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APPENDIX E

NEW ORDERS AND SHIPMENTS FOR INDUSTRIAL SUBDIVISIONS, 1948-62

I. Measures of Relative Timing

Table E-1 presents measures based on the most detailed industry breakdown available for the OBE data of the pre-1963 vintage. This analysis had been completed before the revision that produced the current Census series going back to 1953. The older series begin for the most part in 1948 and end early in 1962. They suffer from the smallness of some of the samples and the difficulty of assigning to relatively narrow industry categories the dollar figures reported by multi-product companies. Figures on this level of disaggregation are not published, and only restricted use could be made of them, in compliance with the wishes of the compiling agency.¹ But the comparability of the paired series is not in question, and, with proper caution, they are believed to deserve attention for the limited purpose of this analysis.

Primary Metals

Table E-1 groups the industrial subdivisions of the detailed OBE set by the major durable goods industries as listed in Tables 4-5 and 4-6, thereby facilitating comparisons between these tables; but in making such comparisons the very unequal weights of these subdivisions must be taken into account. Thus within the primary metals group, iron and steel, being about twice as large, in terms of the average levels of orders or sales, as the other two component industries taken together,

¹ In particular, I am not at liberty to reproduce the charts on which the following analysis is based, although references to them must be made to describe the behavior of the series. In footnotes attached to Table 4-6 I point out the significant difficulties that have been encountered in dating the turning points in the series; the charts are available to support the decisions made.

Table E-1
 Timing of Value of New Orders at Turns in Shipments, by Business Cycle Turning Zones,
 Thirty-one Industrial Subdivisions of Manufacturing, 1948-61

Industry	Lead (-) or Lag (+) in Months of New Orders at Turns in Shipments in Turning Zone Associated with													Av. Lead (-) or Lag (+) in Months				
	1948		1949		Korean War ^a		1953		1954		1957		1958		1960		1961	
	Reces- sion: Peak (1)	Re- sion: Trough (2)	Reces- sion: Peak (3)	Re- sion: Trough (4)	1950- 52: Peak (5)	1951- 52: Trough (6)	Reces- sion: Peak (7)	Reces- sion: Trough (8)	Reces- sion: Peak (9)	Reces- sion: Trough (10)	Reces- sion: Peak (11)	Reces- sion: Trough (12)	Reces- sion: Peak (13)	Reces- sion: Trough (14)	Reces- sion: Peak (15)	Reces- sion: Trough (16)	Reces- sion: Peak (17)	Reces- sion: Trough (18)
PRIMARY METALS																		
1. Iron and steel	-1	-1	-4	0	0	0	-11	-2	-1	-4	-9	-2.2	-4.4	-3.3				
2. Primary nonferrous metals	0	+1	-4	0	-1	0	0	+1	0	-2	-3	-1.2	+0.8	-0.2				
3. Other primary metals	-6	-4	-7 ^b	0 ^b	0	-7	-1	-3	-3	-3	-3	-3.4	-3.4	-3.4				
FABRICATED METAL PRODUCTS																		
4. Heating and plumbing ^c	n.i.	-7 ^d	-1 ^d	-4 ^d	-6 ^d	-12 ^d	+2	-4	-1	-8	-2.8	-6.0	-2.8					
5. Structural metal work ^c	n.i.	-7 ^d	-1 ^d	-4 ^d	-6 ^d	-12 ^d	+3	-6	-7	-4	-3.5	-5.0	-3.5					
6. Tin cans and other ^c	n.i.	-7 ^d	-1 ^d	-4 ^d	-6 ^d	-12 ^d	-3	-2	-2	-1	-2.0	-1.5	-2.0					
ELECTRICAL MACHINERY																		
7. Electrical generator apparatus	-4	-2	n.s.	n.s.	-2	-7	0	-1	+5	+7	-0.2	-0.8	-0.5					
8. Radio, TV, and equip.	+4	-6	0	+3	0	-2	-1 ^b	0	n.i.	n.i.	+0.8	-1.8	-0.5					
9. Other electrical equip.	n.i.	-11	n.s.	n.s.	-4	-7	0	0	0	-8	-1.2 ^e	-6.5 ^e	-4.3 ^e					
MACHINERY EXCEPT ELECTRICAL																		
10. Metalworking mach.	n.i.	-6	-15	n.t.	n.t.	-17	-13	-1	n.s.	n.s.	-14.0	-8.0	-10.4					
11. General mach.	-3	-4	-7 ^b	-2 ^b	-5	-7	-8	-6	+3	-4	-4.0	-4.6	-4.3					

12. Special mach.	n.i.	-7	-6	0	n.i.	n.i.	-5	-9	n.s.	n.s.	-5.5	-5.3	-5.4
13. Engines and turbines	n.i.	-2	n.s.	n.s.	-23	-1	-20	-8	-6	-3	-16.3	-3.5	-9.0
14. Construction mach.	n.i.	-7	-8	-1 ^b	0 ^b	-6	-10	0	-8	0	-6.5	-2.8	-4.4
15. Office and store machines	n.i.	-7	-4 ^r	0 ^r	-4	+1	n.s.	n.s.	-2 ^b	+3 ^b	-3.3 ^e	-0.8 ^g	-1.9 ^e
16. Agricultural implements	-1	-1	0	n.t.	n.t.	-3	-1	0	-2	n.i.	-1.0	-1.3	-1.1
17. Household and service appliances	n.i.	-1	^h	^h	+1	-11	-4	0	-5	-2	-2.7	-3.5	-3.1
18. Other mach. and parts	n.i.	-6	n.s.	n.s.	0	-5	-9	-5	-5	-2	-4.7	-4.5	-4.6
TRANSPORTATION EQUIPMENT													
19. Motor vehicles	n.a.	n.i.	+5	-5 ^b	-13 ^b	-10	-3 ^b	0	-1	0	-3.0 ¹	-3.8 ¹	-3.4 ¹
20. Motor vehicle parts and accessories	-1	-6	-6 ^b	0 ^b	-3	+9	-9 ^b	-1	-4	+1	-4.6 ¹	-3.0 ¹	-3.8 ¹
21. Aircraft	n.a.	n.s.	n.s.	n.s.	-10	n.m.	-14	-11	n.o.	n.o.	-12.0	-11.0	-11.7
22. Other nonautomotive transportation equip.	n.a.	-12	n.s.	n.s.	-5 ^b	-12	-8 ^b	-3	n.i.	n.i.	-6.5	-9.0	-8.0
OTHER DURABLE GOODS INDUSTRIES													
23. Lumber ¹	-2 ^k	-2 ^k	0 ^k	-3 ^k	-2 ^k	-1	-2	0	0	-1	-2.0	-0.7	-1.2
24. Furniture ¹	+2	+4	-2	-6	0	0	-6	0	0	0	-1.0	-0.3	-0.6
25. Stone, clay, and glass prod.													
26. Professional and scientific instruments ¹													
27. Miscellaneous incl. ordnance ¹	n.i.	-5 ¹	-2 ¹	+2 ¹	-11 ¹	-3	-2	+1	+2	+1	0	-0.3	-0.2
NONDURABLE GOODS INDUSTRIES REPORTING UNFILLED ORDERS ^m													
28. Textile-mill prod.	-2 ^b	-5	-4	-7	-1	-1	-6	-2	-5	-6	-3.6	-4.2	-3.9
29. Leather and leather prod.	-2	-5	0	-3	0	-3	+1	-5	-2	n.i.	-0.6	-4.0	-2.1
30. Paper and allied prod.	-7	0	-4	-3	-3 ^b	+1 ^b	0	+4	n.t.	n.t.	-3.5	+0.5	-1.5
31. Printing and publishing	n.t.	n.t.	n.t.	n.t.	n.t.	n.t.	+1	+1	-1	0	0	+0.5	+0.2

Notes to Table E-1

n.a. = data for new orders not available.

n.i. = not identified (timing of new orders and/or sales uncertain).

n.m. = not matched.

n.o. = no turn in new orders at this recession or revival.

n.s. = no turn in sales at this recession or revival.

n.t. = no turning points at this recession or revival.

^a These pairs of peaks or troughs represent "extra" turns, not related to a cyclical recession or revival recognized in the National Bureau chronology.

^b Based on minor but well-established turns in new orders and/or shipments. Included in the averages.

^c The series for these components of the fabricated metals industry have been seasonally adjusted for the NBER by the Census electronic-computer method.

^d Timing measures for total fabricated metal products. Not included in the component-industry averages of lines 4-6, columns 11-13.

^e Two timing comparisons can be made for this industry in addition to those listed in the table, since the series declined between February-March 1955 and March 1956. If these comparisons (+1 for peaks, 0 for troughs) were included, the averages would read -0.8, -5.2, and -3.2 for peaks, troughs, and all turns, respectively.

^f The turns in shipments mark a retardation here rather than a contraction, but the observations are sufficiently firm to be included in the averages. (The series show pronounced upward trends.)

^g Two timing comparisons can be made for this industry in addition to those listed in the table, since the series declined briefly in the second half of 1955. If these comparisons (-2, -2) were included, the averages would read -3.0, -1.0, and -1.9 for peaks, troughs, and all turns, respectively.

^h Both series declined in the second half of 1950 and the first half of 1951, but their relative timing is uncertain because of double-turn configurations. However, roughly coincident patterns or short lags of new orders are suggested. Taking them into account would lead to somewhat smaller average leads than those shown in the table.

ⁱ Two timing comparisons can be made for this industry in addition to those listed in the table, since the 1955-58 declines in new orders and sales were interrupted by short but marked increases in the second half or last three quarters of 1956. These additional comparisons and the averages which would include them are:

	Lead (-) or Lag (+) at		Av. Lead (-) or Lag (+) Incl. Additional Comparisons		
	Troughs 1956	Peaks 1956-57	Peaks	Troughs	All Turns
Motor vehicles	-2	0	-2.8	-3.0	-2.9
Motor vehicle parts and accessories	-3	-2	-4.3	-2.8	-3.6

^j The series on new orders for these industries begin in 1953 and their timing at peaks corresponding to the 1953 recession cannot be determined. For the earlier years data are available on lumber and furniture (combined) and on professional instruments and miscellaneous including ordnance (combined). The series for new orders have been seasonally adjusted for the NBER by the Census electronic-computer method.

^k Timing measures for lumber and furniture. Not included in the component-industry averages of lines 23 and 24, columns 11–13. Included in the turning-zone averages of line 28, columns 1–5.

^l Timing measures for professional and scientific instruments and miscellaneous including ordnance. Not included in the component-industry averages of lines 26 and 27, columns 11–13. Included in the turning-zone averages of line 28, columns 2–5.

^m The series for new orders in this group, and the series for leather shipments, have been received from the Department of Commerce in seasonally unadjusted form only. They have been seasonally adjusted for the NBER by the Census electronic-computer method.

influences the over-all results most strongly. In primary nonferrous metals, shipments follow new orders closely with short lags, while in the other two industries *N* and *S* show larger amplitude and timing differences.

The dates of the major steel strikes are marked by precipitously low levels of shipments for the iron and steel industry: October 1949, June–July 1952, July 1956, and August–October 1959. New orders also show declines in these months but much smaller ones. In 1949 and 1952 the strike months were surrounded by sufficiently low and broad valleys in these series to qualify as specific-cycle troughs. In 1956 and 1959, however, this was not the case, despite the particular gravity of the 1959 strike. In 1952, 1956, and especially in 1959, new orders reached very high levels in some of the months preceding the strike, indicating intensified protective purchasing in anticipation of the work stoppage. However, in 1949 there is little evidence of such precautionary buying. The 1959 strike was followed by a strong but very brief recovery in new orders for iron and steel products. Apparently the users soon found that, given the signs of weak demand ahead, their steel inventories, greatly expanded due to the prestrike buying hike, were still ample. This gave rise to much concern about the “steel cycle.” Similar but much weaker developments took place in connection with the two earlier strikes, particularly that of 1952.

The steel strikes left relatively weak impressions on the other components of the primary and fabricated metals industries, according to our orders and sales data.

Fabricated Metal Products

Of the three components of the fabricated metal products group, heating and plumbing is the smallest, structural metal work the inter-

mediate, and tin cans and other the largest. The latter shows the smallest divergences between N and S and the shortest order leads of the three. The heating and plumbing subdivision includes construction materials and equipment, items which are produced largely to stock (such as sanitary ware and oil burners; see Table 4-2). Structural metal work, on the other hand, includes some important products made mainly to order and with much longer delivery periods (such as fabricated structural steel; see Table 4-1), although it contains a variety of standardized metal items for buildings as well. The records for the components of the fabricated metals group are still too aggregative and too short (they begin in 1955) to bring out these distinctions well.

Electrical Machinery

Radio, television, and communications equipment constitute the largest component of the electrical machinery group. New orders and shipments for this industry show strong upward trends, substantial declines in 1951 and 1953-54, and very mild cyclical fluctuations in 1956-62. There is much jagged month-to-month movement in new orders around the fairly smooth shipments series but larger and more systematic divergences seem to have occurred only in the early Korean period and in 1953-54. The timing of the two series is, by and large, approximately coincident, as might have been expected. The rest of the electrical machinery group consists in large part of products used by industry rather than households; electrical generating and transmission equipment, the second largest component of the group, is, of course, entirely of this nature. Here a few longer order leads are encountered, but coincidences and short leads are more common (and there are also a couple of disturbing lags). Most of the average measures are rough coincidences. The charts indicate that new orders and shipments became generally much more similar in the second half of the period than they were in the first, and this behavior is reflected in the greater frequency of the coincidences.

Machinery Except Electrical

The N - S relationships in the subdivisions of the nonelectrical machinery group vary a great deal. The differences apparently mainly reflect the contrast between heavy made-to-order industrial machinery and standardized types of equipment and appliances.

Metalworking machinery, the largest of the components, in which sales grew rapidly in the early 1950's and again after 1958, shows very long leads on three out of five occasions (two at peaks). This industry produces mainly machine tools, for which we have long separate records confirming the tendency of new orders to turn down well ahead of the peaks in shipments (Table 4-1). However, metalworking machinery orders and shipments moved quite closely together after mid-1958, incidentally skipping the 1960 contraction. No similar development can be observed in engines and turbines, the only other machinery industry with very long order leads. In this, the smallest of our components of the nonelectrical machinery group, new orders show very large irregular month-to-month movements but also large cyclical fluctuations around the contrastingly smooth sales.

General and special industrial machinery, two components of intermediate and similar size, have average leads of new orders exceeding four and five months. These summary figures may understate somewhat the typical leads here, especially for special industrial machinery (judging from the frequency of longer leads). A similar statement can be made for construction machinery and other machinery, where the means are also somewhat larger than four months.²

In household appliances and service-industry machinery, the leads of new orders appear to be relatively short, particularly toward the end of the period covered; the average lead here is about three months. Finally, at the other end of the scale from metalworking and engines and turbines are office and store machines and agricultural implements, in which new orders lead shipments by mean intervals of only 1 to 2 months. The former is an industry with a rapid growth in sales interrupted only by mild fluctuations. Except in 1948-49 and the early Korean period (1950-51), the divergences between *N* and *S* are small. They are much larger, both cyclically and month-to-month, in agricultural implements, where the series show less growth and more fluctuations, but the leads of orders are consistently short.

² Other machinery, a sizable category, comprises valves and fittings, fabricated pipe, ball and roller bearings, and machine shops (jobbing and repair). It is industry group 359 in the 1945 Standard Industrial Classification (the OBE series here used are derived from Internal Revenue Service classifications, which are based on the 1945 SIC). Ranked by the average monthly value of new orders in 1961, this industry is the third largest in the nonelectrical machinery group, following metalworking and agricultural machinery. Special and general industrial machinery rank fourth and fifth, office machines and household appliances sixth and seventh, construction and mining machinery eighth, and engines and turbines ninth.

Transportation Equipment

In the transportation equipment group, motor vehicle orders are particularly difficult to interpret, as noted in Chapter 4. Also, their relation to shipments in the earlier part of the period is blurred. Separating manufacturers of complete motor vehicles from those who turn out only parts and accessories shows that these irregularities relate to the former, not the latter. After 1955, the two series for motor vehicles followed a closely similar course. In parts and accessories, the relation has been more consistent throughout, with new orders fluctuating more and moving ahead of shipments. Here too, however, some tendency toward shorter leads and smaller differences in amplitude is visible in the second half of the period.

In aircraft, there is a striking contrast between the huge cyclical and month-to-month fluctuations of new orders and the smoothness of the value of shipments. When converted to quarterly values, the OBE series resemble closely the Census-Civil Aeronautics Commission series shown in Chart 4-1. The data confirm that aircraft account for the bulk of total nonautomotive transportation equipment and are mainly responsible for the behavior of new orders and shipments in that division as a whole (see Chart 3-4). The leads in the monthly series can be established only crudely because of the large erratic component in orders, but there is no doubt that they are long. The remainder of nonautomotive transportation equipment shows little growth compared to aircraft, less erratic movements in new orders, and shipments that follow orders more faithfully. Although some of the comparisons at peaks are obscured by short extra movements in orders, the evidence suggests that the leads in this category are often long, too. One would expect this, since the series include railroad equipment and shipbuilding, but it must be noted that they also cover a variety of smaller standardized items such as boats, motorcycles, and bicycles.

Other Durable Goods Industries

The measures for "other durables" confirm earlier results by showing short leads or coincidences for lumber and for stone, clay, and glass products, where production to stock prevails, and for furniture, where orders can be promptly handled in batches. The timing of new orders and shipments is rather irregular but on the average synchronous

for the combination of miscellaneous manufacturing industries that includes ordnance and accessories. These measures are of little use, since they refer to a highly heterogeneous residual category that, regrettably, cannot be subdivided.³ That the defense products as a whole had mostly long lags of shipments, is shown in Chapter 4. On the other hand, it is of interest, although perhaps a little surprising, that the order leads are as long as seven months on the average for professional and scientific instruments.⁴

II. Timing of New Orders at Business Cycle Turns

Table E-2 shows the timing of the subdivision series for new orders at each of the recessions and revivals of the period 1948-61. Once more, leads of new orders can be seen as predominant at every major reversal in aggregate economic activity, but also as varying greatly from turn to turn. The ranking of the episodes by the averages for the twenty-seven subdivisions of the durable goods sector is almost the same as the ranking by length of lead of aggregate new orders for the sector (see Table E-2, line 32, and Table 11-2, line 2). Starting with the longest leads, one finds that the 1957 peak ranks first, followed by the peaks of 1960, 1953, and 1948. Among the leads at troughs, which are generally shorter, those at the 1954 revival rank first, followed in descending order by 1949, 1961, and 1958.⁵

The over-all cyclical conformity of the series here examined is high. The proportions of business cycle turns and new-order turns matched are 92.8 and 78.0 per cent, respectively, for the twenty-seven subdivisions of the durable goods sector, according to Table E-3, columns 2-4. The corresponding percentages for the six major durable goods industries (based on observations for 1948-61 only) are 100.0 and 88.2.

³ This combination consists of SIC major groups 19 and 39 (classification of 1945). Group 19, ordnance, includes artillery, small arms, ammunition, tanks, etc. The other, miscellaneous, includes jewelry; musical instruments; toys; sporting goods; pens, pencils, and other office and artists' materials; costume novelties, fabricated plastics products; brooms, matches, candles, and other miscellaneous manufacturing industries.

⁴ This is the 1945 SIC major group 38, covering laboratory, scientific, engineering, medical, and mechanical measuring instruments; photographic and optical goods; and watches and clocks. Four of the observations for this industry are based on well-identified turning-point dates. The last one is more doubtful, perhaps overstating the lead.

⁵ The last two have reversed positions in the ranking for total durables but the same positions in the ranking according to the averages for the six major durable goods industries. The leads at both the 1958 and the 1961 troughs were short in most cases, and the differences between them are small.

Table E-2
Timing of Value of New Orders at Each Business Cycle Turn,
Thirty-one Industrial Subdivisions of Manufacturing, 1948-61

Industry	Lead (-) or Lag (+) in months of New Orders at Business Cycle Turns							
	Peak Nov. 1948 (1)	Trough Oct. 1949 (2)	Peak July 1953 (3)	Trough Aug. 1954 (4)	Peak July 1957 (5)	Trough April 1958 (6)	Peak May 1960 (7)	Trough Feb. 1961 (8)
PRIMARY METALS								
1. Iron and steel	0	-1	0	-11	-8	-2	-15	-11
2. Primary nonferrous metals	+1	-4	-1	-6	-18	-1	-13	-1
3. Other primary metals	-5	-4	0 ^a	-5	-20	-2	-13	-2
FABRICATED METAL PRODUCTS								
4. Heating and plumbing ^b					-15	-1	-6	-1
5. Structural metal work ^b					-2	-5	-10	-2
6. Tin cans and other ^b					-6	-2	-5	-2
Total products	n.i.	-5 ^c	-6 ^c	-10 ^c				
ELECTRICAL MACHINERY								
7. Electrical generator apparatus	-4	-6	0	-5	-12	-4	+4	+4
8. Radio, TV, and equipment	0	-9	-3	-2	-1 ^a	-3 ^a	n.a.	n.i.
9. Other electrical equipment	+1	-5	-6 ^d	-5	-5	+1	-8	-7
MACHINERY EXCEPT ELECTRICAL								
10. Metalworking machinery	n.i.	-3	n.m.	-9	-19	+1	-5 ^b	-7 ^b
11. General machinery	-2	-2	0	-7	-5	-2	0	-2
12. Special machinery	n.i.	-3	n.i.	n.i.	-7	-4	-1	-1
13. Engines and turbines	-4	+2	-23	-7	+14	-2	-16	-3
14. Agricultural implements	0	+1	-20	0	n.m.	n.m.	-12	n.i.
15. Construction machinery	n.i.	-6	n.i.	n.i.	-9	+1	-11	-4

16. Office and store machines	n.i.	-10	-4	-6	-2 ^a	-5 ^a	-5 ^a	-5 ^a
17. Household and service appliances	-4	-9	-6	-7	-14	-4	-11	-2
18. Other machinery and parts	n.i.	-2	-4	-3	-20	-1	-8	-6
TRANSPORTATION EQUIPMENT								
19. Motor vehicles	n.a.	n.i.	-13 ^a	-8	-8 ^a	+5	+4	-1
20. Motor vehicle parts and accessories	-1	-5	-10	-8	-7 ^a	-1	-14	0
21. Aircraft	n.a.	-3	-7	-11	-11	-9	n.t.	n.t.
22. Other nonautomotive transportation equipment	n.a.	-6	-12	-7	-7 ^a	-2	n.i.	n.i.
OTHER DURABLE GOODS INDUSTRIES								
23. Lumber ^e				-3	-16	-1	-10	-2
24. Furniture ^e				-9	-20	+2	-10	0
25. Stone, clay, and glass products	-5 ^f	-5 ^f	-5 ^f					
26. Professional and scientific instruments	+1	-3	-4	-7	-23	-1	-10	-1
27. Miscellaneous incl. ordnance ^e				-4	-15	-4	n.m.	n.m.
Series 26 and 27 combined	n.i.	-3 ^g	-13 ^g	-9	-18	-1	-1	0
NONDURABLE GOODS INDUSTRIES REPORTING UNFILLED ORDERS ^h								
28. Textile-mill products	-8 ^a	-8	-9	-9	-9 ^a	-5	-5	-7
29. Leather and leather products	-13	-3	-7	-6	-6	-1	+3	n.i.
30. Paper and allied products	-9	-3	-3 ^a	-7 ^a	-3 ⁱ	0	n.t.	n.t.
31. Printing and publishing	n.t.	n.t.	n.t.	n.t.	-11	+2	+1	0
AVERAGE LEAD (-) OR LAG (+), IN MONTHS								
32. 27 industrial subdivisions of durable manufactures	-1.7	-4.1	-6.8	-6.5	-11.6	-1.8	-7.7	-2.5
(No. of observations)	(13)	(22)	(20)	(23)	(26)	(26)	(23)	(22)

Notes to Table E-2

n.a. = not available.

n.i. = not identified (timing uncertain).

n.m. = not matched.

n.t. = no turn in new orders.

^a Based on a minor but well-established turn in new orders. Included in the averages.

^b The series on new orders for these components of the fabricated metals industry begin in 1955. They have been seasonally adjusted for the NBER by the Census electronic-computer method.

^c Timing measures for total fabricated metal products. Included in the turning-zone averages of line 32, columns 2-4.

^d The series underwent a major contraction between February 1951 and March 1954, which was interrupted by a retardation in the second half of 1951 and 1952. This comparison is based on the secondary peak of new orders in January 1953, which ended that retardation.

^e The series on new orders for these industries begin in 1953 and their timing at peaks corresponding to the 1953 recession cannot be determined. For the earlier years data are available on lumber and furniture (combined) and on professional instruments and miscellaneous including ordnance (combined). The series have been seasonally adjusted for the NBER by the Census electronic-computer method.

^f Timing measures for lumber and furniture. Included in the turning-zone averages of line 32, columns 1-3.

^g Timing measures for professional and scientific instruments and miscellaneous including ordnance. Included in the turning-zone averages of line 32, columns 2-3.

^h These series were received from the Department of Commerce in seasonally unadjusted form. They have been seasonally adjusted for NBER by the Census electronic-computer method.

ⁱ Based on a secondary peak of new orders. The first peak occurred in May 1956, i.e., fourteen months before the reference date.

The relative frequency of leads at business cycle peaks also is just a little lower for the less aggregative series (83.3 per cent as compared with 95.5 per cent for the six major industries), while the proportions of leads at troughs are virtually identical (86.5 and 87.0 per cent). One difference that may be significant, however, is that short leads at peaks are more frequent among the observations for the industrial subdivisions. Rough coincidences account for 25.6 per cent of the measures in this set, while the corresponding figure for the six major industries is 13.6 per cent.⁶

⁶ The proportions of rough coincidences among the timing observations at business cycle troughs are much higher and very similar in the two sets: 51.7 and 52.2 per cent for the twenty-seven subdivisions and the six major industries, respectively. The tabulation below gives the distribution

The four nondurable goods industries that report unfilled orders have, as a group, relatively low proportions of turns matched (61.3 per cent, whether based on business cycle turns or on new-order turns), but this is due mainly to the poor conformity record of one series, printing and publishing. Here too, leads of new orders prevail decidedly, accounting for 84.4 per cent of the observations at peaks and 75.0 per cent of those at troughs.

Clearly, a two-digit industry can contain subdivisions with quite different timing patterns. Nonelectrical machinery, for which a relatively fine breakdown is available in these data, offers the best example of this in the contrast between the short leads of general machinery and the long leads of engines and turbines (see Table E-3, lines 11 and 13).

Again, there is a strong tendency for the leads to be longer on the average at peaks than at troughs; there are only four exceptions to this rule among the thirty-one series covered. The peak-trough differences are often large and probably significant. Convincing formal tests of this are hard to get because of the small numbers of observations available per series, but the high degree of consensus among the series in showing these differences strongly suggests that there is a real dichotomy here, at least for the postwar cycles.

Long leads of new orders dominate the averages at business cycle peaks for most of the component industries, according to Table E-3, column 5. Their prevalence is indicated particularly among the series for nonelectrical machinery, nonautomotive transportation equipment, and other durable goods industries.⁷ Eighteen of these mean leads range from 8 to 15 months and seven are about 5 or 6 months each. In

of the leads and lags for the subdivision data, which is based on Table E-2, lines 1-27, and underlies some of the statements just made.

Number of Timing Observations

	<i>Total</i>	<i>Leads</i>	<i>Exact Coin- cidences</i>	<i>Lags</i>	<i>Rough Coin- cidences</i>
At peaks	78	65	8	5	20
At troughs	89	77	4	8	46

⁷ The leads at peaks for electrical machinery components average appreciably less than the corresponding measures for this industry as a whole, as given in Tables 11-2 and 11-3. Elsewhere, too, there are differences between the two sets of measures, but they are on the whole not large, and a rough reconciliation is possible when account is also taken of the discrepancies between data of different vintages.

Table E-3
 Summary Measures of Timing of Value of New Orders at Business Cycle Turns,
 Thirty-one Industrial Subdivisions of Manufacturing, 1948-61

Industry	Period Covered ^a (1)	No. of Observations ^b (2)	Business Cycle Turns		Av. Lead (-) or Lag (+) (months)			Av. Dev. from Av. Lead or Lag (months)		
			Skipped ^c (3)	Extra Turns in New Orders ^d (4)	Peaks (5)	Troughs (6)	All Turns (7)	Peaks (8)	Troughs (9)	All Turns (10)
PRIMARY METALS										
1. Iron and steel	1948-61	8	0	2	-5.8	-6.2	-6.0	5.8	4.8	5.2
2. Primary nonferrous metals	1948-61	8	0	2	-7.8	-3.0	-5.4	7.8	2.0	4.9
3. Other primary metals	1948-61	8	0	2	-9.5	-3.2	-6.4	7.0	1.2	4.1
FABRICATED METAL PRODUCTS										
4. Heating and plumbing ^e	1957-61	4	0	0	-10.5	-1.0	-5.8	4.5	0.0	4.8
5. Structural metal work ^e	1957-61	4	0	2	-6.0	-3.5	-4.8	4.0	1.5	2.8
6. Tin cans and other ^e	1957-61	4	0	0	-5.5	-2.0	-3.8	0.5	0.0	1.8
ELECTRICAL MACHINERY										
7. Electrical generator apparatus	1948-61	8	0	2	-3.0	-2.8	-2.9	5.0	3.4	4.2
8. Radio, TV, and equip.	1948-61	6	2	4	-1.3	-4.8	-3.0	1.1	2.9	2.0
9. Other electrical equip.	1948-61	8	0	2	-4.5	-4.0	-4.2	2.8	2.5	2.6
MACHINERY EXCEPT ELECTRICAL										
10. Metalworking machinery	1949-61	6	1	1	-12.0	-4.5	-7.0	7.0	3.5	4.7
11. General machinery	1948-61	8	0	2	-1.8	-3.2	-2.5	1.8	1.9	1.8

12. Special machinery	1949-61	5	2	2	-4.0	-2.7	-3.2	3.0	1.8	1.8
13. Engines and turbines	1948-61	8	0	0	-14.2	-2.5	-8.4	5.2	2.5	7.0
14. Agricultural implements	1948-60	5	2	2	-10.7	+0.5	-6.2	7.1	0.5	7.8
15. Construction machinery	1949-61	5	2	2	-10.0	-3.0	-5.8	1.0	2.7	3.4
16. Office and store machines	1949-61	7	0	2	-3.7	-6.5	-5.3	1.1	1.8	1.5
17. Household and service appliances	1948-61	8	0	2	-8.8	-5.5	-7.1	3.8	2.5	3.1
18. Other machinery and parts	1949-61	7	0	2	-10.7	-3.0	-6.3	6.2	1.5	4.4
TRANSPORTATION EQUIPMENT										
19. Motor vehicles	1953-61	6	0	4	-5.7	-1.3	-3.5	6.4	4.4	6.2
20. Parts and accessories	1948-61	8	0	4	-8.0	-3.5	-5.8	4.0	3.0	3.5
21. Aircraft	1949-61	5	2	2	-9.0	-7.7	-8.2	2.0	3.1	2.7
22. Other nonautomotive transportation equip.	1949-61	5	2	2	-9.5	-5.0	-6.8	2.5	2.0	2.2
OTHER DURABLE GOODS INDUSTRIES										
23. Lumber ^f	1954-61	5	0	0	-13.0	-2.0	-6.4	3.0	0.7	5.3
24. Furniture ^f	1954-61	5	0	0	-15.0	-2.3	-7.4	5.0	4.4	6.7
25. Stone, clay, and glass products	1948-61	8	0	2	-9.0	-3.0	-6.0	7.5	2.0	5.5
26. Professional and scientific ins. ^f	1954-61	3	2	2	-15.0	-4.0	-7.7	^e	0.0	4.9
27. Miscellaneous incl. ordnance ^f	1954-61	5	0	0	-9.5	-3.3	-5.8	8.5	3.8	6.2
NONDURABLE GOODS INDUSTRIES REPORTING UNFULFILLED ORDERS										
28. Textile-mill products	1948-61	8	0	2	-7.8	-7.2	-7.5	1.4	1.2	1.4
29. Leather and leather products	1948-61	7	0	2	-5.8	-3.3	-4.7	4.4	1.8	3.8
30. Paper and allied products	1948-61	6	2	2	-5.0	-3.3	-4.2	2.7	2.4	2.6
31. Printing and publishing	1948-61	4	4	0	-5.0	+1.0	-4.0	6.0	1.0	4.5
32. 27 industrial subdivisions of durable manufactures ^h		167	13	47	-7.8	-3.6	-5.6	5.5	2.7	4.3

Notes to Table E-3

^a The dates identify the years of the first and the last reference turn at which the timing of the series can be determined. For some industries, the series begin in 1949. Even where the 1948 data are available, it is in some cases impossible to determine the timing of the series at the 1948 recovery without still earlier figures. In one case (line 14) the timing of the series at the 1961 recovery is similarly uncertain.

^b The number of reference turns in periods identified in column 1 that are matched by like turns in new orders.

^c The number of reference turns not matched during the periods identified in column 1. The sum of the corresponding entries in columns 2 and 3 gives the maximum number of timing observations possible for these periods.

^d Refer to periods identified in column 1. In all but a few cases, these turns relate to the extra movements during the Korean period 1950–52. Some of these turns are minor rather than major or specific-cycle, but all are clearly identifiable.

^e Series begins in 1955.

^f Series begins in 1953; timing at the 1953 recession uncertain.

^g Only one observation is available.

^h Summary of the timing measures for the industries listed in lines 1–27. Entries in columns 2–12 are totals. Entries in columns 13–18 are averages weighted by the number of observations for each item.

contrast, none of the averages for troughs exceeds 8 months and only four exceed 6 months. Seventeen fall in the range of 3 to 6 months and ten are shorter still (column 6). The dispersion of timing is as a rule less for the trough than for the peak observations (columns 8 and 9).

III. Timing of Unfilled Orders at Business Cycle Turns

The full record for the series on order backlogs of industrial subdivisions mainly confirms the patterns observed for the more comprehensive series in the current Census compilation. A summary presentation of the results will therefore be sufficient. Table E-4 strongly demonstrates three points. First, unfilled orders for durable goods show high cyclical conformity in the period covered, in the sense of having matching business cycle turns, with very few exceptions, and very few extra movements and turns (columns 2–4).⁸ Second, the peaks in these

⁸ Among the few series for which these measures indicate low cyclical conformity are those for electrical generators, radio and television, and office and store machines. In unfilled orders for these industries, upward trends tend to overwhelm the cyclical fluctuations.

series tend to precede the end of business expansions, frequently by long intervals (column 5). Third, the upturns in backlogs occur more often after than before the end of business contractions, tending to lag the revivals by short average intervals (column 6).

The lapses from one-to-one correspondence between business cycle reversals and backlog turns amounted to about 6 per cent of the relevant "opportunities to match." For the subdivisions of durable manufactures (Table E-4, lines 1-26, columns 2-4), the totals are as follows: number of observations, 163; business cycle turns skipped, 10; extra turns, 11. For the nondurable goods industries, the proportions of unmatched turns, particularly of extra turns in the backlog series, are considerably larger (see lines 27-30, columns 2-4).

Virtually all of the series have average leads at business recessions.⁹ These vary from four months for household appliances to seventeen months for leather products (column 5). The nondurable goods industries show some of the earliest downturns, but the leads are on the average large—from seven to twelve months—for each of the industry groups covered, except electrical machinery. This is broadly consistent with the corresponding measures for the comprehensive series, which also fall in the same range of long leads (see Table 11-13). The averages are not swayed by a few very long leads, and in general the effect on them of extreme observations is moderate.¹⁰

Two-thirds of the timing averages at troughs are rough coincidences, but lags outnumber leads for an equally large proportion of the industries. There are very few long leads of unfilled orders at the recent business revivals, but long lags do appear in some averages.

To sum up, leads of intermediate or long duration appear to be characteristic of the timing of unfilled orders at business recessions, at least in the recent decades. On the other hand, rough coincidences with some tendency to lag prevail at business revivals. These features are clearly demonstrated by the data for both the major industries

⁹ The two exceptions are again the industries with strong upward trends in backlogs (radio and television, and office and store machines).

¹⁰ Thus, the use of medians instead of means would not alter the results in any essential way. The mean-median differences are as often negative as positive. Also, they are on the whole not large relative to the averages involved. Where the median leads are smaller than the mean leads, the average discrepancy is 2.5 months, and in the opposite case it is 1.6 months.

Table E-4
 Summary Measures of Timing of Unfilled Orders at Business Cycle Turns,
 Thirty Industrial Subdivisions of Manufacturing, 1948-61

Industry	Period Covered ^a (1)	No. of Observations ^b (2)	No. of Business Cycle Turns		Av. Lead (-) or Lag (+) (months)		Standard Deviation	
			Skipped ^c (3)	Extra Turns ^d (4)	Peaks (5)	Troughs (6)	Peaks (7)	Troughs (8)
PRIMARY METALS								
1. Iron and steel	1948-61	8	0	0	-7.0	-0.5	3.4	1.8
2. Primary nonferrous metals	1948-61	8	0	0	-6.8	-0.5	5.4	0.5
3. Other primary metals	1948-61	8	0	0	-12.2	+1.0	8.2	1.2
FABRICATED METAL PRODUCTS								
4. Heating and plumbing ^e	1957-61	4	0	0	-5.0	+5.0	1.0	3.0
5. Structural metal work ^e	1957-61	4	0	0	-6.0	+4.0	1.0	2.0
6. Tin cans and other ^e	1957-61	4	0	0	-11.5	0	1.5	0
ELECTRICAL MACHINERY								
7. Electrical generator apparatus	1949-61	5	2	1	-4.5	+8.7	2.5	4.8
8. Radio, TV, and equipment	1949-61	5	2	2	+0.5	+0.3	2.5	4.5
9. Other electrical equipment	1949-61	7	0	0	-5.3	+3.5	2.5	3.3
MACHINERY EXCEPT ELECTRICAL								
10. Metalworking machinery	1949-61	5	2	0	-14.5	+5.0	4.5	2.4
11. General machinery	1949-61	7	0	0	-7.3	+3.5	4.0	4.2
12. Special machinery	1949-61	7	0	0	-10.7	-0.8	9.1	3.6
13. Engines and turbines	1949-61	7	0	0	-10.7	+2.5	4.8	4.4

14. Agricultural implements	1948-60	7	0	0	-8.5	+6.3	2.6	1.7
15. Construction machinery	1949-61	7	0	0	-11.7	+1.5	5.4	3.4
16. Office and store machines	1949-61	5	2	4	+2.0	+1.7	2.0	3.4
17. Household and service appliances	1949-60	6	0	2	-4.3	+0.3	2.5	6.8
18. Other machinery	1949-61	7	0	0	-10.3	+2.8	6.2	0.4
TRANSPORTATION EQUIPMENT								
19. Motor vehicles	1949-61	7	0	0	-5.7	+4.0	1.9	5.7
20. Motor vehicle parts and accessories	1948-61	8	0	0	-11.5	+0.8	5.0	1.3
21. Aircraft	1949-60	4	2	0	-5.5	+5.0	4.5	7.0
22. Other nonautomotive	1949-61	7	0	0	-9.0	+2.0	2.9	1.9
OTHER DURABLE GOODS INDUSTRIES								
23. Lumber ^f	1953-61	6	0	2	-6.3	-2.0	2.6	0.8
24. Furniture ^f	1953-61	6	0	0	-9.7	-1.3	7.3	1.9
25. Stone, clay, and glass	1948-61	8	0	0	-12.8	+0.2	9.9	3.0
26. Professional and scientific instruments ^f	1953-61	6	0	0	-9.0	+1.0	4.2	7.8
NONDURABLE GOODS INDUSTRIES								
27. Textile-mill products	1948-61	7	1	3	-10.0	-3.8	5.9	2.7
28. Leather and leather products	1948-61	8	0	2	-17.0	-1.8	2.5	1.9
29. Paper and allied products	1948-61	6	2	2	-16.3	-2.3	4.0	2.5
30. Printing and publishing	1948-61	7	1	2	-6.5	-0.7	7.1	4.5

^a The dates identify the years of the first and last reference turn at which the timing of the series can be determined.

^b The number of reference turns matched by like turns in unfilled orders.

^c The number of reference turns not matched. The sum of the corresponding entries in columns 2 and 3 gives the maximum number of observations possible for the period identified in column 1.

^d Turns that mark extra movements in unfilled orders not corresponding to business cycle expansions or contractions.

^e Series begins in 1955.

^f Series begins in 1953.

(Table 11-13) and their subdivisions (Table E-4). The accompanying tabulation shows the distribution of leads and lags for the twenty-six components of durable goods manufactures.¹¹

Number of Timing Observations

	<i>Total</i>	<i>Leads</i>	<i>Exact Coin- cidences</i>	<i>Lags</i>	<i>Rough Coin- cidences</i>
At peaks	76	72	1	3	13
At troughs	87	22	14	51	57

¹¹ This count covers the series listed in Table E-4, lines 1-26. It is also of interest to compare this distribution with its counterpart for new orders (see note 6, above).