification, may pay off better than the Soviet experts hoped for originally and may control increases in employment.

Productivity of labor on various rail lines in the USSR varies greatly from 100,000 traffic-kilometers per worker on the South Sakhalin Railroad to 1,550,000 traffic-kilometers per worker on the Omsk Railroad.** The wide range of output per worker for the various railroad systems is the consequence of different working conditions, as well as of equipment and facilities, and of the varying nature of the work performed. For example, the tracks of the Omsk Railroad run over a level area with few bridges and viaducts, whereas the Transcaucasus Railroad crosses many bridges and viaducts. As a result, the latter railroad must employ many more men to guard and maintain these bridges and viaducts. On another railroad it may be necessary to employ more men and facilities to repair rolling stock and to provide a fuel supply.

Climatic conditions also contribute to the relative productivity of labor on the railroads of the USSR. More materials, labor, and facilities must be used on railroads where the weather is inclement or where the snowfall is abundant. Stations must be protected and cleaned, drainage must be assured in the spring, and repair and maintenance must be provided for the various machines used in combating snow and water.

The nature and extent of work performed, resulting in various levels of traffic density, is probably the most important single factor. The large volume of through traffic on the Omsk Railroad, for example, creates very favorable conditions for obtaining a high level of performance with fewer workers. In contrast, railroads engaged in considerable loading and unloading operations, in making up and switching trains, and in hauling considerable suburban passenger traffic will show a lower productivity per worker.

B. Relationship of the Productivity of Labor to Costs and Value of the Railroad Product.

Since 1950, in spite of decreased prices to consumers and increased costs of labor, the railroads of the USSR have become increasingly

* Appendix A, p. 30, below.
** See Table 16, Appendix A.

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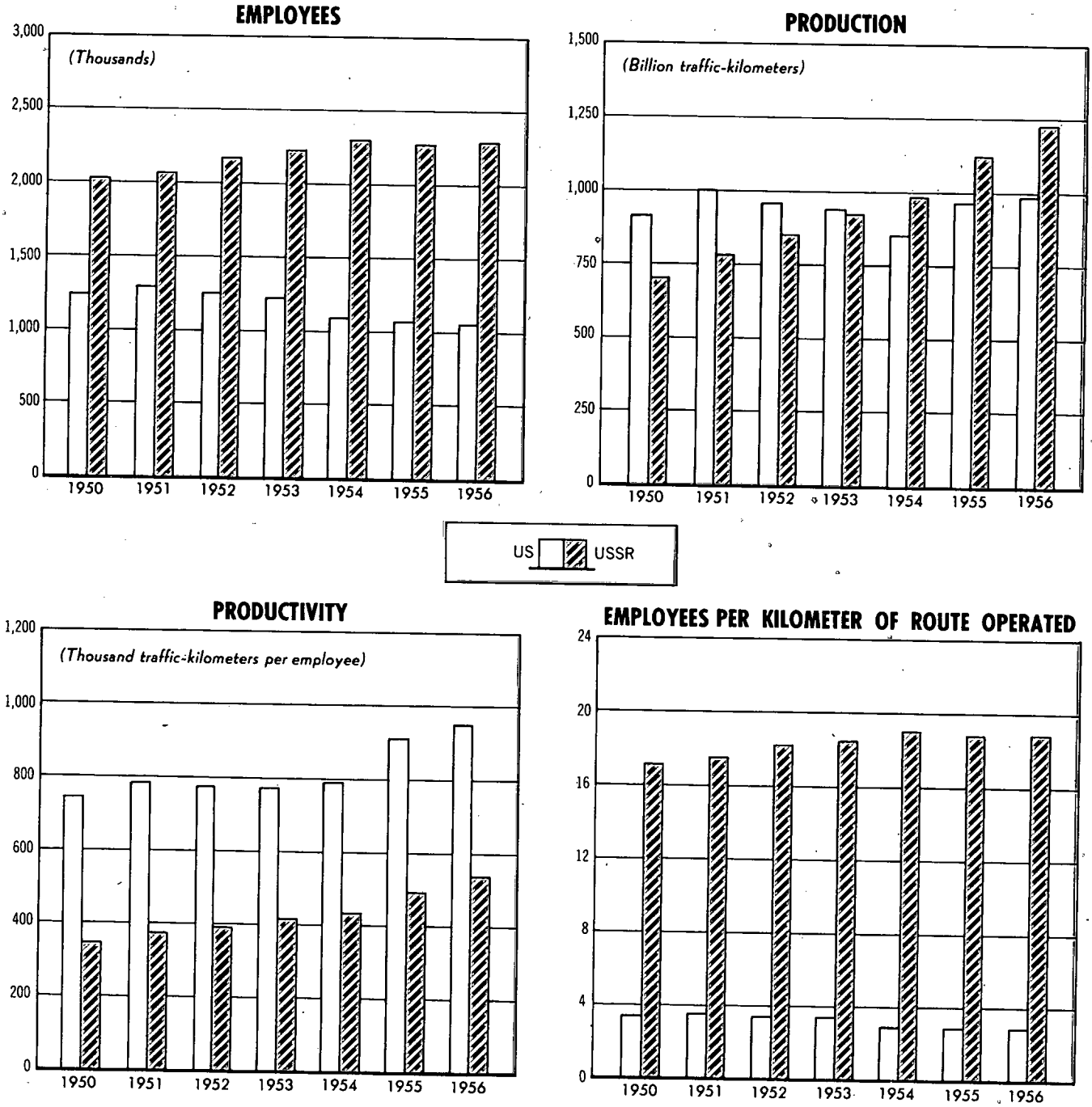
Figure 3

US AND USSR
PRODUCTIVITY OF LABOR BY RAILROAD EMPLOYEES
1950-56



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profitable. During 1950-56 the increased productivity of labor was reflected in the relationship of cost to price. The net operating revenue per employee in 1956 was 132 percent above the level of 1950, and gross operating revenue per employee had increased 26 percent. During that same period, labor costs per employee increased 8 percent, and gross revenue, reflecting lowered rates, decreased 18 percent per unit of traffic.

The increase of 53 percent in the productivity of labor during 1950-56 offset decreases in rates to the extent that gross operating revenue per employee per traffic-kilometer decreased only 29 percent, and operating cost per employee per traffic-kilometer decreased 39 percent. Net operating revenue per traffic-kilometer, therefore, has increased 51 percent, as shown in Table 17.*

If the present rate structure is maintained and if current trends in costs and volume of traffic continue, net operating revenue will increase even more in the future. Internal pressures, however, are likely to promote either decreases in rates, increases in earnings, or a combination of the two. Substantial concessions could be made to consumers and employees without lowering the present level of profit.

C. Comparison of Productivity of Labor on the Railroads of the US and the USSR.

In order to arrive at a meaningful comparison of the productivity of labor on the railroads of the US and the USSR, it has been necessary to estimate a comparable labor force. Neither Soviet data for total employment of the MPS nor those for operating employees are strictly comparable to data on the labor force on US railroads. The MPS performs many functions which are handled for the US railroads either by private contractors or by the government. On the other hand, total employment on US railroads encompasses something more than the concept of operating employees. By eliminating employment for those functions of the MPS which do not compare with functions of US railroads, it has been possible to estimate comparable labor forces and to compare the output per railroad employee in the USSR with that per railroad employee in the US.

Such a comparison, as shown in Table 18,** provides a very interesting picture of Soviet inefficiency and overstaffing. In 1953, when total production of the US and Soviet railroad networks was approximately the same, the US had a productivity per employee about 88 percent higher than that of the USSR. Application of advanced

* Appendix A, p. 32, below.
** Appendix A, p. 33, below.

technology and continued high utilization of equipment has made it possible recently for the productivity of labor on Soviet railroads to gain a little on that of US railroads. In 1956, however, productivity per employee on US railroads was still about 77 percent higher than in the USSR.

VI. Effect of Improvements to the Railroad System of the USSR on the Cost and Productivity of Labor.*

An extensive program for improving the existing plant and equipment of the railroads of the USSR, under way since the Fourth Five Year Plan (1946-50), has gained considerable momentum. Plans were announced in 1956 for complete conversion of motive power from steam to diesel-electric and electric traction by 1970. 25/ This change in mode of traction is the principal source of current and planned increases in productivity of labor, and the correlation may be seen readily from the substantial upward trend in the productivity of labor, as shown in Table 15.** This increase was considerably greater in 1955, 1956, and 1957 than in previous years, undoubtedly because of the extension of dieselization and electrification. [redacted] the new modes of traction have been largely responsible for an increase of 38.8 percent*** in the productivity of labor during 1955-57. 26/ Even greater gains are possible because about 80 percent of the freight traffic was still handled by steam traction in 1957. Continued intensive use of plant and equipment, the dynamic shift to diesel and electric traction, and other improvements should continue to push the productivity of labor upward, thereby making available to other endeavors a substantial supply of labor that otherwise would be required in rail transport. The effects of increased productivity of labor, largely the result of improvement and modernization, on requirements for manpower are shown in Table 19.****

50X1

A. Dieselization and Electrification.

The effects of both dieselization and electrification on the productivity of labor and on costs are similar. These forms of traction make possible the operation of heavier and speedier trains with smaller train crews as well as with a reduced number of personnel required for ancillary facilities. The net effect is to decrease both requirements for manpower and costs of labor and operation per unit of traffic. For example, between 1953 and 1956, the Omsk Railroad converted its Barabinsk Division to electric traction and its Petropavlovsk Division to

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* See Tables 19 through 22, Appendix A.
** Appendix A, p. 30, below.
*** Increase of 36.3 percent is calculated from Table 15, Appendix A.
**** Appendix A, p. 34, below.

diesel traction. As a result of converting the Barabinsk Division to electric traction, the productivity of labor increased from 3.3 million gross ton-kilometers per operating employee in 1953 to 5.0 million gross ton-kilometers per operating employee in 1956. Dieselization of the Petropavlovsk Division resulted in an increase from 2.7 million gross ton-kilometers per operating employee in 1953 to 3.7 million gross ton-kilometers per operating employee in 1956. 27/

Increases of 50 percent in productivity of labor under electric operation and of 39 percent under diesel operation demonstrate the possibilities for savings in cost of labor on a railroad with high-density traffic. A Soviet estimate in 1956 of increased productivity of labor and of decreased cost of labor resulting from the changeover from steam locomotives to diesel and electric locomotives is shown in Table 20.* 28/

Electrification would contribute to reductions of from 25 to 30 percent in the over-all number of workers on the railroads, of 70 percent in the number of locomotive crews and the number of workers occupied in servicing locomotives, and of 50 percent in the number of repair crews for locomotives. 29/ Although dieselization and electrification permit the use of less manpower per traffic-kilometer, a greater percentage of highly trained personnel is required. Nearly 16,000 locomotive engineers, 30,000 engineer helpers, more than 10,000 skilled repairmen, and hundreds of engineers and technicians must be trained by 1960 for the planned introduction of diesel traction alone. 30/

B. Other Improvements.**

Many other improvements accompany the changeover in the type of motive power on the Soviet railroads, all of which will contribute to the subsequent increase of productivity of labor and to the decrease in the cost of labor per traffic-kilometer. The estimated cost of labor per traffic-kilometer on Soviet railroads in shown in Table 21.*** Conversion of all trunkline rolling stock to automatic coupling was completed in 1957, 31/ and by 1959 all cars are to be equipped with airbrakes. Capital outlay required for these projects is more than 15 billion rubles. 32/

The old 2-axle type of freight car, which now makes up only 20 percent of the total freight car park in terms of capacity, is disappearing rapidly and is being replaced by the larger 4-axle type of freight car with a capacity of 60 tons. Passenger cars delivered

* Appendix A, p.35, below.
** See Figures 4 through 10, following p. 16.
*** Appendix A, p. 36, below.

since 1955 have been equipped with roller bearings, and production of freight cars with roller bearings was to begin in 1956. 33/

Electronic equipment for processing data is being introduced. One such machine, an electronic calculator for traction, after being fed data on track profile, train weight, and locomotive power, indicates the most advantageous speed for the various sections of the track. 34/ In 1956, devices for automatic blocking and centralized control of traffic were installed on more than 1,500 km of track, and 876 km of double track were laid. 35/ Lazar Kaganovich, then Deputy Premier and former Minister of Railroad Transport, estimated that electrification of switches alone would eliminate the need for almost all of the 120,000 switchmen employed as of 1955. 36/ For reconstructing track on the railroads of the USSR, more efficient equipment -- including machines for laying track, machines for cleaning ballast, tie-tampers, pneumatic spike hammers, and the like -- is being put into use. 37/

All the improvements named above combined with the steady drive for more efficient organization of labor together with dieselization and electrification will increase productivity of labor and will lower the cost of labor per traffic-kilometer. The cost of 0.03 ruble per traffic-kilometer in 1955 is expected to decrease to 0.02 ruble per traffic-kilometer by 1960.

VII. Estimated Relationship of the Cost of Labor to Revenue on the Railroads of the USSR.

Since 1950 the trend has been for gross operating revenue of Soviet railroads to exceed increasingly both the cost of operating labor and total costs of operation, even though railroad freight tariffs have been lowered 5 times during the same period, representing an average over-all reduction of 30 percent. Decreasing costs, largely the consequence of advancing technology and a high level of traffic, have made this increase in net revenue possible in spite of a use of labor considered wasteful by US standards. A comparison of the costs of operation and of revenue on Soviet railroads is shown in Table 22.*

In 1955, gross operating revenue exceeded the cost of operating labor by approximately 38 billion rubles, or 192.9 percent. If present trends continue, by 1960 gross operating revenue will exceed the cost of operating labor by about 66 billion rubles, or approximately 300 percent. Because the cost of operating labor amounts to about 45 percent of the total costs of operation, gross operating revenue may exceed the total cost of operation by about 84 percent by 1960.

* Appendix A, p. 37, below.

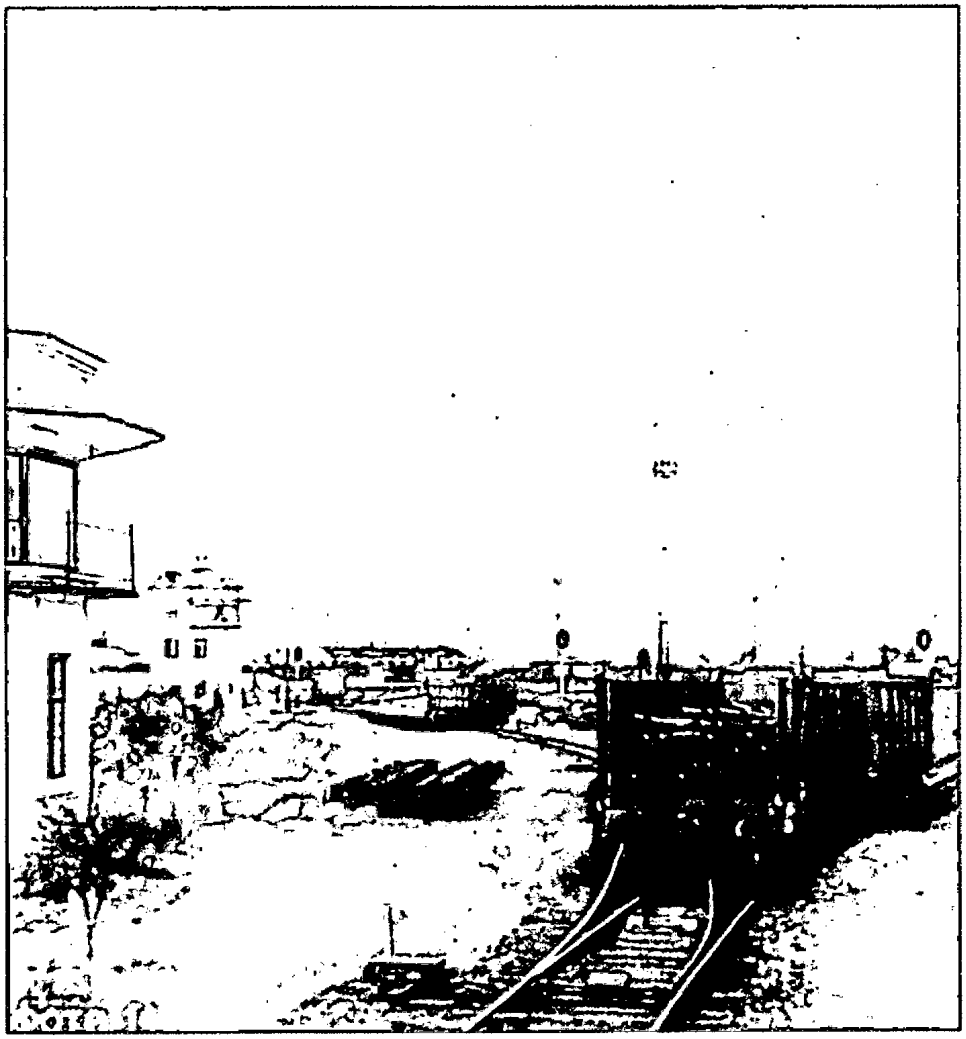

Figure 4. USSR: General View of a Mechanized Classification Yard

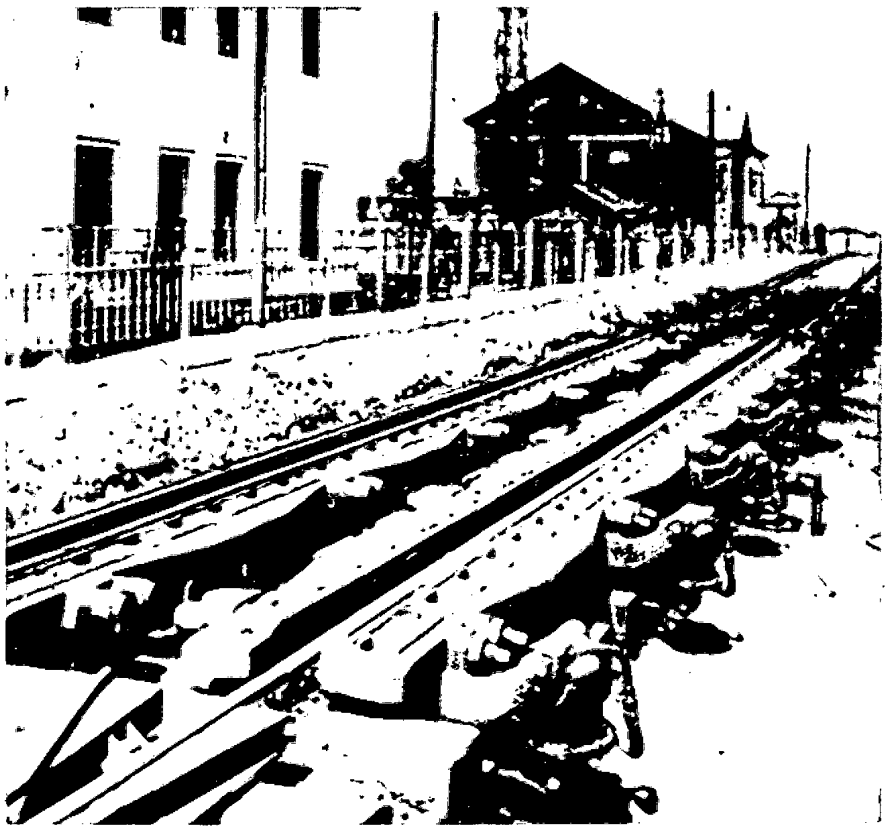

Figure 5. USSR: Railroad Car Retarding Device

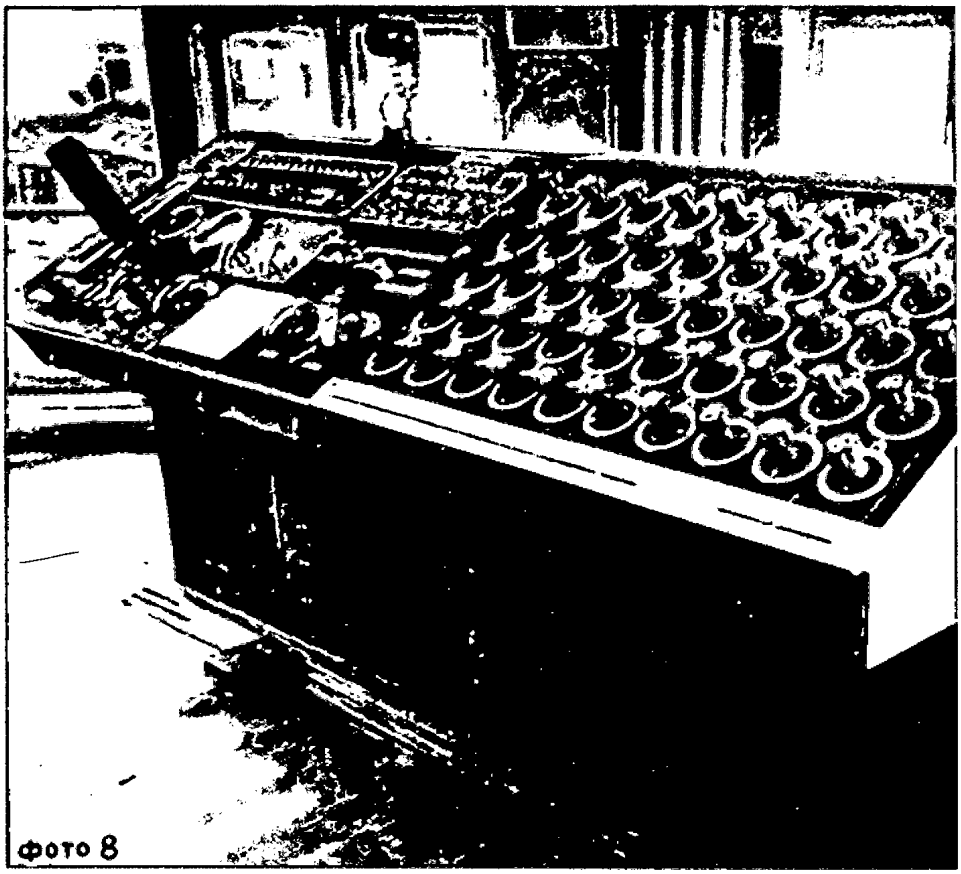

Figure 6. USSR: Automatic Central Switch and Signal Control Panel

Figure 7. USSR: Electro-Pneumatic Switch Control Panel

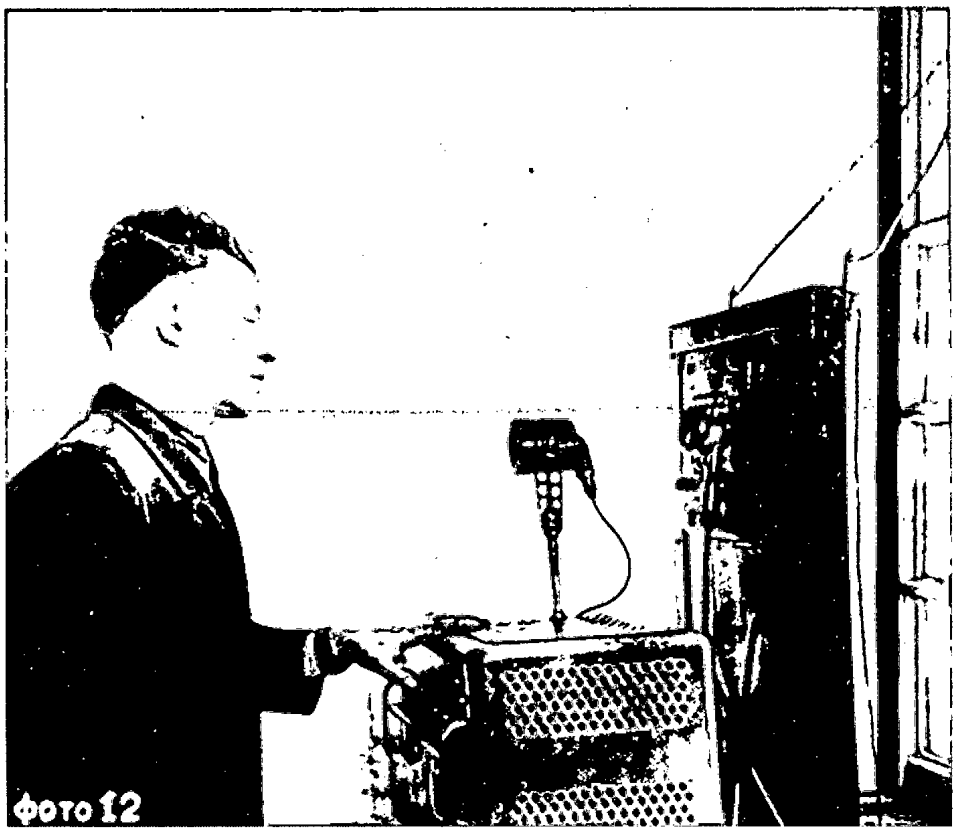

Figure 8. USSR: Two-Way Yard Communications System

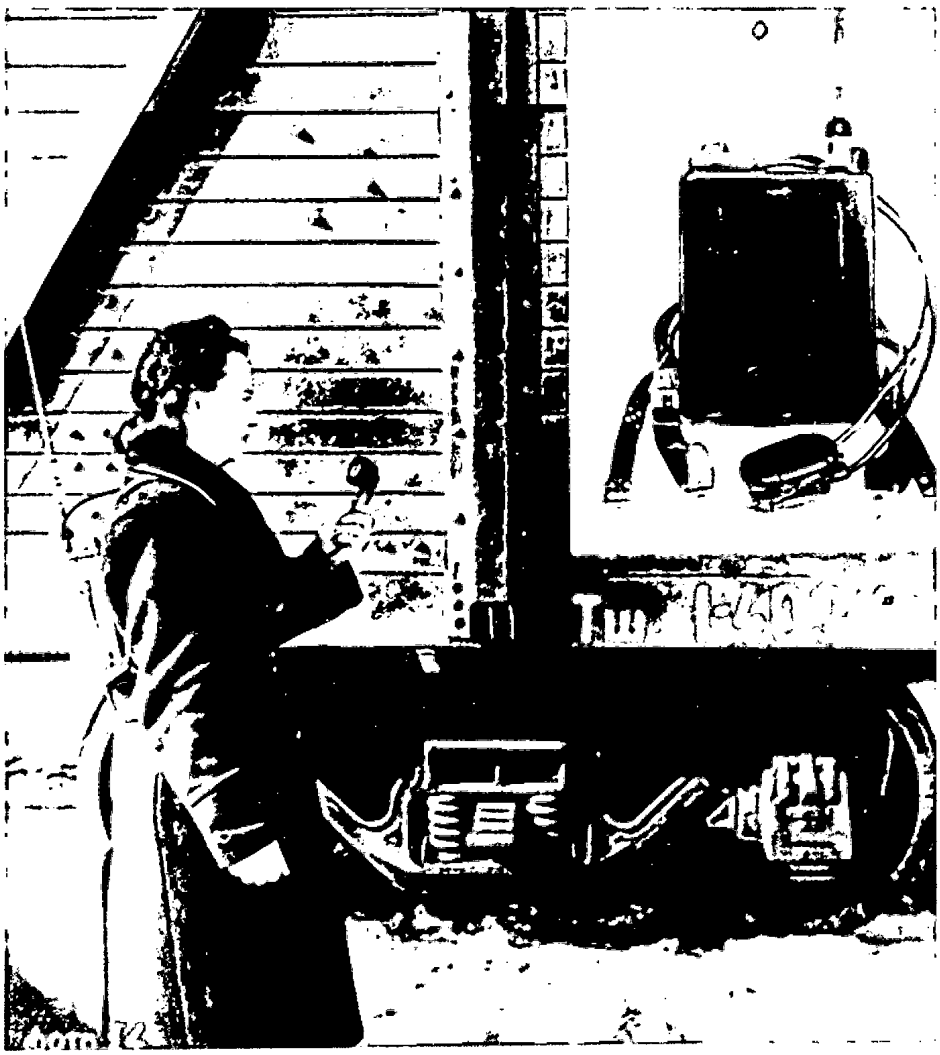

Figure 9. USSR: Walkie-Talkie for Yard Walkers

Figure 10. USSR: Operator Selecting Tracks and Controlling Switches

APPENDIX A

STATISTICAL TABLES

Table 1

Estimated Employment on the Railroads of the USSR a/
1950-60

Year	Total State-Employed Labor Force (Thousand)	Ministry of Railroad Transport (Thousand)	Percentage of the Total State-Employed Labor Force	Operating Employees of the Ministry of Railroad Transport b/ (Thousand)	Nonoperating Employees of the Ministry of Railroad Transport (Thousand)
1950	39,800 c/	3,014 d/	7.6	1,712 d/	1,302 e/
1951	41,400 c/	3,088 d/	7.5	1,765 d/	1,323 e/
1952	42,500 c/	3,233 d/	7.6	1,866 d/	1,367 e/
1953	44,600 c/	3,326 d/	7.5	1,901 d/	1,425 e/
1954	46,800 c/	3,421 d/	7.3	1,968 d/	1,453 e/
1955	47,900 c/	3,400 d/	7.1	1,980 d/	1,420 e/
1956	50,000 c/	3,414 d/	6.8	1,980 d/	1,434 e/
1957	52,100 f/	3,436 g/	6.6	1,993 h/	1,443 e/
1958	54,100 f/	3,390 g/	6.3	1,966 h/	1,424 e/
1959	55,900 f/	3,338 g/	6.0	1,936 h/	1,402 e/
1960	57,700 f/	3,281 g/	5.7	1,903 h/	1,378 e/

a. Rabochiy i sluzhashchiy are wage earners and salaried employees.
b. For definition of operating and nonoperating employees, see the footnote, p. 2, above.
c. 38/
d. 39/
e. Difference between total number of employees and operating employees of MPS.
f. 40/
g. Based on the estimate that operational workers constituted about 58 percent of total employment in the MPS since 1950.
h. Table 12, p. 27, below.

Table 2

Percentage Distribution of Total Railroad Employment in the USSR by Function a/

Function	Percent
Direct railroad work	
Railroad operation	49.2
Repair and maintenance	3.5
Loading and unloading	1.1
Other railroad tasks (secondary-auxiliary work)	10.0
Total	63.8
Production enterprises	10.9
Construction	10.7
Training establishments	3.2
Medical-sanitary establishments	3.8
Workers' supply	5.4
Other b/	2.2
Total	100.0

a. 41/. Probably based on data for 1955.
b. Including political sections, scientific institutes, transport expediting offices, the state railroad publishing house, and the like.

Table 3

Percentage Distribution of Operating Employees on the Railroads of the USSR by Function
1950 and 1954

Management Branch	Percent	
	1950 a/	1954 b/
Locomotive service	23.6	24.6
Track maintenance	22.3	21.5
Traffic management	17.6	18.2
Car service	11.0	10.6
Passenger service	6.8	7.4
Signaling and communications	4.2	4.0
Commercial service	2.6	4.1
Other c/	11.9	9.6
Total	100.0	100.0

a. 42/
b. 43/
c. Including building and installation, political sections, and the like.

Table 4

Percentage of the Total Number of Operating Employees on the Railroads of the USSR Represented by Selected Occupations a/

Occupation	Percent
Locomotive engineers	4.5
Assistant locomotive engineers	4.5
Locomotive firemen	2.9
Conductors	3.7
Train car masters	1.4
Mechanics for locomotive repair	1.8
Mechanics for car repair	3.9
Car inspectors	2.5
Station attendants	1.9
Train makeup men	0.8
Switchmen	6.3
Road masters	0.6
Track walkers	4.6
Track foremen	1.6
Freight train police	4.4
Track workers	12.3
Total	57.7

a. 44/. Probably based on data for 1954.

Table 5

Comparison of the Labor Force on the Railroads of the US and the USSR
1950-56

Year	US a/ (Thousand)	USSR b/ (Thousand)	Employees per Kilometer of Route Operated: US c/	Employees per Kilometer of Route Operated: USSR d/
1950	1,221	2,013	3.4	17.2
1951	1,276	2,063	3.5	17.5
1952	1,227	2,160	3.4	18.2
1953	1,206	2,222	3.3	18.5
1954	1,065	2,285	2.9	19.0
1955	1,058	2,271	2.9	18.8
1956	1,042	2,281	2.9 e/	18.9

a. 45/
b. Adjusted for comparability with the railroad labor force in the US. Using Table 2, p. 19, above, as a basis and eliminating those MPS employees estimated to be engaged in functions not performed by the US railroads, 66.8 percent of the total MPS employment is believed to be comparable to the railroad labor force in the US for purposes of productivity. Total employment of the MPS is from Table 1, p. 18, above.
c. 46/
d. 47/
e. 48/

Table 6

Comparison of Estimated Average Annual Earnings of Railroad Employees and of the State-Employed Labor Force in the USSR 1950-56

Rubles

Year	Operating Employees	Nonoperating Employees	All Employees a/	State-Employed Labor Force b/
1950	8,712 c/	8,541 d/	8,640	7,600
1951	9,120 e/	8,941 d/	9,045	7,800
1952	9,228 a/	9,047 d/	9,152	8,000
1953	9,204 e/	9,024 d/	9,128	8,150
1954	9,396 e/	9,212 d/	9,319	8,350
1955	9,396 f/	9,212 d/	9,319	8,600
1956	9,500 g/	9,314 d/	9,422	8,850

a. Derived from columns 1 and 2 on the basis that operating employees represent 58 percent of total employment of the MPS, as shown in Table 1, p. 18, above.

b. 49/

c. 50/

d. The earnings of operating employees are estimated to be 102 percent of those of nonoperating employees. This differential is an induction from observed differentials, 2 percent for 1934 and 1.2 percent for the 1941 plan. 51/

e. Estimate, based on one sample railroad system and adjusted by inspection for bias on the basis of comparison with national averages for 1950, 1952, and 1955. 52/

f. 53/

g. Average earnings are estimated to resume a gradual increase as mechanization takes over, requiring a greater percentage of skilled, better-paid personnel.

Table 7

Estimated Average Annual Earnings of Selected Groups of Railroad Employees in the USSR a/

Group	Rubles
Locomotive crews	15,870
Train crews	14,330
Locomotive repair and maintenance workers	9,720
Freight conductors	9,510
Train makeup men (excluding switchmen)	8,140
Passenger conductors	7,980
Car repair and maintenance men	7,960

a. 54/. Probably based on data for 1955.

Table 8

Monthly Wage Rates for Selected Employees of the Ministry of Railroad Transport of the USSR Selected Years, 1954-57

Job Description	Year	Monthly Rate a/ (Rubles)
Unskilled workers in enterprises of MPS	1957 b/	300 to 350 (minimum wage)
Train makeup men (excluding switchmen)	1956 c/	500
Railroad construction workers		
Time	1954 d/	300
Piece		394
Railroad metal workers		
Time	1954 e/	312
Piece		418

a. This is the basic wage rate. Actual earnings include bonuses; therefore, the basic wage rate comprises an estimated 40 to 50 percent of actual earnings. 55/
b. 56/
c. 57/
d. 58/
e. 59/

Table 9

Monthly Wage Rates for Signaling and Communications Employees of the Ministry of Railroad Transport of the USSR 1955

Rubles

Job	Monthly Wage Rates		
	Category I a/	Category II	Category III
Chief of signaling and communications division	1,500	1,300	1,200
Deputy chief of signaling and communications division	Wage rates are established at 15 percent less than the rate for the chief		
Assistant division chief for personnel	1,000	930	880
Chief of signaling and communications road laboratory	1,000	980	880
Senior engineer	1,000	980	880
Engineer	830 to 930	790 to 880	790
Communications inspector	880	740	640
Technician and technician/norm-fixer	600 to 690	550 to 640	500 to 600
Senior electrician, supervisor of interlocking switch or relay point	930	830	740
Division shop supervisor	Same as electrical mechanics and senior electrical mechanics, depending on the volume of work at the shops		
Person on duty to guarantee communications	830 to 930	790 to 880	740 to 790
Electrician, Grade I	740	640	550
Electrician, Grade II	640	575	500
Communications and signaling, interlocking, and block-system installation man, Grade I	600	550	475
Communications and signaling, interlocking and block-system installation man, Grade II	550	500	425
Signaling, interlocking, and block-system mechanic and senior helper for electrical mechanic	475	425	385
Storage battery man	475	425	385
Chief bookkeeper	930	880	830
Senior bookkeeper		640 to 740	
Bookkeeper		500 to 600	
Cashier		450 to 500	
Senior accountant		410 to 450	
Accountant		385 to 425	

a. Categories are established according to the volume of work of installations, taking into account the degree to which they are equipped technically. 60/

Table 10

Average Annual Earnings per Employee
for Selected Industries in the USSR
1955

Rubles

Industry	Average Annual Earnings
Rail transport	9,400 a/
Shipbuilding	9,600 b/
Electric power	9,600 c/
Construction	7,680 d/

a. From Table 6, p. 23, above.
b. 61/
c. 62/
d. Estimate

50X1

Table 11

Comparison of Average Annual Earnings in the US and the USSR
1950-56

	US		USSR	
Year	Railroad Employees a/ (Dollars)	Nonagricultural Labor Force b/ (Dollars)	Employees of the Ministry of Railroad Transport c/ (Rubles)	State-Employed Labor Force d/ (Rubles)
1950	3,785	3,085	8,640	7,600
1951	4,182	3,317	9,045	7,800
1952	4,352	3,500	9,152	8,000
1953	4,415	3,653	9,128	8,150
1954	4,560	3,737	9,319	8,350
1955	4,719	3,911	9,319	8,600
1956	5,107	4,100	9,422	8,850

a. 64/
b. 65/
c. From Table 6, p. 23, above.
d. From Table 14, p. 29, below.

S-E-C-R-E-T

Table 12

Cost of Labor on the Railroads of the USSR 1950-60

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
	Total Employees			Operating Employees					Nonoperating Employees				
Year	Number of Employees a/ (Thousand)	Total Money Earnings b/ (Billion Rubles)	Total Cost of Labor c/ (Billion Rubles)	Number of Employees a/ (Thousand)	Average Annual Earnings d/ (Rubles)	Total Money Earnings e/ (Billion Rubles)	Other Payments for Labor f/ (Billion Rubles)	Total Cost of Labor (Billion Rubles)	Number of Employees g/ (Thousand)	Average Annual Earnings h/ (Rubles)	Total Money Earnings i/ (Billion Rubles)	Other Payments for Labor j/ (Billion Rubles)	Total Cost of Labor k/ (Billion Rubles)
1950	3,014	26.03	28.60	1,712	8,712	14.91	1.47	16.38 l/	1,302	8,541	11.12	1.10	12.22
1951	3,088	27.93	30.55	1,765	9,120	16.10	1.51	17.61 m/	1,323	8,941	11.83	1.11	12.94
1952	3,233	29.59	31.66	1,866	9,228	17.22	1.20	18.42 m/	1,367	9,047	12.37	0.87	13.24
1953	3,326	30.36	32.89	1,901	9,204	17.50	1.46	18.96 m/	1,425	9,024	12.86	1.07	13.93
1954	3,421	31.88	33.47	1,968	9,396	18.49	0.92	19.41 m/	1,453	9,212	13.39	0.67	14.06
1955	3,400	31.68	33.81	1,980	9,396	18.60	1.25	19.85 n/	1,420	9,212	13.08	0.88	13.96
1956	3,414	32.17	35.07	1,980	9,500	18.81	1.70	20.51 m/	1,434	9,314	13.36	1.20	14.56
1957	3,436	33.13	36.21	1,993	9,725 o/	19.38	1.8 p/	21.18 q/	1,443	9,530 o/	13.75	1.28	15.03
1958	3,390	33.42	36.67	1,966	9,950 o/	19.56	1.9 p/	21.46 q/	1,424	9,735 o/	13.86	1.35	15.21
1959	3,338	33.64	37.06	1,936	10,175 o/	19.70	2.0 p/	21.70 q/	1,402	9,940 o/	13.94	1.42	15.36
1960	3,281	33.78	37.37	1,903	10,400 o/	19.79	2.1 p/	21.89 q/	1,378	10,150 o/	13.99	1.49	15.48

a. From Table 1, p. 18, above.
b. Total of columns 6 and 11.
c. Total of columns 8 and 13.
d. From Table 6, p. 23, above.
e. Column 4 multiplied by column 5.
f. Column 8 less column 6. Includes special awards, social insurance, and the like.
g. Column 1 less column 4.
h. From Table 6, p. 23, above. Operating employees earn an estimated 102 percent of wages paid to nonoperating employees.
i. Column 9 multiplied by column 10.
j. Percentage of money earnings assumed to be the same as for operating employees, as shown in columns 6 and 7.
k. Column 11 plus column 12.
l. 66/. Payments to labor total 45.2 percent of operating cost for 1950.
m. Based on 1950 and 1955 ratio, 45.3 percent of operating cost.
n. 67/. Wages and supplementary payments to labor are 45.4 percent of operating cost (see Table 22, p. 37, below).
o. Because it is estimated that the productivity of labor will increase by about the same amount during 1956-60 as during 1950-56, it is estimated that the average wage will follow the same trend.
p. It is estimated that the cost of fringe benefits will increase slightly as concessions are granted to labor.

S-E-C-R-E-T

Table 13

Estimated Cost of Labor, Average Annual Earnings of Employees, and Net Operating Income of the Ministry of Railroad Transport of the USSR Selected Years, 1950-60

Year	Total Cost of Labor a/ (Billion Rubles)	Traffic-Kilometers Performed b/ (Billion)	Cost of Labor per Traffic-Kilometer c/ (Kopeks)	Average Annual Earnings of Employees d/ (Rubles)	Net Operating Income e/ (Billion Rubles)
1950	28.60	690	4.14	8,640	6.31
1955	33.81	1,112	3.04	9,319	14.43
1956	35.07	1,222	2.87	9,422	16.9
1960	37.37	1,777	2.10	10,296	39.99

a. From Table 12, p. 27, above.
b. From Table 15, p. 30, below.
c. Total labor cost per traffic-kilometer; column 1 divided by column 2.
d. Derived from data in Table 12, p. 27, above.
e. Derived from data in Table 22, p. 37, below.

Table 14

Annual Earnings of Railroad Employees
and of the State-Employed Labor Force in the USSR
1950-60

	State-Employed Labor Force			Ministry of Railroad Transport	
Year	Total Employment a/ (Thousand)	Average Earnings b/ (Rubles per Year)	Total Money Earnings c/ (Billion Rubles)	Total Money Earnings d/ (Billion Rubles)	Earnings as a Percent of Total Earnings of State-Employed Personnel
1950	39,800	7,600	302.5	26.03	8.6
1951	41,400	7,800	322.9	27.93	8.6
1952	42,500	8,000	340.0	29.59	8.7
1953	44,600	8,150	363.0	30.36	8.4
1954	46,800	8,350	390.8	31.88	8.2
1955	47,900	8,600	411.9	31.68	7.7
1956	50,000	8,850	442.5	32.17	7.3
1957	52,100	9,300	484.5	33.13	6.9
1958	54,100	9,650	522.1	33.42	6.4
1959	55,900	10,050	561.8	33.64	6.0
1960	57,700	10,500	605.9	33.78	5.6

a. From Table 1, p. 18, above.
b. 68/
c. Column 1 multiplied by column 2.
d. From Table 12, p. 27, above.

Table 15

Productivity of Labor on the Railroads of the USSR
1950-60

Year	Operating Employees a/ (Thousand)	Production (Billion Traffic-Kilometers)	Productivity (Thousand Traffic-Kilometers per Operating Employee)
1950	1,712 a/	690 b/	403 b/
1951	1,765 a/	776 b/	440 b/
1952	1,866 a/	849 b/	455 b/
1953	1,901 a/	916 b/	482 b/
1954	1,968 a/	986 b/	501 b/
1955	1,980 a/	1,112 b/	562 b/
1956	1,980 a/	1,222 b/	617 b/
1957	1,993 c/	1,361 d/	683 e/
1958	1,966 c/	1,490 f/	758 g/
1959	1,936 c/	1,628 f/	841 g/
1960	1,903 c/	1,777 f/	934 g/

a. 69/
b. 70/
c. Column 2 divided by column 3.
d. 71/
e. 72/
f. Estimate, based on an increasing length of freight haul and a projection of the rate of growth for tons-originated and for passenger traffic.
g. Estimate, based on the annual rate of increase in productivity of labor during 1954-57.

Table 16

Productivity of Labor on Selected Railroads of the USSR a/
1955

Railroad	Productivity (Thousand Traffic-Kilometers per Employee)
Average for the network	562
Omsk	1,550
South Ural	1,010
Krasnoyarsk	890
Karaganda	770
Sverdlovsk	620
Donets	580
Moscow-Kursk-Donbas	490
Transcaucasus	340
Belorussian	290
South Sakhalin	100

a. 73/

Table 17

Comparison of Operating Revenues and Operating Costs of Rail Transport in the USSR a/
Selected Years, 1950-60

Year	Gross Operating Revenue per Operating Employee (Rubles)	(Index)	Net Operating Revenue per Operating Employee (Rubles)	(Index)	Labor Costs per Operating Employee (Rubles)	(Index)	Gross Operating Revenue per Traffic-Kilometer (Kopecks)	(Index)	Gross Operating Revenue per Operating Employee per Traffic-Kilometer (Kopecks)	(Index)	Operating Cost per Operating Employee per Traffic-Kilometer (Kopecks)	(Index)	Net Operating Revenue per Traffic-Kilometer (Kopecks)	(Index)
1950	24,854	100	3,686	100	9,568	100	6.17	100	0.0000036	100	0.00000306	100	0.914	100
1955	29,369	118	7,288	198	10,025	105	5.23	85	0.00000264	73	0.00000199	65	1.297	142
1956	31,404	126	8,535	232	10,359	108	5.09	82	0.00000257	71	0.00000187	61	1.383	151
1960	46,406	187	21,014	570	12,319	129	4.97	81	0.00000261	73	0.00000143	47	2.250	246

a. Derived from data in Table 15, p. 30, above and Table 22, p. 37, below.

Table 18

Productivity of Labor of Railroad Employees in the US and the USSR
1950-56

	Employees (Thousand)		Production (Billion Traffic-Kilometers)		Productivity (Thousand Traffic-Kilometers per Employee)		Employees per Kilometer of Route Operated	
Year	US a/	USSR b/	US c/	USSR d/	US	USSR	US e/	USSR f/
1950	1,221	2,013	910	690	745	343	3.4	17.2
1951	1,276	2,063	1,000	776	784	376	3.5	17.5
1952	1,227	2,160	952	849	776	393	3.4	18.2
1953	1,206	2,222	935	916	775	412	3.3	18.5
1954	1,065	2,285	849	986	797	432	2.9	19.0
1955	1,058	2,271	956	1,112	904	490	2.9	18.8
1956	1,042	2,281	990	1,222	950	536	2.9 g/	18.9

a. 74/. Class I railroads.
b. Adjusted for comparability with the railroad labor force in the US. Using Table 2, p. 19, above, as a basis and eliminating the employees of the MPS believed to be engaged in functions not performed by US railroads, for purposes of determining productivity of labor, 66.8 percent of the total employment by the MPS is believed comparable to the US Class I railroad labor force. Total employment by the MPS is given in Table 1, p. 18, above.
c. 75/. Short ton-miles and passenger-miles converted to metric ton-kilometers and passenger-kilometers with factors of 1.45999 and 1.60935.
d. 76/
e. 77/
f. 78/
g. 79/

Table 19

Savings in Manpower as a Result of Increasing Productivity of Labor on the Railroads of the USSR
1950-60

Year	(1) Traffic-Kilometers a/ (Billion)	(2) Operational Manpower Requirements at Level of Productivity in 1950 b/ (Thousand Traffic-Kilometers per Employee)	(3) Actual Productivity a/ (Thousand Traffic-Kilometers per Operating Employee)	(4) Actual Operating Manpower Requirements (Thousand)	(5) Manpower Saved by Increase over Productivity in 1950 (Thousand)
1950	690	1,712	403	1,712	
1951	776	1,925	440	1,765	160
1952	849	2,106	455	1,866	240
1953	916	2,272	482	1,901	371
1954	986	2,446	501	1,968	478
1955	1,112	2,759	562	1,980	779
1956	1,222	3,032	617	1,980	1,052
1957	1,361	3,377	683	1,993	1,384
1958	1,490	3,697	758	1,966	1,731
1959	1,628	4,040	841	1,936	2,104
1960	1,777	4,409	934	1,903	2,506

a. See Table 15, p. 30, above.
b. Column 1 divided by column 3.

Table 20

Reductions in the Operating Labor Force and Increases in Productivity of Labor Resulting from Conversion from Steam to Electric and Diesel-Electric Traction on the Railroads of the USSR

Percent

	VL-22m Electric Locomotive	N-8 Electric Locomotive	TE-3 Diesel Locomotive
Reduction in expenditures for maintenance of locomotive and conductor crews	50	50	50
Reduction in locomotive crews	27	40	30
Reduction in entire working contingent	9	13	10
Increase in productivity of labor of locomotive crews	37	67	43
Increases in productivity of labor of entire working contingent	10	15	11

Table 21

Estimated Cost of Labor per Traffic-Kilometer on the Railroads of the USSR
1950-60

Year	Production a/ (Billion Traffic-Kilometers)	Total Cost of Labor (Billion Rubles)	Unit Cost of Labor (Kopecks per Traffic-Kilometer)
1950	690	28.60	4.14
1951	776	30.55	3.94
1952	849	31.66	3.73
1953	916	32.89	3.59
1954	986	33.47	3.39
1955	1,112	33.81	3.04
1956	1,222	35.07	2.87
1957	1,361	36.21	2.66
1958	1,490	36.67	2.46
1959	1,628	37.06	2.28
1960	1,777	37.37	2.10

a. From Table 15, p. 30, above.
b. From Table 12, p. 27, above.

Table 22

Operating Costs and Operating Revenue on the Railroads of the USSR
Selected Years, 1950-60

Year	Gross Operating Revenue (Billion Rubles)	Total Operating Cost (Billion Rubles)	Average Operating Cost per Traffic-Kilometer (Kopecks)	Gross Operating Revenue as Percent of Operating Costs	Total Operating Labor Cost (Billion Rubles)	Gross Operating Revenue as Percent of Operating Labor Cost
1950	42.55 a/	36.24 b/	5.252 c/	117.4 d/	16.38 e/	259.8
1955	58.15 a/	43.72 b/	3.932 c/	133.0 d/	19.85 e/	292.9
1956	62.18 a/	45.28 b/	3.705 c/	137.3 f/	20.51 e/	303.2
1960	88.31 g/	48.32 h/	2.719 i/	183.8 j/	21.89	403.4

a. Column 2 plus the absolute amount represented by the percentage in column 4.
b. Column 3 multiplied by traffic-kilometers estimated in Table 14, p. 29, above.
c. 80/
d. 81/
e. See Table 12, p. 27, above.
f. 82/
g. The estimated revenue from freight traffic is 66.99 billion rubles (1,595 billion ton-kilometers multiplied by 4.2 kopecks -- the average rate per ton-kilometer under the present rate structure). The estimated revenue from passenger traffic is 16.56 billion rubles (182 billion passenger-kilometers multiplied by 9.1 kopecks -- the average rate per passenger-kilometer under the present rate structure). This figure is 127 percent of the revenue from passenger traffic for 1956 (13.01 billion rubles -- 143 billion passenger-kilometers multiplied by 9.1 kopecks). It is estimated that other revenue will increase by the same percentage as revenue from passenger traffic and in 1960 will be 4.76 billion rubles (127 percent of the figure 3.75 billion rubles for 1956).
h. Estimated labor cost has been about 45.3 percent of total operating cost.
i. Total operating cost divided by the number of traffic-kilometers estimated in Table 15, p. 30, above.
j. Derived from columns 1 and 2.

APPENDIX B

METHODOLOGY

The methodology used to determine the number of employees on the railroads of the USSR was to accept Soviet statistics published through 1956 on both absolute numbers of operating employees and on the total number of employees of the MPS. Statistics in absolute terms on labor productivity published through 1956 also were accepted and projected through 1960 on the basis of percentage increase. The figure derived for the productivity of labor in 1960 was applied to the planned production (traffic-kilometers) for 1960, and on that basis the required number of operating manpower was computed. Planned production for the intervening years was interpolated, and the total requirement for manpower was estimated on the basis of the relationship between the total number of operating and nonoperating employees during 1950-60.

Annual earnings of the railroad labor force were determined by multiplying the estimated labor force by the estimated average annual earnings per employee. The detailed technique for arriving at the average annual earnings is explained in Table 6.*

The cost of operating the railroads was derived from announced statistics on traffic-kilometers and cost per traffic-kilometer for 1950, 1954-57, and estimated cost for 1960. Data for the intervening years were then interpolated. The total cost of labor on the railroads was derived from announced percentages on the operating cost.

Gross revenue through 1956 was estimated from Soviet statements of revenue in excess of operating cost. The estimate for 1960 is based on estimated traffic and estimated revenue per unit of traffic. In order to compare employment and productivity of labor on the railroads of the US and the USSR, statistics of the Association of American Railroads for Class I railroads were accepted, and statistics announced by the USSR on employment in the MPS were adjusted to eliminate functions not performed by railroads in the US. Techniques for estimating these figures are explained in some detail in the statistical tables in Appendix A.

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* P. 23, above.

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