Transportation and Handling Costs of Selected Fresh Fruits and Vegetables

in the SAN FRANCISCO BAY TERMINAL MARKET AREA

by Stanford Research Institute

An Agricultural Marketing Act (RMA, Title II) Contract Report

Marketing Research Report No. 2

U. S. DEPARTMENT OF AGRICULTURE
BUREAU OF AGRICULTURAL ECONOMICS

WASHINGTON, D. C. MAY 1952

For sale by the Superintendent of Documents, U. S. Government Printing Office
Washington 25, D. C. - Price 35 cents

FOREWORD

This is one of a number of studies carried out under the Agricultural Marketing Act of 1946 (RMA, Title II) program designed to increase the efficiency of marketing farm products.

This report was done under contract by the Stanford Research Institute. It relates to the factors responsible for costs of transporting and handling fruits and vegetables in terminal markets in Oakland and San Francisco. It makes available facts relating to the efficiency of marketing fresh fruits and vegetables and suggests methods of improving transporting and handling practices in these and other cities. The Oakland and San Francisco terminal markets were selected for the study because they offered a chance to observe and analyze costs of marketing fruits and vegetables under two substantially different methods of operation, and because they are the concentrating and distributing markets for one of the major fruit-and-vegetable-producing areas in the United States.

One dollar of each five spent for food by civilian consumers is used to buy fruits and vegetables. Only meat and meat products, which take one dollar of each four are of greater importance in the food budget of the average family in the United States. Meanwhile, marketing and handling charges for fruits and vegetables accounted for an average of 65 cents of each dollar spent at retail for food in 1951--that is, for each dollar received by farmers for growing and delivering the products to the first purchaser, an additional two dollars was added for transportation, processing, and other handling and selling charges, before the product was finally bought by the consumer at retail. This underlines the importance of trying to find ways and means of reducing transporting and handling charges for fruits and vegetables, both from the standpoint of giving better returns to farmers and of holding down the average consumer's annual food bill.

The facts and analyses given in this report are not complete--that is, research studies rarely answer all the questions which one could ask. Further, research in a broad sense is never complete until it has been understood and interpreted by those able to use the results, and it is always a problem as to the best ways or methods of bringing about suggested improvements. Publication of these findings alone will probably not be adequate for this purpose. But the information made available in this report should create further interest in the problem and suggest ways and means by which efficiency can be increased in similar market areas throughout the country.

Oris V. Wells

Chief, Bureau of Agricultural Economics

C O N T E N T S

ACKNOWLEDGEMENTS

Stanford Research Institute Project Team

This project was under the general direction of Bonnar Brown, Assistant Chairman of the Department of Business and Industrial Economics. The investigation was conducted by the following Institute staff members: Thomas A. Mainwaring, Robert O. Shreve, Lewis W. Forman, Theodore G. Schad, and Alice D. Weiner. Statistical work was directed by Howard C. Nielson, assisted by Irving Weiss.

Bureau of Agricultural Economics Participation

The basic research plan for this project was developed by D. B. DeLoach and Donald E. Church of the Bureau of Agricultural Economics.

Sources of Information

Stanford Research Institute acknowledges with appreciation the help and cooperation of many individuals and organizations without whose assistance the completion of this study would not have been possible. Material assistance was received from wholesale dealers and secondary handlers in the Oakland and San Francisco wholesale markets; wholesale dealer associations; retail chain organizations; railroad companies and their bureaus; trucking and local drayage companies and their associations; insurance organizations; associations of growers and shippers of fresh fruits and vegetables; Public Utilities Commission, California; the California Department of Employment; Federal State Market News in Oakland and San Francisco; and locals of market drivers' and helpers' unions in Oakland and San Francisco, as well as from others.

TRANSPORTATION AND HANDLING COSTS FOR SELECTED FRESH FRUITS AND VEGETABLES IN THE SAN FRANCISCO BAY TERMINAL MARKET AREA

Prepared in Bureau of Agricultural Economics

GENERAL SUMMARY OF FINDINGS

This section highlights the major findings that resulted from the research work on this study, particularly the more important differences in costs between markets and marketing channels, and among commodities. Detailed findings resulting from the study are reported in sections that deal with specific segments of the Oakland and San Francisco markets. The analysis of detailed findings, including comparisons of costs developed by the study, comprises a separate section of the report.

1. Costs for unloading selected commodities from rail cars at team tracks, 1/ transporting by truck to wholesale markets, and unloading on wholesale dealers' sidewalks are less in Oakland, with one exception, than in San Francisco. Costs per package are less in Oakland by the following amounts:

   Apples - 2.6 cents per box
   Oranges - 2.1 cents per box
   Peaches - 1.6 cents per lug
   Potatoes - 1.6 cents per 50 lb. sack
   Potatoes - 2.6 cents per 100 lb. sack
   Tomatoes - 1.0 cent per lug

   Cost per crate of lettuce is 0.5 cent greater in Oakland than in San Francisco. These costs are determined by charges made by for-hire drayage companies. Costs for unloading commodities from rail cars onto the rail platform of a retail chain warehouse are considerably less than drayage costs from team tracks to wholesale dealers' sidewalks in each city. Depending upon commodity and type of package, unloading costs at the retail chain warehouse are estimated to be from 4.4 to 9.2 cents less per package than drayage costs from team tracks to wholesale stores in Oakland and from 5.6 to 8.7 cents less per package than costs for similar drayage in San Francisco. Receiving costs for rail receipts at wholesale dealers' stores in each city could be materially reduced if the stores were located on rail sidings and equipped with rail platforms. In both cities, however, construction of a new wholesale market would be required to accomplish this.

2. Total handling costs, including handling of commodities into, within, and out of wholesale stores, and secondary handling by wholesale dealers, are less in the Oakland than in the San Francisco market. Differences in total handling costs between

1/ Side tracks where freight cars are stationed for unloading.

the markets range from 1.1 to 8.0 cents per package for the selected commodities. Factors that create the differential in cost are: (a) lower wage rates in Oakland; (b) more favorable physical market conditions in Oakland; (c) fewer handlings of commodities.

3. Total handling costs into, within, and out of a retail chain warehouse are substantially less than costs for similar operations at wholesale dealers' stores in the Oakland and San Francisco markets. These handling costs for the various selected commodities at the retail chain warehouse are from 0.9 to 5.4 cents less per package than costs for similar handlings at Oakland wholesale stores and from 2.9 to 11.7 cents less per package than costs at San Francisco wholesale stores. Lower costs at the retail chain warehouse are due to: (a) warehouse layout designed for efficiency in operation; (b) efficient utilization of mechanical equipment for moving commodities in palletized lots; (c) fewer handlings of commodities; (d) shorter distances to deliver commodities to motortrucks. To provide wholesale dealers with stores having physical facilities comparable to those at the retail chain warehouse would require the construction of a new wholesale market in each city.

4. Costs per pound for moving different sized packages of a given commodity the same number of times vary inversely with the weights of packages studied during the research work. This relationship exists at wholesale markets in which hand labor is used and at a retail chain warehouse in which mechanical equipment is used.

5. Cost per pound for handling the different commodities studied in packages of approximately the same gross weight are the same when packages are handled the same number of times. This relationship exists at dealers' stores in each wholesale market and at the chain-store warehouse. Charges made by lumpers for unloading trucks by local drayage companies and by cold-storage warehouses, however, sometimes differ for different commodities, although packages are of approximately the same gross weight.

6. In the Oakland wholesale market differences in handling costs due to volume of business handled by wholesale stores are statistically significant. Firms handling more than 200,000 packages in the period studied experienced an average handling cost of 4.4 cents per package, compared with 5.8 cents per package for smaller firms. Factors which may contribute to the difference in handling costs are described in Analysis of Findings, a separate section of this report. In the San Francisco wholesale market, however, the difference in cost per package is not significant between houses with a large volume of business and those with a small volume.

7. Seasonal influence is strong on dealers' handling costs in both the Oakland and San Francisco markets. Handling costs per package decrease as the total volume of packages increases. During January, the average handling cost per package at wholesale dealers' stores in Oakland was 5.6 cents and in San Francisco was 10.6 cents. During July, the peak volume month, the average cost per package in Oakland was 4.4 cents and in San Francisco was 8.8 cents.

8. Differences in costs incurred in the terminal market exist between packages of commodities transported to Oakland and San Francisco by rail and by line-haul truck. Costs are less for commodities delivered by truck than for those delivered by rail cars terminated on team tracks. Including the cost of unloading trucks, which usually is absorbed by the trucking companies, the cost per package of various commodities delivered by line-haul truck in Oakland is from 3.6 to 11.9 cents less than costs when the packages are delivered by rail cars terminated on team tracks. In San Francisco, the differential ranges from 5.1 to 9.1 cents.

   Costs per package are higher, however, for commodities delivered by truck than for those delivered on rail sidings to receiving facilities equipped with rail platforms. For example, including the cost of unloading trucks, costs per package of commodities delivered by truck are from 0.8 to 3.2 cents greater than costs when packages are delivered by rail on the siding of a retail chain warehouse.

INTRODUCTION

OBJECTIVE

The United States Department of Agriculture is presently engaged in research regarding transportation costs and their economic effects on agriculture, and on the measurement of costs and margins in marketing farm products. Measurement and analysis of the costs of transportation and handling of selected fresh fruits and vegetables in terminal markets in the San Francisco Bay area constitute a significant part of the program in both fields of research. Under a contract agreement effective January 30, 1951, with the Department of Agriculture, Stanford Research Institute undertook to perform the research work outlined below. The general objectives of the investigation were as follows:

1. Measurement of transportation and handling costs in such a way as to provide a means for obtaining an estimate of the total transportation costs f.o.b. point of origin to wholesale dealers in Oakland and San Francisco by use of published tariffs or motor-carrier charges plus the costs developed in the study. Such over-all cost figures are essential in a study of the relation between differentials in transportation costs to various markets and their effect upon prices and distribution of products. Over-all costs are also significant as one of the elements of cost and margins in the marketing of agricultural products.

2. Measurement of the cost of each of the major significant steps in the transporting and receiving process after arrival at the terminal market and until the products are received on the floor of the primary (including the retail chain) or secondary handler; and measurement of the cost of major functions performed at each step for the purpose of ascertaining the relative magnitude of costs involved at each point in the expectation that such information will be useful in discovering ways and means for reducing such costs.

3. Measurement of differences in costs among commodities and among marketing channels and between the same or similar costs in Oakland and San Francisco markets for the purpose of discovering the probable causes for such cost differences and to assist in indicating, at least partially, the extent to which such costs may be reduced.

Specific commodities included in this study are apples, lettuce, oranges, peaches, potatoes, and tomatoes.

PROGRESS REPORTS

During the course of this project, the Department of Agriculture was informed regarding progress of work by means of written progress reports. Two progress reports, one dated July 20, 1951, and the other November 16, 1951, were submitted by Stanford Research Institute to the sponsor of the research project.

DESCRIPTION OF MARKETS

THE OAKLAND MARKET AREA

The physical movement of fresh fruits and vegetables into the Oakland market area is divided into three major categories which are described below.

Wholesale Market

The largest volume of receipts in the Oakland market area occurs at the wholesale market, which is composed of about 30 wholesale dealers. These dealers are concentrated on Franklin Street, which is the main street of the market, from First to Fifth Streets, and approximately one-half block in each direction from Franklin. No established boundaries mark the physical limits of the market area.

Wholesale dealers' stores are located in buildings which were constructed during 1916. Most of the buildings are joined solidly together and few have platforms for loading and unloading trucks. Packages of fresh fruits and vegetables are received by wholesale dealers 2/ on their sidewalks where they are unloaded from line-haul trucks or from local drayage trucks. Rail car receipts are transferred to trucks at team tracks located within a half-mile of the center of the market and then are drayed to the dealers' sidewalks.

Dealers' sidewalks are broad and are covered by roofs which afford some protection from sun or rain to merchandise piled on the sidewalks. Considerable produce is sold and delivered to retailers without entering the wholesale dealers' stores. The main floors of the stores are at sidewalk level. They are used for display and storage purposes. Packages are moved into, about, and out of the stores, usually on hand trucks, by the dealers' porters.

Although streets in the market area are wide, vehicular traffic is heavy and considerable congestion results. Line-haul trucks usually arrive and unload during the afternoon and night. Some of these may still be in the market area when selling and delivering activities begin. At 5 a.m. the market officially opens for sales, and at 5:30 a.m. deliveries to retailers' trucks may be started. Many wholesale dealers in Oakland are service wholesalers, and their trucks take up parking space in the market area. Many East Bay retailers, however, come to the market and pick up their purchases in their own trucks. Due to congestion and lack of parking space, a retailer's truck may be parked a considerable distance from the wholesaler store at which a purchase is made. This

2/ Freight trucks which brought the products from the shipping point.

merchandise must be delivered to the retailer's truck by the wholesaler's porters, who use hand trucks for this operation. Only one power-driven fork-lift truck was found in the entire market.

Direct Buyers

Several large retail chain organizations in the Oakland market area buy and receive fresh fruits and vegetables directly. Their receiving facilities are located outside the wholesale market area. These include central distribution warehouses located on rail sidings, making possible handling from the rail car directly into the warehouse.

Storage Warehouses

Two warehouse companies provide cold-storage facilities for fresh fruits and vegetables in the Oakland market area. Both of these warehouses are located within approximately a half mile of the wholesale produce market. Shipments from growing areas to cold-storage warehouses are made by rail and by truck. From the storage warehouses the commodities later are moved by truck either to the wholesale market or to retail organizations.

Private storage facilities in the area are maintained by one wholesaler who specializes in potatoes.

THE SAN FRANCISCO MARKET AREA

There are three major classifications of the movement of fresh fruits and vegetables into the San Francisco area. These are described here. Large direct buyers are not included as a classification. They consist of chain-store organizations and the great bulk of their receipts are accomplished at central distribution warehouses located in the Oakland metropolitan area. Deliveries from these warehouses are made by truck to retail stores in both the Oakland and the San Francisco areas.

Wholesale Market

The wholesale market accounts for the greatest volume of receipts in the San Francisco area. This market is comprised of approximately 60 dealers. Physically, the wholesale market is concentrated in a small area of San Francisco which extends on Washington Street from Drumm Street to Front Street and for approximately a half block on each side of Washington Street. As is the case in Oakland, no established boundaries mark the physical limits of the wholesale market area.

Physical conditions and facilities that affect the transportation and handling of commodities in the San Francisco wholesale market are similar to those in the Oakland wholesale market. Wholesale "houses" occupy old buildings, most of which were constructed about 1906. These structures were built solidly together and most of them lack loading and unloading platforms for trucks. There are no rail spur tracks in the wholesale market area. Rail shipments are received from cars spotted on nearby team tracks. Packages must be transferred to motortrucks at the team tracks, then drayed to the wholesale market. Commodities are delivered by both local drayage and line-haul trucks to wholesale dealers' sidewalks, which are covered by roofs to protect the produce.

As in Oakland, wholesale dealers' porters, using hand trucks, move packages on to the display and storage floors of the wholesale houses, which are at sidewalk level. They also deliver commodities to retailers' trucks which may be parked as much as three blocks away. Market receipts, sales to retailers, and deliveries to retailers' trucks are accomplished in the San Francisco market during approximately the same periods of the day as in the Oakland market.

The physical condition of the San Francisco wholesale market was described in detail in a report entitled Improving the San Francisco Wholesale Fruit and Vegetable Market by W. Calhoun, H. E. Erdman, and G. L. Mehren, and published by the Bureau of Agricultural Economics, United States Department of Agriculture, in 1943. Physical market conditions apparently have not changed significantly since that time.

The San Francisco wholesale market differs from the Oakland wholesale market as follows:

1. The Oakland wholesale market is composed largely of service wholesalers who deliver commodities to retail stores in their own trucks. In the San Francisco market there are relatively few service wholesalers. In San Francisco, it is the general practice of retailers to go to the market and to transport commodities to their own stores in their own trucks.

2. Streets and sidewalks in the San Francisco wholesale market generally are narrower than those in the Oakland market.

Because of these differences, congestion of both vehicular and pedestrian traffic usually is greater in the San Francisco market than in the Oakland market.

Storage Warehouses

Cold-storage facilities for fresh fruits and vegetables are provided by two companies in San Francisco whose warehouses are located a short distance from the wholesale market. Direct shipments can be

208625 O—52——2

made by rail and by truck from producing areas to each of these warehouses. Commodities are transported from these "ice-houses" by motortruck either to the wholesale market or to retail stores.

Private storage facilities are maintained in the San Francisco wholesale market by several "potato houses." These are wholesale organizations that specialize in potatoes which are sold chiefly to wholesale dealers. Potatoes are shipped by truck or by rail from producing areas to these warehouses. Later the potatoes are transported by truck to the sidewalks of the wholesale dealers.

Direct Shipments to Independent Retailers and Consumers

Direct shipments by motortruck are made to the farmers' market in San Francisco where commodities are sold directly to consumers. Some movement of fresh produce by truck is reported direct to retail outlets. These movements direct to consumers and retailers, however, are relatively unimportant in terms of the total movement of produce into the San Francisco market area. Therefore, they are not included in the study.

METHODS OF CONDUCTING WORK

PRELIMINARY INVESTIGATION

A preliminary survey of terminal markets in Oakland and San Francisco was conducted by members of the project team with the assistance of Federal State Market News personnel in both cities. The purpose of this initial investigation was to determine the major transportation and handling processes for fresh fruits and vegetables in the San Francisco Bay terminal market area and to develop a tentative work plan to be followed in carrying out the research project. The findings of this preliminary investigation and a tentative work plan were submitted to the Department of Agriculture in a report entitled Plan For Research dated April 30, 1951.

Major findings of the preliminary investigation which influenced the course of the research work include the following:

1. The analysis of a significant portion of the total market volume for each commodity can be accomplished by covering transportation and handling operations during the first 7 months of the year. Accordingly, the research work was planned to cover the period January 1, 1951, through July 31, 1951.

2. Sources of information necessary to ascertain the various costs of transportation and handling were identified.

3. Certain costs of transportation and handling incurred in the terminal markets are relatively unimportant in terms of total costs and can be excluded from the study. These include costs for extra switching of rail cars within the terminal market area; physical loss due to transportation, handling and storage; and line-haul truck waiting time, for unloading in the wholesale market areas.

4. A major element of cost in the terminal market is incurred by wholesale dealers in the physical handling of commodities at their stores.

5. Utilization of a sampling technique for selecting wholesale dealers from whom to obtain data pertaining to handling costs is indicated to be a practicable method for obtaining reliable information in this segment of the terminal market.

6. A statistical method must be determined for properly allocating handling costs of wholesale dealers to specific packages of commodities.

FIELD INVESTIGATION

An extensive field investigation was conducted by full-time staff members of the Stanford Research Institute to obtain the data necessary for the study. A major portion of the field work was devoted to an analysis of handling processes among wholesale dealers in Oakland and San Francisco and to obtaining data from dealers' records from which their handling costs for specific packages could be ascertained. Considerable time was also spent in gathering information pertaining to other components of total transportation and handling costs from various sources which are described later in the report. The major portion of the field investigation was accomplished in the Oakland and San Francisco areas. In addition, considerable assistance was received from sources of information, particularly grower and shipper organizations, contacted in the Los Angeles area.

STATISTICAL WORK

In addition to the sampling technique, a major statistical problem involved the formulation and testing of a method for accurately allocating to specific packages the total handling costs incurred by wholesale dealers. A detailed description of the statistical method utilized is presented in the Appendix.

EXPRESSION OF COSTS

Costs for the performance of functions may be expressed as the amount of expenditure required for an organization to accomplish the functions itself, or to have the services performed by another organization. In this study both methods of expressing costs are utilized. In the following sections of the report, detailed descriptions of costs indicate the particular type used in each instance.

In this study costs of handling and transportation are developed for organizations which utilize their own personnel and facilities in performing functions. These organizations are wholesale dealers, potato houses, and a retail chain organization, which handle commodities into and out of their stores and warehouses, and wholesale dealers who perform certain drayage operations. Costs of these operations, as developed in this study, include only costs of direct labor and equipment incurred in performing these operations, as indicated later in the report. Direct costs of labor include gross wages paid to employees engaged in the physical operation, company payroll taxes on these wages, and costs to the employer for compensation insurance and hospitalization and life insurance on these employees. Direct costs for trucks and mechanical equipment include costs of motor fuel, oil, repairs and maintenance, depreciation, and insurance. General administrative and overhead costs are not included because of the difficulty of obtaining and allocating such costs; observation of the operations indicated that these costs were insignificant.

WHOLESALE MARKET COSTS

RECEIVING COSTS

Unloading Direct Truck Receipts

Fresh fruits and vegetables are transported to the Oakland and San Francisco wholesale markets by three principal types of trucking operations. In order of importance in terms of volumes transported, these are: (1) for-hire trucks, including both common and contract carriers, (2) farmers' trucks, and (3) wholesale dealers' trucks.

The cost of unloading commodities from trucks at wholesale dealers' stores is a cost incurred in the wholesale market. The unloading operation consists of removing packages from the body of the truck and stacking them properly in piles on the dealer's sidewalk. In both the Oakland and San Francisco markets, most unloading is performed by laborers, known as "lumpers." In Oakland, these men are members of the Brotherhood of Teamsters and Auto Truck Drivers, Local No. 70, and in San Francisco they are members of Commission Market Drivers, Salesmen and Helpers, Local No. 280. Rates and regulations regarding truck unloadings in both market areas are established by contractual agreements between these unions and the Truck Owners Association of California.

In each market long-line trucks are unloaded by union lumpers. Two lumpers are employed for unloading each truck, except when the driver has been driving for less than 8 hours. Then only one lumper is required, for the driver may help in the unloading. Generally, truck shipments originating north of Chico and Ukiah; east of Sacramento, Stockton, and Modesto; and south of Fresno and San Luis Obispo are unloaded by two lumpers. Farmers, from any point, are permitted to unload their trucks when delivering their own merchandise.

Regardless of who performs the work, unloading of trucks in the Oakland and San Francisco wholesale market areas is a two-man operation. No mechanical equipment is used for truck unloading in either market. The only equipment utilized consists of gravity rollers, which are owned either by the lumpers or by the trucking company.

The usual practice is for trucking companies to absorb the unloading costs. This practice means that unloading costs are included in the transportation rate. The unloading operation is an important element of cost and should influence total transportation rates.

In both the Oakland and San Francisco markets, lumpers are paid for unloading on a piece-rate basis set by agreements referred to above. Although identical agreements between unions representing lumpers and the trucking companies' association are in effect in both markets, there are several instances of differences in rates charged for specific packages of commodities. These apply to packages not specifically covered in the agreements, which are unloaded at rates agreed upon on the spot between lumpers and truck drivers, who represent the trucking companies.

In addition to the basic rates per package paid for unloading, total costs to trucking companies for the unloading operation include: employers' contributions to Federal old age benefits, State unemployment insurance, and the costs of compensation insurance. Because two men are involved in this operation, rates and total costs per package for unloading trucks in both markets shown in table 1 are double the rate per employee.

Table 1.- Truck unloading costs, by commodity and by type of package, wholesale markets, Oakland and San Francisco

Commodity	Type of package	Oakland		San Francisco	
		Basic wage rate	Total cost per package	Basic wage rate	Total cost per package
		Cents	Cents	Cents	Cents
Apples	Box	2.00	2.14	2.00	2.14
Lettuce:					
Dry	Crate	3.00	3.20	3.00	3.20
Ice-packed	do.	4.00	4.28	4.00	4.28
Top-iced	do.	4.00	4.28	4.00	4.28
Oranges:					
Packed	Box	2.50	2.68	2.50	2.68
Loose	do.	2.50	2.68	2.50	2.68
Peaches	Crate	1.50	1.60	1.50	1.60
	Lug	1.50	1.60	1.50	1.60
Potatoes	do.	2.00	2.14	1.50	1.60
	50 lb. sack	1.50	1.60	1.50	1.60
	100 lb. do.	2.50	2.68	2.50	2.68
Tomatoes	Carton	1.00	1.06	1.50	1.60
	Flat	1.50	1.60	1.50	1.60
	Crate	1.50	1.60	1.50	1.60
	Lug	1.50	1.60	1.50	1.60

Dry crates of lettuce are those that have not been in direct contact with ice. Ice-packed lettuce has ice within the crate. Top-iced lettuce is packed without ice, but the crates are covered with crushed ice after they have been placed in a truck or rail car. Crates of top-iced and ice-packed lettuce are handled by the lumpers at a higher rate than dry crates of lettuce, chiefly because of the extra work involved in removing ice from the truck and the more difficult working conditions caused by ice and water.

Very few shipments of ice-packed lettuce are made to the Oakland and San Francisco markets. Top-iced lettuce is shipped to both these markets from the Imperial Valley and Arizona during the early part of the year.

Rail Receipts

Elements of handling and transportation costs incurred in rail delivery of fresh fruits and vegetables to the Oakland and San Francisco wholesale markets which are developed in this study are (1) demurrage and (2) drayage from rail team tracks to wholesale dealers' sidewalks. Extra switching charges applied on cars after arrival within the terminal market city are also costs which are incurred within the market areas. Investigation revealed, however, that the costs of extra switching of rail cars are relatively minor and that these costs could not be ascertained for an expenditure of time and money commensurate with the value of the information.

Rail Car Demurrage.- To deliver by rail fresh fruits and vegetables to wholesale markets in Oakland and San Francisco, rail cars are spotted on team tracks located near the market areas. Information regarding the number of cars upon which demurrage was assessed and the total amount of demurrage assessments for cars of the six selected commodities terminated on the team tracks was supplied by the Pacific Car Demurrage Bureau. The data, summarized in table 2, cover terminations by the three rail carriers serving both markets: the Atchison, Topeka and Santa Fe Railway Company, the Southern Pacific Company, and the Western Pacific Railroad Company. A 3-percent Federal transportation tax has been added to the basic costs in order to show total costs.

Table 2.- Rail car demurrage at team tracks, by commodity and by type of package, Oakland and San Francisco

Commodity	Type of package	Cars assessed	Total demurrage 1/	Demurrage per package: In assessed cars	Demurrage per package: Total market rail receipts 2/
		Number	Dollars	Cents	Cents
Oakland					
Apples	Box	29	568.56	2.45	1.78
Lettuce	Crate	12	280.16	7.30	5.84
Oranges	Box	3	17.51	1.27	.63
Peaches	---	---	---	---	---
Potatoes	100 lb. sack	495	3,313.51	1.86	1.07
Tomatoes	Lug	3	18.54	.92	.18
San Francisco					
Apples	Box	7	60.77	1.09	.30
Lettuce	Crate	14	193.64	4.32	3.56
Oranges	Box	4	46.35	2.52	1.44
Peaches	---	---	---	---	---
Potatoes	100 lb. sack	440	3,400.03	2.15	.89
Tomatoes	Lug	28	582.98	3.08	.91

1/ January 1 - July 31, 1951. Includes 3 percent Federal transportation tax.

2/ Excludes receipts of direct receivers.

Unloading and Transportation.- Packages of fresh fruits and vegetables in rail cars spotted on the team tracks must be unloaded from the cars onto trucks, drayed to the wholesale market area, and unloaded onto the dealers' sidewalks.

Transfer of commodities from rail cars to trucks at the team track is usually a continuous movement. Trucks are backed up to the rail-car doors and fruits and vegetables are handled from the rail-car directly into the truck. In some cases, however, the physical movement is broken and the material comes to rest on rail platforms from which position it is later loaded into trucks.

Unloading of rail cars and drayage to wholesale dealers' stores is accomplished either by (1) for-hire drayage companies, or (2) wholesale dealers who utilize their own trucks, teamsters, and helpers.

In the Oakland market, moving fruits and vegetables from rail cars on team tracks to dealers' stores is performed for the most part by the dealers, who use their own trucks. A relatively small portion is handled by for-hire drayage companies. In San Francisco, the bulk of this drayage operation is performed by for-hire drayage companies. Several of the larger dealers and the secondary handlers in the San Francisco market, however, make a practice of doing their own hauling in their own trucks. The two markets differ in this respect because many dealers in the Oakland market are service wholesalers who operate trucks for delivering to retailers, while few of the San Francisco dealers are service wholesalers and operate trucks.

Hired drayage from team tracks.- During the first 7 months of 1951, rates charged for drayage by for-hire companies serving the Oakland wholesale market were determined by negotiation between the drayage companies and the wholesale dealers served. Subsequently, minimum rates for various weights set by the California Public Utilities Commission became effective. Drayage rates applying in the Oakland market, shown in this report, represent average rates per package during the first 7 months of 1951 and were obtained through interviews conducted among drayage companies and wholesale houses in Oakland.

During the same period, average rates charged by for-hire drayage companies in the San Francisco market were the minimum rates published by the California Public Utilities Commission. In San Francisco, the competitive situation among drayage companies generally establishes the minimum tariff rates as the going rates. Drayage rates in effect in the San Francisco market as presented in this report, are minimum rates published in City Carriers Tariff No. 1-A, issued by the California Public Utilities Commission. These rates were in effect until July 25, 1951, when higher rates became effective.

In table 3, a 3-percent Federal transportation tax has been added to the basic drayage rates in order to show total drayage cost per package to shippers. Rates shown in the table are for drayage service, which

includes transfer of material from rail car to truck at the team track, transportation to the wholesale market, and unloading commodities on the dealer's sidewalk.

Table 3.- Average hired drayage rates from team tracks to wholesale dealers' sidewalks, by commodity and by type of package, Oakland and San Francisco 1/

Commodity	Type of package	Rate per package 2/	
		Oakland	San Francisco
		Cents	Cents
Apples	Box	5.150	7.725
Lettuce	Crate	10.300	9.785
Oranges	Box	6.180	8.240
Peaches	Lug 3/	5.150	6.695
Potatoes	50 lb. sack 3/	5.150	6.695
	100 lb. sack	7.210	9.785
Tomatoes	Lug 3/	5.150	6.180

1/ Oakland: January 1 - July 31, 1951; San Francisco: January 1 - July 24, 1951.

2/ Includes 3-percent Federal transportation tax.

3/ It is reported that the following type packages are not received in the Oakland and San Francisco markets by rail: peaches in crates, potatoes in lugs, tomatoes in cartons, flats, and crates.

Private drayage from team tracks.- As previously indicated, in the Oakland market many wholesale dealers haul commodities from rail cars at the team tracks to their sidewalks in their own trucks. In the San Francisco market, relatively few of the wholesale dealers engage in this operation and for-hire drayage companies do most of this hauling for dealers.

Service wholesalers in both markets usually utilize their trucks for this operation during periods when they are not needed for delivering commodities to retail stores. The general practice is to dispatch a regular driver and a helper to accomplish this operation. Several round trips of the truck from the wholesale house to the team tracks may be required to haul the shipment to a dealer's sidewalk, depending upon the portion of the total carload that is destined for that particular dealer.

Approximations of truck and labor costs to wholesalers were obtained during the study. Certain information required for estimating costs was obtained from one wholesale dealer in the Oakland market and from two dealers in the San Francisco market. Information furnished by these dealers is in two major classifications:

209825 O—52—3

1. Certain data relating to cost obtained from dealers' books of account from which direct labor costs and fringe costs for labor to employers for Federal old age benefits, State unemployment insurance and workmen's compensation insurance per man-hour could be computed for truck drivers and drivers' helpers. These data, which cover the last fiscal year, consist of gross wages paid to drivers and drivers' helpers, company payroll taxes on these wages, and the amounts paid for compensation insurance on these employees.

   Data from which truck costs per hour could be computed. These data consist of the total cost of insurance on trucks, depreciation on trucks, and number of trucks operated during the fiscal year. Certain truck costs were not obtainable from dealers' records. These were estimated, based on published information obtained from outside sources. These costs include the cost of motor fuel, oil, repairs, and maintenance.

2. Estimates of the number of man-hours of driver and helper labor required for unloading one rail car of the particular commodity onto the truck, unloading the packages from the truck onto the dealers' sidewalks, travel time from the wholesale house to the rail car and return, and the number of round trips required for the drayage of the total rail-car shipment. Average waiting times at the team tracks are included in these estimates.

One of these dealers was able to furnish information as to the average times required for specific handling operations on certain commodities, based on time records maintained by the organization. This information was utilized with factors of relative time requirements for handling specific packages, which were obtained from a study of porter handling costs described later in the report, to check and adjust estimates of labor requirements for the drayage of specific commodities submitted by other wholesalers.

The general practice of wholesale dealers in both markets is to operate trucks only if deliveries are made to retail customers. Trucks are operated primarily for the delivery service. Their use for this purpose is accorded precedence over the drayage operation from team tracks to wholesale dealers' sidewalks, to the extent that for-hire drayage is used when the wholesalers' own trucks are engaged in deliveries to retail stores. No attempt was made, therefore, to allocate truck costs between delivery and drayage operations, other than on the basis of time actually spent on the drayage operation.

Estimates of private drayage costs are shown in table 4.

Table 4.- Average costs for private drayage from team tracks to wholesale dealers' sidewalks, by commodity and by type of package, Oakland and San Francisco

Commodity	Type of package	Unloading: Rail car to truck	Unloading: Truck to dealers' sidewalks	Travel	Total
		Oakland			
		Cents	Cents	Cents	Cents
Apples	Box	2.0	1.2	1.0	4.2
Lettuce	Crate	2.8	1.8	1.7	6.3
Oranges	Box	3.0	1.9	1.2	6.1
Peaches	Lug	1.5	.9	.5	2.9
Potatoes	50 lb. sack	2.0	.9	.8	3.7
	100 lb. do.	3.5	1.6	1.5	6.6
Tomatoes	Lug	1.5	.9	.8	3.2
		San Francisco			
Apples	Box	1.9	1.2	0.5	3.6
Lettuce	Crate	2.7	1.7	.9	5.3
Oranges	Box	2.9	1.8	.6	5.3
Peaches	Lug	1.4	.9	.3	2.6
Potatoes	50 lb. sack	1.9	.8	.5	3.2
	100 lb. do.	3.3	1.5	.8	5.6
Tomatoes	Lug	1.4	.9	.4	2.7

WHOLESALE DEALER HANDLING COSTS

In both the Oakland and San Francisco wholesale markets, commodities delivered to the dealer's door are either left on the sidewalk of the street by line-haul trucks or trucks that have drayed commodities from team tracks. Commodities are sold directly from these locations or are moved inside the dealer's establishment for display and temporary storage until they are sold. In either case, they are physically handled by the dealer's porters.

Commodities that are moved within the store are placed on the main floor which is at sidewalk level. A combination of a number of different handlings may take place regarding commodities moved within the store. These handlings may include: (1) hauling into store; (2) sorting; (3) high piling; (4) breaking down the stack for a customer; (5) moving into and out of refrigerator; (6) moving into and out of a storeroom; (7) assembling into orders; and (8) delivering to motortruck.

Hand trucks are utilized for handlings in which distances are involved. One power-driven fork-lift truck, however, is used in the Oakland wholesale market. All commodities, sold either from the sidewalk location or

from the floor of the store, are delivered next to the truck that will transport them to the retail store. Because of traffic congestion, retailers often park their trucks at considerable distances from wholesale stores where purchases are made. Deliveries to these trucks are impeded by pedestrian and vehicular traffic and by packages of commodities piled on sidewalks and streets.

Preliminary investigation revealed that no records of handling costs for specific commodities are kept by wholesale dealers and that costs of specific handlings of packages of commodities must be developed from basic data. Most wholesalers keep daily receipt books which list incoming shipments, thus making possible a tabulation of the total receipts of each commodity for a given period of time. Porter payroll records are available for tabulating total costs of labor incurred in the handling processes.

The basic method followed in ascertaining handling costs per package of wholesale dealers consisted of ascertaining the total number of packages of each commodity handled by wholesalers and allocating as accurately as possible, total handling costs for labor to packages of each commodity.

A study of the composition of the two wholesale markets and their monthly patterns of receipts indicated that reliable information regarding costs of dealer handlings of the specific commodities could be developed, utilizing basic data covering the first 7 months of the year. It was also indicated that reliable information might be developed from data obtained from a sample of the wholesale dealers in each market. Discussion of the sample may be found in the appendix. Accordingly, arrangements were made to obtain data for the period January through July 1951 from 10 wholesale dealers in the Oakland market and 9 wholesale dealers in the San Francisco market. In planning this phase of the work, provision was made for statistically testing the reliability of the information obtained by means of this sampling process.

Data and information at wholesale houses were gathered by members of the Institute's staff. Only 2 wholesale dealers maintain tabulated monthly records of all receipts that could be used in this study. At the remaining 17 wholesale houses, it was necessary to transcribe data for the 7-month period from the dealers' daily receipt books to special listing sheets developed for this purpose. Data covering all commodities handled were obtained and these were tabulated by months.

A record of total gross wages paid to porters for each of the 7 months was obtained from each dealer in the sample. From these totals deductions were made for estimated costs to the dealer for any functions not included in the study, but performed by porters, for example, processing and repackaging of some fruits and vegetables. In some of the smaller wholesale houses, porter work is at times done by the owners and managers of the organizations. In such cases, estimates of the time spent by owners and managers on this work were obtained and costs computed on the basis of regular porters wage scales were included in the handling costs of these organizations. Total monthly wage costs for each dealer were derived by adding costs to the

employer for contributions to Federal old age benefits; State unemployment insurance; workmen's compensation insurance; and, in the case of San Francisco wholesalers only, contributions to employees' hospitalization, and like insurance premiums.

Several factors influence the total cost for handling packages in wholesale houses: the number of times a given package is handled, and the weight and size of the package.

Handling factors representing the average number of times the various commodities are physically handled were developed for each wholesale house, with the assistance of the dealers. These factors are based upon an analysis of the methods and procedures used in the particular wholesale house.

No complete list was available of the average gross weights of various types of packages of all commodities received in the Oakland and San Francisco markets. Such a list was developed with the assistance of the following organizations: Trans-Continental Freight Bureau; Southern Pacific Company; Western Growers Association; California Fruit Growers Exchange; Public Utilities Commission, State of California; and several other organizations including wholesale dealers and trucking companies. Average gross weights were determined and utilized for more than 350 different packages of fresh fruits and vegetables.

It was also necessary to determine the cubic sizes of the various types of packages used for all commodities. Information regarding the size and shape of packages was obtained from Freight Container Tariff No. 1-C, Pacific Coast and Trans-Continental Territories, issued by J. J. Quinn, Agent; from wholesale dealers; and from observations made in the market.

The statistical method developed for allocating porter costs to specific packages of commodities is one of multiple regression analysis, in which the several factors referred to above are represented. The statistical method is described in detail in the appendix. Statistical tests of reliability of the findings are also described in the appendix.

In this section of the report, average dealer handling costs per package for the 7-month period are reported. Handling costs per package by months are reported later in the report.

Handling Into and Within Wholesale Stores

Handling commodities into and within wholesale stores include all handlings, from the time the packages are first moved by porters from the wholesale dealers' sidewalks, up to, but not including, the final handling to the motor trucks which transport the commodities to retail stores. Average handling costs per package for the Oakland and San Francisco wholesale markets are shown in table 5.

Table 5.- Average handling cost per package, by commodity, and by type of package, wholesale dealers, Oakland and San Francisco

Commodity	Type of package	Handling cost per package			
		Into and within dealers' stores	Out of dealers' stores	Secondary handling by dealer	Total
		Oakland			
		Cents	Cents	Cents	Cents
Apples	Box	6.62	1.41	0.17	8.20
Lettuce	Crate	4.39	2.00	.12	6.51
Oranges:					
Packed	Box	4.69	2.10	.11	6.90
Loose	do.	4.10	1.67	.10	5.87
Peaches	Crate	3.27	.92	.09	4.28
	Lug	3.57	1.12	.09	4.78
Potatoes	do.	2.67	1.12	.06	3.85
	50 lb. sack	2.90	1.42	.10	4.42
	100 lb. do.	3.65	2.41	.11	6.17
Tomatoes	Carton	3.54	.59	.09	4.32
	Flat	3.98	.86	.09	4.93
	Crate	4.03	.88	.11	5.02
	Lug	4.61	1.12	.11	5.84
		San Francisco			
Apples	Box	7.61	3.68	0.22	11.51
Lettuce	Crate	8.92	5.35	.27	14.54
Oranges:					
Packed	Box	7.75	5.63	.19	13.57
Loose	do.	5.88	4.40	.18	10.46
Peaches	Crate	6.21	2.28	.11	8.60
	Lug	7.21	2.84	.15	10.20
Potatoes	do.	1.96	2.84	.12	4.92
	50 lb. sack	2.72	3.70	.12	6.54
	100 lb. do.	4.78	6.52	.21	11.51
Tomatoes	Carton	7.66	1.61	.22	9.49
	Flat	8.67	2.12	.15	10.94
	Crate	8.78	2.17	.17	11.12
	Lug	10.13	2.84	.28	13.25

Handling Out of Wholesale Stores

Moving a commodity out of a wholesale store involves a single handling which consists of moving the commodity from the store to the motor-truck which transports it to the retail stores. Porters usually utilize hand trucks to perform this operation. Average handling costs per package for the Oakland and San Francisco wholesale markets appear in table 5.

Secondary Handling by Wholesale Dealers

Most wholesale dealers buy relatively small quantities of fresh fruits and vegetables from other wholesale dealers in the market. The reasons for such purchases are:

1. To obtain supply quickly during periods of temporary shortages.

2. To obtain supplies for orders of items not usually handled by the dealers, for example, specific brands, grades, etc.

The procedure usually followed in such cases is for delivery to be made to the purchaser's wholesale house by the seller's porter. Therefore, a second porter-handling operation is involved when one wholesaler buys from another wholesaler.

Investigation indicated that the quantity of the selected commodities involved in a secondary handling of this type is not large, in terms of total commodities handled by wholesale dealers. Estimates of the relative quantities of such purchases of each of the selected commodities were obtained from each dealer. These estimates were used in computing additional handling costs per package among primary wholesale dealers due to secondary handling. Costs resulting from secondary handling among primary handlers when spread over all packages (whether subject to secondary handling or not) are shown in table 5.

Total Wholesale Dealer Handling Costs

Total wholesale dealer average handling costs per package, consisting of costs of handlings into and within the wholesale stores, handling out of the stores, and secondary handlings by wholesale dealers are shown for Oakland and San Francisco markets in table 5.

STORAGE

Temporary storage facilities for commodities in the Oakland and San Francisco wholesale markets are provided usually on the main floors of the wholesale houses. Many wholesale dealers maintain refrigerators which are used for temporary storage of the more highly perishable commodities. Storage facilities for longer periods of time are provided by cold-storage warehouse companies. Some potato houses have their own private storage facilities, in which chiefly potatoes and onions are stored after arrival in the market area. These private storage facilities, however, are not refrigerated.

It should be pointed out that the cost of storage within the terminal market area should not necessarily be considered a market cost. Commodities destined for markets can be, and are, stored at points outside the market areas, for example, in the growing areas. Commodities stored in the market areas could be stored at other points, and presumably this would be done if they were not stored within the market areas. For example,

potatoes are stored in sizable quantities in the market areas. However, they are also stored in large quantities in growing areas, usually in barns and sheds.

Cold Storage Warehouses

Two cold storage warehouse companies provide storage facilities for fresh fruits and vegetables in the Oakland market area and two companies provide similar facilities in the San Francisco market area. In both market areas, the warehouses are located short distances from the wholesale markets. Shipments of commodities are made by rail and truck from producing areas direct to these warehouses. All the storage facilities have rail spur tracks which make direct rail deliveries to them possible. Later the commodities are transported by truck from warehouses to wholesale markets or direct to retail stores. Of the selected commodities included in the study, only apples and potatoes were placed in cold-storage warehouses in sizable quantities in each market during the first 7 months of 1951.

The storage process involves the following major elements of cost: (1) truck and rail-car unloading at storage warehouses; (2) handling into storage area from rail and truck platforms; (3) storage costs; (4) handling from storage area to warehouse truck platforms; (5) truck loading; (6) drayage to wholesale dealer's door; and (7) truck unloading at wholesale dealer's sidewalk.

Unloading and Handling into Storage.- In the case of rail shipments, cold-storage warehouse tariffs provide for one rate, which includes the cost of unloading rail cars on the warehouse spur track, as well as handling into and out of storage and storage for a stated period of time.

Information received from a cold-storage warehouse company indicates that the approximate labor costs per package for unloading rail cars and handling commodities into storage areas are:

Apples	-	2.3 cents per box
Potatoes	-	2.4 cents per 50 lb. sack
Potatoes	-	4.7 cents per 100 lb. sack

These costs were derived by multiplying the average number of man-hours of labor required for the operations by the cost of the company for labor per man-hour. Costs of labor include the basic wage and such fringe costs as those for company payroll taxes and compensation insurance, but do not include general administrative and overhead expenses.

Most trucks are unloaded at the cold-storage warehouses by lumpers who are employed and paid by the truck operators. Lumpers unload the commodities from the trucks onto the warehouse truck platforms.

The cost of this handling operation is absorbed by the trucking companies. This practice means that the cost is included in the line-haul rate. Lumpers' rates for unloading commodities from trucks to warehouse

platforms are the same as those that apply in the wholesale markets for unloading the same commodities from trucks onto the dealers' sidewalks. The same rates apply in both cities.

Lumpers' basic wage rates per package and total costs to truck operators, including employers' costs for contributions to Federal old age benefits, State unemployment insurance, and costs of workmen's compensation insurance, are shown below. Rates shown are double the rate per employee because two men are employed in this operation.

Commodity	Type package	Basic wage rate Cents	Total cost per package Cents
Apples	Box	2.0	2.1
Potatoes	50 lb. sack	1.5	1.6
Potatoes	100 lb. sack	2.5	2.7

Cost of handling commodities received by truck from the truck platform, where they are placed by lumpers, into warehouse storage areas is included in the warehouse tariff rate. Based on information received from one warehouse company, the approximate costs of labor per package for this operation, including costs for company payroll taxes and compensation insurance, are indicated to be:

Apples - 3.1 cents per box
Potatoes - 3.1 cents per 50 lb. sack
Potatoes - 6.3 cents per 100 lb. sack

Handling Out of Storage Areas.- Cost of handling commodities out of storage areas of warehouses to truck platforms for delivery to the wholesale market or retail stores is also included in the tariff rate.

Information from which labor costs incurred in this operation can be approximated was also received from the same warehouse company which supplied information regarding costs of rail-car unloading and handling into storage. It is indicated that the per-package labor costs to the warehouse company for handling packages out of storage to the truck platform are:

Apples - 1.2 cents per box
Potatoes - 1.2 cents per 50 lb. sack
Potatoes - 2.4 cents per 100 lb. sack

Total Storage and Handling Charges.- Effective cold-storage warehouse rates that apply in Oakland and San Francisco appear in California Warehouse Tariff Bureau, Cold Storage Warehouse Tariff No. 6-B, California Public Utilities Commission No. 85. The rates are the same for Oakland as for San Francisco. Tariff storage rates shown below represent lowest rates for boxes of applies, that is, in lots of 500 or more packages. Storage rates for potatoes are expressed in the tariff as rates per 100 pounds. These have been converted to rates per type package indicated below. Rates shown are the lowest rates that apply on potatoes, that is, in lots of 20,000 pounds or more.

Storage period	Storage rate per package: Apples (Box)	Potatoes (50 lb. sack)	Potatoes (100 lb. sack)
	Cents	Cents	Cents
First month's period or part	12.0	9.8	17.5
Per month thereafter or part	3.0	5.0	10.0

Tariff rates include charges for unloading freight cars and for handling commodities into and out of the storage warehouse. Provision is made for these costs in the rate for the first month's storage.

Cold-storage warehouse charges are based on the length of time commodities remain in storage. Information was obtained from two of the four cold-storage warehouses from which could be computed the average charge per package incurred by apples and potatoes moved into and out of these warehouses during the first 7 months of 1951. Charges for service, in addition to regular handling and storage charges, are included in these figures, that is, charges for racking potatoes. Average charges incurred at both warehouses combined are:

Apples - 18.3 cents per box
Potatoes - 11.6 cents per 50 lb. sack
Potatoes - 28.1 cents per 100 lb. sack

These figures mean that in the warehouses in question apples were kept for about 3 months on the average, 50-pound bags of potatoes for about 2 months, and 100-pound bags of potatoes for about 2 months. The average cold-storage charges for apples shown above are believed to be fairly representative of the charges for all apples that moved into and out of cold storage in the Oakland and San Francisco markets during the 7 months. However, the average costs for all potatoes that moved into and out of cold-storage warehouses during the period may be considerably higher than the average shown for the two warehouses. Estimates received from potato houses regarding the quantity of potatoes they placed in cold storage during the period and their average cold-storage costs indicate that much larger quantities of potatoes may have been stored in the two nonreporting warehouses. The average storage charge per sack on these potatoes may have been considerably higher. The average cost of cold storage for potatoes for two potato houses which supplied exact information from their records was 4.9 cents per 100 pound sack, indicating an average storage period of about 4 months. For the San Francisco Bay area as a whole, therefore, the average period is probably somewhere between 2 and 4 months.

Truck Transportation and Handling.- As previously described, commodities moved out of cold storage warehouses are placed on warehouse truck platforms. From this position they are loaded onto trucks and drayed to wholesale markets, where they are unloaded onto the sidewalks of dealers, or directly to retail stores. The drayage operation to the wholesale market is performed either by (1) hired drayage companies, or

(2) wholesale dealers using their own trucks and personnel. The practice of wholesale dealers in hiring drayage companies or utilizing their own trucks for hauling commodities from cold-storage warehouses to their stores in wholesale markets in Oakland and San Francisco is similar to that regarding drayage from the rail team tracks to wholesale-market areas. In Oakland the bulk of this operation is performed by dealers who use their own trucks. In San Francisco for-hire drayage companies are more commonly used.

Hired drayage to wholesale markets.- Costs of loading commodities from cold-storage warehouse platforms onto trucks and of unloading commodities from trucks onto wholesale dealers' sidewalks are included in the drayage rates in effect among drayage companies that serve the Oakland and San Francisco wholesale markets (table 3).

In both the Oakland and the San Francisco market areas, rates charged by drayage companies for hauling commodities from cold-storage warehouses to wholesale markets in the same cities are the same as for hauling the commodities from team tracks to wholesale dealers' sidewalks in the same city. The Federal transportation tax of 3 percent was added to the basic rates in order to show total drayage costs to shippers.

Private drayage to wholesale markets.- In the Oakland market, many wholesale dealers haul their commodities in their own trucks from cold-storage warehouses to their own sidewalks. In the San Francisco market, only a few dealers use their own trucks.

Estimates of truck and labor costs to wholesale dealers who perform this drayage operation were obtained in the same way as that used to determine costs for hauling from team tracks to wholesale stores. A description of the methods used is presented earlier in the report. Estimates of the time requirements for labor and truck for loading and unloading operations and travel between points were obtained from the same dealers, or were computed in the same way. Average waiting times at the warehouses are included in these estimates. Costs are shown in table 6.

Private Storage

Private storage facilities for sizable lots of commodities are maintained in the San Francisco Bay area markets by the potato houses. In addition to potatoes, large quantities of onions are stored at these facilities. These private storage facilities commonly consist of small one-story warehouses whose floors are at sidewalk level. Private storage warehouses are not refrigerated.

In the Oakland market area, one potato house maintains a private storage warehouse. Information was not obtained regarding the operations of this company.

In the San Francisco market, private storage facilities are maintained by five potato houses, four of which used these facilities for storing potatoes during the first 7 months of 1951.

Potatoes were received at these warehouses either by local drayage from rail team tracks or direct by line-haul truck; or by a combination of both methods of transportation. From these private storage warehouses most of the potatoes later were transported by truck to the sidewalks of wholesale dealers and the remainder were delivered to retail chain organizations.

Table 6.- Private drayage: Average costs from cold storage warehouses to wholesale dealers' sidewalks for selected commodities, by type of package, Oakland and San Francisco

Commodity	Type of package	Truck		Travel	Total cost
		Loading from warehouse platforms	Unloading at dealers' sidewalks		
		Oakland			
		Cents	Cents	Cents	Cents
Apples	Box	1.8	1.2	0.9	3.9
Potatoes	50 lb. sack	2.1	1.1	.7	3.9
	100 lb. do.	3.4	1.9	1.1	6.4
		San Francisco			
Apples	Box	1.6	1.0	1.1	3.7
Potatoes	50 lb. sack	1.7	.8	.8	3.3
	100 lb. do.	2.7	1.4	1.4	5.5

Unloading and Handling into Storage.- One private warehouse received potatoes direct from rail cars located on the warehouse rail siding. Information regarding the costs of rail-car unloading and handling of potatoes into storage at this warehouse was not obtained as such information would be identifiable with the particular company operating the warehouse.

Rail shipments of potatoes were received at the warehouses of the four companies from rail cars spotted on the team tracks. These potatoes were unloaded from cars onto trucks, then drayed to private warehouses. Some potato houses use their own trucks and personnel for this, while others hire drayage companies to do it for them.

Charges made by hired drayage companies cover costs of unloading potatoes from rail cars onto trucks at the team tracks, transportation to the private warehouses, and unloading the trucks. The cost of handling into the warehouse is an additional cost that must be borne by the potato house.

Rates charged by drayage companies for the complete drayage operation from rail cars to private warehouses are the same as for drayage from team tracks and public cold-storage warehouses to wholesale dealers'

sidewalks. Including the 3-percent Federal transportation tax, these rates in San Francisco from January 1 through July 24, 1951, were 6.7 cents per 50-pound sack of potatoes and 9.8 cents per 100-pound sack.

San Francisco potato houses which hire outside drayage companies to transport potatoes from team tracks to their private warehouses employ laborers on a piece-rate basis to handle the potatoes into storage areas. The prevailing basic rates in San Francisco for this labor are reported to be 1.3 cents per 50-pound sack and 1.5 cents per 100-pound sack. Total costs to employers, including employers' contributions to Federal old age benefits, State unemployment insurance, and costs of compensation insurance, are 1.3 cents per 50-pound sack and 1.6 cents per 100-pound sack.

Potato houses which operate trucks for delivering commodities to customers use their own trucks and personnel to unload rail cars at the team tracks, transport potatoes to their private warehouses, unload the potatoes, and handle them into storage areas.

Estimates of truck and labor costs per package to potato houses, which perform the complete drayage operation and handling of potatoes into private storage, were obtained in the same way as the cost to wholesale dealers for hauling commodities in their trucks from team tracks to wholesale market. This method is described earlier in the report. Costs of both labor and trucking are included in estimates of costs of the various operations that comprise the complete process. Potato houses estimated cost of unloading and handling into storage are shown in table 7.

Table 7.- Potatoes: Estimated cost of unloading and handling into storage by operation, potato houses, San Francisco

Operation	Cost per sack	
	50 pound	100 pound
	Cents	Cents
Unloading		
Rail car to truck	1.9	3.3
Truck at warehouse	.8	1.5
Handling into storage	.9	1.7
Travel	.5	.8
Total	4.1	7.3

Most line-haul trucks are unloaded at private storage warehouses by union lumpers. Lumpers unload sacks of potatoes from the trucks and stack them on the sidewalks of the private warehouses. Regulations regarding unloading of trucks by lumpers are described earlier in the report.

Lumpers are employed and paid by the truck operators. The cost of this handling operation generally is absorbed by the trucking companies. The cost of unloading, therefore, is included in the line-haul rate. Lumpers' rates for unloading potatoes from trucks at private storage warehouses are the same as those already reported for unloading trucks at wholesale dealers' sidewalks. Lumpers' basic wage rate per package for unloading potatoes and total costs per package to employers, including employers' contributions to Federal old age benefits, State unemployment insurance, and the costs of compensation insurance shown below are double the rate per employee because two men are employed in this operation.

Type package	Basic wage rate	Total cost per package
	Cents	Cents
50 lb. sack	1.5	1.5
100 lb. sack	2.5	2.7

Potatoes received by line-haul truck are handled into storage areas of private storage warehouses either by regular employees of the potato house or by part-time employees who are hired on a piece-rate basis.

The basic wage rates for part-time employees hired to perform this operation are reported to be 1.3 cents per 50-pound sack and 1.5 cents per 100-pound sack. Total costs to employers, including employers' contributions to Federal old age benefits, State unemployment insurance, and costs of compensation insurance are 1.3 cents per 50-pound sack and 1.6 cents per 100-pound sack.

It is estimated that the costs of handling potatoes into storage when regular employees of the potato house perform the operation are 1.0 cent per 50-pound bag and 1.5 cents per 100-pound bag. These approximations are based upon an estimate of the average amount of labor required to perform the operation, multiplied by per-hour costs of labor to the employer, including, in addition to the basic wage, costs of employer's contributions to Federal old age benefits, State unemployment insurance, and costs of compensation insurance.

Storage Costs.- The average storage cost per bag of potatoes in private storage is determined by total costs for storage facilities and the number of packages of commodities passing through storage during a given period of time. As both potatoes and onions are stored in private warehouses, total costs must be properly allocated to packages of these two commodities.

Two of the four potato houses in San Francisco which stored potatoes in their own warehouses during 1951 supplied the following information regarding their operations:

1. The total number of packages of potatoes and onions that passed through their private storage during 1950.

2. Estimated average length of time for potatoes and onions in private storage during 1950.

3. Total costs for the year 1950 for: (a) rent paid for storage facilities; (b) maintenance of warehouse; (c) insurance on stored potatoes and onions.

4. Changes that occurred between the first 7 months of 1950 and 1951 in respect to items 1, 2, and 3.

Data for 1950 regarding costs and volume handled were adjusted on the basis of changes reported to have occurred between 1950 and 1951. In order to allocate total storage warehouse costs between potatoes and onions, all packages of these commodities were converted to common units and these totals were weighted by the average length of time each commodity remained in storage.

The estimated average storage cost for potatoes at the two private warehouses combined is 7.5 cents per 100-pound sack for a storage period of about 10 days on the average. There is reason to believe that the average storage cost per bag for all potatoes in private storage warehouses in San Francisco is somewhat lower than this estimate. The proprietor of one of the other two potato houses estimates that lower average storage costs per package are experienced by his organization. Greater quantities of potatoes reportedly move into and out of the storehouses maintained by the two remaining companies. A greater rate of turn-over would result in lower per package storage costs if other factors were equal.

Handling Out of Storage.- Potatoes are handled out of storage areas of private storage warehouses, either by part-time employees who are hired on a piece-rate basis or by regular employees of the potato houses. Part-time employees are paid the same rates for this as those applying for handling potatoes into the storage areas. Basic wage rates are reported to be 1.3 cents per 50-pound bag and 1.5 cents per 100-pound bag. Total costs to employers, including contributions for Federal old-age benefits, State unemployment insurance, and costs of compensation insurance, are 1.3 cents per 50-pound bag and 1.6 cents per 100-pound bag.

Information was not obtained from which labor costs per package could be computed separately for handling potatoes out of storage when regular employees of the potato houses perform this operation. Presumably, costs would not differ materially from costs of handling into storage. These costs, including costs to employers for contributions to Federal old-age benefits, State unemployment insurance, and costs of workmen's compensation insurance are estimated to be 1.0 cent per 50-pound bag and 1.5 cents per 100-pound bag.

Truck Transportation and Handling.- Potatoes are transported by truck from private storage warehouses either to the sidewalks of wholesale dealers or direct to retail organizations.

Costs of loading potatoes onto trucks at the storage warehouse, transportation to the wholesale dealer's store, and unloading potatoes from truck onto the dealer's sidewalk are included in the drayage rates charged by drayage companies in San Francisco. Rates charged for drayage from private storage warehouses to wholesale dealers' sidewalks are the same as those charged for drayage from rail cars at the team track and from cold-storage warehouses to dealers' sidewalks. Including the 3-percent Federal transportation tax, these rates, from January 1 through July 24, 1951, were 6.7 cents per 50-pound bag of potatoes and 9.8 cents per 100-pound bag.

Drayage from private storage warehouses to wholesale dealers' sidewalks may be performed by trucks and personnel of the potato houses or by the wholesalers' own trucks and personnel. Estimated truck and labor cost of this drayage operation was developed in the same way as the cost to wholesale dealers for hauling commodities in their own trucks from team tracks to the wholesale market. The method followed is described earlier in the report. Estimated costs for the drayage operation, which consist of loading the truck at the private storage warehouse, transportation to the wholesale dealer's door, and unloading potatoes on the sidewalk are about 4.1 cents per 50-pound bag and 7.2 cents per 100-pound bag.

DIRECT BUYERS' COSTS

Several large retail chain organizations are the important direct receivers of fresh fruits and vegetables in the San Francisco Bay terminal market area. The receiving facilities of these organizations are located in the Oakland metropolitan area, outside the wholesale market area. Although retail outlets of some of these chain-store companies are located in San Francisco and in other nearby cities, distribution to these outlets is made from central warehouses in the Oakland metropolitan area.

One retail chain organization offered cooperation and assistance in ascertaining costs of all handling operations at its central receiving and distribution warehouse. The elements of cost developed by the study of operations at this particular warehouse may not represent average costs for similar operations experienced by all direct receivers. But as handling operations conducted at the warehouse are comparable with operations conducted in wholesale markets in Oakland and San Francisco, the cost figures indicate roughly the differences in costs that result from the performance of similar functions under markedly different conditions.

Commodities that are delivered to the central warehouse of this retail chain organization by line-haul trucks are unloaded by lumpers onto pallets placed on the truck platform of the warehouse. The warehouse is located on a rail siding. Commodities delivered to the warehouse by rail car are also unloaded onto pallets that are placed either on the warehouse platform or on the floor of the car after it is partially unloaded.

Palletized packages of commodities are moved within the warehouse by power-driven fork-lift trucks. The following movements, or combinations of movements, which are accomplished by fork-lift trucks, take place after the packages are unloaded from the line-haul truck or rail car: (1) hauling into storage area on warehouse floor; (2) moving into refrigerator; (3) moving to an assembly bay. At the assembly bay, where orders are made up for delivery to retail stores, the operation becomes one of hand labor. Packages are assembled into orders which are moved a relatively short distance by hand truck to a truck platform, from which they are loaded onto trucks for delivery to retail outlets.

The problem of developing handling costs per package for the selected commodities in the study was similar to that encountered in determining similar costs among wholesale dealers in the Oakland and San Francisco markets. The basic method followed was the same as that used in ascertaining handling costs of wholesale dealers, that is, finding the total volume of each commodity handled at the warehouse and applying a method for allocating total costs for labor and mechanical equipment to each commodity as accurately as possible.

205625 O—35—5

Preliminary investigation revealed that although no current summary records of receipts of commodities are maintained, weekly summaries of deliveries of commodities to retail stores were available for the period January 1 to July 31, 1951. Further investigation revealed the lag between receipts at the warehouse and deliveries to retail outlets is very short. It was indicated that this time lag would be insignificant in terms of data summarized for monthly periods. Therefore, data representing deliveries from the warehouse, rather than receipts at the warehouse, were utilized in ascertaining the total volume of each commodity handled during each of the 7 months.

A record of the total gross wages paid to warehouse employees engaged in the handling of fresh fruits and vegetables was obtained for each of the 7 months. During the 7 months an increase occurred in wage rates for warehousemen. In order to reflect current labor costs during the entire period, this increase in the wage rate was extended to the entire 7-month period, and adjusted total gross wages for months preceding the wage increase were used in this study. Total monthly wage costs were derived by adding to basic wage costs the costs to the employer for contributions to Federal old-age benefits, Federal unemployment insurance, State unemployment insurance, and costs of workmen's compensation insurance.

The number of times a package is physically handled influences the total cost of handling it at the warehouse. With the assistance of personnel in the chain-store organization, handling factors were developed which represent the number of times the various commodities are handled. These factors are based on an analysis of the handling methods and procedures followed in regard to each commodity.

The weight of a package also influences handling costs in operations in which hand labor is involved. The list of average gross weights of various types of packages of all commodities received in the Oakland and San Francisco markets, which was developed for use in determining handling costs at wholesale houses, was used in allocating total handling costs to specific packages at the retail chain warehouse.

The statistical method used to allocate labor costs to specific packages of commodities is similar in many respects to that developed for allocating porter costs to specific packages at wholesale stores in Oakland and San Francisco. However, an additional problem involved in allocating costs to packages at the chain-store warehouse was created by the practice of using mechanical equipment for certain handlings and hand labor for the remainder. A detailed description of the statistical method followed is presented in the appendix of this report.

UNLOADING

Rail Car Unloading

The chain-store warehouse is located on a rail siding. Commodities delivered to the warehouse by rail car can be unloaded from the car directly onto the warehouse platform. In practice, commodities are

unloaded from the rail car onto pallets placed on the warehouse platform. The pallets are then hauled into the warehouse by fork-lift trucks. When sufficient space has been cleared within the rail car, packages are stacked on a pallet placed on the floor of the car and the fork-lift truck removes the palletized packages from the car.

During the first 7 months of 1951, potatoes were the only commodity received at the warehouse by rail. An estimate of the cost for unloading 100-pound bags of potatoes was obtained as follows: Personnel of the chain-store organization supplied an estimate of the number of man-hours required to unload the complete rail car. Total man-hours of labor was multiplied by the total labor cost to the company per hour; this included, in addition to the basic wage rate, costs to the employer for contributions to Federal old-age benefits, Federal unemployment insurance, State unemployment insurance, and cost of workmen's compensation insurance. Total cost for mechanical equipment, derived by multiplying the hours in use by computed costs per hour, was added to labor costs. The combined cost of labor and mechanical equipment was divided by the number of bags unloaded to determine the unloading cost per bag.

Approximations of the costs of unloading other commodities from rail cars at the warehouse were made as follows: As described later in the report, costs per package were developed for handling packages from assembly bays to the truck platform. Handling-cost factors were developed to show the relationship of costs of handling potatoes to costs of handling other commodities (assembly bay to truck platform). It was concluded that the costs of unloading other commodities from rail cars would be in the same relationship to unloading potatoes as in the assembly bay handling, as both were done by hand labor. Accordingly, these factors were applied to labor costs for unloading potatoes from the rail car to estimate labor costs for the other commodities. The cost of mechanical equipment was computed separately for various commodities. Estimated costs for unloading packages of various commodities are shown below:

Commodity	Type of package	Unloading cost per package
		Cents
Apples	Box	0.8
Lettuce	Crate	1.1
Oranges	Box	1.2
Peaches	Lug	0.6
Potatoes	50 lb. sack	0.8
Potatoes	100 lb. sack	1.4
Tomatoes	Lug	0.6

Although these costs are presented as approximations of actual costs, sufficient accuracy is believed to have been achieved to warrant their use in comparisons with costs incurred in the wholesale market.

Truck Unloading

Truck unloading costs for various commodities at the chain warehouse in San Francisco are the same as in the Oakland wholesale market. Trucks are unloaded by union lumpers, who unload packages from trucks onto pallets placed on the truck platform of the warehouse. Lumpers are hired and paid by truck operators, who absorb unloading costs. Lumpers' wage rates are on a per-package basis and are specifically outlined in an agreement between the lumpers' union and truck operators. Basic rates charged per package for truck unloading are shown in table 1, as are total costs per package to employers. These include employers' contributions to Federal old-age benefits, State unemployment insurance, and the costs of compensation insurance.

HANDLING INTO AND WITHIN WAREHOUSE TO ASSEMBLY BAYS

Palletized packages of commodities are moved from truck and rail platforms of the warehouse to positions on the main floor. Depending upon the perishability of the particular commodity and the warehouse supply situation in relation to current retail orders, a commodity may be moved first either to a storage position on the main floor, into the refrigerator, or directly to an assembly bay. Regardless of the combinations of movements within the warehouse, all commodities eventually are placed in assembly bays. All movements of commodities up to the time they are placed in these bays are in palletized lots and are done by power-driven fork-lift trucks.

Per-package costs for handling commodities within the warehouse until they are placed in assembly bays were developed from data obtained from the retail-chain organization. A detailed description of the statistical methods followed in ascertaining these costs is presented in the appendix of this report. Handling costs per package for the selected commodities shown in table 8 are average costs for January 1 through July 31, 1951. They include both labor and mechanical equipment costs.

HANDLING FROM ASSEMBLY BAYS TO TRUCK LOADING PLATFORM

At assembly bays commodities are assembled into orders, then are moved a relatively short distance to the truck platform. From the truck platform they are later loaded into trucks for transportation to retail stores.

The commodities are assembled into orders and moved from bays to truck platform by hand labor. Hand trucks are used to move them to the truck platform.

The statistical method used to allocate total costs for this operation to specific commodities is described in detail in the appendix of this report. Average costs per package for this handling operation from January 1 through July 31, 1951, are shown in table 8.

Table 8.- Handling: Estimated cost per package, chain-store warehouse, by commodity and by type of package 1/

Commodity	Type of package	Handling cost per package: Labor and mechanical equipment into and within warehouse	From assembly bay to truck loading platform	Total
		Cents	Cents	Cents
Apples	Box	1.36	1.41	2.77
Lettuce	Crate	1.76	2.11	3.87
Oranges:				
Packed	Box	1.94	2.21	4.15
Loose	do.	1.94	1.60	3.54
Peaches	Crate	.49	.86	1.35
	Lug	.52	1.08	1.60
Potatoes	do.	.97	1.08	2.05
	50 lb. sack	1.36	1.42	2.78
	100 lb. do.	2.51	2.69	5.20
Tomatoes	Carton	.33	.60	.93
	Flat	.47	.80	1.27
	Crate	.49	.82	1.31
	Lug	.52	1.08	1.60

1/ Excludes unloading costs.

TOTAL HANDLING COSTS EXCLUDING UNLOADING COSTS

Total handling costs per package for selected commodities at the chain store warehouse, which consist of the combined costs of handlings by mechanical equipment within the warehouse, and handlings by hand and hand truck from the assembly bays, are shown in table 8. These costs include, in addition to the basic wage rate, costs to the employer for contributions to Federal old-age benefits, Federal unemployment insurance, State unemployment insurance, and costs for workmen's compensation insurance. Mechanical equipment costs are also included.

HANDLING COSTS AMONG SECONDARY HANDLERS

For purposes of this study secondary handlers of fresh fruits and vegetables are considered to be those wholesalers who buy substantial quantities of their supply from other dealers in the wholesale market.

A number of secondary handler organizations operate in the Oakland and San Francisco market areas. The stores of these dealers are located in the wholesale markets of both cities. Secondary handlers use their own trucks to make deliveries to their customers. Customers are usually restaurants, hotels, and retail grocery stores, which desire the service rendered by secondary handlers. In addition to delivery service, many secondary handlers perform some or all of the following services for their customers: (1) selling commodities in less than regular package units; (2) sorting commodities into size groups; (3) sorting commodities by degree of ripeness or condition; and (4) trimming certain commodities, such as lettuce. Because of the variety of services performed by secondary handlers, commodities generally are physically handled a greater number of times by these organizations than they are by other wholesale dealers.

Preliminary investigation revealed that the quantities of the selected commodities passing through secondary handlers in each of the markets are relatively small. Because of this and the complicated handling operations of some of these dealers, it was not found possible to conduct a detailed study of their handling costs within the time and expense limits of the over-all study. It was decided, therefore, to develop as accurate an estimate as possible of the volume of business passing through secondary handlers, and the amount of their purchases from the wholesale markets, and, also, to obtain any qualitative information that might assist in the use of this information.

VOLUMES HANDLED AND SOURCES OF SUPPLY

In the Oakland market, eight organizations account for most of the business done by secondary handlers. Estimates of the total volume of each of the selected fresh fruits and vegetables handled by these organizations combined, and the proportion bought from the wholesale market were received from proprietors of three of the largest organizations. These three independent sets of estimates were combined into a single estimate for each commodity by staff members of the Stanford Research Institute. The resulting estimates are presented as rough approximations of the volume of business passing through secondary handlers in the Oakland market from January 1 through July 31, 1951.

Seven organizations do most of the business undertaken by secondary handlers in the San Francisco market area. Complete information regarding the volume of receipts by sources of supply of one of these organizations was obtained from its records for the 7 months. Similar information was obtained from the records of four other secondary handlers for certain months. From this information, volume of business of these four for the 7 months was estimated. The remaining two organizations did not make their

records available. The volumes of business for these were estimated with the assistance of a leading secondary handler in the San Francisco market. It is believed that reasonably accurate estimates of the total volume of business of secondary handlers in San Francisco were obtained in this way.

In order to simplify the work, estimates of volumes handled were made in units of the more common packages handled. These estimates were later converted into units of the various packages handled by secondary handlers in the same proportions as various-type packages are received in the total wholesale market. For oranges, however, an estimate received from a secondary handler was used.

Estimated total receipts and estimated volumes of purchases from the wholesale markets for secondary handlers in Oakland and San Francisco are shown in table 9.

Table 9.- Total receipts and purchases from wholesale dealers by secondary handlers, by commodity and type of package, Oakland and San Francisco, January 1-July 3, 1951

Commodity	Type of package	Oakland		San Francisco	
		Total receipts	Purchases from wholesale market	Total receipts	Purchases from wholesale market
		Thousands	Thousands	Thousands	Thousands
Apples	Box	14.0	12.0	20.3	12.9
Lettuce	Crate	30.0	18.0	37.8	27.3
Oranges:					
Packed	Box	9.0	8.5	13.8	12.0
Loose	do.	9.0	8.5	13.8	12.0
Peaches	Crate	1.1	1.0	1.2	1.0
	Lug	6.2	5.6	4.5	4.5
Potatoes	do.	1.0	.1	6.6	1.0
	50 lb. sack	.6	.1	4.1	.7
	100 lb. do.	34.5	4.9	92.5	14.8
Tomatoes	Carton	2.2	2.0	3.8	3.7
	Flat	6.8	6.3	18.5	17.9
	Crate	1.6	1.5	6.5	6.2
	Lug	21.9	20.3	24.0	23.1

QUALITATIVE INFORMATION REGARDING SECONDARY HANDLERS

When commodities are bought by secondary handlers from the wholesale market, there have been costs to the wholesale dealers of the kind previously reported. Commodities are delivered to the stores of the secondary handlers by the wholesale dealer's porters.

All commodities, including those bought from wholesale dealers, are handled in the stores of the secondary handler by his own porters. These stores are similar to those of other wholesale dealers. Secondary handlers receive commodities on their sidewalks, as do other wholesale dealers, whether the delivery is made by line-haul trucks, drayage trucks transporting commodities from rail cars on team tracks, from storage warehouses, or by porters of wholesale dealers. To a great extent, the physical handling of commodities following their receipt is the same among secondary handlers as that reported for wholesale dealers, except for additional physical handlings necessary to perform services for customers, described earlier in this section. An additional difference is that the porters of secondary handlers do not usually deliver commodities to retailers' trucks parked in the wholesale market areas.

In comparing per-package handling costs of secondary handlers with those for wholesale dealers, costs for reconditioning, sorting, and repackaging commodities must be eliminated, as was done in developing such costs among wholesale dealers. This study has determined that handling costs for a given quantity of a commodity are greater in the wholesale market when the size of unit handled is smaller. Some secondary handlers handle and sell less than standard-size packages. Moreover, one secondary handler, in discussing handling costs, pointed out that he pays his porters higher wages than the prevailing rate for porters in the wholesale market. This is done to attract and keep superior porters, which he considers necessary for efficient performance of operations that are more complex than those performed generally by porters of other wholesale dealers. A reasonable estimate appears to be that costs per package for handling commodities among secondary handlers would then equal or exceed handling costs per package for wholesale dealers previously reported.

SUMMATION OF COSTS BY MARKETING CHANNELS

In this section the various elements of cost developed during the research project are summarized by marketing channels in Oakland and San Francisco. Certain of the costs in the following summaries are estimates which accurately reflect actual costs. A few are approximations of considerably less accuracy. Those who use the summaries are referred to preceding sections of the report in which detailed explanations are given of costs and the methods used in ascertaining them.

Table 10.- Direct truck receipts: Average handling costs per package, by commodity and by type of package, wholesale markets, Oakland and San Francisco

Oakland

Commodity	Type of package	Handling costs per package				
		Unloading truck 1/	By porters: Into and within wholesale store	By porters: Delivery to retailer's truck	Secondary handling by wholesale dealer	Total
		Cents	Cents	Cents	Cents	Cents
Apples	Box	2.14	6.62	1.41	0.17	10.34
Lettuce, dry	Crate	2/ 3.20	4.39	2.00	.12	9.71
Oranges:						
Packed	Box	2.68	4.69	2.10	.11	9.58
Loose	do.	2.68	4.10	1.67	.10	8.55
Peaches	Crate	1.60	3.27	.92	.09	5.88
	Lug	1.60	3.57	1.12	.09	6.38
Potatoes	do.	2.14	2.67	1.12	.06	5.99
	50# sack	1.60	2.90	1.42	.10	6.02
	100# do.	2.68	3.65	2.41	.11	8.85
Tomatoes	Carton	1.06	3.54	.69	.09	5.38
	Flat	1.60	3.93	.86	.09	6.53
	Crate	1.60	4.03	.83	.11	6.62
	Lug	1.60	4.61	1.12	.11	7.44
		San Francisco				
Apples	Box	2.14	7.61	3.68	0.22	13.65
Lettuce, dry	Crate	2/ 3.20	8.92	5.35	.27	17.74
Oranges:						
Packed	Box	2.68	7.75	5.63	.19	16.25
Loose	do.	2.68	5.38	4.40	.18	13.14
Peaches	Crate	1.60	6.21	2.28	.11	10.20
	Lug	1.60	7.21	2.34	.15	11.80
Potatoes	do.	1.60	1.96	2.84	.12	6.52
	50# sack	1.60	2.72	3.70	.12	8.14
	100# do.	2.68	4.78	6.52	.21	14.19
Tomatoes	Carton	1.60	7.66	1.61	.22	11.09
	Flat	1.60	8.67	2.12	.15	12.54
	Crate	1.60	8.78	2.17	.17	12.72
	Lug	1.60	10.13	2.84	.28	14.85

1/ Paid by truck operators and usually included in line-haul rate.
2/ The cost for top-iced lettuce is 0.0428 cent.

Table 11.- Direct rail receipts: Average handling costs per package, by commodity and by type of package, wholesale markets, Oakland and San Francisco

Commodity	Type of package	Handling costs per package					
		Rail car demurrage 1/	Drayage, team track: to wholesale dealer's sidewalk 1/	By porters: Into and within wholesale store	By porters: Delivery to retailer's truck	Secondary handling by wholesale dealer	Total
		Cents	Cents	Cents	Cents	Cents	Cents
Oakland							
Apples	Box	1.78	5.15	6.62	1.41	0.17	15.13
Lettuce	Crate	5.84	10.30	4.39	2.00	.12	22.65
Oranges	Box	.63	6.18	4.69	2.10	.11	13.71
Peaches	Lug	---	5.15	3.57	1.12	.09	9.93
Potatoes	50# sack	2/	5.15	2.90	1.42	.10	9.57
	100# do.	1.07	7.21	3.65	2.41	.11	14.45
Tomatoes	Lug	.18	5.15	4.61	1.12	.11	11.17
San Francisco							
Apples	Box	0.30	7.73	7.61	3.68	0.22	19.54
Lettuce	Crate	3.56	9.79	8.92	5.35	.27	27.89
Oranges	Box	1.44	8.24	7.75	5.63	.19	23.25
Peaches	Lug	---	6.70	7.21	2.84	.15	16.90
Potatoes	50# sack	2/	6.70	2.72	3.70	.12	13.24
	100# do.	.89	9.79	4.78	6.52	.21	22.19
Tomatoes	Lug	.91	6.18	10.13	2.84	.28	20.34

1/ Includes 3 percent Federal transportation tax.
2/ Included in figure for 100# sack.

Table 12.- Truck receipts passing through cold storage warehouses: Average cost per package, selected commodities, to wholesale markets, Oakland and San Francisco

Commodity	Type of package	Cost per package					
		Unloading truck 1/	Storage rate 2/		Drayage to wholesaler's sidewalk 3/	Porter handling at wholesale dealer's store	Total 4/
			First month	Each month after first			
		Cents	Cents	Cents	Cents	Cents	Cents
Oakland							
Apples	Box	2.14	12.00	3.00	5.15	8.20	27.49
Potatoes	50# sack	1.60	9.75	5.00	5.15	4.42	20.92
	100# do.	2.68	17.50	10.00	7.21	6.17	33.56
San Francisco							
Apples	Box	2.14	12.00	3.00	7.73	11.51	33.38
Potatoes	50# sack	1.60	9.75	5.00	6.70	6.54	24.59
	100# do.	2.68	17.50	10.00	9.79	11.51	41.48

1/ Paid by truck operators and usually included in line-haul rate.
2/ Includes handling into storage areas from truck platform and handling out of storage areas to truck loading platform.
3/ Includes 3 percent Federal transportation tax.
4/ Minimum based on one month's storage.

Table 13.- Rail receipts passing through cold storage warehouses: Average cost per package, selected commodities, to wholesale markets, Oakland and San Francisco

Commodity	Type of package	Cost per package: Storage rate 1/ First month	Storage rate 1/ Each month after first	Drayage to wholesaler's sidewalk 2/	Porter handling at wholesale dealer's store	Total 3/
		Cents	Cents	Cents	Cents	Cents
Oakland						
Apples	Box	12.00	3.00	5.15	8.20	25.35
Potatoes	50# sack	9.75	5.00	5.15	4.42	19.32
	100# do.	17.50	10.00	7.21	6.17	30.88
San Francisco						
Apples	Box	12.00	3.00	7.73	11.51	31.24
Potatoes	50# sack	9.75	5.00	6.70	6.54	22.99
	100# do.	17.50	10.00	9.79	11.51	38.80

1/ Includes unloading rail cars, handling into storage areas and handling out of storage areas to truck loading platform.

2/ Includes 3 percent Federal transportation tax.

3/ Minimum, based on one month's storage.

Table 14.- Potatoes: Average costs for truck and rail receipts passing through private storage warehouses to wholesale dealers, by type of package, San Francisco

Operation by receipts	Type of package	
	50 pound sack	100 pound sack
	Cents	Cents
Direct truck receipts		
Unloading truck 1/	1.60	2.68
Handling:		
Into storage	1.31	1.57
Out of storage	1.31	1.57
By porters at wholesale dealer's store	6.54	11.51
Storage costs 2/	3.74	7.47
Drayage from storage warehouse to wholesale dealer's sidewalk 3/	6.70	9.79
Total	21.20	34.59
Rail receipts		
Drayage from:		
Team track to private storage warehouse 3/	6.70	9.79
Private storage warehouse to wholesale dealer's sidewalk 3/	6.70	9.79
Handling:		
Into storage	1.31	1.57
Out of storage	1.31	1.57
By porters at wholesale dealer's store	6.54	11.51
Storage costs 2/	3.74	7.47
Total	26.30	41.70

1/ Paid by truck operators and usually included in line-haul rate.
2/ Average cost per sack at two private storage warehouses.
3/ Includes 3 percent Federal transportation tax.

Table 15.- Estimated costs for direct truck and rail receipts at chain-store warehouse, by commodity and by type of package, Oakland

Commodity	Type of package	Cost per package							
		Direct truck receipts				Rail receipts			
		Unloading truck 1/	Handling: Into and within warehouse	Handling: Assembly bay to truck loading platform	Total	Unloading car	Handling: Into and within warehouse	Handling: Assembly bay to truck loading platform	Total
		Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents
Apples	Box	2.14	1.36	1.41	4.91	0.76	1.36	1.41	3.53
Lettuce, dry	Crate	2/ 3.20	1.76	2.11	7.07	1.11	1.76	2.11	4.98
Oranges:									
Packed	Box	2.68	1.94	2.21	6.83	1.17	1.94	2.21	5.32
Loose	do.	2.68	1.94	1.60	6.22	---	---	---	---
Peaches	Crate	1.60	.49	.86	2.95	---	---	---	---
	Lug	1.60	.52	1.08	3.20	.53	.52	1.08	2.18
Potatoes	do.	2.14	.97	1.08	4.19	---	---	---	---
	50# sack	1.60	1.36	1.42	4.38	.76	1.36	1.42	3.54
	100# do.	2.68	2.51	2.69	7.88	1.35	2.51	2.69	6.55
Tomatoes	Carton	1.06	.33	.60	1.99	---	---	---	---
	Flat	1.60	.47	.80	2.87	---	---	---	---
	Crate	1.60	.49	.82	2.91	---	---	---	---
	Lug	1.60	.52	1.08	3.20	.58	.52	1.08	2.18

1/ Paid by truck operators and usually included in line-haul rate.
2/ The cost for top-iced lettuce is 0.0428 cent.

Table 16.- Minimum costs for commodities distributed through secondary handlers, including purchases from wholesale market, direct truck receipts, and direct rail receipts, by commodity and by type of package, Oakland and San Francisco

Oakland

Commodity	Type of package	Purchases from wholesale market: Porter handling: Wholesale dealer	Purchases from wholesale market: Porter handling: Secondary handler 1/	Purchases from wholesale market: Total	Direct truck receipts: Unloading truck 2/	Direct truck receipts: Porter handling 1/	Direct truck receipts: Total	Direct rail receipts: Rail car demurrage	Direct rail receipts: Drayage from team track to store	Direct rail receipts: Porter handling 1/	Direct rail receipts: Total
		Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents
Apples	Box	8.20	8.20	16.40	2.14	8.20	10.34	1.78	5.15	8.20	15.13
Lettuce, dry	Crate	6.51	6.51	13.02	3/ 3.20	6.51	9.71	5.84	10.30	6.51	22.65
Oranges:											
Packed	Box	6.90	6.90	13.80	2.68	6.90	9.58	.63	6.18	6.90	13.71
Loose	do.	5.87	5.87	11.74	2.68	5.87	8.55	4/	4/	4/	4/
Peaches	Crate	4.28	4.28	8.56	1.60	4.28	5.88	4/	4/	4/	4/
	Lug	4.78	4.78	9.56	1.60	4.73	6.38	---	5.15	4.78	9.93
Potatoes	do.	3.85	3.85	7.70	2.14	3.85	5.99	4/	4/	4/	4/
	50# sack	4.42	4.42	8.84	1.60	4.42	6.02	5/	5.15	4.42	9.57
	100# do.	6.17	6.17	12.34	2.68	6.17	8.85	1.07	7.21	6.17	14.45
Tomatoes	Carton	4.32	4.32	8.64	1.06	4.32	5.38	4/	4/	4/	4/
	Flat	4.93	4.93	9.86	1.60	4.93	6.53	4/	4/	4/	4/
	Crate	5.02	5.02	10.04	1.60	5.02	6.62	4/	4/	4/	4/
	Lug	5.84	5.84	11.68	1.60	5.84	7.44	.18	5.15	5.84	11.17

San Francisco

Commodity	Type of package	Purchases from wholesale market: Porter handling: Wholesale dealer	Purchases from wholesale market: Porter handling: Secondary handler 1/	Purchases from wholesale market: Total	Direct truck receipts: Unloading truck 2/	Direct truck receipts: Porter handling 1/	Direct truck receipts: Total	Direct rail receipts: Rail car demurrage	Direct rail receipts: Drayage from team track to store	Direct rail receipts: Porter handling 1/	Direct rail receipts: Total
		Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents
Apples	Box	11.51	11.51	23.02	2.14	11.51	13.65	0.30	7.73	11.51	19.54
Lettuce, dry	Crate	14.54	14.54	29.08	3/ 3.20	14.54	17.74	3.56	9.79	14.54	27.89
Oranges:											
Packed	Box	13.57	13.57	27.14	2.68	13.57	16.25	1.44	8.24	13.57	23.25
Loose	do.	10.46	10.46	20.92	2.68	10.46	13.14	4/	4/	4/	4/
Peaches	Crate	8.60	8.60	17.20	1.60	8.60	10.20	4/	4/	4/	4/
	Lug	10.20	10.20	20.40	1.60	10.20	11.80	---	6.70	10.20	16.90
Potatoes	do.	4.92	4.92	9.84	1.60	4.92	6.52	4/	4/	4/	4/
	50# sack	6.54	6.54	13.08	1.60	6.54	8.14	5/	6.70	6.54	13.24
	100# do.	11.51	11.51	23.02	2.68	11.51	14.19	.89	9.79	11.51	22.19
Tomatoes	Carton	9.49	9.49	18.98	1.60	9.49	11.09	4/	4/	4/	4/
	Flat	10.94	10.94	21.88	1.60	10.94	12.54	4/	4/	4/	4/
	Crate	11.12	11.12	22.24	1.60	11.12	12.72	4/	4/	4/	4/
	Lug	13.25	13.25	26.50	1.60	13.25	14.85	.91	6.18	13.25	20.34

1/ Estimated minimum costs for secondary handlers on basis costs will equal or exceed those of wholesale dealers.
2/ Paid by truck operators and usually included in line-haul rates.
3/ The cost for top-iced lettuce is 0.0428 cent.
4/ Not received by rail transportation.
5/ Included in figure for 100# sack.

ANALYSIS OF FINDINGS

Analysis of the findings of the study is concerned primarily with measuring differences in costs among commodities and among marketing channels and between the costs for performing the same or similar handlings in the Oakland and San Francisco markets. The purpose of the analysis is to discover the probable causes for such differences in cost and to indicate the extent to which such costs may be reduced.

Costs of handling and transportation for only one direct receiver, a retail chain organization in Oakland, were ascertained during the study. Costs of this organization are compared with similar handling and transportation costs developed for the Oakland and San Francisco wholesale markets.

WHOLESALE MARKETS AND DIRECT RECEIVER COSTS

Unloading Trucks

Comparison by Markets and Channels.- The per-package cost for unloading the same type package of a particular commodity is the same at the Oakland and San Francisco wholesale markets and at the central distribution warehouse of the retail chain organization. The exceptions apply to lugs of potatoes and cartons of tomatoes which are not specifically covered by the agreements between labor unions and truck operators.

As agreements between labor unions and truck operators provide for the same per-package charges for unloading commodities onto a wholesale dealer's sidewalk, or upon a retail chain organization's truck platform, no method for reduction of this handling cost is indicated by the study.

Comparison by Commodities.- Truck unloading costs per pound for selected commodities are shown by type of package in table 17. Comparison indicates:

1. Unloading costs per pound for the same commodities are less when package weights are greater, that is, when commodities are packaged in larger quantities. Such differences in cost per pound are measurable in the following table.

2. In some cases, unloading costs per pound differ for different commodities although package weights are about equal.

Rail Receipts

Of the selected commodities included in the study, only apples, potatoes, and tomatoes are transported in sizable amounts to Oakland and San Francisco markets by rail carriers.

Table 17.- Unloading: Truck costs per pound, by commodity and by type of package, Oakland and San Francisco

Commodity	Type of package	Gross weight	Cost per pound	
			Oakland	San Francisco
		Pound	Cents	Cents
Apples	Box	50	0.043	0.043
Lettuce	Crate	80	.040	.040
Oranges:				
Packed	Box	85	.032	.032
Loose	do.	63	.043	.043
Peaches	Crate	25	.064	.064
	Lug	35	.046	.046
Potatoes	do.	35	.061	.046
	50 lb.sack	50	.032	.032
	100 lb.do.	101	.027	.027
Tomatoes	Carton	13	.082	.123
	Flat	22	.073	.073
	Crate	23	.070	.070
	Lug	35	.046	.046

Rail Car Demurrage.- The amount of rail car demurrage assessed on cars of selected commodities terminated on rail sidings of direct receivers was not ascertained during the study. Presumably cars that can be unloaded directly into central distribution warehouses would be unloaded quickly enough to avoid incurring such assessments.

Differences between Oakland and San Francisco markets in the amounts of demurrage incurred per package in terms of total market receipts for selected commodities, shown previously in this report, are not great. Apparently there is no consistent pattern of such differences among commodities in either market.

Demurrage assessments often are incurred, not because of lack of physical facilities for receiving, but because temporary storage in the rail car is desired. For example, commodities may be held in a rail car for speculative purposes, that is, when it is thought that the difference between current and subsequent prices at which the commodities might be sold will more than equal demurrage assessments that accrue during the waiting period.

No method for the reduction of costs due to rail-car demurrage was indicated by the study.

Unloading and Transportation.- Commodities transported to wholesale markets in Oakland and San Francisco by rail carriers arrive at team tracks near the markets. They are loaded onto trucks from the rail cars, then drayed to the markets and unloaded onto wholesale dealers's sidewalks.

At the central distribution warehouse of the retail chain organization in Oakland, commodities arrive at warehouse sidings and are unloaded directly onto the warehouse platform.

Comparison by markets and channels.- A direct comparison can be made between costs incurred for handlings between rail cars and wholesaler dealers' sidewalks in each city, and these costs can be compared with the retail chain organization's cost for unloading rail cars.

As indicated in table 18, during the period surveyed drayage charges in San Francisco were higher for identical packages of all commodities except lettuce than charges in Oakland. This was because minimum drayage rates published by the Public Utilities Commission were effective in the San Francisco market but not in Oakland. Since July 1951, the Public Utilities Commission minimums became operative in Oakland.

Also shown in table 18 are the differences by commodity between drayage costs for San Francisco wholesalers and unloading costs for the retail chain warehouse. These differences in cost indicate the approximate extent to which the cost of handling and moving commodities from rail cars to the receiving locations of wholesale houses might be reduced if wholesale houses were located on rail sidings and had rail platforms and if dealers utilized mechanical equipment efficiently in unloading. Provision of such facilities for rail-car receipts at wholesale dealers' stores, however, would require construction of entirely new wholesale markets in both cities.

Table 18.- Rail receipts: Costs to wholesale dealers' sidewalks and to unloading platform of chain store warehouse, by commodity and by type of package, Oakland and San Francisco

Commodity	Type of package	Rate per package			
		Oakland drayage 1/	San Francisco		
			Drayage	Unloading at chain store warehouse	Difference
		Cents	Cents	Cents	Cents
Apples	Box	5.150	7.725	0.755	6.970
Lettuce	Crate	10.300	9.785	1.106	8.679
Oranges	Box	6.180	8.240	1.165	7.075
Peaches	Lug	5.150	6.695	.579	6.116
Potatoes	50 lb. sack	5.150	6.695	.761	5.934
	100 lb. do.	7.210	9.785	1.353	8.432
Tomatoes	Lug	5.150	6.180	.579	5.601

1/ Includes 3-percent Federal transportation tax.

Comparison by commodities.- Costs per pound for the entire handling and transporting operation from rail cars to receiving locations are shown by type of package in table 19.

Table 19.- Rail receipts: Costs per pound to wholesale dealers' sidewalks and to unloading platform of chain-store warehouse, by commodity and by type of package, Oakland and San Francisco

Commodity	Type of package	Gross weight	Cost per pound		
			Wholesale market		Chain store warehouse
			Oakland	San Francisco	
		Pounds	Cents	Cents	Cents
Apples	Box	50	0.10	0.15	0.015
Lettuce	Crate	80	.13	.12	.014
Oranges	Box	85	.07	.10	.014
Peaches	Lug	35	.15	.19	.017
Potatoes	50 lb.sack	50	.10	.13	.015
	100 lb.do.	101	.07	.10	.013
Tomatoes	Lug	35	.15	.18	.017

Drayage charges per pound for a given commodity vary inversely with the weight of the package. For example, in San Francisco the charge per pound for potatoes is 0.1 cent in 100-pound sacks and 0.13 cent in 50-pound sacks. A similar relationship exists at the retail chain warehouse. Drayage charges per pound are the same in Oakland for boxes of apples and bags of potatoes of approximately the same weight, but differ in San Francisco.

Handling Costs at Wholesale Stores and Retail Chain Warehouse

In both the Oakland and San Francisco wholesale markets, commodities are moved from sidewalks into and within the wholesale houses and to retailers' trucks by porters using hand trucks. At the retail chain warehouse, commodities are moved into and within the warehouse and to assembly bays by means of power-driven mechanical equipment. The only use of hand trucks is from the assembly bays to truck-loading platforms.

Handling Into and Within Wholesale Stores and Retail Chain Warehouse.- Costs per package for handling selected commodities into and within wholesale houses in Oakland and San Francisco, but not including delivery to retail trucks, and costs per package for handling the same commodities at the retail chain warehouse until they are placed in assembly bays are given in table 20. Contrary to the usual pattern, potatoes receive less handling in San Francisco than in Oakland. This results in disproportionately low handling costs for potatoes in San Francisco.

Table 20.- Handling: Costs at wholesale dealers' stores and at chain-store warehouse, by commodity and by type of package, Oakland and San Francisco

Commodity	Type of package	Handling costs per package					
		Wholesale stores		Chain store warehouse	Wholesale stores over Oakland	Wholesale over chain	
		Oakland	San Francisco		San Francisco over Oakland	Oakland	San Francisco
		Cents	Cents	Cents	Cents	Cents	Cents
Apples	Box	6.62	7.61	1.36	0.99	5.26	6.25
Lettuce	Crate	4.39	8.92	1.76	4.53	2.63	7.16
Oranges:							
Packed	Box	4.69	7.75	1.94	3.06	2.75	5.81
Loose	do.	4.10	5.88	1.94	1.78	2.16	3.94
Peaches	Crate	3.27	6.21	.49	2.94	2.78	5.72
	Lug	3.57	7.21	.52	3.64	3.05	6.69
Potatoes	do.	2.67	1.96	.97	1/ .71	1.70	.99
	50 lb. sack	2.90	2.72	1.36	1/ .18	1.54	1.36
	100 lb. do.	3.65	4.78	2.51	1.13	1.14	2.27
Tomatoes	Carton	3.54	7.66	.33	4.12	3.21	7.33
	Flat	3.98	8.67	.47	4.69	3.51	8.20
	Crate	4.03	8.78	.49	4.75	3.54	8.29
	Lug	4.61	10.13	.52	5.52	4.09	9.61

1/ Extent to which costs for these operations are lower in the San Francisco wholesale market than in the Oakland wholesale market.

Comparison by markets and channels.- With the exception of potatoes in lugs and in 50-pound bags, handling costs per package are lower for each commodity in the Oakland wholesale market than in the San Francisco market. Lower handling costs per package in the Oakland market are apparently due to two reasons: (1) basic porter wage rates are lower in the Oakland market and employers in Oakland do not contribute to porters' hospitalization and life insurance premiums, as is the case in San Francisco, and (2) the average number of handlings of commodities is less in the Oakland market than in the San Francisco market.

The basic wage rate for porters is 19 percent lower in the Oakland market than the basic wage rate plus employers' contributions to employees' insurance premiums in the San Francisco market.

The number of handlings is less in the Oakland market mainly because considerably higher percentages of total commodities handled in the Oakland market are delivered directly from dealers' sidewalks to retailers' trucks than is the case in the San Francisco market, where higher percentages of commodities are handled into and out of the dealers' stores. This is

possible because dealers' sidewalks and the streets of the market in Oakland are considerably wider than those in San Francisco. Exact measurements of these differences in handling practices were not obtained during the study, but they were observed by staff members of the Institute who conducted investigations in the wholesale markets of both cities.

Handling costs per package for each selected commodity are shown to be lower at the retail chain warehouse than at wholesale stores in Oakland and San Francisco. This is the case although the basic wage rate for warehousemen is 29 percent higher than the wage rate for porters in the Oakland wholesale market and 3.9 percent higher than the wage rate for porters, plus employers' contributions to employees' insurance premiums in the San Francisco wholesale market.

Lower handling costs into and within the chain-store warehouse are attributable partially to the following factors:

1. Warehouse lay-out designed for efficiency in operations.

2. Efficient use of mechanical equipment for moving commodities in palletized lots. Commodities are moved by hand trucks in the wholesale markets.

3. Fewer handlings of commodities than take place in the wholesale markets.

Undoubtedly, handling costs among wholesale dealers in each market could be reduced if their stores were more like the retail chain warehouse in lay-out and facilities.

Differences between handling costs per package at the retail chain warehouse and wholesale markets, shown above, however, do not measure the extent to which handling costs among wholesale dealers might be reduced if dealers' stores were as well laid out as the retail chain warehouse and if wholesale dealers could use mechanical equipment efficiently for handling operations. Handling operations of wholesale dealers may necessarily be more costly than those of a retail chain organization. Factors that may contribute to more costly operations among wholesale dealers might include the following:

1. A high peak, though relatively short, period of handling activity when retail buyers are in the wholesale market.

2. Displaying commodities.

3. Providing service for many retail buyers who consume time in shopping and bargaining for commodities.

Comparison by commodities.- Costs per pound for handling selected commodities into and within wholesale houses in Oakland and San Francisco, and the retail chain warehouse are shown in table 21.

Table 21.- Handling: Costs at wholesale dealers' stores and at chain-store warehouse, by weight, by commodity, and by type of package, Oakland and San Francisco

Commodity	Type of package	Gross weight	Handling costs per pound		
			Wholesale stores		Chain store warehouse
			Oakland	San Francisco	
		Pounds	Cents	Cents	Cents
Apples	Box	50	0.132	0.152	0.027
Lettuce	Crate	80	.055	.112	.022
Oranges:					
Packed	Box	85	.055	.091	.023
Loose	do.	63	.065	.093	.031
Peaches	Crate	25	.131	.248	.020
	Lug	35	.102	.206	.015
Potatoes	do.	35	.076	.056	.028
	50 lb. sack	50	.057	.054	.027
	100 lb. do.	101	.036	.047	.025
Tomatoes	Carton	13	.272	.589	.025
	Flat	22	.181	.394	.021
	Crate	23	.175	.382	.021
	Lug	35	.132	.289	.015

When different sized packages of a given commodity are moved the same number of times, handling costs per pound vary inversely with the weights of the packages. This relationship exists both at the wholesale markets in which hand labor is used and at the retail chain warehouse in which mechanical equipment is utilized. Costs of handling packages of different commodities of approximately the same gross weight, however, are influenced by the number of times the various commodities are handled.

Handling Out of Wholesale Stores and Retail Chain Warehouse.- In table 22 costs per package are shown for handling selected commodities out of wholesale houses to retailers' trucks in Oakland and San Francisco and from assembly bays to truck-loading platforms at the retail chain warehouse.

Table 22.- Handling: Costs per package of handling out of wholesale dealers' stores and at chain-store warehouse, by commodity and by type of package, Oakland and San Francisco

Commodity	Type of package	Handling costs per package					
		Wholesale stores		Chain store warehouse	Wholesale stores San Francisco over Oakland	Wholesale over chain	
		Oakland	San Francisco			Oakland	San Francisco
		Cents	Cents	Cents	Cents	Cents	Cents
Apples	Box	1.41	3.68	1.41	2.27	0.00	2.27
Lettuce	Crate	2.00	5.35	2.11	3.35	1/.11	3.24
Oranges:							
Packed	Box	2.10	5.63	2.21	3.53	1/.11	3.42
Loose	do.	1.67	4.40	1.60	2.73	.07	2.80
Peaches	Crate	.92	2.28	.86	1.36	.06	1.42
	Lug	1.12	2.84	1.08	1.72	.04	1.76
Potatoes	do.	1.12	2.84	1.08	1.72	.04	1.76
	50 lb. sack	1.42	3.70	1.42	2.28	.00	2.28
	100 lb. do.	2.41	6.52	2.69	4.11	1/.28	3.83
Tomatoes	Carton	.69	1.61	.60	.92	.09	1.01
	Flat	.86	2.12	.80	1.26	.06	1.32
	Crate	.88	2.17	.82	1.29	.06	1.35
	Lug	1.12	2.84	1.08	1.72	.04	1.76

1/ Extent to which costs are lower in Oakland wholesale market than at the retail chain warehouse.

Comparison by marketing channels.- Costs per package for handling commodities out of wholesale houses to retail trucks in Oakland are less for each commodity than is the case in the San Francisco wholesale market. There are two major reasons for these differences in costs between the two markets:

1. The basic wage rate for porters in the Oakland market is 19 percent less than the basic wage rate plus employers' contributions to employees' insurance premiums in San Francisco. Oakland wholesale dealers do not contribute to porters' insurance premiums.

2. Physical conditions in the San Francisco market are such that delivering commodities to retailers' trucks requires more porter time in San Francisco than in the Oakland market. These conditions were described in detail earlier in the report.

Another factor probably contributes to the differences in costs of delivery between the two markets. It is reported that the proportion of service wholesalers, that is, wholesale dealers who deliver to retail stores that use their own trucks, is higher in the Oakland market than

in the San Francisco market. Service wholesalers usually maintain parking space at their sidewalks for their own trucks, whereas retail dealers must park their trucks wherever they can find space. Often a retail dealer's truck is parked a considerable distance from the wholesale store in which a purchase is made. The average distance that a porter must travel to deliver commodities to a retailer's truck is considerably greater than the distance to the truck of the wholesaler by whom he is employed.

Handling costs per package from the assembly bay to the truck-loading platform of the retail chain warehouse are less than handling costs out of wholesale houses to retailers' trucks in Oakland and San Francisco by the amounts shown in table 22. Handling costs from the assembly bay to the truck-loading platform at the retail chain warehouse include costs for assembling orders, which could not be computed separately within the limits of this study. The cost for assembling orders in the wholesale markets, however, is included among costs for handling into and within the wholesale stores.

Differences in the costs of these operations between the Oakland wholesale market and the retail chain warehouse are slight. In the case of apples, lettuce, oranges, and potatoes, costs per package are the same or less in the Oakland wholesale market than at the retail chain warehouse. Costs per package for handling commodities in the San Francisco wholesale market, however, are considerably higher in respect to all commodities than costs at the retail chain warehouse.

The reduction in cost to wholesalers that would be accomplished if wholesalers were able to deliver commodities to retail trucks at their own truck platforms would probably not be as great as these figures indicate. Factors that might result in higher handling costs to wholesale dealers than to a retail chain organization operating under similar plant conditions and facilities might include:

1. A high peak, but relatively short, period of handling activity when retail buyers are in the wholesale market.

2. A considerably larger number of relatively small purchases to be delivered to trucks.

3. Longer waiting periods while trucks move to and from the truck platforms.

Comparison by commodities.- Costs per pound for handling selected commodities out of wholesale houses to retailers' trucks and from the retail chain warehouse assembly bays to the truck-loading platform are shown in table 23.

Figures show that handling costs per pound vary inversely with the weights of the packages. This is the case in both wholesale markets and at the retail chain warehouse. The figures also show that costs for handling packages of different commodities of approximately the same gross weight are the same at dealers' stores within each wholesale market or at the chain store warehouse.

Table 23.- Handling: Costs per pound of handling out of wholesale dealers' stores and chain-store warehouse by commodity and by type of package, Oakland and San Francisco

Commodity	Type of package	Gross weight	Cost per pound		
			Wholesale market		Chain-store warehouse
			Oakland	San Francisco	
		Pounds	Cents	Cents	Cents
Apples	Box	50	0.028	0.074	0.028
Lettuce	Crate	80	.025	.067	.026
Oranges:					
Packed	Box	85	.025	.066	.026
Loose	do.	63	.027	.070	.025
Peaches	Crate	25	.037	.091	.034
	Lug	35	.032	.081	.031
Potatoes	do.	35	.032	.081	.031
	50 lb.sack	50	.028	.073	.028
	100 lb.do.	101	.024	.065	.027
Tomatoes	Carton	13	.053	.124	.046
	Flat	22	.039	.096	.036
	Crate	23	.038	.094	.036
	Lug	35	.032	.081	.031

Analysis of Total Handling Costs

Weight of packages.- The influence of weight on the cost of handling packages is noteworthy. The figures below, using potatoes as an example, show the economies gained in the Oakland and San Francisco wholesale markets and at a retail chain warehouse by using one 100-pound bag rather than two 50-pound bags.

Quantity	Weight	Handling costs		
		Oakland	San Francisco	Retail chain
		Cents	Cents	Cents
2 - 50 lb. bags	101	8.6	12.8	5.6
1 - 100 lb. bag	101	6.1	11.3	5.2
		Percent	Percent	Percent
Percentage saved		30	12	6

The handling of two 50-pound bags takes considerably more effort than handling one 100-pound bag. In the Oakland market, the number of packages handled affects unit cost more than in the San Francisco market, and 30 percent of the cost of handling 50-pound bags could be saved by using 100-pound bags. In the San Francisco market area, weight has more bearing on unit cost than number of packages. There the saving in using one 100-pound bag over using two 50-pound bags is only 12 percent. In the retail chain organization, where a great deal of mechanical handling is involved, cubic space becomes important, rather than number or weight of packages. The

saving in handling one 100-pound bag over handling two 50-pound bags is only 6 percent. This is mainly because two 50-pound bags take no more room on the pallet than one 100-pound bag and the mechanical portion of the handling costs virtually the same.

Size of wholesale store.- In San Francisco, there is no significant difference in per-package cost between houses that have a large volume of business and houses with a small volume.

In Oakland, the difference due to volume handled by the firm is significant. Firms handling greater volumes have lower per unit costs. Firms handling more than 200,000 packages in the period studied averaged 4.4 cents per package, compared with 5.8 cents per package for smaller firms. This may be because in Oakland the average number of handlings of commodities by smaller firms is greater than among larger firms. An additional reason may be that a higher proportion of the commodities handled by larger firms are delivered in their own service trucks to retail stores than is the case among smaller firms. As previously indicated, this may result in lower costs of handling.

Seasonal.- The figures in table 24 show the effect on per-package cost of volume of packages handled in the wholesale market. There is a marked seasonal differential. Costs per package decrease as total volume of packages increases. A similar relationship holds for tonnage handled. In San Francisco, costs per package reflect changes in volume more than in Oakland, and monthly costs per package vary over a much wider range. This greater variation in cost with changes in volume in San Francisco reflects the tendency there to expand the work force rapidly with volume increase but not to contract quickly with volume decrease.

The total number of packages by month is the total actually observed in the wholesale stores used in this study.

Table 24.- Handling: Seasonal variation in costs per package, Oakland and San Francisco

Month	Oakland		San Francisco	
	Packages handled	Cost per package	Packages handled	Cost per package
	Thousands	Cents	Thousands	Cents
January	256	5.63	372	10.64
February	227	5.60	356	10.53
March	257	5.35	422	10.13
April	309	4.83	408	10.27
May	369	4.31	451	9.52
June	392	4.15	495	8.31
July	406	4.37	505	8.76
August	316	4.77	478	9.64

STORAGE

Cold Storage Warehouses

Comparison by Markets.- Rates for commodities stored at warehouses, published in tariffs filed with the California Public Utilities Commission, are the same in Oakland and in San Francisco. Costs for the following operations are included in a single storage rate for each commodity: (1) rail car unloading; (2) handling into storage from warehouse rail and truck platforms; (3) storage costs; (4) handling from storage areas to warehouse truck platforms. Presumably storage rates might be reduced if costs to storage warehouses for performing these services were reduced. A study of warehousing costs, however, is not within the scope of this research work.

Other elements of cost involved in the total cold storage process--unloading line-haul trucks at warehouses and drayage from warehouses to wholesale dealers' sidewalks--are the same as costs analyzed previously for similar operations involved in direct receipts at wholesale markets and at a direct receiver's facilities.

Comparison by Commodities.- Storage costs per pound at cold-storage warehouses in Oakland and San Francisco are as follows:

Commodity	Type package	Gross weight	Cost per pound	
			First month	Subsequent months
		Pounds	Cents	Cents
Apples	Box	50	0.2	0.1
Potatoes	50 lb. sack	50	.2	.1
Potatoes	100 lb. sack	101	.2	.1

Total storage costs per pound are less for the same commodity--potatoes--when the package size is larger. Storage costs per pound for different commodities of approximately the same gross weight are different, for example, apples in boxes and potatoes in 50-pound bags.

Private Storage Warehouses

Information regarding costs incurred at the only private storage warehouse in Oakland was not obtainable. Private storage warehouses in the San Francisco Bay terminal market area are not refrigerated. Comparisons of costs by markets and by warehouse channels, therefore, are not possible. Other elements of cost in the total private storage warehouse process--costs of the drayage operations and truck loadings--are the same as those analyzed earlier among other costs incurred in the wholesale markets. Costs of handling potatoes into and out of private storage cannot be analyzed separately in a study of this type.

SECONDARY HANDLERS

Detailed information regarding costs of handling operations among secondary handlers was not obtained during this study. The extent to which handling costs of secondary handlers may be reduced, or the way in which reductions in cost may be accomplished, is not determinable within the limits of this study.

RAIL AND TRUCK RECEIPTS

Differences in costs incurred in the terminal market exist between packages of commodities transported to Oakland and San Francisco by rail and by line-haul truck. Costs are less for commodities delivered by truck than those delivered by rail cars terminated on team tracks. However, costs are higher for commodities delivered by truck than those delivered on rail sidings to receiving facilities equipped with rail platforms.

Wholesale Markets

In both the Oakland and San Francisco wholesale markets, the difference in handling costs between packages of the same commodities received by rail and by truck can be measured by the difference between drayage rates for commodities from team tracks to wholesale dealers' sidewalks, plus demurrage charges, and the lumpers' rates for unloading line-haul trucks. These differences are shown for commodities received by rail and by truck in table 25. The differences are subject to the qualification that truck-unloading costs are included in the transportation rate and that transportation rates may differ as between rail and truck.

Table 25.- Demurrage and drayage costs: Excess of rail receipts over unloading costs for truck receipts, by commodity and by type of package, Oakland and San Francisco

Commodity	Type of package	Rate per package	
		Oakland	San Francisco
		Cents	Cents
Apples	Box	4.79	5.89
Lettuce	Crate	11.86	9.07
Oranges	Box	4.13	7.00
Peaches	Lug	3.55	5.10
Potatoes	50 lb. sack	1/ 3.55	1/ 5.10
	100 lb. do.	5.60	8.00
Tomatoes	Lug	3.73	5.49

1/ Demurrage charges are included in figure for 100 lb. sacks.

Storage Warehouses

Cold-storage warehouse tariff rates include costs for unloading commodities from rail cars on the warehouse spur track. They do not include costs for unloading line-haul trucks, which are covered by the transportation rate. Costs per package for unloading trucks are shown below.

Commodity	Type package	Cost per package for unloading trucks	
		Oakland	San Francisco
		Cents	Cents
Apples	Box	2.1	2.1
Potatoes	50 lb. sack	1.6	1.6
Potatoes	100 lb. sack	2.7	2.7

Differences in cost for potatoes received by rail and by truck at private storage warehouses in San Francisco are the same as those shown in the previous subsection for the San Francisco wholesale market.

Direct Receiver

Costs of unloading commodities from rail cars onto the rail platform of a retail chain warehouse were shown earlier in this report. The amounts by which costs for unloading commodities from line-haul trucks exceed costs of unloading rail cars at the warehouse are shown below. Again, it should be noted that the truck line pays for unloading.

Commodity	Type package	Amount per package
		Cents
Apples	Box	1.4
Lettuce	Crate	3.2
Oranges	Box	1.5
Peaches	Lug	1.0
Potatoes	50 lb. sack	.8
Potatoes	100 lb. sack	1.3
Tomatoes	Lug	1.0

APPENDIX--STATISTICAL METHODS

WHOLESALE MARKETS--INTERNAL HANDLING COSTS

The objectives of this study included the ascertainment of average costs in San Francisco and in Oakland for the handling of six specific commodities by wholesale dealers. None of the wholesale dealers allocated costs to particular functions or particular commodities and accordingly it was necessary for the Stanford Research Institute to develop a method of allocation.

Examination of the handling activity in the wholesale dealers' establishments led to the conclusion that these factors could account for variations in total dealer costs: number of package handlings, weight handled, and cubic volume handled. It was also decided that it was necessary to differentiate between the ordinary handlings within a store, such as moving boxes from one position to another, high piling, etc., and the last handling which involves the hauling of the produce by hand truck to the retailer's truck, which in some instances is several blocks away from the store. From observation, it was clear that this handling took considerably more time than the others and could not be counted as equivalent in cost analysis. Therefore, number of package handlings was treated as two factors, the first consisting of the number prior to the last, and the second consisting of the last handling.

The approach used to ascertain unit costs for different commodities in different types of packages was one of multiple regression analysis. Each type of package for each commodity is characterized by a specific weight, a specific cubic volume, and by a specific number of handlings within each store. The regression equation employed originally was as follows:

$$y = ax_1 + bx_2 + cx_3 + dx_4 + ex_5 + fx_6 + k$$

where:

y = total handling costs for a firm

x_1 = total number of package handlings exclusive of the last (number of packages x number of handlings for each)

x_2 = total number of packages (last handling)

x_3 = total weight in all but the last handling (packages x weight per package x number of handlings)

x_4 = total weight in last handling

x_5 = total cubic volume in all but the last handling (packages x volume x number of handlings)

x_6 = total cubic volume in last handling

The various commodities and types of packages enter into this equation by reason of the fact that, in ascertaining the totals x_1, x_3, x_4, x_5, and x_6, account is taken of the dealer's actual receipts in each category and the handlings, weights, and volume applicable to each.

In a test of this equation covering about half of the data obtained, it was discovered that the multiple regression coefficient was not improved significantly by the addition of the cubic-volume factor. In fact, as this factor introduced an additional restriction, the analysis is actually less reliable with than without it. This does not imply that differences in bulk have no effect, but it does imply that total handling costs can be explained with a sufficient degree of accuracy by the number of handlings and the weight. In consequence of this test, the cubic-volume factor was dropped and the equation became:

$$y = ax_1 + bx_2 + cx_3 + dx_4 + k$$

Because there are about 60 wholesale dealers in San Francisco and 30 in Oakland and because a substantial amount of time is involved in presentation of the problem to a dealer and in obtaining his cooperation, it was imperative to conduct this study on a sample basis. For this purpose, 9 dealers were selected in San Francisco and 10 in Oakland. The largest dealers were included as well as some of the small ones. The large houses were perhaps oversampled, but this was done deliberately to insure that the specific commodities to be covered by this study would be represented in good volume in the sample.

The sample coverage of the market as indicated by the percentage handled by the sample dealers is as follows:

	San Francisco Percent	Oakland Percent
All commodities	54	59
Apples	51	79
Lettuce	55	74
Oranges	86	47
Peaches	78	70
Potatoes	41	53
Tomatoes	60	87

With regard to the sampling of large and small dealers, it may be noted that the t-test showed no significant difference between the mean per-package cost of the large dealers and that of the small dealers in San Francisco. As applied to Oakland, the t-test showed a significant difference, but the Oakland sample consisted of five large and five small dealers. In view of the fact that the Oakland sample covers a third of the stores and more than half of the volume, the sample is considered fully adequate and representative.

Because of time limitations, it was not possible to cover the full year of 1951. The first 7 months were chosen because they reflect all of the seasonal differences in volume, both in rail and truck deliveries, and include the main seasons for each of the specific commodities studied. Furthermore, the last 5 months are similar in many ways to the first 7. August is very nearly equivalent to July in total volume and in the volume of the six commodities. The September-October period is similar to April-June, and November-December to January-March.

The data then consisted of 63 observations for San Francisco and 70 for Oakland, a single observation being one month's experience at one wholesale house. The regression analysis resulted in the following equations, where x_1 and x_2 are in hundreds of packages, x_3 and x_4 are in tons and y is in dollars.

San Francisco

$$y = .480\ x_1 + .501\ x_2 + .709\ x_3 + 1.133\ x_4 + 47.95$$

Oakland

$$y = .379\ x_1 + .604\ x_2 + .343\ x_3 + .367\ x_4 + 39.54$$

The multiple regression coefficient for both these equations was 91.5. The standard error of estimate was $1,072.00 per dealer or $0.022 per package in San Francisco and $379.00 per dealer or $0.012 per package in Oakland.

These equations were in terms of the total handling costs for the dealers. They were converted into equations that could be used directly for the computation of the cost of a particular package. These are as follows:

San Francisco

$$y = .00480\ x_1 + .00600 + .03546\ x_3 + .05665\ x_4$$

Oakland

$$y = .00379\ x_1 + .00729 + .01713\ x_3 + .01834\ x_4$$

In these equations:

x_1 = sum for all sample dealers of number of packages of the specific commodity handled by each dealer, multiplied by the handlings given by each dealer, this sum divided by the total number of packages handled by all dealers.

x_2 = falls out because the number of last handlings is 1. The constant k is spread into the coefficient of x_2 as this term is the same whatever the package or commodity.

x_3 = x_1 multiplied by the weight of the package in cwt. The coefficient has been adjusted to convert from tons to cwt.

x_4 = weight of the package in cwt. The coefficient has been adjusted to convert from tons to cwt.

It should be noted that the data collected make it possible to ascertain by this method the cost of handling any type of package of any commodity handled by the market. The method is not limited to apples, lettuce, oranges, peaches, potatoes, and tomatoes, which are specifically treated in the study.

RETAIL CHAIN--INTERNAL HANDLING COSTS

A procedure similar to that described in the preceding section for handling by wholesale dealers was originally planned for the allocation of retail chain costs. This plan was based on the assumption that data could be obtained from several retail chains, as seemed likely from discussions held during the initial programming stage of the research. As it turned out, however, only one retail chain actually provided data. These data gave only seven observations for analysis, one for each month. With four restrictions on but seven observations, a multiple regression analysis would have been meaningless.

The alternative method developed involved breaking the problem into two parts and analyzing each separately. One part covered the handling which takes place in the retail chain warehouse when orders are put together in the assembly bay and transferred to the delivery truck. The orders are carried on hand trucks and the whole process is a hand operation. Careful examination led to the conclusion that this process is very similar to that performed in the Oakland wholesale market, exclusive of the last handling which involves carrying the goods for some distance to the retailer's truck. The other part covered the handling which takes place in the retail chain warehouse when goods are transported from the platform to storage or to assembly bays, and from storage to assembly bays. This process is accomplished with the use of mechanical equipment.

The first requirement was to divide total costs into the above two parts. From consultation with retail chain employees and observation, factors were established to relate the costs of the various operations. Giving a value of one to the cost of moving from the platform to storage, it was concluded that moving from storage to the assembly bay had a value of $1\frac{1}{2}$, moving from platform to assembly bay a value of $1\frac{1}{2}$, and making up orders and moving from assembly bay to trucks a value of $2\frac{1}{2}$. By means of data on the number of movements in each category for all the commodities handled, the total costs in each of the parts were determined.

For analysis of the cost factors in the hand operation part from assembly bay to trucks, reference was made to the first and third terms of the equation developed for the wholesale market, as the other terms relate to the last handling. Assuming that this operation was equivalent to two handlings, a projected total cost was obtained representing what the chain-store business would have cost if handled in the wholesale market. This cost was then compared with the cost allocated to the operation

by the procedure described in the preceding paragraph. The relationship between these two cost figures provided the means for adjusting coefficients a and c to approximate levels for application in the retail chain operation. The equation for this purpose then became:

$y = .0895\ x_1 + .0810\ x_3$, where y is in dollars, x_1 in hundreds of packages, and x_3 in tons.

Converted for use in calculating the cost of a single package of a specific commodity, this equation became:

$$y = .00179 + .00810\ x_3$$

When x_3 is the weight of the package in cwt., x_1 falls out because there are two handlings for each package of each commodity and the coefficient was multiplied by two. The coefficient of x_3 was multiplied by two for the same reason and also adjusted to convert from tons to cwt.

In the case of handling by a mechanical process--use of lift trucks--cubic volume becomes the important consideration. The limiting factor is the amount that can be put on a pallet, and this is regulated by space or cubic volume practically independently of weight in the range of commodities with which we are dealing. Consequently, it was concluded that the cost analysis could be accomplished by means of an equation of the form:

$$y = ex_7 + k$$

where:

x_7 = total cubic volume in all handlings (packages x volume x number of handlings)

The data consisted of only seven observations, one for each month. Calculation resulted in the following equation, where x_7 is in terms of cubic feet and y in dollars.

$$y = .453\ x_7 + 588.46$$

The coefficient of regression was 76.0. Converted for use in calculating the cost of a single package of a specific commodity, the equation became:

$$y = .00453\ x_7 + .00079$$

where:

x_7 = volume of package in cubic feet multiplied by the number of handlings.

The constant was divided by the total number of packages handled by the retail chain to get a per-package constant.

Obviously, the figures obtained by this analysis for retail chain costs are not as reliable as the figures for wholesale dealer costs, but it is considered that they are adequate for the uses to which they are put.

☆ U. S. GOVERNMENT PRINTING OFFICE O—1952