

FOREWORD

Many people can STATEMENT BY AUTHOR indirectly to this study. Dr. L. W. Cassidy and the staff of the Bureau of Economic Research at The University of Arizona and is deposited in The University Library to be made available to borrowers under rules of the Library.

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Dr. Philip Hudson offered me invaluable assistance during the writing of this thesis. I am extremely grateful to him for his help in editing the manuscript and making many constructive suggestions.

SIGNED: Robert Arthur Phillips

To all these people I am extremely grateful.

APPROVAL BY THESIS DIRECTOR

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July 5, 1960
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THE FOREWARD

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CHAPTER I
INTRODUCTION

Definition of Business Cycles

In Measuring Business Cycles, Wesley C. Mitchell and Arthur F. Burns observe that the type of definition needed by the student of business cycles "depends upon the researches he has in view."¹ This study requires a definition which will serve as a point of departure without requiring a previous commitment to a causal theory. For this reason, Mitchell's definition has been chosen.

Business cycles are a type of fluctuation found in the aggregate economic activity of nations that organize their work mainly in business enterprises; a cycle consists of expansions occurring at about the same time in many economic activities, followed by similarly general recessions, contractions and revivals which merge into the expansion phase of the next cycle; this sequence of changes is recurrent but not periodic; in duration business cycles vary from more than one year to ten or twelve years; they are not divisible into shorter cycles of similar character with amplitudes approximating their own.²

1. Wesley C. Mitchell and Arthur F. Burns, Measuring Business Cycles (New York: National Bureau of Economic Research, 1946), p. 3.

2. Wesley C. Mitchell, Business Cycles: The Problem and Its Setting (New York: National Bureau of Economic Research, 1927), p. 468.

The first phrase of Mitchell's definition limits business cycles to economies which he refers to elsewhere as "business economies," and describes as communities in which most "economic activity takes the form of making and spending money."³ As Neff and Weifenbach point out, the essentials in this economy are the "specialization of function and the exchange of goods and services...and not the money as such; money is merely the tool."⁴

Concept of Local Economies: The aggregate business economy is made up of a number of geographical sub-units which are producing and trading with one another. Conceptually, any one locality may be isolated and its economy defined as its production activities (i.e., manufacturing, mining and farming) and its importing and exporting.

A community receives its direct income from two sources. Its residents receive a return on the factors of production applied to the production of goods and services sold outside the community. It does not matter if these factors are located in the community or at some other location. Furthermore, any locally owned factors employed by persons or agencies receiving income from sources outside the community would fall into this category. Examples of

3. Ibid., p. 63.

4. Philip Neff and Annette Weifenbach, Business Cycles in Selected Industrial Areas (Berkeley: University of California Press, 1949), p. 2.

this might be expenditures by tourists and expenditures of outside fiscal bodies, less the taxes collected by those fiscal bodies in the community. A second source of direct income would be capital transfers. An investment made in the community with money earned elsewhere would be an example of a capital transfer. Whatever the source of direct income, part of it is used to purchase locally produced goods and services and part of it leaves the community through payments made for imports. In turn, that portion of the direct income used to employ local factors of production is used to employ other locally owned factors. This income is the indirect or derived income of the community.

Local Business Cycles: Fluctuations in the aggregate economic activity of the nation, or business cycles, are usually associated with changes in national income. Local business cycles might then be defined as changes in the income of the locality. Given the sources of local income, fluctuations in that income can occur from any changes in the conditions which affect the sources of that income. Changes in the quantity demanded of goods and services produced for export or in the numbers or incomes of those who receive their incomes from sources outside the community would affect local income directly. Changes in this direct income would result in income changes in the local community.

in changes in the income of those who produce goods and services for sale in the local market. A national recession, for example, might result in a decrease in the quantity demanded of a city's exports, cut the dividends of local citizens who owned stock in firms outside the community or affect the city's tourist business. This cut in local income would be reflected in the incomes of those who produce goods and services for sale to these people.

In practice, it is difficult to separate those who receive income from sources outside the community from those who receive incomes from factors employed in the local market. For purposes of this study manufacturing will be considered to be directed primarily at the export market. Employment in such categories as "construction," "public utilities and transportation," "finance, real estate and insurance," and "trade" will be considered to be the sale of a factor of production in the localized or home market.

Statement of the Problem: It is the purpose of this paper to study business cycles in Phoenix and Tucson, Arizona, during the period of 1947-1958. To do this, an examination of the nature of the economies of the two communities will be made and the sources of their incomes pointed out. Next, a number of statistical indicator time series will be observed for evidence of cyclical activity. Finally, an examination of the changes which these fluctuations in income cause in the local economies will be made.

CHAPTER II

THE ECONOMIES OF PHOENIX AND TUCSON

The Method

To get a clearer picture of the economic functions performed by the economies of Phoenix and Tucson, the employment data for these two cities were compared with those for cities of similar size.

First, a peer group or comparison group for each city was selected from the ten standard metropolitan areas most nearly like each of the two communities in size in 1950.¹ The percentages of the total population which were employed and the percentages employed in manufacturing for Phoenix, Tucson, and their respective comparison groups are presented in Table I. Next, the proportions of each of the work forces employed in nine specific categories were computed for data from the first quarter of 1956. The proportions employed in the various categories for each of the two cities and their peer groups appear as Table II.

1. 1956 data were not available for Hartford, Connecticut, in the Phoenix comparison group. They were replaced by data for Omaha, Nebraska. New Bedford and Fall River, Massachusetts, were replaced by Macon, Georgia, and Roanoke, Virginia, in the Tucson comparison group for the same reason.

TABLE I

PERCENTAGES OF POPULATION EMPLOYED AND EMPLOYED IN
MANUFACTURING FOR PHOENIX, TUCSON,
AND THEIR PEER GROUPS, 1950²

City or Peer Group	Percent Employed	Percent Employed in Manufacturing
Phoenix	32.8%	9.2%
Phoenix' Peer Group	39.6	22.7
Tucson	30.4	4.9
Tucson's Peer Group	37.2	12.6

The data for 1950 and 1956 are not directly comparable. The 1950 percentages were calculated from estimates of the total number employed and included many workers not covered by O. A. S. I. The 1956 data are drawn from the records of O. A. S. I. in each of the standard metropolitan areas and exclude many workers included in the 1950 data.

Observations: In 1950, both cities ranked lower than the median figure for their comparison groups in proportion of the total population employed. Tucson had the lowest percentage of its population employed of all the cities in its group; Phoenix ranked next to the lowest in its group. Both Tucson and Phoenix are considerably lower than the median percentages of the labor force employed in manufacturing. Both cities ranked lowest in their

2. Cf. Appendix I.

TABLE II
 PERCENTAGE OF LABOR FORCE EMPLOYED IN SELECTED
 CATEGORIES: PHOENIX, TUCSON, AND
 THEIR PEER GROUPS, 1956³

Employment Category	Phoenix	Phoenix's Peer Group	Tucson	Tucson's Peer Group
Manufacturing	21.5%	34.6%	22.9%	23.4%
Contract Construction	11.0	7.0	11.3	10.0
Public Utilities and Transportation	8.0	8.0	6.3	7.8
Wholesale Trade	10.5	9.9	5.6	8.2
Retail Trade	25.2	20.5	26.6	24.0
Finance, Insurance and Real Estate	7.3	7.3	5.0	6.7
Services	14.8	10.7	15.6	10.8
Hotels, Motels, and Resorts	3.3	1.4	3.8	1.6
Medical and Dental	1.3	1.1	1.9	1.3

respective groups. Tucson ranked lowest among the 178 standard metropolitan areas in the nation.

The populations of the cities in each group probably did not grow at the same rate during the period from 1950 to 1956. Population figures for 1956 were not available and the 1950 population data are the only basis for comparison.

3. Cf. Appendix I.

Manufacturing had grown in importance in Phoenix and Tucson between 1950 and 1956 until the two communities were more like their peer groups in this respect. In Tucson's comparison group, the range of percentages employed in manufacturing varied from a low of 20.5% (Montgomery, Alabama) to 57.9% (Winston-Salem, North Carolina). The range in Phoenix's peer group was from 17.2% (Oklahoma City, Oklahoma) to 54.0% (Wheeling, West Virginia-Stuebenville, Ohio). Phoenix and Tucson had higher than average proportions of their labor forces employed in contract construction, retail trade and service occupations. Tucson ranked highest in its comparison group in contract construction and service occupations. In the case of retail trade, it was second only to Montgomery, Alabama's 26.8%. In comparison to its peer group, Phoenix ranked highest in these three categories. Phoenix and Tucson ranked highest in their respective comparison groups in percentages of their work forces employed in the service sub-category of "hotels, motels and resorts." In another service sub-category, "medical and dental," both cities had somewhat higher than average percentages of their labor forces employed. Tucson ranked higher than Phoenix in this category and led all of the twenty-two cities in the two comparison groups.

Phoenix and Tucson appeared to be quite similar in the proportions employed in the various categories. The only notable difference was that Phoenix had considerably more of its labor force employed in wholesaling.

Conclusions: Neither Phoenix nor Tucson could be called "major industrial centers"; however, manufacturing has grown in importance in the two communities and they are now more like cities of similar size in this respect. It may be concluded that manufacturing represents a source of income which is becoming relatively more important in Phoenix and Tucson. There appear to be large numbers of people in both Phoenix and Tucson who receive incomes directly from sources located outside of the city in which they reside. This would include those persons who receive pensions, annuities and dividends. The existence of people not employed but receiving income would help explain the relatively small proportion of the total population employed in the two cities in 1950. It would also help account for the relatively high proportions of workers employed in such activities as construction, retailing and service occupations. The importance of tourist business in both cities is evidenced by the high percentages of workers employed by hotels, motels and resorts. Tourists also would represent

an important source of income to Phoenix and Tucson.

Changes in either city's income could come from one of three sources. A change in the quantity demanded, or in the demand, of those goods and services which are produced for export could affect either city's income. As manufacturing grows in importance as a source of income for Phoenix and Tucson a change of this type becomes more capable of affecting their respective incomes.

Because persons receiving income from sources outside the cities (this would include tourists) contribute to the income of both cities, changes in the cities' incomes can come about in two ways. A change in the number of these persons located permanently or temporarily in either city could affect local income. Furthermore, any change in the incomes which these people receive is capable of affecting the local incomes of the two communities.

It may be concluded that Phoenix and Tucson are not economic "islands." Their incomes are dependent upon conditions outside of the two communities. While neither city is heavily industrialized, the dependence of many buyers in the local markets on incomes received from exterior sources reinforces the ability of national economic conditions to affect the incomes of both cities.

CHAPTER III

II. CYCLICAL ACTIVITY IN PHOENIX AND TUCSON

The Data Used

The purpose of this chapter is to present evidence of business cycle activity in Phoenix and Tucson. To accomplish this purpose, a number of time series which reflect general business activity will be presented. Much has been written about what constitutes ideal data for the study of business cycles. To be sure, it would depend upon the purposes of the particular investigation. In this study, as in many local studies, selection of ideal data is quite hypothetical. The researcher must be satisfied with whatever continuous, comparable series he can find. The three series available for this study were bank debits, retail sales, and non-agricultural employment.¹ Bank debits and non-agricultural employment are listed by the National Bureau of Economic Research as "roughly coincident indicators" of business cycle turns. Retail sales are listed as a "lagging indicator," but with

1. Cf. Appendix I.

a small average lag.² The three series can be considered to be reasonably good indicators of the timing of business cycles.

Several difficulties arose with the use of these series and before going further several limitations on their use must be pointed out.

Bank debits and retail sales are a function of both prices and physical output. It is common practice to "deflate" series of this type by some price index; however, in the cases of the two series under consideration, deflation would raise more questions than it would answer. It may be safely assumed that the bank debit series for both cities reflect a large volume of real estate transactions, some of which are speculative in nature. A realistic price index would have to account for such transactions and no available price index could do this. In the case of retail sales, a price index for each of the two cities would have to be developed. It could not be assumed that the price levels in the two communities or the relative weights of the various commodities in the index would allow the use of a national price index. In light of these conditions, any deflation attempted with either series would result in a distortion of the various changes

2. Geoffrey H. Moore, Statistical Indicators of Cyclical Revivals and Recessions (Occasional Paper XXXI, New York: National Bureau of Economic Research, 1950), pp. 64-65.

quite arbitrarily deflated series. Since comparisons will only be made between the series for each community and with the like series for the two communities, the need for deflation has been reduced.

In the case of the employment series, it was necessary to estimate the total non-agricultural employment in both counties prior to the fourth quarter, 1948. This was done by calculating the percentage of the total number employed in the state by each county after this date, adjusting for the trend of this proportion and extrapolating county totals from the known state totals for 1947 and the first three quarters of 1948.

Finally, it was necessary to assume that Maricopa County and Pima County are synonymous with Phoenix and Tucson, respectively. As was noted above, the Bureau of the Census considers them synonymous for defining the two standard metropolitan areas.

Seasonal Adjustments: There are four types of changes in business data: seasonal, secular, cyclical, and irregular or episodic.³ The exposition of cycles requires the elimination from the series of all changes which are not cyclical. On purely theoretical grounds, only consistent definitions of the various changes would be

3. Peter O. Steiner, Introduction to Time Series Analysis (New York: Rinehart, 1956), p. 4.3.

necessary.⁴ Unfortunately, consensus does not exist on these definitions. Furthermore, the mechanical method employed in elimination of any of the changes which are not cyclical can alter the timing, amplitude and pattern of the cyclical residual. For these reasons, the adjustments made to the time series of this study will be explained prior to the introduction of adjusted data into the discussion. The adjustment for seasonal variation is the subject of this section; the problem of irregular changes and secular trend are discussed in subsequent sections.

Seasonal fluctuations are the "recurrent pattern of change within the period that results from the operation of forces connected with climate or custom at different times of the period."⁵ The word "period," in this case, refers to one year.

The technique used in this study for the elimination of seasonal changes was the "ratio-to-moving-average" method. This method, to a large measure, eliminates those changes which are not cyclical from the data before the seasonal variation is measured. Particularly important to this study was the fact that the method required no

4. Philip Neff and Annette Weifenbach, Business Cycles in Selected Industrial Areas (Berkeley: University of California Press, 1949), p. 31.

5. Werner Z. Hirsch, Introduction to Modern Statistics (New York: MacMillan, 1957), p. 288.

previous commitment to a particular trend.

Specifically, the method used was similar to that described in any elementary text book on statistics.⁶ The ratios of the original data to centered four-quarter moving averages was computed. These ratios were arrayed and examined for seasonal patterns. All series appeared to have

a definite seasonal pattern so an index was constructed using a modified mean of seven years and corrected so that the sum of the indexes was four hundred.⁷

Several differences may be noted in the seasonal indexes appearing in Chart I. The indexes for employment in the two communities are almost completely reverse of the index for the United States. First quarter is high in Phoenix and Tucson; it is the lowest quarter for the nation as a whole. Third quarter is the national high, but the lowest quarter in Phoenix and Tucson.

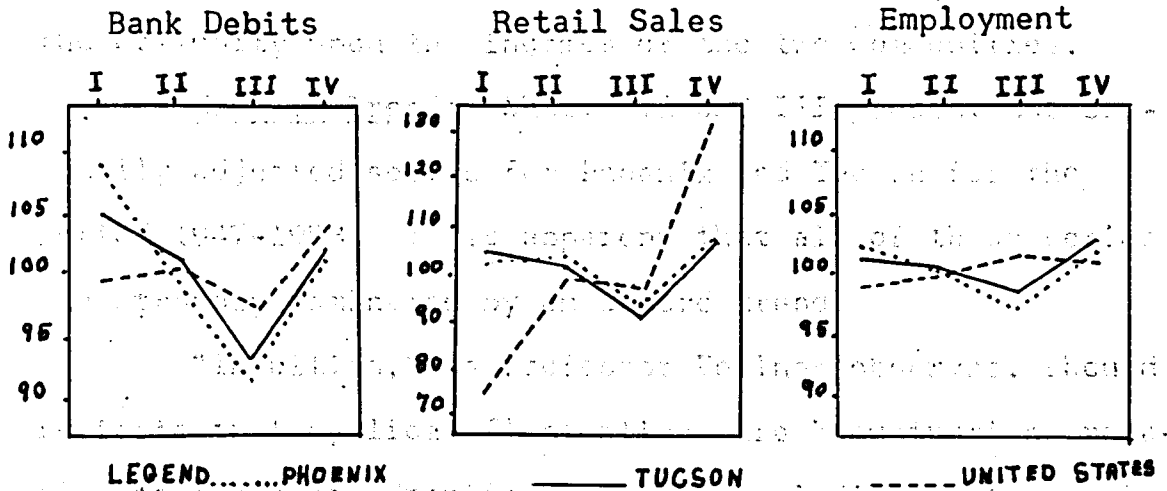
In the bank debits series the third quarter is the lowest for Phoenix and Tucson and directly comparable to the United States as well, but the quarter of highest activity for the two Arizona cities differs from that of the nation. For Phoenix and Tucson it occurs in the fourth quarter; in Phoenix and Tucson, the first quarter is high.

As will be noted later, the employment previously designated as home-market follows this same

6. For example: Frederick E. Croxton and Dudley J. Cowden, Practical Business Statistics (Englewood Cliffs, N. J.: Prentice-Hall, 1948), pp. 255-259.

7. Cf. Appendix II.

CHART I
SEASONAL INDEXES FOR BANK DEBITS, RETAIL SALES
AND EMPLOYMENT: PHOENIX, TUCSON, AND
THE UNITED STATES, 1947-1958⁷



It is doubtful that the seasonal indexes of the United States department store sales and the retail sales series for Phoenix and Tucson are directly comparable. However, it is possible to see that this series follows the pattern of the other series by showing that the first quarter in Phoenix and Tucson is quite active, relative to the rest of the nation.

As will be noted later, the employment previously designated as home-market employment follows this same

9. William J. Fellner, *Money and Business in America* (New York: McGraw-Hill, 1959), p. 33.

7. Cf. Appendix II.

8. *U.S. Bureau of Economic Analysis*, p. 216.

general seasonal variation.⁸ The relatively high degree of economic activity apparent in the first quarter in Phoenix and Tucson serves to demonstrate once more the impact of tourists and other persons receiving income from outside of the community upon the incomes of the two communities.

Secular Trend: Charts II and III present the seasonally adjusted series for Phoenix and Tucson for the period 1947-1958. It is apparent that all of these series are strongly dominated by an upward trend.

"Intuition," as Professor Fellner observes, should indicate that cyclical fluctuations are "fluctuations relative to trend."⁹ Granting this, several difficulties arise when one seeks to eliminate secular trend from specific series.

Trend may be defined as "the long run gradual growth or decline in a series which is an expression of such fundamental forces as population growth, improvements in know-how and productivity, increases in the supply of capital equipment, and changes in consumption habits."¹⁰ It will be remembered that in the absence of a deflation of bank debits and retail sales, price increases are also

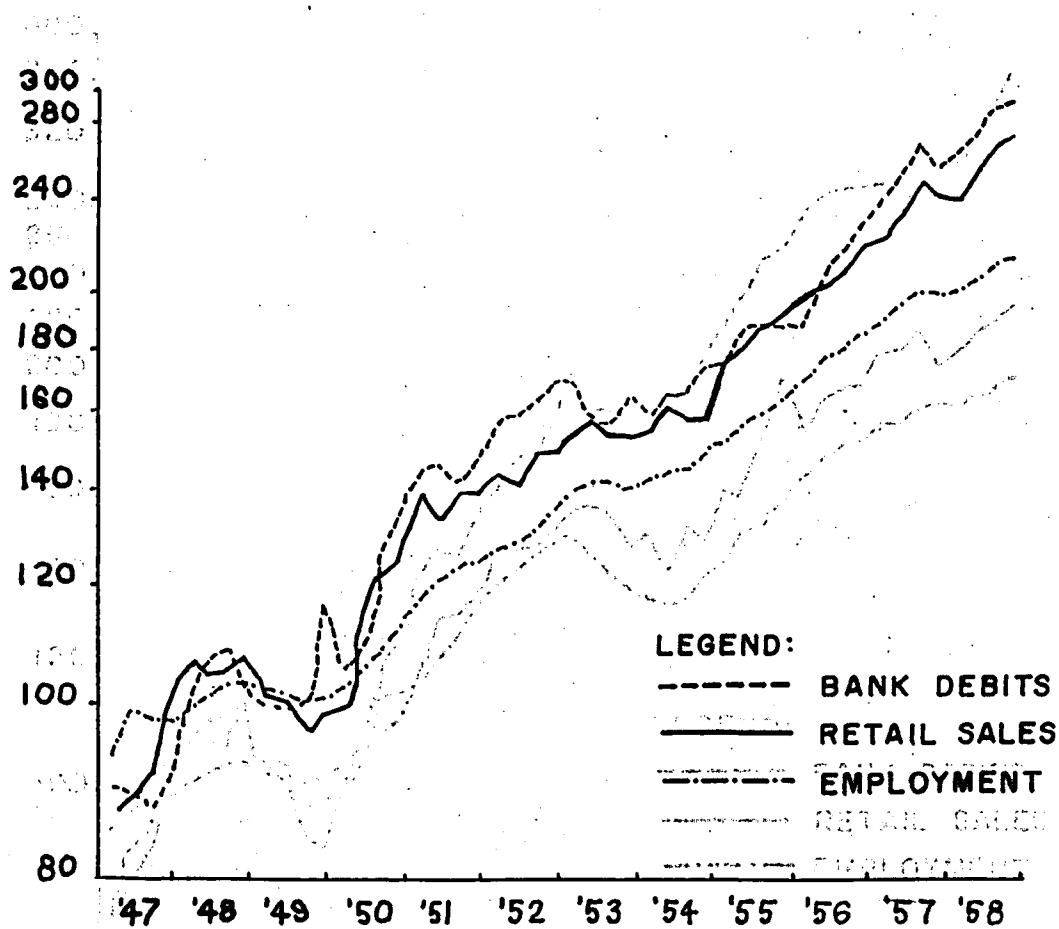
8. Cf. Appendix II.

9. William E. Fellner, Trends and Cycles in Economic Activity (New York: Henry Holt and Co., 1956), p. 31.

10. Hirsch, op. cit., p. 286.

CHART II
 BANK DEBITS, RETAIL SALES AND EMPLOYMENT
 PHOENIX, 1947-1958¹¹

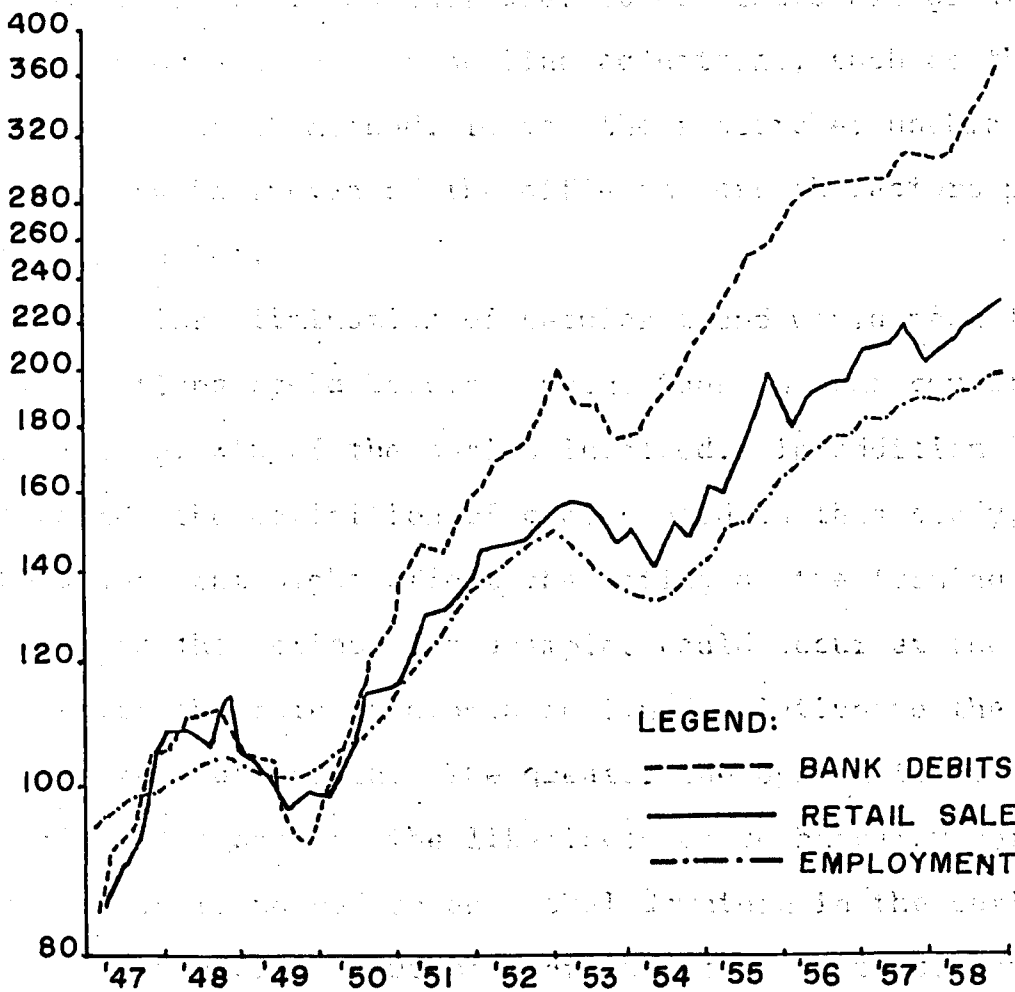
Seasonally Adjusted Index
 (1947-1949 = 100)



¹¹. Cf. Appendix III.

CHART III
BANK DEBITS, RETAIL SALES AND EMPLOYMENT
TUCSON, 1947-1958¹²

Seasonally Adjusted Index
 (1947-1949 = 100)



LEGEND:
 - - - - - BANK DEBITS
 _____ RETAIL SALES
 - · - · - EMPLOYMENT

12. Cf. Appendix III.

included as a part of the trend in those series. The elimination of trend is an attempt to summarize all those factors of growth and statistically describe the "normal" situation at any one moment of the series. Elimination of all of the factors of growth with a single trend line assumes that these factors operate with a consistent force over time. Furthermore, to eliminate all growth factors by a single trend line adjustment, such as the "least squares" method, leaves the researcher unable to study the influence of the different growth factors present in the series. The elimination of secular trend would mean that the fluctuations would become fluctuations in some computed rate of growth of the series involved. In addition to amending the definition of cycles used in this study, such an adjustment might affect the dating of the turning points. Peaks in the series, for example, would occur at the point at which the rate of growth declined relative to the computed rate of growth. The greater the upward trend in the series, the greater the likelihood of technically defined peaks occurring before an actual downturn in the series.

One of the purposes of the study is to compare the timing of cycles in Phoenix and Tucson with the cycles occurring in the national economy. In making these comparisons, the National Bureau of Economic Research's reference

dates will be used. Since these dates are derived from seasonally adjusted data¹³ it seems necessary to limit the processing of the series for the two communities to an adjustment for seasonal variation.

Irregular Movements: One further distinction which must be drawn is the separation of irregular or episodic events from cyclical fluctuations. In a city the size of Phoenix or Tucson, the actions of a single employer or group of employees could greatly affect the economy of the city. For that matter, changes in the national economy which affected the community's income could be explained as episodic events, in that they lie in conditions outside the community's control.

In this paper, transmission of those national business conditions referred to as cyclical to the local economy will be accepted as cyclical activity in the local economy. Events of a purely local nature will be pointed out and their tendency to reinforce or counteract the cyclical forces will be noted.

Timing of Cycles: Table III compares the peak and

13. Wesley C. Mitchell and Arthur F. Burns, Measuring Business Cycles (New York: National Bureau of Economic Research, 1946), p. 36. Trend elimination is performed by the National Bureau of Economic Research; however, this is limited to the elimination of the inter-cycle trend. This means that the dating of cycles must precede any trend elimination.

TABLE III

PEAKS AND TROUGHS: N. B. E. R. REFERENCE CYCLES,
PHOENIX AND TUCSON INDICATOR SERIES; 1947-1958¹⁴

N. B. E. R. ¹⁵			
Reference Cycle	Bank Debits	Retail Sales	Employment
<u>Phoenix</u>			
IV 1948 (Peak)	III 1948*	IV 1948	III 1948*
IV 1949 (Trough)	III 1949*	III 1949*	III 1949*
II 1953 (Peak)	IV 1952*	II 1953	II 1953
III 1954 (Trough)	II 1953*	IV 1953*	IV 1953*
III 1957 (Peak)	III 1957	III 1957	III 1957
I 1958 (Trough)	IV 1957*	I 1958	IV 1957*
<u>Tucson</u>			
IV 1948 (Peak)	III 1948*	IV 1948	IV 1948
IV 1949 (Trough)	IV 1949	III 1949*	III 1949*
II 1953 (Peak)	I 1953*	II 1953	I 1953*
III 1954 (Trough)	IV 1953*	II 1954*	II 1954*
III 1957 (Peak)	III 1957	III 1957	-
I 1958 (Trough)	I 1958	IV 1957*	-

*Phoenix or Tucson leads national series

trough dates of the cycles in the series being studied with the reference cycle turning points established by the

14. Cf. Appendix III.

15. Geoffrey H. Moore, Measuring Recessions (Occasional Paper LXI, New York: National Bureau of Economic Research, 1958), p. 261.

National Bureau of Economic Research.

It is apparent that Phoenix and Tucson have experienced fluctuations in their levels of economic activity roughly coincident with those of the national economy.

Downturns in the indicator series of the two cities have occurred at approximately the same time as national recessions. In view of the previously mentioned ways in which the economies of both cities are tied to the national economy it is not surprising that decreases in the national income should cause decreases in the incomes of the two communities.

The series presented for Phoenix and Tucson show a marked tendency to turn up before the national economy. This would suggest that there is some stabilizing force, or forces, at work in the two local economies which operate somewhat independently of the general business cycle. An examination of these forces will be made in a later chapter.

Amplitude of Cycles: Only one method of measuring the amplitude of the expansion and contraction periods of the business cycles in Phoenix and Tucson will be attempted in this paper. Measurements were made from the turning points in the specific series. The contractions were measured as percentage changes from the peaks to the troughs in the specific series and the expansions were measured from the troughs. The results of these measurements appear in Table IV.

expansion and contraction. TABLE IV Phoenix series is the same as the Tucson series. PERCENTAGE CHANGES; PEAKS TO TROUGHS AND TROUGHS TO PEAKS; PHOENIX AND TUCSON INDICATOR SERIES; In the period 1947-1958¹⁶ the series are as follows:

<u>Bank Debits</u>		<u>Retail Sales</u>		<u>Employment</u>	
<u>Phoenix</u>					
III'48-IV'49	-8.4%	IV'48-III'49	-10.2%	III'48-III'49	-3.0%
III'49-IV'52	70.1	III'49-II'53	63.8	III'49-II'53	42.1
IV'52-II'53	-8.2	II'53-IV'53	-3.3	II'53-IV'53	-1.0
II'53-III'57	70.7	IV'53-III'57	59.8	IV'53-III'57	42.6
III'57-IV'57	-5.1	III'57-I'58	-2.9	III'57-IV'57	-.6
<u>Tucson</u>					
III'48-IV'49	-18.1%	IV'48-III'49	-15.2%	IV'48-III'49	-3.5%
IV'49-I'53	118.4	III'49-II'53	63.8	III'49-I'53	48.6
I'53-IV'53	-12.5	II'53-II'54	-10.8	I'53-II'54	-11.1
IV'53-III'57	75.0	II'54-III'57	53.5	II'54-III'57*	41.1
III'57-I'58	-0.8	III'57-IV'57	-6.2	III'57-I'58*	0.9

*N. B. E. R. turning points used in absence of any decline in the Tucson employment series.

relative severity in Tucson; however, the series during 1948-1958 would appear to have been somewhat more severe than it was in Phoenix. In Phoenix, it appears that the contractions have been decreasing in terms of relative severity. The two expansion phases represented almost equal relative amounts of growth. In comparison, Tucson does not appear to have had such a feature. One striking feature of the measurements of 1948-1958 is that the relative severity of the contractions during the expansion phase from 1948 to 1957. 16. Cf. Appendix III.

expansion and contraction in the Phoenix series is the appearance of almost fixed ratios between the relative changes in the series. During periods of contraction the series seem to decline in about a five to three to one ratio between bank debits, retail sales and employment, respectively. A seven to six to four ratio seems to characterize the periods of expansion.

Such regularity does not appear in the Tucson series. Bank debits tend to be more volatile than retail sales, particularly in periods of expansion, but move somewhat independently in proportion to the other series in periods of contraction. Employment also seems to move somewhat independently in the periods of decline. This lack of a regular pattern again suggests the presence in the community of people who do not depend upon wages and salaries for their income.

The contractions seem to have been of decreasing relative severity in Tucson; however, the decline during 1953 would appear to have been somewhat more severe than it was in Phoenix. During this period Tucson lost a major employer which probably accounts for the relative severity of this decline and the lengthened period of contraction.

In comparison to Phoenix, Tucson appears to have grown slightly more during the expansion phase from 1949 to 1953 and slightly less during the expansion phase from 1954 to 1957.

Conclusions: When statistical indicator series for Phoenix and Tucson are adjusted for seasonal variation, periods of growth and decline appear during the periods in which the national economy was experiencing growth or decline. This behavior bears out the conclusions of the previous chapter which pointed out the ways in which the economies of the two cities were tied to the national economy. Both the measurements of timing and amplitude of the cyclical movements of the indicator series in Phoenix and Tucson suggest that there are conditions within these communities which affect and are affected by changes in national income. The purpose of the remaining chapters is to examine the nature of some of these conditions.

The cyclical movements of the indicator series are consistent in the two cities. With the exception of the 1940-41 cycle in Maricopa County, all of the cycles follow the general shape of an "S" curve; the 1940-41 cycle in Maricopa County resembles a "U" curve.

In addition to the explanation of the shapes of the cyclical movements, the statistical analysis will be introduced.

1. Although the terms "S" curve and "U" curve usually refer to frequency distributions, they are used in this chapter in a purely descriptive sense.

CHAPTER IV

CYCLICAL PATTERNS IN PHOENIX AND TUCSON

Introduction

The purpose of this chapter is to examine the patterns of the two cycles evident in the time series presented for each city and examine the forces at work within the economies of the two communities which give the cycles their shape.

Charts IV and V, which are pictures of the two complete cycles visible in the data for the two communities, show the striking similarity in the appearance of the cycles. For each cycle, all three indicator series are consistent in their shapes. With the exception of the 1953-1958 cycle in Maricopa County, all of the cycles follow the general shape of an "S" curve; the 1953-1958 cycle in Maricopa County resembles a "J" curve.¹

To aid in the examination of the shapes of the particular cycles, two analytical devices will be introduced.

1. Although the terms "S" curve and "J" curve usually refer to frequency distributions, they are used in this chapter in a purely descriptive sense.

CHART IV
BANK DEBITS, RETAIL SALES AND EMPLOYMENT
PHOENIX: TWO COMPLETE CYCLES²

Seasonally Adjusted Index
(1947-1949 = 100)

1948-1953

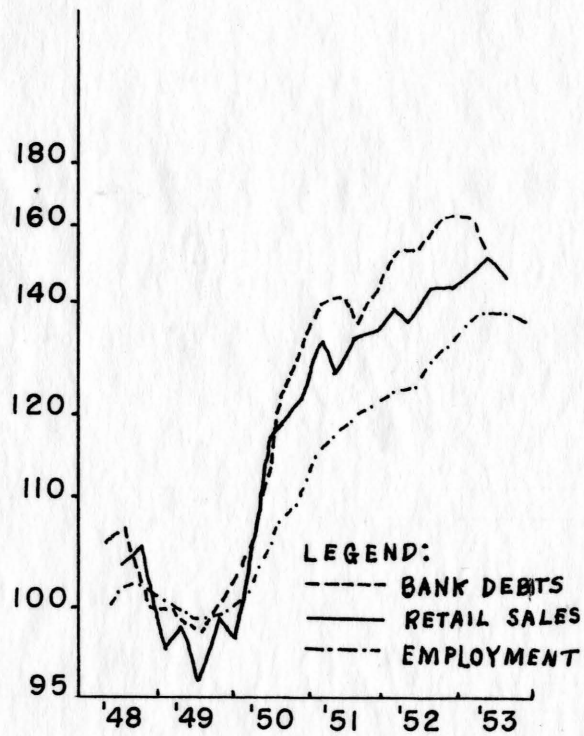
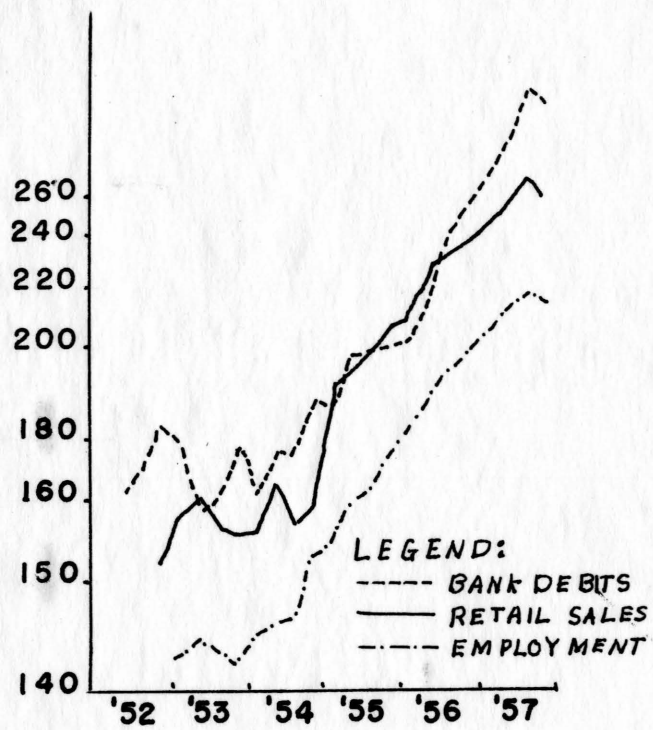


CHART IV -- Continued

1952-1957



2. Cf. Appendix III.

CHART V

BANK DEBITS, RETAIL SALES AND EMPLOYMENT
TUCSON: TWO COMPLETE CYCLES³

Seasonally Adjusted Index
(1947-1949 = 100)

1948-1953

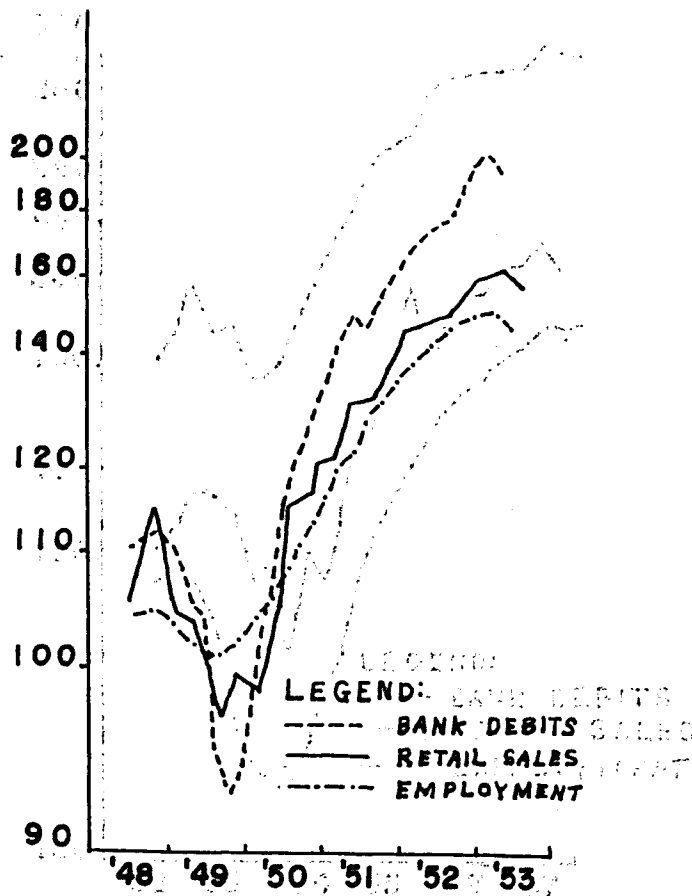
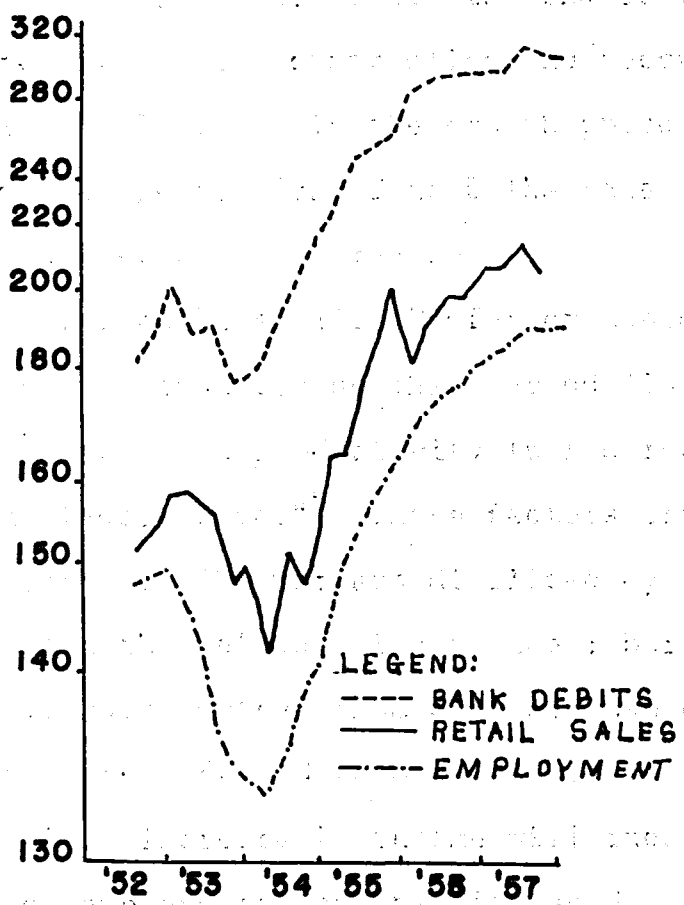


CHART V -- Continued.

1952-1957



3. Cf. Appendix III.

A Growth Cycle: For the analysis of this chapter, a three-stage growth cycle similar to the one described by Professor Hansen will be employed.⁴ It is illustrated in Figure I. The complete cycle consists of a peak to peak movement with the second peak higher than the first. Phase I (A to B) represents the actual decline in the series. Phase II (B to C) is the stage during which the series recovers to its former level. These two phases might be called, respectively, the contraction and recovery phases.

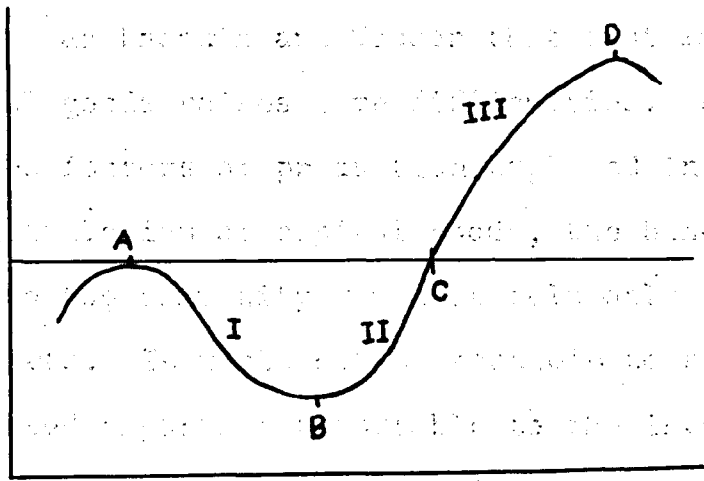
Phase III (C to D) is the growth phase of the cycle. As the series progresses from C to D the rate of growth declines as the series nears the peak.

In analyzing Phase III, Professor Hansen explains that the gain in output during this period "is due to two factors: (a) increased productivity (per worker), and (b) growth in the labor force."⁵ These factors are underlying or enabling forces. The workers displaced by technological improvements and the net addition to the labor force must be employed to raise output from C to D. Hansen argues that to raise output from C to D a gain in real income must take place. This increase in income will induce investment which provides employment for the displaced and new

4. Alvin H. Hansen, Business Cycles and National Income (New York: Norton, 1951), p. 485.

5. Loc. cit.

FIGURE I
A GROWTH CYCLE⁶



workers.⁷

The Employment Multiplier: A contemporary and widely accepted way of viewing changes in national income is through the use of the investment multiplier, "which is the ratio of an increase of income to a given increase in new investment."⁸ Briefly, its workings may be described in the following manner:

An increase of investment raises incomes in the capital goods industries, and this induces an

6. Loc. cit.

7. Ibid., p. 486.

8. Dudley Dillard, The Economics of John Maynard Keynes (New York: Prentice-Hall, 1948), p. 76.

increase of consumption expenditures. Thus an increment of investment induces an increase in consumption. The two increments together equal the increase in income.⁹

Attempting to apply this analysis directly to communities such as Phoenix and Tucson that must import most of their capital goods raises some difficulties. Aside from locally owned factors of production employed in the construction and installation of capital goods, the benefits of an investment to the community would be felt only through increased exports. It would not be possible to separate those increased exports attributable to the investment in the locality from those induced by investments elsewhere. For the purposes of this study, it is necessary only to begin the analysis with the increase in direct income, whatever the source of the increased demand for exports.

An increase in community exports leads to an increase in employment in those industries which produce for export. This increase in exports brings additional direct income to locally owned factors of production employed in this industry. In the terminology of the conventional investment multiplier, this increase in community income would be an autonomous increase. The owners of these locally owned factors, in turn, increase their consumption expenditures which induces a further gain in employment in

See Hansen, "Multiplier in an Expanding Industrial World," *Los Angeles County, 1946-47*, *Journal of Economics*, Vol. 1, No. 2, August 1947, p. 24.

9. Hansen, op. cit., p. 171.

those industries which sell in the local market.¹⁰

There are many possible leaks in this system. Increased imports, hoarding by residents, decreases in transfer payments from outside fiscal bodies, higher tax payments to outside fiscal bodies and local factor payments to owners residing outside the community are all examples of possible leaks.¹¹

There is also a possibility of net additions to the community's income coming from sources other than manufacturing. This type of increased income would also induce employment in local-market industries.

Employing the Analytical Tools: Returning to the scheme of the growth cycle, it is now possible to say that it is the employment multiplier which lifts output from C to D during Phase III of the cycle. The initial impetus provided by the gain in the community's income through the sale of locally owned factors of production employed in manufacturing will induce a further gain in the community's output, as measured by its employment, and a further gain in its income. Applying this analysis to Phoenix and Tucson it may be expected that the periods of most rapid

10. George H. Hildebrand and Arthur Mace, Jr., "The Employment Multiplier in an Expanding Industrial Market: Los Angeles County, 1940-47," Review of Economics and Statistics, XXXII (August 1950), 242.

11. Loc. cit.

growth, as evidenced by the indicator series, would be those periods in which manufacturing employment is increasing most rapidly. Home-market employment will also be rising during this period and will continue to rise although the impetus provided by the autonomous increase in income grows weaker.

To observe the workings of the employment multiplier, the non-agricultural employment series was separated into three categories: (a) manufacturing, (b) construction and (c) home-market employment. It was suggested earlier that only manufacturing employment in the form of producing goods for export would raise local income directly. Hildebrand and Mace took great pains in separating that manufacturing conducted for export from that which was performed for the local market.¹² In the short run, however, it would make little difference whether the manufacturing was for export or home-market consumption. Manufacturing for the home-market which decreased imports and employed previously unemployed factors of production would have the same net effect on community income. Furthermore, the nature of the data of the employment series makes a division of manufacturing employment impractical.

12. Ibid., p. 241.

Home-market employment includes the categories of "trade" (both wholesale and retail), "public utilities and transportation," "finance, real estate and insurance" and "services."

Construction employment was separated from home-market employment because it is both a function of increased income and a type of employment which results in increased income. As income grows, consumers would be induced to spend part of this income on housing, presumably with some time lag and dependent upon other factors such as the availability of existing housing and the level of rent. On the other hand, construction uses the savings of the community and outsiders¹³ to put local factors of production to work. In this sense, it increases the direct income of the community.

Charts VI and VII present these three employment series. It was necessary to put all three on different scales since the gains in some categories, particularly manufacturing, made the use of one scale impractical.

Pima County Cyclical Patterns: In the period beginning in 1948 and extending through the downturn in 1953, the indicator series for Tucson follow the pattern

13. John H. Denton, "A Comparison of Mortgage Lending in Phoenix and Tucson," Arizona Business and Economic Review, VII (May 1958), pp. 1-4.

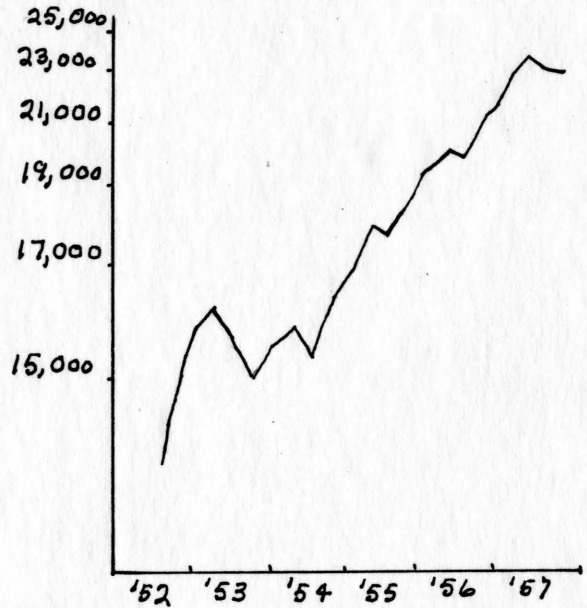
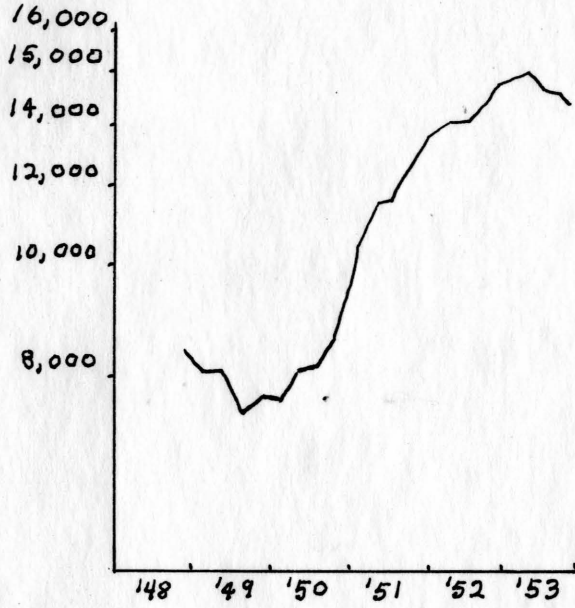
CHART VI

MANUFACTURING, HOME-MARKET AND CONSTRUCTION EMPLOYMENT
PHOENIX: TWO COMPLETE CYCLES¹⁴

1948-1953

1952-1957

Manufacturing Employment



Home-Market Employment (Seasonally Adjusted)

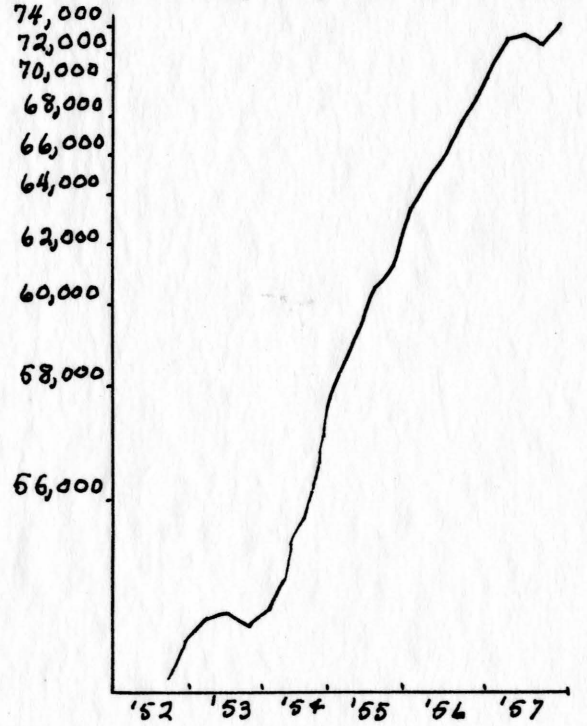
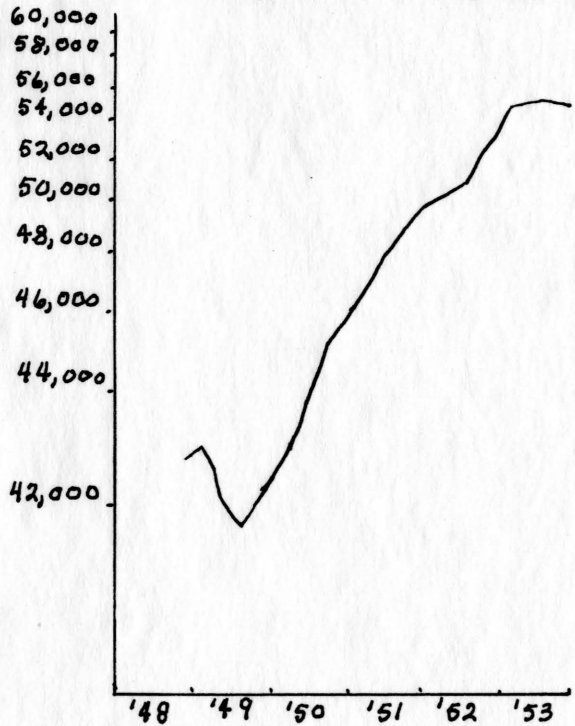
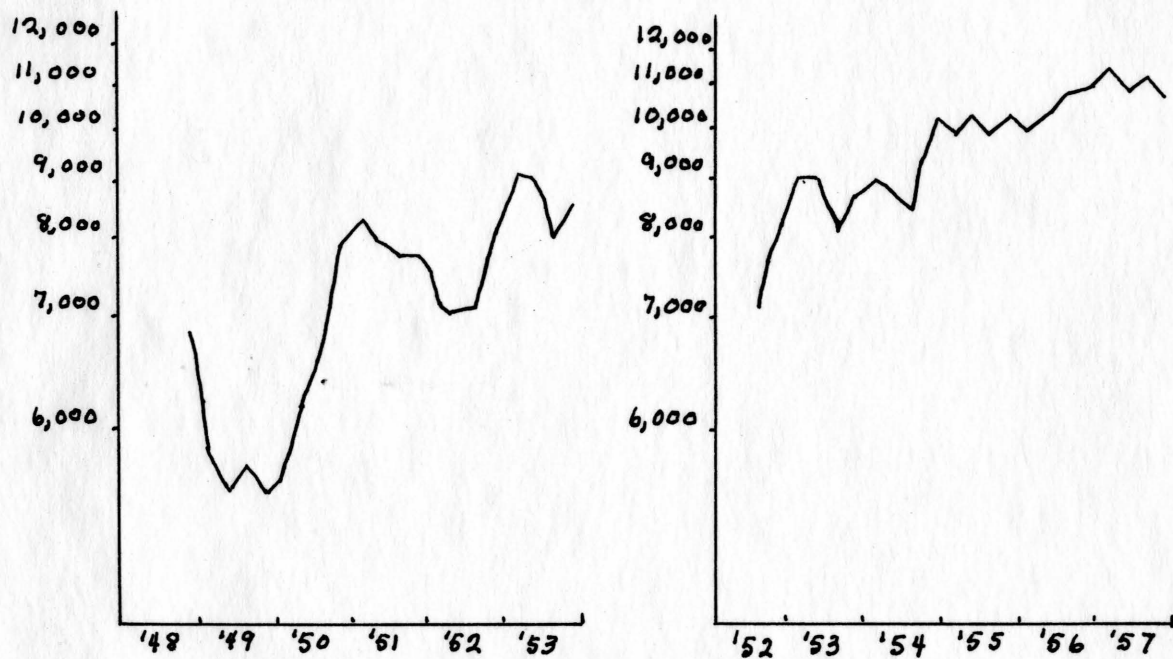


CHART VI -- Continued

Construction Employment



14. Cf. Appendix IV.

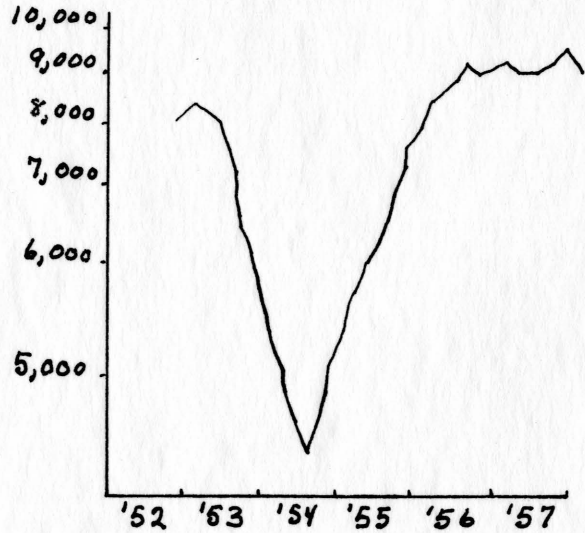
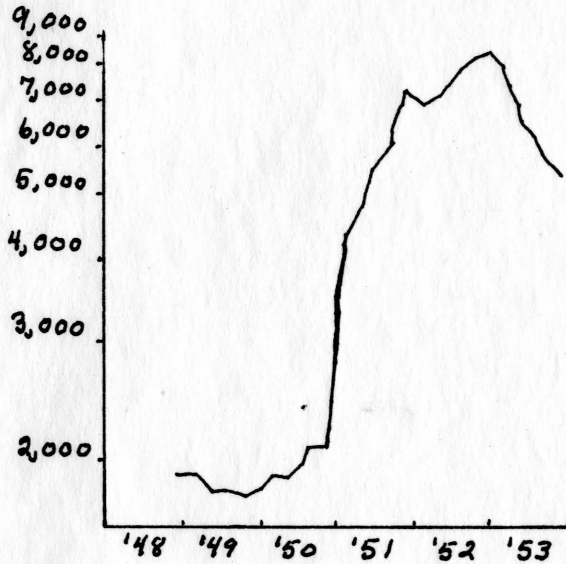
CHART VII

MANUFACTURING, HOME-MARKET AND CONSTRUCTION EMPLOYMENT
TUCSON: TWO COMPLETE CYCLES¹⁵

1948-1953

1952-1957

Manufacturing Employment



Home-Market Employment (Seasonally Adjusted)

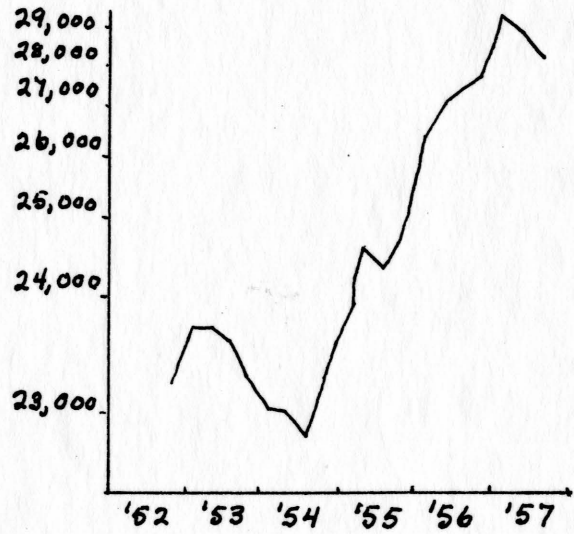
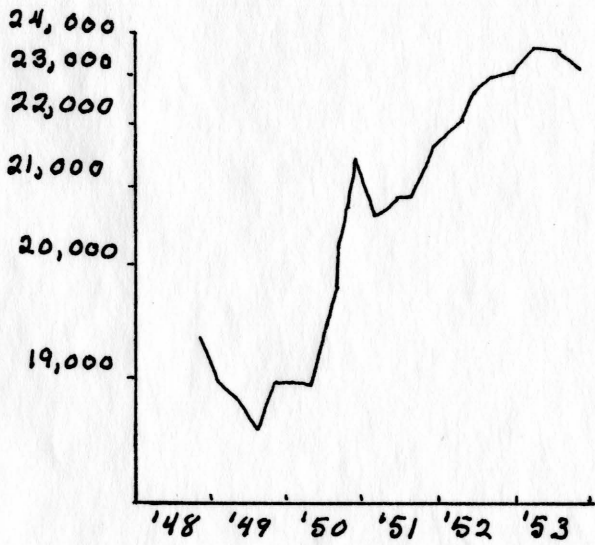
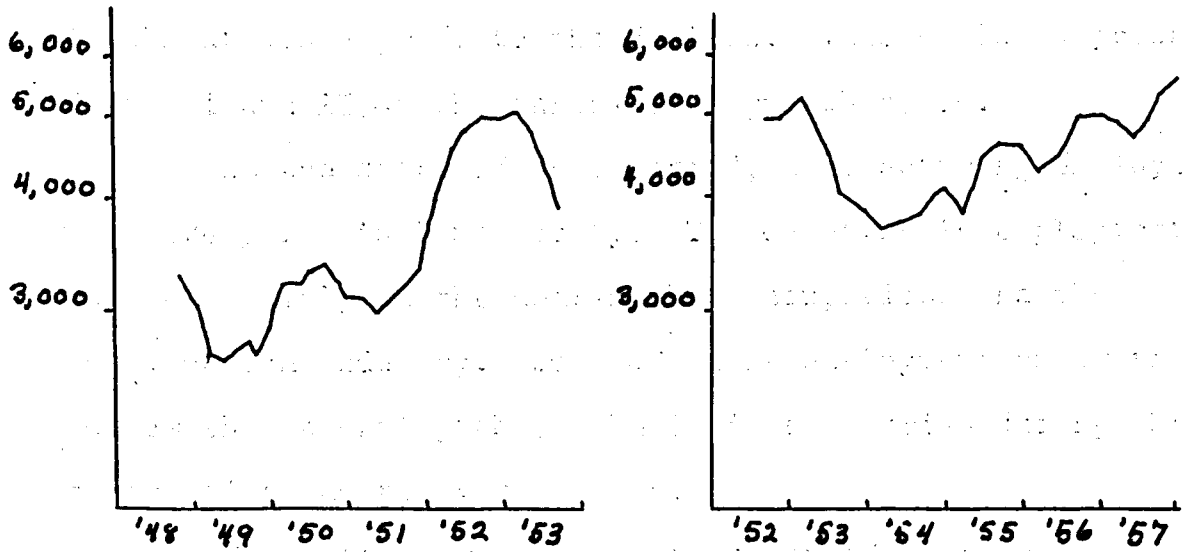


CHART VII -- Continued

Construction Employment



of an "S" curve. The decline came in all series late in 1948 and lasted until late in 1949. Employment and bank debits turned up in the fourth quarter of 1949; retail sales

lagged, turning up in the first quarter of 1950. By about the third quarter of 1950, all three series had reached the levels attained prior to the decline. This would comprise Phases I and II of the three-stage growth cycle.

At the start of this period, manufacturing employed relatively few in Pima County. The downturn in employment was felt mainly in the home-market occupations and the construction industry. Both of these employment categories follow the general path of the indicator series during the contraction and recovery phases.

Manufacturing employment increased sharply in the first quarter of 1950 and continued to grow at a rapid rate during the entire year. By the end of 1951 it was growing at a much slower rate and continued to grow at a reduced rate during 1952. Bank debits and retail sales grew rapidly during 1951 and continued to grow, but at a decreasing rate, during 1952. Substantial gains were still being

made by home-market employment and construction during 1952, but the impetus provided by the increase in direct income from manufacturing employment was beginning to weaken.

The downturn in 1953 was signalled by a downturn in manufacturing employment. Employment in home-market

industries and construction followed and retail sales and bank debits declined as the force of the loss of the income was felt.

The contraction phase continued until early in 1954. Employment in construction picked up slightly in the first quarter of 1954. In the second quarter, manufacturing employment began to rise rapidly. As it continued to rise, the increased community income brought about a gain in retail sales and an increase in home-market employment. Manufacturing employment continued to rise at an almost constant rate until it stabilized at slightly more than 9,000 in the second quarter of 1956. This period of rapid growth in manufacturing employment is again coincidental with the periods of most rapid growth in the indicator series. After manufacturing employment had leveled off, home-market employment and construction employment continued to grow. Just as in the previous growth phase, the impetus provided by the increasing direct income was growing weaker and the indicator series began to slow down in their rates of growth.

Just as recovery came in early 1950 in the absence of any significant change in manufacturing employment, the downturns in the indicator series in 1957 occurred in the absence of any downturn in manufacturing employment. This would bear out the notion that the economy of Tucson is

tied to the national economy in ways other than through the sale of its factors of production allocated to producing manufactured goods. The magnitude of the changes brought in the indicator series by changes in manufacturing employment shows that, although other factors may affect business cycles in Tucson, manufacturing is a major destabilizing force in the community.

Maricopa County Cyclical Patterns: The cycle which is evident in the indicator series of Phoenix from 1948 to 1953 follows the general pattern of an "S" curve.

As the employment series begins in the fourth quarter of 1948, employment in manufacturing and construction was declining. Bank debits began to fall in this quarter; retail sales and home-market employment began to fall in the fourth quarter. This contraction phase continued until the third quarter of 1949 when all indicator series turned up and the recovery phase of the cycle began. Recovery was accomplished to a great degree in the absence of any appreciable gains in manufacturing employment. However, as the indicator series begin to enter the growth phase of the cycle, it is a gain in manufacturing employment that picks up and through the employment multiplier brings the period of most rapid growth in the indicator series. As the rate of increase in manufacturing employment begins to slacken the indicator series begin to

flatten out and form the upper part of the "S" curve. A rather substantial construction boom, as evidenced by the construction employment data, occurred in early 1953, but the drop in manufacturing employment, concurrent with a drop in construction employment, signalled another downturn in early 1953.

The cycle beginning in 1953 and extending through 1957 resembles a "J" curve. The forces which operated to give the other cycles an "S" shape act in a somewhat different manner during this period. Bank debits, retail sales and employment began to pick up in late 1953. During 1954 these series moved somewhat unevenly to a point of recovery. Employment was increasing during this year in the home-market category. Construction employment rose during the last quarter of 1953 and first quarter of 1954, but a labor dispute cut it back during the second and third quarters of 1954. During the fourth quarter of 1954, as the indicator series were still bumping along toward recovery, manufacturing employment reached a point of recovery and started to grow. It continued to grow at an almost constant rate until the second quarter of 1957. As it continued this growth, further employment in home-market and construction industries was stimulated. The indicator series reached their recovery points as manufacturing employment began to rise

rapidly and all during the period of rapid gains in manufacturing employment the indicator series increased at an almost constant rate.

The downturn in 1957 came first in manufacturing. In the following quarter all of the indicator series turned down.

Conclusions: In both cities, and particularly in Tucson, economic activity shows some tendency to fluctuate independently of manufacturing. Recovery from a downturn can be accomplished in the absence of a gain in manufacturing employment and, in the case of Tucson, a downturn may occur without a downturn in manufacturing employment.

However, manufacturing employment is an important element in the economies of both cities. Downturns in this category result in downturns in economic activity in each city. Furthermore, the periods of most rapid growth in both cities are associated with those periods in which manufacturing employment is increasing at a rapid rate. Manufacturing employment appears to induce employment in other categories which are primarily oriented to the local market.

The economies of both Phoenix and Tucson are tied to conditions in the national economy through the income received on the factors of production allocated to manufacturing for export.

CHAPTER V

THE ROLE OF POPULATION GROWTH

Population Increases in Maricopa and Pima Counties

Between 1940 and 1958 population in Maricopa and Pima Counties approximately tripled. The population increases have been at a somewhat more rapid rate since 1950. Table V shows the populations of Maricopa and Pima Counties for the years 1940, 1950, and 1958 as index numbers.

POPULATION IN MARICOPA AND PIMA COUNTIES:
1940, 1950 AND 1958 (1940 = 100)¹

Date	Maricopa	Pima
1940	100	100
1950	178	198
1958	304	345

Much of this increase has been due to in-migration. Between 1940 and 1950, the total net in-migration for Maricopa County has been estimated at 96,418. This would account for 66% of the population increase during this

1. Cf. Appendix V.

period. Total net in-migration for Pima County was 46,354 during the same period, or approximately 68% of the population increase.²

Population Growth and Business Cycles: Since 1950 the population increases for the two counties have been somewhat erratic from year to year. Figure II shows these percentage increases in population on a year to year basis. More specifically, they are percentage changes from April to April, as that is the month in which the population estimates are made.

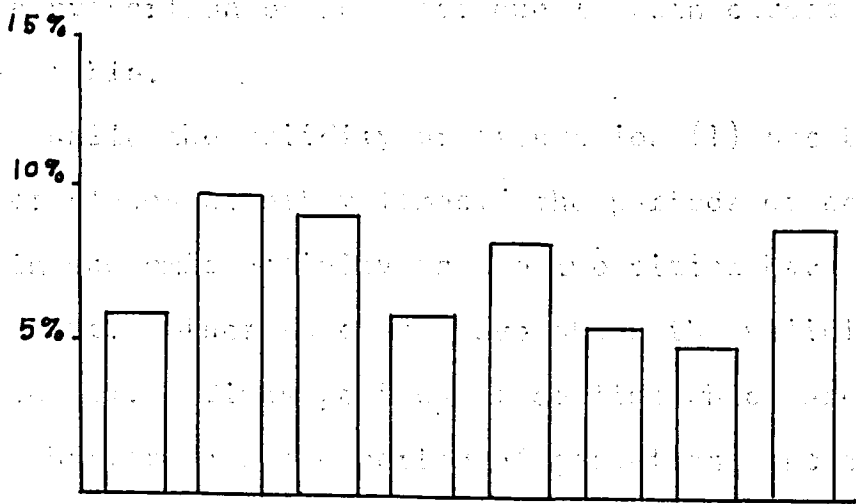
Viewed in the light of the cyclical patterns discussed in the two preceding chapters, it appears that the rate of population growth is connected with the business cycle.

As an upswing begins, population growth begins increasing in terms of the rate of growth. This rate of growth seems to increase as the growth phase of the business cycle continues. Downturns in economic activity are associated with decreases in the rate of population growth.

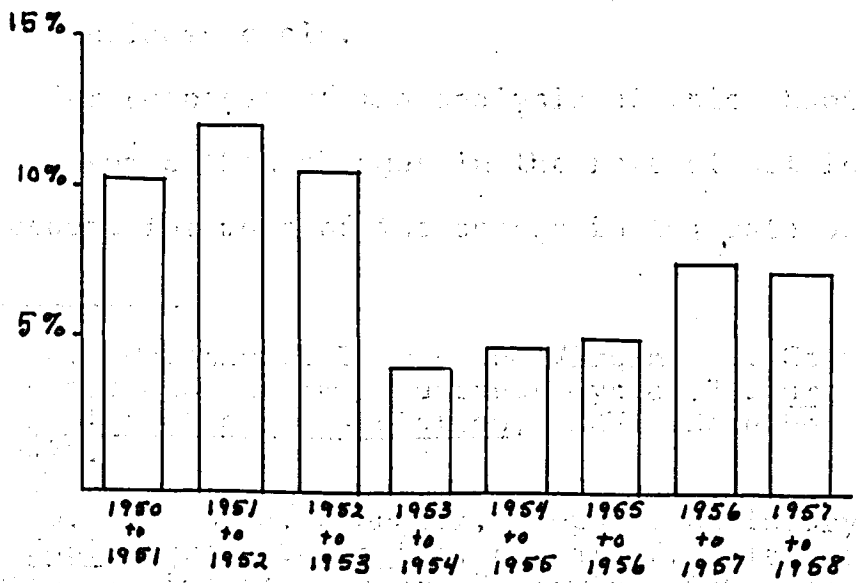
Part of this population growth is due to natural increase and part is due to in-migration. Three assumptions

2. Donald J. Bogue, Components of Population Change, (1940-50): Net Migration and Natural Increase for Each Standard Metropolitan Area and State-Economic Area (Studies in Population Distribution XII, Oxford, Ohio: Scripps Foundation, 1957), p. 101.

FIGURE II
 PERCENTAGE INCREASES IN POPULATION,
 MARICOPA AND PIMA COUNTIES, BY YEARS,
 1950 - 1958



PIMA COUNTY



3. Cf. Appendix V.

are possible concerning the proportion of the population growth attributable to these two causes: (1) In-migration is constant; the variation is due to changes in the birth rate. (2) Natural increases are relatively constant; the variation is due to changes in the rate of net in-migration. (3) The proportion of increase due to both causes is relatively stable.

While the validity of assumption (1) has been shown in other places at other times,⁴ the periods of actual decline in economic activity in the two cities have been quite short. Other scholars have shown the validity of assumption (2).⁵ Given periods of decline which are, in most cases, shorter than the period of gestation, the acceptance of assumption (2) would seem to be the most logical. Acceptance of assumption (3) would not substantially alter the proposition that the rate of in-migration fluctuates with the business cycle.

For purposes of the analysis of this chapter it will be assumed that changes in the rate of net in-migration account for much of the change in the rate of

4. Dorothy S. Thomas and Virginia L. Galbraith, "Birth Rates and Interwar Business Cycles," Journal of the American Statistical Association, XXXVI (December 1941), pp. 465-76.

5. Joseph J. Spengler, "Population Theory," A Survey of Contemporary Economics, Bernard F. Haley, editor (Homewood, Illinois: Richard D. Irwin, 1952), II, 122-124.

population growth and that the pattern of change is substantially the same.

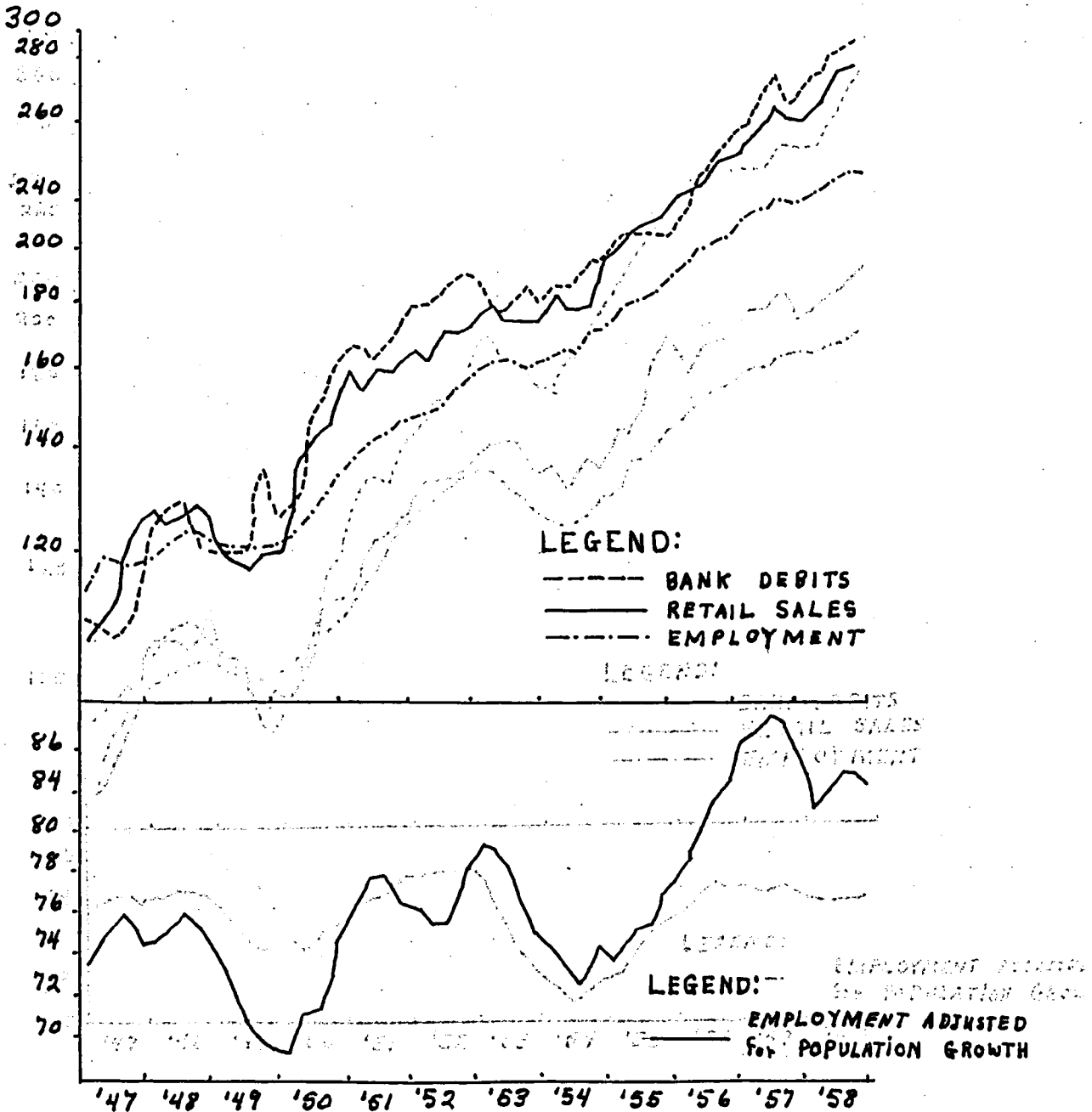
Employment and Population Growth: To study the relationship between population growth and employment the following procedure was used. The population estimates for any one April were assumed to be the population for the second quarter of that year. Population estimates were then made for each quarter, assuming a straight line growth from second quarter to second quarter. An index was constructed using the 1950 census count (second quarter) as 100. Using this index, the seasonally adjusted non-agricultural employment series was reduced.

The actual figures presented in this resultant series are not meant to have any significance in themselves. The fluctuations are the important aspect of this series. When the series is moving up on the scale, employment is increasing faster than population. When the line is running horizontal, employment and population are increasing at the same rate. When the line moves downward on the graph, population is increasing faster than employment.

Charts VIII and IX present this reduced series for the respective cities. Charts II and III have been superimposed onto the charts for the purpose of comparing the relationship of employment and population growth to the business cycle.

CHART VIII

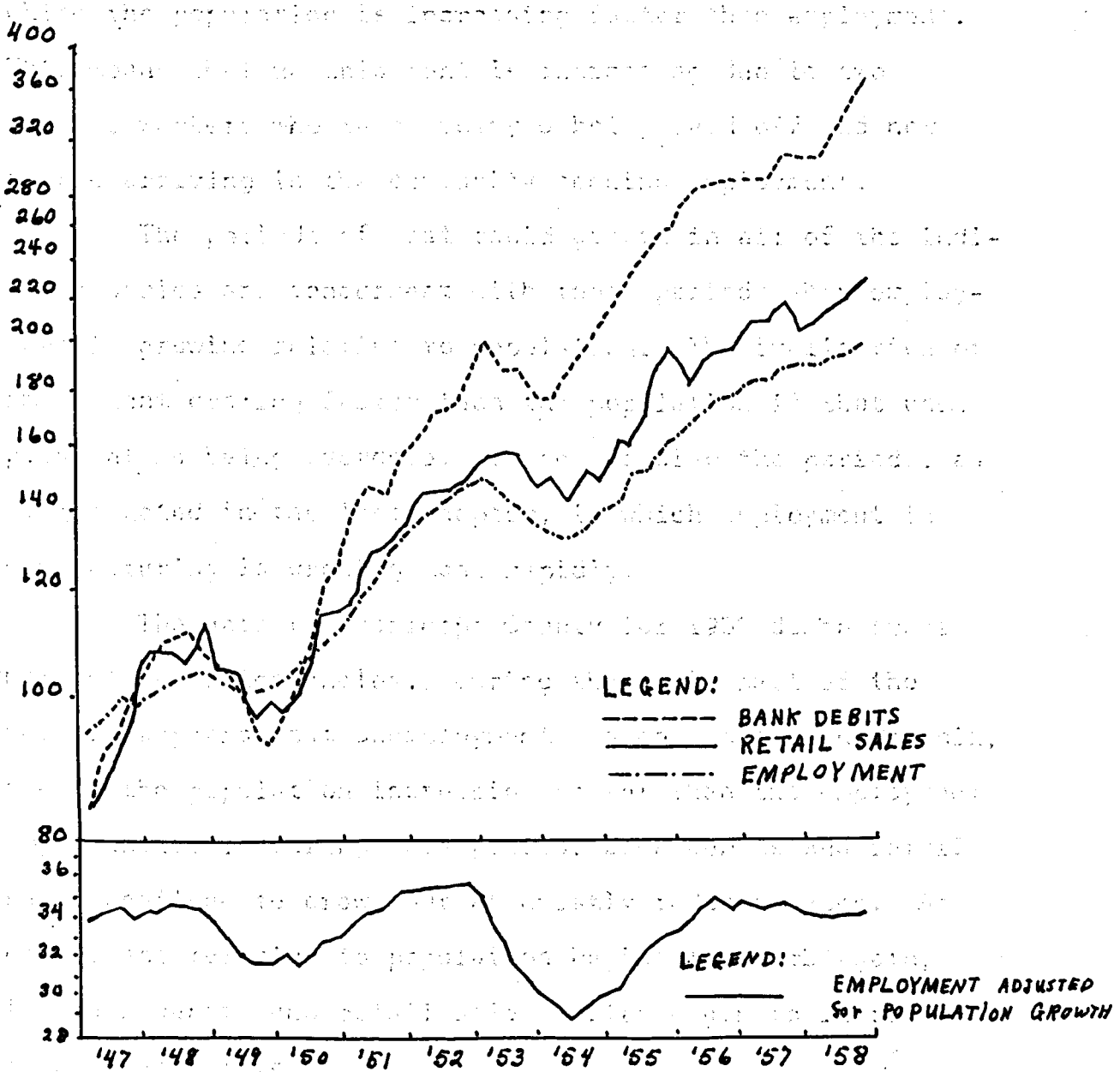
BANK DEBITS, RETAIL SALES AND EMPLOYMENT
WITH EMPLOYMENT ADJUSTED FOR POPULATION GROWTH
PHOENIX, 1947-1958⁶



6. Cf. Appendixes III and V.

CHART IX

BANK DEBITS, RETAIL SALES AND EMPLOYMENT
WITH EMPLOYMENT ADJUSTED FOR POPULATION GROWTH
TUCSON, 1947-1958



7. Cf. Appendixes III and V.

There are direct relationships between the indicator series and the reduced employment series. Associated with periods of downturn in both communities are periods in which the population is increasing faster than employment. This means that unemployment is increasing due to two causes, workers who were employed being laid off and new people arriving in the community seeking employment.

The periods of most rapid growth in all of the indicator series are concurrent with those periods when employment is growing relative to population. The implication of employment growing faster than the population is that unemployment is being overcome. These are also the periods, as it was noted in the last chapter, in which employment in manufacturing is growing most rapidly.

The data for Maricopa County for 1952 demonstrate both of these tendencies. During the early part of the year it appears that unemployment was developing in Phoenix, due to the population increasing faster than the employment opportunities. During this period, bank debits and retail sales continue to grow, but at greatly reduced rates. As employment relative to population begins to climb again, the bank debits and retail sales series begin to increase at a greater rate.

During 1952, the last half of 1956 and all of 1957, the adjusted employment series in Pima County indicates

that employment and population were increasing at approximately the same rate. Apparently a state of dynamic equilibrium was being maintained during these periods. During these periods the indicator series continue to grow, but at decreasing rates of growth. These are also the periods, according to the data presented in the previous chapter, in which manufacturing employment is growing at a reduced rate or is stable. The greater proportion of new job opportunities in these periods is in the industries selling goods and services in the home market, including construction.

At the end of the downswings in the indicator series for both communities in 1949 and 1953 there are periods in which unemployment is growing or periods in which relatively large amounts of unemployment exist. These are also the recovery periods, as defined in Chapter IV. The recovery period in Maricopa County during 1954 is particularly notable. Although the employment series turns up in the first quarter of 1954, employment relative to population does not turn up until the fourth quarter.

These periods of recovery in spite of substantial or growing unemployment suggest that part of the in-migration consists of people who are not dependent upon wages and salaries earned in either of the two communities. An influx of these people into the local economy would raise the community's income in spite of unemployment.

Conclusions: There are definite relationships between business cycle activity and population growth. As the economies of the two cities begin to recover from a downturn, employment opportunities tend to grow faster than the population. These are also the periods in which manufacturing employment is expanding most rapidly and economic growth is most rapid, as shown by the indicator series.

As the cycle runs its course, population increases more rapidly and tends to catch up with employment opportunities. By this time the initial impetus provided by the rapid increase in manufacturing employment is weakening and the induced home-market employment is providing most of the increasing employment.

An actual decline in employment increases unemployment through laid off workers and increases to the labor supply which the economies of the two cities are unable to employ.

The periods of growing unemployment or relatively large amounts of unemployment are somewhat longer than the periods of actual decline in the indicator series. This suggests the possibility that many of the immigrants have sources of income, or sources of purchasing power, other than wages and salaries earned in the two communities.

CHAPTER VI

CONCLUSIONS

The economies of Phoenix and Tucson are tied to the national economy in three ways: (1) through the sale of locally owned factors of production employed in manufacturing goods and services for export, (2) through the dependence of some of the residents of both communities upon income received from sources outside the communities, and (3) through expenditures made by tourists.

These sources supply the direct income which supports the sale of locally produced goods and services in the local market. This sale of factors in the local market also raises income, but this income is of a passive nature and is dependent upon the sources of direct income.

To the extent that these external sources of income are reduced by national recessions, Phoenix and Tucson are affected. The seasonally adjusted bank debits, retail sales and employment series show downturns during each of the three recessions since World War II.

Following these periods of decline, the economies of both cities continue their growth. The periods of most rapid growth come during those periods in which manufacturing employment is growing at a rapid rate and employment

opportunities in home-market occupations are being induced by the increasing local income.

As the periods of growth continue the rate of population growth begins to increase. As the initial impetus provided to home-market employment begins to weaken, population tends to catch up with the expansion of employment opportunities. When this happens, the rate of growth begins to slacken.

Phoenix and Tucson have experienced considerable growth since World War II. However, this does not mean that they are immune to the national business cycle, for national economic conditions appear to be capable of affecting the growth of two communities and causing lapses in that growth.

The study was conducted in cooperation with the Bureau of Economic Research, University of California, Berkeley, California. The study was supported by the National Science Foundation, Washington, D. C. The study was conducted in cooperation with the Bureau of Economic Research, University of California, Berkeley, California.

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by G. W. C. The series is based on right of workers:
manufacturing, mining and construction; construction; insurance

APPENDIX I

part of the series: state, insurance, insurance
and state: **SOURCES OF DATA** state and government.

The series: The series used were obtained from unpublished data

Bank Debits

obtained from April 1955 to 1958, by the

The series used were obtained from unpublished data
made available to the Bureau of Business and Public Re-
search at the University of Arizona, Tucson, Arizona; by
the Federal Reserve Bank of San Francisco.

Retail Sales: The series used have been calculated
from sales tax collections in Maricopa and Pima Counties by
the Research Department of the Valley National Bank of
Phoenix, Arizona. Since 1955, these series have been pub-
lished in the Arizona Statistical Review, issued by the
Valley National Bank annually in October. The data for 100
years prior to 1955 was made available to the author from
unpublished material in the files of the bank's research
department.

Employment: The employment estimates used were ob-
tained from unpublished data furnished by the Research and
Reports Section, Unemployment Compensation Division of the
Arizona Employment Security Commission.

The data are estimates of total numbers employed in
each county and include estimates for workers not covered

by O. A. S. I. The series is broken into eight categories: manufacturing; mining and quarrying; construction; transportation and public utilities; trade; finance, insurance and real estate; services and miscellaneous; and government.

Population: The population estimates used are those made during April of each year, since 1950, by the Management Controls, Economics and Statistics Section, Employment Security Commission, Arizona State Employment Service. These estimates are published each year, in October, in Arizona: Basic Economic Data, by the Arizona State Employment Service.

The population estimates for the years 1947, 1948 and 1949 were made by the author using a straight line growth extrapolation between the census totals for 1940 and 1950.

Peer Group Statistics: The peer groups for the two cities were selected by picking the five standard metropolitan areas which were larger and the five which were smaller than each of the two cities in the study, using data from the 1950 census.¹ The group was then checked for availability of comparable data for 1956. It was found that the standard metropolitan areas of Hartford, Conn.,

1. U. S. Department of Commerce, Bureau of the Census, County and City Data Book: 1956 (Washington: U. S. Govt. Printing Office, 1957); Table 3, pp. 346-363.

New Bedford, Mass., and Fall River, Mass., could not be isolated in the 1956 data and they were eliminated from the comparison groups. The 1956 data were taken from published material prepared from O. A. S. I. payments made during the first quarter of 1956.² In arriving at the median value in each employment category for each comparison group, Phoenix and Tucson were included in the peer groups. The totals of the percentages presented in Table II do not equal 100% for Phoenix, Tucson or their respective groups. There are several reasons for this. First, the categories "hotels, motels and resorts" and "medical and Dental" are sub-categories of the general category "service." Second, while there was employment in mining in almost every standard metropolitan area, this category frequently contained no record of the number employed due to the Department of Commerce's policy of withholding those totals when they might tend to disclose information about individual employers. Finally, percentages were not calculated for two employment categories, "agricultural service workers" and "unclassified," which account for small proportions of the total employment in

2. U. S. Department of Commerce, U. S. Department of Health, Education and Welfare, County Business Patterns, First Quarter, 1956 (Washington: U. S. Govt. Printing Office, 1958).

each standard metropolitan area. The standard metropolitan areas included in the Phoenix comparison group were: Omaha, Neb.; Fort Worth, Tex.; Wheeling, W. Va.-Steubenville, Ohio; Syracuse, N. Y.; Knoxville, Tenn.; Phoenix; Richmond, Va.; Oklahoma City, Okla.; Charleston, W. Va.; Nashville, Tenn.; and Jacksonville, Fla.

Standard metropolitan areas included in the Tucson comparison group were: Winston-Salem, N. C.; Albuquerque, N. M.; Hampton-Newport News-Warwick, Va.; Columbia, S. C.; Jackson, Miss.; Tucson; Altoona, Pa.; Montgomery, Ala.; Raleigh, N. C.; Macon, Ga.; and Roanoke, Va.

United States Series: For purposes of comparison of seasonal indexes, bank debits, department store sales and non-agricultural employment series were obtained for the nation as a whole.

The bank debit series used was the revised series for 338 reporting centers, not including New York City, which was begun January 1, 1953.

The department store sales series is the monthly series compiled by the Federal Reserve Board and published as an index (1947-49 = 100).

Non-agricultural employment, as published by the Federal Reserve Board, is the series compiled by the Bureau of the Census.

All three of these series are published monthly in the Federal Reserve Bulletin published by the Board of Governors, Federal Reserve System, Washington, D. C.

The method used for computing the seasonal indexes was the ratio-to-moving-average method described in Chapter III and used in calculating all seasonal indexes used in this study.

Category	Seasonal			
	I	II	III	IV
...	100.0	99.0	100.0	100.0
...	100.0	100.0	99.0	100.0
...	100.0	100.0	97.0	100.0
...	100.0	99.7	97.0	100.0

Source: Bureau of Economic Analysis,
 Statistical Abstract, 1947-1958

Category	Seasonal			
	I	II	III	IV
...	100.0	100.0	99.0	100.0
...	100.0	100.0	99.0	100.0
...	100.0	99.7	97.0	100.0
...	100.0	100.0	99.0	100.0

APPENDIX II

SEASONAL INDEXES,
RATIO-TO-MOVING-AVERAGE METHODSeasonal Indexes,
Maricopa County, 1947-1958

<u>Series</u>	<u>Quarters</u>			
	<u>I</u>	<u>II</u>	<u>III</u>	<u>IV</u>
Bank Debits	108.4	98.8	90.6	102.2
Retail Sales	101.9	100.8	91.9	105.4
Employment	101.7	100.0	97.0	101.3
Home-market Employment	102.0	99.7	97.0	101.3

Seasonal Indexes,
Pima County, 1947-1958

<u>Series</u>	<u>Quarters</u>			
	<u>I</u>	<u>II</u>	<u>III</u>	<u>IV</u>
Bank Debits	104.4	100.9	93.1	101.6
Retail Sales	103.2	100.2	91.2	105.4
Employment	101.2	99.7	97.7	101.4
Home-market Employment	102.0	100.1	96.6	101.3

**Seasonal Indexes,
United States, 1947-1958**

<u>Series</u>	<u>Quarters</u>			
	<u>I</u>	<u>II</u>	<u>III</u>	<u>IV</u>
Bank Debits	99.8	100.2	96.5	103.5
F. R. B. Department Store Sales	75.2	97.9	95.2	132.2
Employment	98.9	99.5	100.9	100.7
1947	100.0	100.0	100.0	100.0
1948	100.0	100.0	100.0	100.0
1949	100.0	100.0	100.0	100.0
1950	100.0	100.0	100.0	100.0
1951	100.0	100.0	100.0	100.0
1952	100.0	100.0	100.0	100.0
1953	100.0	100.0	100.0	100.0
1954	100.0	100.0	100.0	100.0
1955	100.0	100.0	100.0	100.0
1956	100.0	100.0	100.0	100.0
1957	100.0	100.0	100.0	100.0
1958	100.0	100.0	100.0	100.0

Source: Bureau of Economic Analysis, Department of Commerce, Washington, D.C.

APPENDIX III

SEASONALLY ADJUSTED INDICATOR SERIES

PHOENIX BANK DEBITS
(Adjusted Index, 1947-1949 = 100)¹

<u>Year</u>	<u>Quarters</u>			
	<u>I</u>	<u>II</u>	<u>III</u>	<u>IV</u>
1947	90.0	89.0	86.8	91.7
1948	102.7	107.8	109.4	102.4
1949	102.2	100.7	100.2	117.9
1950	104.7	108.5	125.8	134.4
1951	145.8	147.6	141.2	148.8
1952	158.9	159.5	165.3	171.6
1953	169.2	157.5	158.5	166.9
1954	159.3	167.3	166.0	175.9
1955	174.9	186.3	187.2	188.4
1956	189.5	201.6	214.3	225.0
1957	237.1	246.8	268.3	254.6
1958	262.9	272.3	285.5	290.7

1. Unpublished Data, Federal Reserve Bank, San Francisco, California.

PHOENIX RETAIL SALES
 (Adjusted Index, 1947-1949 = 100)²

<u>Year</u>	<u>Quarters</u>			
	<u>I</u>	<u>II</u>	<u>III</u>	<u>IV</u>
1947	86.8	90.5	93.3	103.6
1948	107.6	105.6	106.1	108.3
1949	99.7	100.7	96.9	101.5
1950	100.0	109.4	123.8	126.5
1951	139.4	133.4	139.1	140.2
1952	145.4	142.9	150.4	150.7
1953	156.1	159.5	155.5	154.2
1954	154.7	162.5	156.8	159.0
1955	179.4	182.3	188.5	193.2
1956	197.5	204.1	211.1	218.0
1957	221.2	233.4	246.3	243.5
1958	239.2	252.2	267.4	272.5

2. Unpublished Data, Valley National Bank, Phoenix, Arizona.

MARICOPA COUNTY NON-AGRICULTURAL EMPLOYMENT
 (Adjusted Index, 1947-1949 = 100)³

<u>Year</u>	<u>Quarters</u>			
	<u>I</u>	<u>II</u>	<u>III</u>	<u>IV</u>
1947	92.8	99.7	98.5	98.1
1948	99.7	101.8	103.8	103.7
1949	102.5	101.3	100.7	101.0
1950	101.8	105.3	109.0	113.3
1951	117.8	121.0	124.0	125.3
1952	127.7	128.8	131.5	137.7
1953	142.2	143.2	142.6	141.7
1954	143.5	145.1	145.6	152.2
1955	153.8	159.0	162.0	166.7
1956	171.4	177.2	183.0	187.6
1957	193.2	197.5	201.9	200.6
1958	200.9	205.8	212.7	216.1

³. Unpublished Data, Arizona State Employment Commission, Phoenix, Arizona.

TUCSON BANK DEBITS
 (Adjusted Index, 1947-1949 = 100)⁴

<u>Year</u>	<u>Quarters</u>			
	<u>I</u>	<u>II</u>	<u>III</u>	<u>IV</u>
1947	82.7	91.1	94.0	102.9
1948	106.5	110.1	111.9	108.3
1949	104.2	104.2	93.4	91.7
1950	100.0	104.8	118.4	124.4
1951	138.7	146.4	144.0	155.4
1952	161.4	178.0	180.4	185.1
1953	200.0	185.7	187.5	175.0
1954	177.0	185.1	195.8	208.9
1955	220.8	233.7	248.8	256.5
1956	275.6	286.3	288.1	288.1
1957	289.3	291.1	306.0	305.4
1958	303.6	315.5	348.8	361.9

⁴. Unpublished Data, Federal Reserve Bank, San Francisco, California.

PIMA COUNTY RETAIL SALES
 (Adjusted Index, 1947-1949 = 100)⁵

<u>Year</u>	<u>Quarters</u>			
	<u>I</u>	<u>II</u>	<u>III</u>	<u>IV</u>
1947	83.0	86.5	91.2	103.9
1948	108.0	108.1	104.9	113.6
1949	103.8	101.6	96.4	98.7
1950	97.5	103.6	114.3	115.0
1951	116.3	129.5	129.2	134.5
1952	144.4	145.8	146.1	151.5
1953	157.0	157.8	155.0	146.9
1954	149.5	140.9	150.4	145.9
1955	163.6	163.8	179.8	198.4
1956	179.9	188.9	195.9	196.1
1957	204.9	207.5	216.3	202.9
1958	205.8	215.6	221.5	225.7

5. Unpublished Data, Valley National Bank, Phoenix, Arizona.

PIMA COUNTY NON-AGRICULTURAL EMPLOYMENT
(Adjusted Index, 1947-1949 = 100)⁶

<u>Year</u>	<u>Quarters</u>			
	<u>I</u>	<u>II</u>	<u>III</u>	<u>IV</u>
1947	93.5	96.1	98.0	98.0
1948	100.3	102.3	103.2	103.9
1949	101.9	101.3	100.3	101.3
1950	102.9	103.6	108.8	112.3
1951	117.8	121.7	126.6	132.5
1952	137.0	140.6	144.5	148.0
1953	149.0	144.5	139.3	134.5
1954	133.8	132.5	135.1	139.0
1955	142.5	150.6	155.8	160.4
1956	164.6	170.8	175.0	175.6
1957	181.3	183.1	187.0	188.0
1958	188.6	191.2	194.8	199.0
1959	202.7	211.9	215.0	218.0

6. Unpublished Data, Arizona State Employment Commission, Phoenix, Arizona.

APPENDIX IV
 MANUFACTURING, HOME-MARKET AND CONSTRUCTION
 EMPLOYMENT, MARICOPA AND PIMA COUNTIES

MANUFACTURING EMPLOYMENT, MARICOPA COUNTY,
 1948-1957¹

<u>Year</u>	<u>Quarters</u>			
	<u>I</u>	<u>II</u>	<u>III</u>	<u>IV</u>
1948				8.4
1949	8.2	8.2	7.5	7.7
1950	7.8	8.0	8.2	8.9
1951	10.0	11.5	11.6	12.6
1952	13.6	14.0	13.9	15.0
1953	15.8	16.1	15.3	14.9
1954	15.4	15.8	15.2	16.2
1955	16.9	18.0	17.7	18.6
1956	19.6	20.5	19.9	21.4
1957	22.7	23.9	23.4	23.2

1. Unpublished Data, Arizona State Employment Commission, Phoenix, Arizona. Data in thousands.

HOME-MARKET EMPLOYMENT, MARICOPA COUNTY
 1948-1957
 (Adjusted for Seasonal Variation,
 Ratio-to-Moving-Average Method)²

<u>Year</u>	<u>Quarters</u>			
	<u>I</u>	<u>II</u>	<u>III</u>	<u>IV</u>
1948				42.6
1949	42.8	41.8	41.6	42.0
1950	42.5	43.3	44.5	45.2
1951	46.0	47.3	47.9	48.8
1952	49.9	50.2	51.0	53.0
1953	54.4	54.6	54.6	54.5
1954	54.7	55.2	55.9	57.5
1955	58.6	60.1	61.7	62.8
1956	64.5	66.0	68.4	69.9
1957	72.0	74.0	75.6	75.7

². Unpublished Data, Arizona State Employment Commission, Phoenix, Arizona. Data in thousands.

CONSTRUCTION EMPLOYMENT, MARICOPA COUNTY,
1948-1957³

<u>Year</u>	<u>Quarters</u>			
	<u>I</u>	<u>II</u>	<u>III</u>	<u>IV</u>
1948				6.9
1949	5.9	5.6	5.8	5.6
1950	5.7	6.4	6.8	7.9
1951	8.3	8.0	7.8	7.8
1952	7.1	7.1	7.3	8.1
1953	9.1	9.0	8.0	8.6
1954	9.0	8.6*	8.4	10.2
1955	10.0	10.3	9.9*	10.3
1956	10.0	10.3	10.8	11.0
1957	11.5	10.8	11.2	10.9

* Decrease due to labor dispute.

3. Unpublished Data, Arizona State Employment Commission, Phoenix, Arizona. Data in thousands.

MANUFACTURING EMPLOYMENT, PIMA COUNTY,
1948-1957⁴

(Adjusted for seasonal variations.)
1948-1957-1957 = year 1957

<u>Year</u>	<u>Quarters</u>			
	<u>I</u>	<u>II</u>	<u>III</u>	<u>IV</u>
1948				1.8
1949	1.8	1.7	1.7	1.7
1950	1.8	1.8	2.0	2.0
1951	4.1	5.0	5.8	7.2
1952	6.9	7.3	7.9	8.3
1953	7.9	6.7	5.9	5.2
1954	4.7	4.5	5.0	5.6
1955	6.1	6.7	7.6	8.3
1956	8.7	9.2	9.1	9.1
1957	9.1	9.1	9.5	9.2
1957	27.2	29.2	32.2	33.1

4. Unpublished Data, Arizona State Employment Commission, Phoenix, Arizona. Data in thousands.

HOME-MARKET EMPLOYMENT, PIMA COUNTY,
1948-1957
(Adjusted for Seasonal Variation,
Ratio-to-Moving-Average Method)⁵

<u>Year</u>	<u>Quarters</u>			
	<u>I</u>	<u>II</u>	<u>III</u>	<u>IV</u>
1948	19.4	19.7	19.4	19.4
1949	19.0	18.9	18.7	19.0
1950	19.0	19.0	19.9	21.6
1951	20.7	20.9	21.0	21.6
1952	22.0	22.6	23.1	23.3
1953	23.7	23.7	23.6	23.2
1954	23.0	23.0	22.8	23.3
1955	23.7	24.6	24.4	24.8
1956	26.3	27.0	27.4	27.9
1957	28.9	29.0	29.5	29.3

5. Unpublished Data, Arizona State Employment Commission, Phoenix, Arizona. Data in thousands.

CONSTRUCTION EMPLOYMENT, PIMA COUNTY,
1948-1957⁶

<u>Year</u>	<u>Quarters</u>			
	<u>I</u>	<u>II</u>	<u>III</u>	<u>IV</u>
1948				3.3
1949	2.8	2.7	2.8	2.7
1950	3.2	3.2	3.4	3.1
1951	3.1	3.0	3.2	3.3
1952	4.0	4.7	5.0	5.0
1953	5.1	4.6	3.9	3.8
1954	3.6	3.7	3.8	4.0
1955	3.7	4.4	4.6	4.6
1956	4.2	4.5	5.0	5.0
1957	4.9	4.8	5.2	5.6
1958			4.1	
1959			4.1	
1960			4.1	
1961			4.1	
1962			4.1	

Source: Unpublished Data, Arizona State Employment Commission, Phoenix, Arizona.

6. Unpublished Data, Arizona State Employment Commission, Phoenix, Arizona. Data in thousands.

APPENDIX V
 POPULATION AND EMPLOYMENT
 ADJUSTED FOR POPULATION GROWTH

POPULATION; 1940, 1947-1958¹

<u>Year</u>	<u>Maricopa County</u>	<u>Pima County</u>
1940	186,000	173,000
1947	287,000*	122,000*
1948	303,000*	128,000*
1949	317,000*	135,000*
1950	332,000	141,000
1951	350,000	155,000
1952	384,000	173,000
1953	407,000	190,000
1954	442,000	197,000
1955	475,000	205,000
1956	500,000	215,000
1957	520,000	230,000
1958	565,000	245,000

* Author's Estimates

1. Cf., Appendix I.

MARICOPA COUNTY EMPLOYMENT
ADJUSTED FOR POPULATION GROWTH, 1947-1958²

<u>Year</u>	<u>Quarters</u>			
	<u>I</u>	<u>II</u>	<u>III</u>	<u>IV</u>
1947	73.6	74.9	76.0	74.6
1948	74.8	75.4	76.1	75.1
1949	73.4	71.7	70.5	69.9
1950	69.6	71.2	72.7	74.6
1951	76.0	77.6	77.7	76.7
1952	76.3	75.3	75.7	78.2
1953	79.5	79.0	77.0	74.9
1954	74.3	73.7	72.6	74.6
1955	74.0	75.1	75.5	76.8
1956	77.9	79.5	81.3	82.6
1957	84.2	85.2	85.3	83.0
1958	81.3	81.8	82.8	82.5

2. Unpublished Data, Arizona State Employment Commission, Phoenix, Arizona. Data in thousands.

PIMA COUNTY EMPLOYMENT
ADJUSTED FOR POPULATION GROWTH, 1947-1958³

<u>Year</u>	<u>Quarters</u>			
	<u>I</u>	<u>II</u>	<u>III</u>	<u>IV</u>
1947	33.3	34.2	34.5	34.1
1948	34.4	34.7	34.6	34.3
1949	33.2	32.6	31.9	31.9
1950	32.1	31.9	32.7	33.0
1951	33.8	34.1	34.5	35.1
1952	35.3	35.3	35.4	35.4
1953	34.9	33.0	31.5	30.4
1954	29.8	29.2	29.5	30.0
1955	30.5	31.9	32.6	33.2
1956	33.6	34.5	34.8	34.3
1957	34.8	34.6	34.7	34.4
1958	34.0	33.9	34.0	34.2

3. Unpublished Data, Arizona State Employment Commission, Phoenix, Arizona. Data in thousands.

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