FEDERAL RESERVE BANK OF RICHMOND

MONTHLY REVIEW

A Seasonally Adjusted World

Federal Outlays in the Sixties

Container Shipping

AUGUST 1970

A SEASONALLY ADJUSTED WORLD

THE CENSUS SEASONAL ADJUSTMENT TECHNIQUE

One of those anonymous seasoned observers of the economic scene allegedly said that, seasonally adjusted, the Great Lakes never freeze. Another commonplace is that a camel, seasonally adjusted, might well be a horse. In any event, the U. S. Department of Labor reported that the unemployment rate in January was 4.2%, but seasonally adjusted it was only 3.9%. It later reported that the Consumer Price Index increased at an annual rate of 7.2% in April, but that the seasonally adjusted rate was only 6%. It is probably of precious little consolation to the consumer when he purchases groceries to know that part of the rising prices is only seasonal in nature, but the knowledge should help him to plan his future purchases. The business conditions analyst, on the other hand, finds it essential to know whether a given rise in prices is seasonal in nature. The seasonality of price changes even affects his forecast of economic policies, for if prices are likely to fall later in the year, policy makers would not be expected to impose any new anti-inflationary measures.

As a general rule, policy making is greatly influenced by seasonal adjustment procedures. A policy maker or business analyst needs to know whether an increase or decrease in a series of business data is seasonal in nature or whether it might indicate a longer-term tendency of the economy. A business strategy designed to cope with long-term tendencies might well be different from one designed to remedy seasonality. For example, one would expect dog sled sales in July to be less than in January. A policy prescription to remove some of the seasonality in those sales might be aimed toward finding some summer use for a dog sled. On the other hand, if sales are falling below what would be expected after allowing for seasonal influences, a different set of forces are probably responsible for the decline. This set of forces could include such things as declining consumer income, relative price and cost changes, changes in consumer tastes (away from dogs toward snowmobiles), etc.

In recent months some problems associated with seasonal adjustment have received attention in the financial press. In particular, the accuracy of the seasonally adjustments for automobiles and retail sales series was questioned. Last fall, the earlier introduction of new model automobiles necessitated a reexamination and revision of the seasonal adjustment factors for automobile sales. Until new factors were published, it was difficult to find much meaningful information in the data. The retail sales series seems to be subject to chronic seasonal adjustment problems. Since retail sales are influenced by unusual weather, holidays, and other special events, it is often difficult to isolate the regular seasonal influences in the data. In any event, the recent problems in interpreting economic data because of seasonal difficulties have pointed out how important it is to be aware of what is behind the statistical technique that is called seasonal adjustment.

Most persons have a general idea of the meaning of seasonal adjustment. However, it is easy to forget the many assumptions and technical considerations that lie behind the statistical processes that convert raw data into seasonally adjusted data. In an effort to make this information more readily available, this article will describe some general principles of seasonal adjustment. Then its focus will turn to a technique of seasonal adjustment which is probably used more often on economic data than any other—the U. S. Department of Commerce, Bureau of the Census' X-11 Variant of Census Method II. The name "X-11 Variant of Census Method II" actually refers to a computer program which is used by the Census Bureau to adjust economic data for seasonal influences. The X-11 program is also available to other users and is widely used throughout the country.

The discussion of X-11 relies in no small measure on the technical papers published by the Bureau of the Census which are listed at the end of the article.

SEASONALLY ADJUSTING A TIME SERIES

A time series is the name given to any series of data regularly spaced over time. The variation in such a series is conventionally assumed to reflect trend, cyclical behavior, seasonal behavior, and irregular influences. The trend and cycle components reflect the longer-term tendencies of the series, whereas the seasonal and irregular components reflect the shorter-term variation.

Suppose that the time series to be adjusted is daily ice cream sales by the neighborhood vendor. An examination of his daily sales statistics over several years should show changes in sales attributable to long-term influences like increasing population in the area or the changing makup of the population, or changes in disposable income. The ice cream sales data also will show regular fluctuations at given times of the year. More ice cream will obviously be sold during the warmer months. These regular fluctuations make up the seasonal component of the time series. Short, erratic upturns or downturns in sales can be caused by any number of events from flat tires to parades. Such short and erratic fluctuations make up the "irregular" component of the time series.

The task for any seasonal adjustment technique is to isolate the seasonal variation by removing the trend, cycle, and irregular components from the original series. The resulting set of seasonal factors or seasonal index numbers reflects the seasonal variation in the data and may be used to remove the seasonal influences from the original raw data.

Almost every seasonal adjustment technique in regular usage employs some kind of moving average. A moving average is simply an average that moves forward one period at a time, dropping one term and adding another. This technique has the property of smoothing the fluctuations in the data. For example, to smooth the irregular jumps in a series like domestic automobile sales, which is published for ten-day intervals, a three-term moving average of the ten-day sales periods might be utilized. The average of the first three periods would be computed, and the resulting figure would represent the automobile sales for the second ten-day period. Then, sales in the second, third, and fourth time periods would be averaged and the average used to represent sales in the third period. This simple process is repeated, moving forward one period at a time, as long as data are left to average.

In the event that the period of the moving average consists of an even number of terms, the average is not centered on a particular term. It must be centered by again averaging each pair of averages. This procedure is illustrated in the accompanying table.

After the "placement" or "centering" problem is solved and the moving average is satisfactorily determined, each average term is divided into the original number for its corresponding time period. Since each term of a 12-month (or 4-quarter) moving average includes data from an entire year, it is unaffected by seasonal and most irregular influences and can be used to trace the longer-term movements in the series. When the original data are divided by the corresponding moving average value, the resulting ratio, therefore, reflects the seasonal and irregular variation in the data. The long-term variation is occasionally removed by subtracting the moving average value from the original data, but usually the components of the time series are assumed to be related multiplicatively so the long-term variation is most often removed by division. This technique of dividing by the moving average is called a ratio-to-moving average method. To convert the resulting ratios into a series of index numbers, they are multiplied by 100.

The table illustrates these techniques using quarterly data on auto sales. The first column shows the original data; the second shows the results for the four-term moving average placed between the quarters; the third column shows the centered moving average (a two-term average of the second column); the fourth column shows the seasonal-irregular factors (or ratios); and the last column shows stable seasonal factors. These were derived by averaging the seasonal-irregular (SI) ratios by quarter in order to remove the irregular variation. For the data in Table I, the seasonal factor for the first quarter would thus be calculated to be 0.975, the average of 0.936 and 1.005.

Suppose, for example, that six years of monthly data are to be used to determine the seasonal changes in a series of economic data. After calculating the moving average and the ratio-to-moving average series, a series of five years of monthly seasonal-irregular ratios will result. This is true because data are lost for the first half of the first year and the last half of the last year when the 12 month moving average is calculated. The adjustor can then average the five SI values for each month to remove any irregular (random) jumps in the series. Normally, the median is chosen in this procedure to remove the sensitivity to extreme irregular values. The result is a series of 12 seasonal ratios, one for each month.

This method of seasonal adjustment is also based on the assumption that the seasonal pattern in the data remains stable over the time period. In the real world seasonals are rarely stable, and most procedures in actual use are designed to allow for changing seasonality. Thus, those techniques would supply 60 instead of 12 seasonal ratios for the 5 years of monthly data.

Since one of the principles of seasonal adjustment is that strictly seasonal patterns should average out over the course of a year, monthly seasonal ratios should add to 12 (to average one). In other words, seasonal adjustment should not affect the annual total. If the year's ratios do not average to one, they are adjusted so that they will, usually by multiplying each ratio by a constant adjustment factor.

AUTOMOBILE SALES

Millions of Autos at Annual Rates Not Seasonally Adjusted*

	1 Automobile Sales[1]	2 Four-Term Average	3 Centered Average	4 Seasonal-Irregular Factors[2]	5 Seasonal Factors[3]
1967					
First Quarter	6.17				
Second Quarter	8.94				
		7.37			
Third Quarter	6.77		7.61	0.890	0.894
		7.85			
Fourth Quarter	7.58		7.90	0.959	1.023
		7.93			
1968					
First Quarter	8.09		8.05	1.005	0.971
		8.17			
Second Quarter	9.29		8.40	1.106	1.101
		8.63			
Third Quarter	7.74		8.63	0.897	0.894
		8.63			
Fourth Quarter	9.40		8.65	1.087	1.023
		8.66			
1969					
First Quarter	8.11		8.66	0.936	0.971
		8.65			
Second Quarter	9.38		8.56	1.096	1.101
		8.46			
Third Quarter	7.70				
		8.22			
Fourth Quarter	8.64				

* Computed using monthly figures.
[1] New car sales by U. S. franchise dealers.
[2] Column 4 equals Column 1 divided by Column 3.
[3] Column 5 shows average of each quarter's ratio in Column 4.
Note: Figures derived from data published in **Ward's Automotive Reports.**

THE X-11 VARIANT OF THE CENSUS METHOD II SEASONAL ADJUSTMENT PROGRAM

The procedure outlined above is a simple seasonal adjustment procedure. The actual procedures used by those who have access to large-scale computer facilities are considerably more complex. The Bureau of the Census' computer program, the X-11 Variant of the Census Method II Seasonal Adjustment Program, is used quite often to adjust series of monthly economic data. In fact, the technique is used to seasonally adjust almost all monthly economic data published by the U. S. Government and is in widespread use throughout the world for adjusting aggregate and even company level data. The method is more complex, mainly because of all the practical problems which arise in moving from the rarified atmosphere of the theoretical into the real world of practical application. Among these practical problems are:

1. Differences in the number of "trading" or "working" days in various months. For example, one month might contain five Sundays and four Saturdays; another might contain only four of each.
2. Special influences attributable to holidays coming at different dates in different years, e.g., the effect of Easter on retail sales.
3. Irregular changes, such as a different introduction date for a new model automobile, unseasonable weather, and strikes.
4. Changing seasonal patterns over time.

The Prior Adjustment Factors The X-11 program allows the user to adjust for trading day differences by supplying a series of prior weights (or ratios) for the series before seasonally adjusting it. These weights can be calculated directly if daily figures are available or indirectly if they are not. They may be calculated from daily data by dividing each number by some measure to take out influences other than trading day variation. For example, one might use a seven-day moving average to get a series of daily adjustment factors, then remove the irregular jumps in the series either by averaging like days (Mondays, Tuesdays, etc.) or some other smoothing technique. Then a series of daily weights would be obtained which would be used to weight the monthly data. For example, if the day of the week weights for a particular month totaled 29.1 and since an average month has 30.44 days, the data for the month in question would be adjusted for trading day variation by multiplying it by a standardizing ratio, 1.046, which is derived by dividing 29.1 into 30.44. The data for the remaining months of the series would be adjusted in like manner.

Also, if daily data are available, the special influences of holidays may be calculated and incorporated into the monthly weights. The retail sales series around the Easter holiday provides a prime example of the holiday date problem since Easter comes on different dates in different years and since it has an important impact upon retail sales. In order to adjust a series of retail sales figures for Easter, one might get data on sales for the several weeks before and after Easter for a number of years. A series of Easter factors could then be developed which would be used to weight the raw data for the month or months involved to standardize the resulting series for Easter. Similar procedures could be used for other holidays.

The X-11 program allows the user to supply prior adjustment factors which can standardize for both trading day and holiday influences. Also, if a particular series of data includes irregularly recurring events, such as different model introduction dates, periods of unseasonable weather, strikes, etc., the prior adjustment factors can be designed to account for those disturbances in the series.

Factors to adjust for different model introduction dates can be estimated in a manner similar to the adjustment for Easter mentioned above. The other types of adjustment for the irregular events are more difficult and require an intimate knowledge of the series to be adjusted. It might be added that in addition to a rather detailed grounding in the data, the user also needs excellent judgment and no small measure of luck to weight properly the effects of these events. If an event such as a strike or bad growing season is nonrecurring but has an important impact upon the data series, the X-11 program can recognize the problem and ignore data from that time period in computing the seasonal factors.

Internally Generated Adjustments It is also possible to have the X-11 program calculate its own weights for monthly trading day differences. The calculations are based upon statistical properties of the data which allow the trading day differences to be inferred from them. This inferential process begins by removing long-term influences from the data by a ratio-to-moving average method to get a series of seasonal-irregular ratios. Preliminary seasonal ratios are then estimated by smoothing the irregular components out of the SI series. The seasonal influences are then removed from the SI series by dividing each SI ratio by its corresponding smoothed SI (or seasonal) ratio. The resulting set of irregular factors reflects the random or unpredictable influences in the data and also includes the regular variation in the data attributable to differences in the number of trading or working days per month.

To find the properties of the series which are regular and caused by trading day differences, each "irregular" factor is classified in one of 21 different categories depending upon the day of the week with which the month started and whether the month had 29, 30, or 31 days. A twenty-second category also exists to include 28-day months, but since each 28-day month has exactly four weeks, all such months are included in the same category regardless of the starting day.

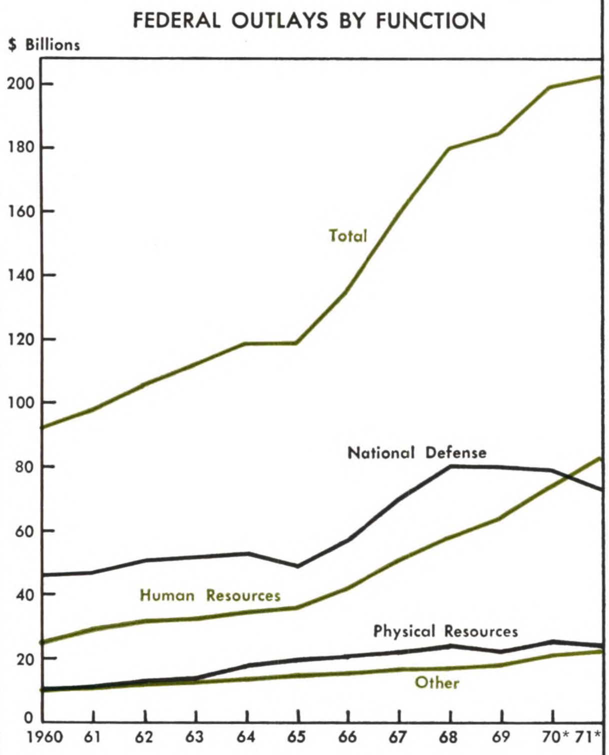
After putting each ratio in its appropriate category, the "extreme" irregular values (those way out of line with the other data) are ignored. A least squares regression technique is then used on the remaining irregular ratios to estimate the factor which would properly weight each of the 22 types of months for trading day differences. The weights are then statistically tested to find whether it is likely that they are due solely to chance. If not, they are used in the subsequent seasonal adjustment process.

The X-11 technique performs these operations automatically. After incorporating the prior weights into the original series, the computer operates on the weighted series to remove long-term and seasonal fluctuations, adjusts the resulting irregular series for extreme values, and then generates a set of weights for the irregular component. Since irregular series are mostly random, the standard deviation provides a measure of the likelihood that a particular value or range of values will occur. Using this concept, the irregular ratios are examined and those ratios which are not likely to be explained by chance alone are weighted, depending upon how unlikely they are, on a graduated basis from zero to the full weight. The extreme irregulars, therefore, are ignored in subsequent calculations because of their zero weight. The less infrequent irregulars are weighted more heavily, and all values which are probably not infrequent are given the full weight of one.

Actually, the X-11 program is designed to perform these operations even if prior adjustment factors are supplied. In that case, these final weights for the irregular component provide an internally generated means of removing extreme random influences which are not adequately covered by the prior adjustment

continued on page 8

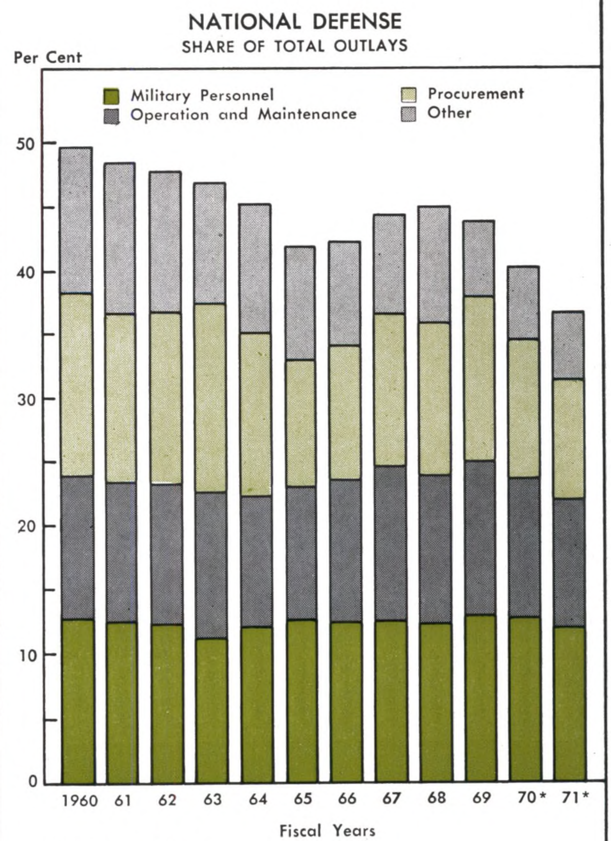
Federal Government outlays (expenditures and net lending) more than doubled in the sixties. Nearly one-half of the $93 billion increase took place between 1966 and 1968. Increasing outlays for national defense contributed heavily to the expansion. Spending for defense leveled off after 1968 while human resource programs continued to expand rapidly. This change in Federal spending priorities is expected to continue this fiscal year as human resource spending outstrips national defense for the first time since the 1930's. Expenditures for physical resource programs more than doubled in the sixties but remained low at about 12% of the total budget. The same is true of other outlays, primarily interest on the national debt, which accounted for about 10% of total outlays throughout the period.



*February estimates

Source: Bureau of the Budget.

The largest component of total outlays during the sixties was national defense. While expenditures for national defense increased $35.3 billion during the sixties, the relative importance of defense outlays declined from nearly 50% of the total budget at the beginning of the decade to only 44% in 1969; it is estimated that this figure will fall to 37% this fiscal year.



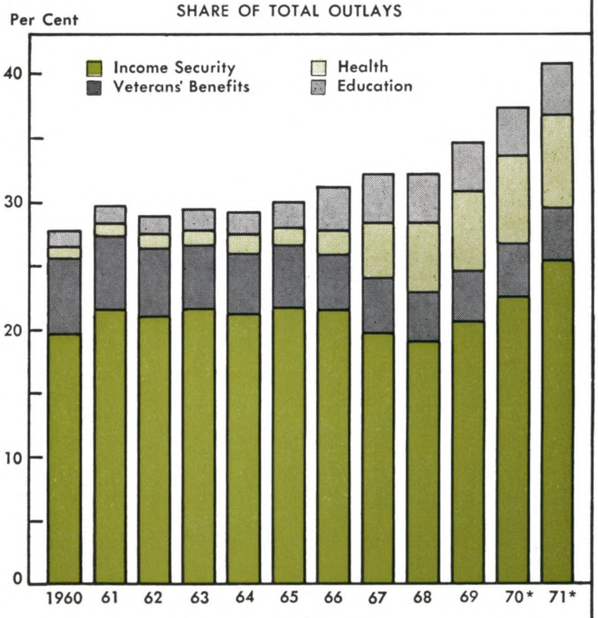
*February estimates.

Source: Bureau of the Budget.

IN THE SIXTIES

Outlays for human resource programs showed the most spectacular growth of the past decade, expanding by 150% and increasing from 28% of total outlays in 1960 to 34% in 1969. The largest component of this category is income security, primarily social security payments, which remained at about 20% of total outlays throughout the sixties. This figure is expected to climb to 25% this fiscal year as a result of more beneficiaries and higher benefits. Health and education expenditures increased substantially during the period while veterans' benefits declined in relative importance. The most rapid increase was in health programs associated with Medicare and Medicaid.

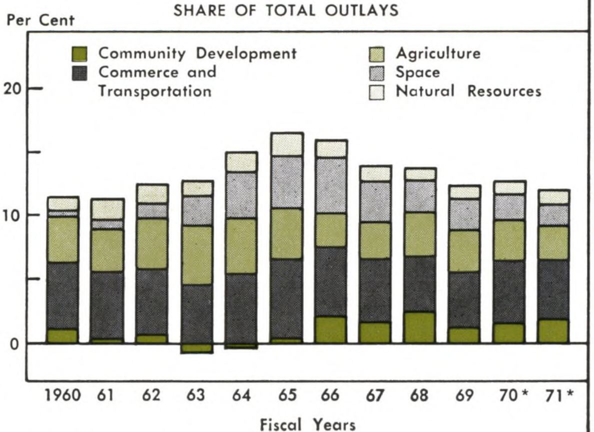
HUMAN RESOURCES
SHARE OF TOTAL OUTLAYS



*February estimates.

Source: Bureau of the Budget.

PHYSICAL RESOURCES
SHARE OF TOTAL OUTLAYS



*February estimates.

Source: Bureau of the Budget.

The relative importance of physical resource programs increased in the first half of the decade and then declined to about its original position. During the sixties net gains were made by community development, space, and natural resource programs while net reductions were registered in the areas of commerce and transportation and agriculture.

Wynnelle Wilson

A SEASONALLY ADJUSTED WORLD

continued from page 5

factors. The more usual situation encountered in actual practice, however, is one in which no prior adjustment factors are supplied. Extreme irregulars in the series would then be handled solely by these internal adjustment methods.

After the final weights are calculated, the X-11 program adjusts the original series modified by prior adjustment factors for extreme irregular variation. The resulting data (the series might be labeled MOXI for modified original with extreme irregulars modified) are used to prepare a set of final seasonal adjustment factors.

Developing the Final Seasonal Index A centered 12-month moving average is taken of the MOXI series, and the ratio-to-moving average method is used to derive a set of seasonal-irregular ratios. After smoothing the ratios to take out the irregular variation, the resulting seasonal factors are used to make a preliminary seasonal adjustment of the MOXI series.

The Census program then uses a rather sophisticated moving average type technique to smooth the preliminary seasonally adjusted MOXI series. The result is a smooth curve which represents trend-cycle or long-term fluctuations. This smooth curve is called the final trend-cycle component and is used to begin the final adjustment of the MOXI series. The final trend-cycle variations are removed from the MOXI series by dividing it by the final trend-cycle component, then the remaining seasonal-irregular values are smoothed with a weighted seven-term moving average to remove the irregular influences. The result is a series of seasonal factors.

Perhaps it might be emphasized that the X-11 technique, as opposed to less sophisticated techniques, generates a seasonal factor for almost every time period for which data are supplied, i.e., each August could have a slightly different seasonal factor. The seasonal factors are not identical for a given month unless there is a stable seasonal pattern in the series over the years. If, as is usually the case, the seasonality of the data gradually changes over time, those differences will be reflected in the set of seasonal factors generated.

Some data are lost because of the moving average techniques employed, but factors for the last months of the data span are estimated by extending the data into the future using averages of the last four seasonal-irregular ratios available for each month as new input for the moving average.

The ratios are then adjusted so that they will total 12 for the year and the final seasonal factors are finally determined. As soon as the factors are ready, they are divided into the original raw data and, voila, a final seasonally adjusted series results. Seasonals are also estimated for a year ahead by adding half the change in a particular month's factor from the preceding year to the current factor.

Some Commentary As is evident from the outline of the seasonal adjustment procedure given above, the adjustment of a time series for seasonal variation is not a simple task. The supplying of accurate prior adjustment factors requires a great deal of sophistication and familiarity with the data. Often, past data are simply not available to indicate how the figures behaved when they were affected by a strike, a tornado, or any of a myriad of nonrecurring events. Even if historical information is available, one might always question whether the data is affected in the same way now as then. The effect of a strike on production of automobiles, for example, depends upon such factors as how well and for what length of time the strike was anticipated by the industry.

For these reasons, the X-11 program normally isolates data affected by events such as these and ignores such data in subsequent calculations. It should be made clear that in so doing X-11 usually provides quite serviceable seasonally adjusted data. Analysts have come to rely on these data to help them in their business and economic research. As time passes and more basic data of better quality become available, the seasonal adjusted data can be expected to give ever more accurate portrayals of the basic nonseasonal tendencies and patterns in economic and business statistics.

William E. Cullison

REFERENCES

Shiskin, Julius, **Introductory Comments,** Seasonal Adjustment Seminar, National Association of Business Economists, March 10, 1969.

Somer, Morton, **The X-11 Variant of the Census Method II Seasonal Adjustment Program—Description of the Standard Output,** National Association of Business Economists' Seminar on Seasonal Adjustments, Philadelphia, March 10, 1969.

U. S. Bureau of the Census, **The X-11 Variant of the Census Method II Seasonal Adjustment Program, Technical Paper No. 15, (1967 revision),** U. S. Government Printing Office, Washington, D. C., 1967.

CONTAINER SHIPPING

The scramble into container shipping over the past five years is spawning broad changes in sea transportation with effects that reach beyond the docks to the railroad and trucking industries. Containerization is the shipping industry's version of mass production. In sharp contrast to conventional shipping techniques under which cargo has to be repacked for each different carrier along its route, a packed container can be shuttled back and forth between carriers with no handling of its interior cargo. Moreover, containers can be maneuvered quickly and efficiently by machines, avoiding the labor intensive methods of moving break-bulk cargo.

Halting Beginnings Container shipping in the United States is approximately 14 years old. The Pan-Atlantic Steamship Company began carrying semi-trailers to Atlantic Coast ports between New York and Puerto Rico in 1956 on modified T-2 tankers. At that time trailers were also being shipped along the Pacific Coast from California to Alaska and from California to Hawaii. The United States Army used containers to ship equipment to Korea in the 1950's and currently uses them in shipping supplies to Viet Nam. Container shipping thrived in U. S. coastal trade for a decade before entering international trade. The transatlantic shipping lines knew the merits of containerization but hesitated to sink large amounts of capital in new ships and containers until goaded by the press of competition.

The fillip came in 1965 when Sea-Land Services, formerly the Pan-Atlantic Steamship Company, announced that it would initiate container shipping in the lucrative North Atlantic trade which includes a high proportion of containerizable cargo. Unwilling to lose part of their market, the major Atlantic shipping lines rapidly began to plan for containerized operations.[1]

Container Characteristics The container itself is a large rectangular box made of steel, aluminum, or plywood. It must be strong enough to withstand heavy weather at sea and rough handling on land while bearing heavy loads. Containers are usually eight feet high, eight feet wide, and come in lengths of multiples of ten feet. Those most commonly used are either 20 or 40 feet in length. The 40-foot container is particularly popular with truckers because it enables them to take maximum advantage of their carrying capacity.

Aluminum is popular in container construction because it is approximately 20 per cent lighter than other container materials. For truckers who must observe over-the-road weight limits, this reduction in non-productive weight is an important source of profits.

Many ingenious methods have been devised to get cargoes into containers and stabilize them for heaving sea voyages. Some containers open at the end, some at the side, and others from the top. They are designed for a variety of cargoes: refrigerated perishables, bulk liquid, dry bulk, pressure tanks, and dry general cargo.

The container shipment is a better security risk than break-bulk cargo from the insurance underwriter's viewpoint. Once it is packed and locked at the point of departure, the container is not opened until it reaches its final destination, making it attractive for shipping high value cargo. However, in the event one exporter is unable to fill a container, a freight forwarder can consolidate his shipment with some other cargo to take full advantage of the space.

Port Facilities The challenge of containerization was no less urgent for Europeans and American ports that depended on the Atlantic commerce. They had to build modern terminals in preparation for the container traffic and to avoid losing business to competitors. The special crane which hoists containers to and from the ship costs \$1 million. The specialized, berth, including installation of equipment, pile driving, and paving costs approximately \$6 million. In addition, a large backup area adjacent to the berth is needed for the temporary storage and sorting of containers in transit.

The Port of New York was well ahead of other East Coast ports when the race began in 1965. In that year one container terminal on Newark Bay had been completed and others came into service soon thereafter.

For the small port with light traffic, the question of developing for container freight poses a serious dilemma. Should it forego the development and risk losing part of its business to competitors; or should it invest and risk not being able to provide enough cargo to lure the containerships? Many small ports are hedging the bet by only adding to their break-bulk capacity one container berth, or a larger crane. With this strategy they can continue to handle

---

[1] This article is indebted to the *Journal of Commerce* for information contained in its excellent series on containerization.

break-bulk shipments and also be prepared for occasional container traffic.

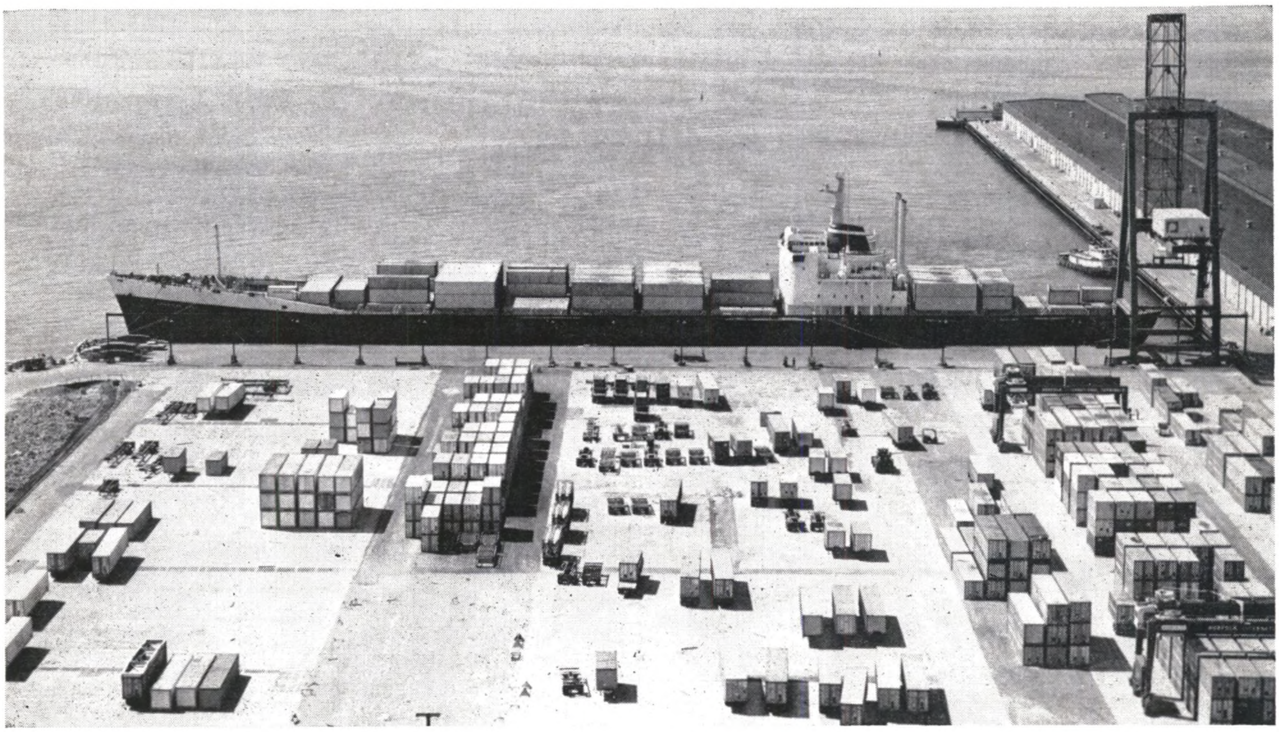
Terminal facilities for handling containers in the Fifth Federal Reserve District are located in Baltimore, Hampton Roads, Morehead City, Wilmington, and Charleston. The Dundalk Marine Terminal in Baltimore Harbor has two container berths in operation with five more to be in service by 1976. Hampton Roads has four container berths serviced by an equal number of rail-based cranes and is the first port where trains can come directly to the terminal to transfer containers. Large gantry cranes are used to move containers on the open docks at Morehead City and Wilmington; Charleston will have a new container terminal in operation by February 1971.

Impact on Ship Design The shipping company that undertakes container operations can remodel a conventional cargo ship or buy a newly designed containership. Either approach is costly. The U. S. Lines's *American Legion,* for example, cost $18 million. It is 700 feet long, can carry over 1,000 containers, and has a service speed of 24 knots. Such ships are constructed with large hatches through which containers, guided by rails, can be lowered into the hold. The rails also secure the containers during the voyage. The decks are wide enough to accommodate additional containers stacked six high A second type of containership which is popular is the roll-on roll-off ship, which has ramps so that trailers can be driven onto the ship in the same way a ferry is loaded.

Impact on Labor Demand The job of longshoreman has traditionally been to sort, load, unload, and store the cargo either in the hold or on dock. Approximately 100 men must work for a week both to unload and to load the conventional cargo ship. In contrast, 40 men can do the same job in only 24 hours using a large container crane. One crane can move a 35-ton container from ship to shore in 2½ minutes—a job that would require 20 man hours if handled as break-bulk.[2]

The changes in methods of cargo handling brought about by containerized operations have caused friction with longshoremen's unions whose jobs are threatened. Instead of one gang per hatch on a 5-7 hatch ship, only two gangs are needed. Furthermore, the packing of cargo for the ocean voyage which longshoremen have traditionally performed on the docks can now be done hundreds of miles inland from

[2] Goldberg, Joseph P., "Containerization as Force for Change on the Waterfront," *Monthly Labor Review,* Vol. 91, January 1968, p. 8.



Photograph courtesy of Virginia Port Authority.

port. The inland exporter can pack his container, which is then brought via truck or train to the dock and hoisted aboard with longshoremen never touching the interior cargo.

The shipping companies and longshoremen's unions worked out an agreement in the early sixties whereby the companies would pay into a union fund part of the savings they made by using containers. In return, the unions consented to reductions in the number of gangs per ship and agreed to move the containers. A further aspect of the agreement was a penalty to be paid by the companies for any containers consolidated within a 50-mile radius of the port by non-members of the longshoremen's unions.

Turnaround Time The conventional cargo ship is in port much of the time, where it earns nothing. Revenues are lost by lengthy stays, and the effectiveness of improved ship power plants and navigational equipment are reduced. By comparison, the containership has a fast turnaround time which makes it more desirable from the ship owner's point of view. The containerships which move Army supplies to Viet Nam are in and out of Da Nang harbor in less than 24 hours, an increase in speed which has enabled the Department of Defense to reduce air freight contracts and return some old freighter ships to moth balls. Another example of faster turnaround is given in the freighter trip from Japan to the West Coast of the United States. Twenty-five days were required for a conventional cargo ship to make the trip, including 12 days in port. Containerships make the journey in 15 days of which only three are spent in port.

The shipping lines would like to take advantage of the rapid turnaround and increase the utilization of their container vessels by reducing the number of port calls. Then while the conventional ships chug in and out of ports looking for cargo, the containership would get a full load on one or two calls. With this goal in mind, some containership operators are waging a campaign to have inland traffic channeled into a small number of advantageous ports. One approach is to send a ship around to collect containers from small ports and then transfer them to a containership at the major port of call.

Cutting the Red Tape The advent of containerization has had considerable impact on the paper work attending cargo shipment. Under traditional shipping procedures separate sets of papers had to be prepared each time the cargo was received by a different carrier. This has been a source of considerable delay. The primary advantage of containerized shipments is rapid delivery, and to maximize this advantage advocates of containerization are trying to reduce the paper work. Shipping representatives from many countries have been meeting in Geneva to develop a simplified piece of paper which would replace the Bill of Lading in that it would be written out when the container was packed and would serve the needs of all through carriers, insurers, and bankers.

The new method of shipping presents challenges to the Customs Bureaus in many countries with container ports. In the past incoming shipments have been inspected at the port of entry, a procedure which will probably change where containers are not opened until traveling many miles inland from port. To avoid hindering the rapid travel of containers, the United States Customs Bureau is considering the establishment of regional inspection stations near heavy users of containers. Provisions are also being made for the temporary duty-free entry of containers which are to be re-exported within three months. Freer movement of containers without inspection or the posting of bonds has also been arranged.

Summary Despite its slow start container shipping has caught on in transoceanic commerce. Since 1965 ports and shipping companies on all major ocean trade routes have been preparing for container traffic. The facility with which containers can be moved by machines permits speedy delivery of cargoes and provides their major advantage over traditional methods of handling cargoes. The rapid transit of the container has meant increased productivity for all carriers involved and less waiting for consignees.

Robert W. Chamberlin