Migration and Population Distribution in Alaska: 1974-1990

by Daniel A. Seiver
March 1, 1976

MIGRATION AND POPULATION DISTRIBUTION IN ALASKA: 1974 - 1990

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Population Study Report Pursuant

to Contract _____

with

Federal-State Land-Use Planning Commission

"MIGRATION AND POPULATION DISTRIBUTION
IN ALASKA: 1974 - 1990"

I. DETERMINANTS OF INTERSTATE MIGRATION AND ANALYSIS OF PROJECTED MIGRATION

I.A. Presentation of MAP Data and Analysis on Interstate Migration

I.A.1. Introduction

Many studies of interstate migration in the United States, and studies of interregional migration in other countries, show that employment opportunities and interregional income differentials are important determinants of migration decisions.[1] Many other variables have been shown to be significant in these studies, but most empirical work has utilized cross-section data. These data are useful for hypothesis testing, but not for projection.

Alaska time-series data are available for net civilian migration for the years 1960-1974, and also for average annual total civilian employment. The growth of civilian employment (EMPGRO) is a good proxy for employment opportunities. As a proxy for income differentials (which include wage differentials), a measure of income in Alaska relative to the United States was constructed. This measure is the ratio of real disposable personal income per capita in Alaska to the same quantity in the United States. (RELINC).[2] In addition to reflecting real wage differentials, RELINC also reflects the relative tax structure and individual economic well-being (per capita personal income).

Using these three time-series on net civilian migration, civilian employment growth, and relative income, multiple regression analysis enables us to estimate the effects of employment growth and relative income on net migration. Figure 1 shows both the historical time-series for net civilian migration and the series predicted by regression equation (1). The "fit" is fairly close. Details of the estimating procedure are contained in the Technical Appendix to this report. The estimating equation is:

$$(1) \quad NETMIG_t = -52.557 + 1.236 \times EMPGRO_t + 57.557 \times RELINC_{t-1} - 3.541 \times DUMMY$$

where

$NETMIG_t$ = Net civilian migration to Alaska, in year t.

$EMPGRO_t = E_t - E_{t-1}$, where E_t = total civilian employment in Alaska in year t,

$RELINC_{t-1}$ = Ratio of Alaska real disposable personal income per capita to U. S. real disposable personal income per capita in year t-1,

DUMMY = 1 in 1964, for earthquake.

I.A.2. Employment growth and net migration

Equation (1) shows the independent effect of employment growth on net migration. Other things equal, growth of 1,000 in civilian employment will lead to net civilian migration of 1,236. This figure is quite reasonable given that many workers migrate to Alaska with few or no dependents,

and that the resident labor force will supply some of the additional labor demanded.[3] An earlier study of migration to Alaska also showed a very close link between employment growth and net migration.[4] The large increases in employment projected by the MAP models thus have a potent effect on net migration, and thus population.

I.A.3. Relative income and net migration

Employment growth in low-wage industries, coupled with rising taxes and a rapidly growing population, is likely to lead to less migration than a regime of employment growth in high-wage industries, with falling taxes and a slowly growing population. While these are clearly extreme cases, relative income trends can have a reinforcing or offsetting effect on the amount of migration induced by a given amount of employment growth. The relative income proxy used in equation (1) takes account of all of the above factors and has a significant independent effect on net migration. The 1972 value of the RELINC term was about 0.85. An increase to 0.86, other things equal, implies net migration in the following year of 570. The total effect of the RELINC term is more complex. Since an increase in Alaska population will reduce RELINC, the additional migration this year will increase population and tend to reduce RELINC the following year, reducing net migration. This servomechanism effect is substantial for large amounts of migration, which are projected in some years of the scenarios discussed below. The relative income ratio is lagged one year to allow time for information to filter down to the rest of the United States.

It is hypothesized that the functioning of the labor market in the state makes the response to employment growth much quicker.[5]

I.A.4. The age-sex distribution of interstate migrants

Much of interstate migration in the United States is attributable to males and females aged 20-34.[6] Migration to and from Alaska, in the past as well as the future, has and no doubt will conform to this pattern. Census data for Alaska for the 1965-1970 period[7] show a pattern of substantial inmigration in the 20-24 age groups, and persistent though smaller, net outmigration in every age group above 35-39 for both sexes. Few Alaskans retire in Alaska. The under-40 data is highly suspect, however, since military migration is included in the totals and cannot be controlled for.[8] The following scheme was used to determine the age-sex composition of the projected net migration streams: for age groups above 35-39, the net outmigration rates for the 1965-1970 period were calculated. These rates, reported in Table 1, are applied to the specific age-sex categories in each year of the projection period. For the under-40 population, the 1965-1970 pattern of net migration to California from non-contiguous states was used. These "migration percentages" add up to 100 and are also reported in Table 1. For example, if net inmigration in a given year is 10,000, 2,590 of the migrants will be males aged 20-24. To determine total net inmigration in the under-40 group, the amount of net outmigration in the over-40 group is calculated. To this quantity is added net migration calculated from equation (1). This total equals total net

Table 1

MIGRATION RATES (40+) OR PERCENTS (0-39)

Age Group	Male	Female
0-1	--	--
1-4	2.4	2.8
5-9	1.7	2.0
10-14	2.4	2.8
15-19	10.4	4.9
20-24	25.9	19.0
25-29	8.2	10.0
30-34	2.5	1.8
35-39	1.1	2.0
40-44	- 0.16	- 0.22
45-49	- 0.16	- 0.18
50-54	- 0.28	- 0.18
55-59	- 0.26	- 0.26
60-64	- 0.68	- 0.84
65 +	- 0.82	- 0.78

inmigration, which is then allocated as noted above. Thus, by definition,

(2) NETMIG = MIGIN - MIGOUT

and by adding MIGOUT to both sides,

(3) NETMIG + MIGOUT = MIGIN.

Thus, given EMPGRO, RELINC, and the values in Table 1, it is possible to project net migration, and also the age distribution of the migration. EMPGRO is supplied directly by the MAP model.[9] The numerator of RELINC is also supplied by the MAP model, and for the projections made below, the U. S. denominator is expected to grow at 1 percent per year through 1989.[10]

I.B. Analysis of Future Interstate Migration Streams Projected Under Alternative Development Scenarios

I.B.1. Introduction to MAP scenarios

The MAP petroleum scenarios are described in detail elsewhere[11] and only a short summary will be presented here. The scenarios are important because the pace at which Alaska's petroleum resources are developed is likely to be the primary determinant of the state's economic growth. The current formulation of the model provides three alternative scenarios for the period 1974-1990: (1) a "limited development" case, in which present developments are carried forward (essentially Prudhoe Bay), a few additional

fields are opened near existing areas and the federal OCS leasing program is limited to the Gulf of Alaska. Total oil production reaches 2 million barrels a day by 1980 and 4 million barrels a day by 1990.[12] (2) An "accelerated development" case in which, in addition to case (1), new petroleum areas are opened up in the northwest, both onshore and offshore, and a second North Slope Oil pipeline is constructed, mainly as a result of leasing in Naval Petroleum Reserve No. 4. In this case, oil production reaches 7.7 million barrels a day in 1990. (3) A "maximum development" scenario which approximates the maximum rate of petroleum development that could occur in Alaska.[13] The rate of development is comparable to that envisioned in the plan in "Project Independence." It is assumed in this scenario that in addition to case (2), the Federal government leases heavily in the Bering and Chukchi Seas. This, in turn, necessitates construction of oil and gas pipelines running from north to south in western Alaska. Availability of the pipelines and processing facilities would then make additional leasing feasible in the new western areas for Native corporations and the state. Alaska's oil production reaches 5.2 million barrels a day in 1985 and nearly 10 million barrels in 1990.

The other key variable determining the size of the state's oil revenues (and the pace of economic growth) will be the price of oil. The model has been run for three cases: wellhead prices of $7, $5, and $3 per barrel in 1973 prices (equal to $11, $9, and $7 per barrel market prices). These nine (3 policies x 3 prices) cases are analyzed below.[14]

I.B.2. Time patterns and quantity of migration

In all the cases studied, there is substantial net migration to Alaska over the projection period. The ranges for the different cases are quite substantial, however. The two extreme cases, L3 (Limited development and $3 oil) and M7 (Maximum development and $7 oil) show the magnitude of the combined effects of the pace of oil development and the price of oil. In the years 1987-1990 alone, the M7 case leads to net migration almost 100,000 higher than in the A5 case, while the L3 case for the same years leads to 20,000 less net migration than in the A5 case. The 1974-1990 patterns are graphed in Figures 2 - 5, with the cases grouped by price of oil (2 - 4), showing the effects of the differing paces of oil development, and the accelerated cases are presented in Figure 5 to show the effect of the price of oil alone on net migration.

The cases vary in a fairly regular fashion (the exceptions are discussed below), with maximum development leading to more net migration than accelerated development, which in turn leads to more migration than limited development, at each oil price. For the accelerated development cases, net migration varies directly with the price of oil. Yet there is a strong time pattern which underlies all the cases: high levels of net migration associated with the pipeline boom (1974-1976) followed by net outmigration of one (L7) to three (L3) years duration (1977-1979). This "bust" is followed by another boom. By the late 1980's, however, the cases diverge markedly, as noted above, from a continuous boom in the M7 case to very moderate amounts of net migration, comparable to

pre-pipeline years, in the L3 case. These variations over time are a direct result of the variations in employment growth projected by the MAP model in the different scenarios. There are several years, however, when the relation M>A>L for net migration is partially reversed. A case in point is 1984-85 in the L5-A5-M5 comparison of Figure 3. For these two years, employment growth is greater in L5 than A5, which is enough to make L5 net migration higher than A5. Other "reversals" in Figures 2 - 4 almost always reflect temporary reversals in the pace of employment growth.

Another factor accounting for the "saw-tooth" patterns of projected net migration is the operation of the RELINC variable noted above. A year of very high net migration leads to rapid population growth which in the following year tends to reduce RELINC, and thus net migration. If employment growth slackens also, there will be an even sharper change in net migration.

I.B.3. Age-sex pattern of migration and the age-sex distribution of the state's population

Section I.A.3. described the methodology used to allocate net migration to Alaska to age-sex categories. Given a 1974 age-sex distribution for the state[15], the effects of different development scenarios (at $5 oil) on the age-sex distribution in 1990 are shown in Figures 6 (A and B) and 7 (A and B). Figure 6 (A) shows the 1974 age-sex distribution for reference.

The major differences are not surprisingly in the age-sex categories most prone to migrate. The 20-34 year olds, male and female, account for the bulk of the increase in the M5 versus A5 case, skewing a youthful 1974 age distribution even more toward these youthful ages. The absolute and relative numbers of children and teenagers is also higher, partly as a result of net migration of families with young children, and partly because the bulk of female fertility occurs during the years 20-34. The opposite effects are noted in the L5 case as compared to the A5 case. Thus, there is a direct relation between the pace of economic development and the comparative youthfulness of the population, operating through the parameters determining the allocation of net migration to age-sex categories. This effect is a corollary of the direct link between net migration, and thus population, and the pace of economic development, which was analyzed above. In the sections below, the effects on total population of the state and the population of the regions of the state are analyzed in detail.

II. STATEWIDE AND REGIONAL POPULATION GROWTH: PROJECTIONS AND INTERPRETATION

II.A. Detailed Analysis of State and Regional Population Projections Under Alternative Scenarios

II.A.1. State population growth

Figure 8 shows the projected state population for 1974-1990 for the three development scenarios at $5 oil. The sharp variations in net

migration do not appear, since 1) in any one year, net migration is only a small fraction of total population, and 2) the population grows each year by the excess of births over deaths (natural increase) which offsets net outmigration, and adds a stable element to population growth. The cumulative effect of net migration is large, however, since the variations in 1990 population are a direct and indirect result of variations in net migration. State population in M5 of 874,000 is 40 percent greater than the L5 population of 620,000. Figure 9 shows the effect of variations in price of oil on state population in the accelerated case. Higher oil prices lead to substantially higher populations, with A7 population exceeding A3 by 160,000 or 25 percent, a somewhat smaller difference than the range between M5 and L5.

In all cases, population grows in all years except 1977 or 1978, when negative net migration exceeds natural increase. In all other years, the two sources of population growth reinforce each other, since the age-sex distribution of net migration tends to increase fertility.

II.A.2. Regional population growth: introduction

A 1970 Census map of Alaska with regional delineations of the MAP model is reproduced in Figure 10. The regions generally correspond to the regions delineated by Rogers in earlier work on Alaska[16], with Fairbanks separated from the Interior region and Anchorage separated from the Southcentral region, giving seven regions in total.

Full-scale regional population models have not yet been constructed, and thus regional populations are determined by an allocation process discussed in detail in the Technical Appendix. The allocation process essentially distributes regional population on the basis of regional employment growth.

II.A.3. Population growth and employment growth in urban regions

The Anchorage region, already the largest and most urbanized region of the state in 1974, grows absolutely and relatively in the 1974-1990 projection period. Anchorage's population in the A5 case reaches 390,000 in 1990, as shown in Figure 11. It is also clear that the M5 and L5 cases have strong effects on Anchorage's population, with M5 1990 population 100,000 above A5, and L5 1990 population about 60,000 less than A5. Even in the L5 case, however, Anchorage's population doubles from its current level. This rapid growth is a direct result of rapid employment growth. Figure 12 depicts employment growth in Anchorage in the A5 case. From a base of 72,000 in 1974, employment more than doubles to 191,000 by 1990. Table 2 shows the effects of rapid population growth in Anchorage on its share of the state's total population in the L5, A5, and M5 cases. The percentage rises substantially in all three cases but is highest in M5, reaching 56.3 percent by 1990. Some further implications of this growth are discussed in Section II.C.

The Fairbanks region and the Southeast region contain the remaining urbanized areas of the state. Population growth in these regions is depicted in Figure 13, and their respective shares of total population are listed in Table 2. While both Southeast and Fairbanks grow fairly rapidly, neither grows nearly as fast as the Anchorage region, and Table 2 shows that each loses ground to Anchorage throughout the projection period.[17] In the M5 case, their combined population percentage drops from 29.4 in 1974 to 22.3. Employment growth for these two regions is, of course, slower than Anchorage's. Figure 12 shows that even though employment in both Fairbanks and Southeast grows fairly rapidly after 1978, neither region can match Anchorage's pace. In absolute terms, however, the populations of both Fairbanks and Southeast grow substantially, reaching 84,000 and 87,000, respectively, in 1990.

II.A.4. Population growth and employment growth in rural regions

The columns labeled "all other" in Table 2 show that the regions which comprise about 90 percent of the state's land area will have a declining share of total state population in the projection period, falling from 27.1 percent to 22.3 - 21.4 percent in 1990. Most of this decline occurs after 1983; in fact, in the M5 case, the 1983 share is higher than the 1974 share. Once again, the trend in employment growth (Figure 12) provides the explanation. Employment rises rapidly to a peak in 1983 and by 1990 has not returned to the 1983 level. This employment pattern in the A5 case reflects additional pipeline construction and OCS development which

Table 2.

REGIONAL PERCENTAGES OF STATE POPULATION 1974-1990

	L5 CASE				A5 CASE				M5 CASE			
	#5	#7	#3	Other	#5	#7	#3	Other	#5	#7	#3	Other
1974	43.5	15.5	13.9	27.1	43.5	15.5	13.9	27.1	43.5	15.5	13.9	27.1
75	43.2	15.3	13.7	27.8	43.2	15.3	13.7	27.8	43.2	15.3	13.7	27.8
76	44.2	14.8	13.9	27.1	44.2	14.8	13.9	27.1	44.2	14.8	13.9	27.1
77	45.3	14.5	14.0	26.2	45.5	14.4	14.1	26.0	45.5	14.4	14.1	26.0
78	45.5	14.4	13.9	26.2	45.4	14.2	13.7	26.7	45.4	14.2	13.7	26.7
79	46.1	14.2	13.9	25.8	45.9	14.0	13.7	26.4	45.9	14.0	13.7	26.4
80	46.5	13.8	13.7	26.0	46.4	13.5	13.4	27.7	46.4	13.5	13.4	26.7
81	47.0	13.6	13.6	25.8	46.5	13.3	13.0	27.2	46.6	13.3	13.0	27.1
82	47.7	13.4	13.5	25.4	47.1	13.1	12.8	27.0	46.9	12.8	12.6	27.7
83	48.0	13.1	13.3	25.6	47.8	12.7	12.7	26.8	47.4	12.2	12.3	28.1
84	48.7	12.9	13.2	25.2	49.1	12.6	12.9	25.4	49.0	12.1	12.5	26.4
85	49.5	12.8	13.2	24.5	50.0	12.5	12.9	24.6	50.4	12.1	12.5	25.0
86	50.3	12.7	13.1	23.9	50.9	12.4	12.8	23.9	50.6	11.6	12.1	25.7
87	50.9	12.6	12.9	23.6	51.7	12.2	12.6	23.5	51.3	11.2	11.7	25.8
88	51.7	12.4	12.7	23.2	52.6	12.0	12.4	23.0	53.8	11.2	12.7	22.3
89	52.5	12.2	12.5	22.8	53.4	11.8	12.2	22.6	55.0	11.1	11.6	22.3
90	53.2	12.1	12.4	22.3	54.2	11.6	12.0	22.2	56.3	10.9	11.4	21.4

impacts these regions, but the employment growth is essentially exogenous and temporary. In fact, Region 4, the Southcentral region, is growing fairly fast throughout the projection period, and by 1990 in the A5 case, has a population (95,000) exceeding both Fairbanks and Southeast. In 1990, then, Southcentral should probably be considered an urbanized region. If Southcentral is removed from the "all other" category, the share of population in the "all other" category drops markedly. Its 1990 population share drops to just 9.0 percent.

Figures 14 and 15 show population and employment trends with the regions aggregated according to Rogers' scheme: Southcentral is combined with Anchorage (the Greater Anchorage Region) and Fairbanks is combined with Interior. Northwest and Southwest are combined for the "other" category. Two-thirds of the state's population resides in the Greater Anchorage Region by 1990, and this region has almost two-thirds of the state's total employment by 1990. Regions 1 and 2, comprising more than half of the state's land area, contain only 7.6 percent of the state's population. The L5 and M5 cases do not produce dramatically different results with respect to population shares. But in the M5 case, the population share of the Greater Anchorage Region rises to 69 percent of the total in 1990, and the share of Northwest and Southwest combined falls a little further to 7.4 percent.

II.B. Intrastate Mobility and Relative Employment Growth

II.B.1. 1965-1970 pattern

The 1965-1970 relationship between employment growth and intrastate mobility can be traced out with some difficulty, given the limited amount of 1970 Census mobility data.[18] Table 3 shows employment growth for each region in the 1965-1970 period, and the number of intercounty migrants 1965-1970, living in each region in 1970, after deductions for armed forces and college student mobility.[19] The analysis is complicated by the fact that Anchorage is the only region comprising one census division (county) and thus for all the other regions, the number of intercounty (inter-census division) migrants is an overstatement of the number of interregional migrants. Nonetheless, the pattern of rapid employment growth in Anchorage drawing intrastate migrants is clear. Only the Northwest region has a higher rate of employment growth, reflecting the Prudhoe Bay discovery in 1968. Of the total employment growth in the state, Anchorage accounts for more than half. Southeast, Southcentral (Kenai-Cook Inlet oil) and Fairbanks account for most of the remaining employment growth (38 percent). The mobility pattern discernible from the Census data in Table 3 shows a similar pattern, keeping in mind that all regions except Anchorage have overstated totals of interregional migrants for the reason noted above. In addition, we cannot calculate net intrastate migration even between counties, since there is no data on the origin of these intercounty migrants. For example, all net intrastate migration might have been to Anchorage, with all other regions simply trading migrants

Table 3

EMPLOYMENT GROWTH

AND INTERCOUNTY MIGRANTS 1965-1970

REGION	EMPLOYMENT GROWTH 1965-1970		1970 RESIDENTS LIVING IN A DIFFERENT ALASKA COUNTY IN 1965
	Quantity	Percent	
1	1,141	45.0	771
2	1,001	26.4	1,050
3	2,848	20.5	2,912
4	2,289	32.1	3,909
5	11,317	36.9	4,411
6	*	*	310
7	2,943	25.6	1,968

Sources: Mobility - U.S. Census, op. cit. in footnote 19
Employment - MAP historical data bank

* = less than 0

among themselves. With this additional caution in mind, we can still note that 63 percent of this intercounty migrant pool resided in just five counties in 1970: Anchorage, Fairbanks, Juneau, and Matanuska-Susitna and Kenai-Cook Inlet. This distribution follows the employment growth distribution fairly closely.[20]

II.B.2. Projected pattern

Without a set of explicit regional population models, it is impossible to measure precisely the pattern of intrastate migration implied by the MAP population projections. It is possible, however, to assign approximate values to the rate of natural increase in each region for the years 1974 - 1990. Then, by comparing actual projected 1990 regional population with the 1990 regional population which would result from natural increase alone, it is possible to estimate the combined effects of interstate and intrastate migration on regional population for comparison with relative regional employment growth. Table 4 lists the 1974 and 1990 populations of the seven regions in the A5 case, and also the 1990 regional populations resulting from 1.7 percent per year natural increase alone.[21] Relative employment growth for the projection period is also shown. The Southwest and Interior regions actually grow more slowly than would be implied by natural increase alone; that is, the balance of net migration between the region and the rest of the state and the United States is negative. Northwest's net migration is slightly positive. These three regions have very

Table 4

1990 REGIONAL POPULATIONS AND EMPLOYMENT GROWTH

A5 CASE

REGION	PERCENT OF TOTAL STATE EMPLOYMENT GROWTH 1974-1990	1990 POPULATION A-5	1990 POPULATION WITH 1.7% RATE OF GROWTH
1	3.0	19,090	18,023
2	4.6	35,363	36,775
3	12.8	86,769	65,051
4	9.3	94,761	60,599
5	60.6	390,255	203,027
6	1.2	10,103	11,421
7	8.6	83,865	72,181

small shares of state employment growth. The great bulk of the excess of total projected regional population over the natural increase population is accounted for by Anchorage. The Anchorage region is almost twice as large in 1990 in the A5 case as it would be if it only grew by natural increase. The Southeast, Southcentral, and Fairbanks regions also grow by migration, although Southcentral actually has as much implied migration as Southeast and Fairbanks combined. The projected relative employment growth over the 1974-1990 period does not fit the pattern of population growth precisely, reflecting different "elasticities" of population growth with respect to employment growth.[22]

II.C. Implications for Population Distribution

The sections above make clear that in 1990 most of the land area of the state of Alaska will be almost as empty as it is today even though Alaska's population will have grown quite rapidly. It is also clear that the pace of economic development will have an important effect on the rapidity of population growth. But, in all cases, over half of the state's population will be located in the Anchorage region, in a large city even by United States standards. Anchorage's "suburbs", part of the Southcentral region, will also be growing rapidly. Fairbanks will increase its relative importance in the northern regions of Alaska, but Alaska will truly become a one-city state. Much of Anchorage's growth will result from interstate migration to Alaska but, in addition, much of the intrastate migration will be directed to Anchorage. The highly skewed geographic

population distribution will no doubt have far reaching economic and non-economic consequences. The age-sex distribution will also be highly skewed toward youth, making Anchorage the recipient of much interstate migration, a particularly "young" city, which could also have important economic and non-economic consequences. The identification and analysis of these consequences are beyond the scope of this paper. One interesting possibility, however, is that individuals with different life-styles will be able to co-exist in Alaska: the urban life-style of the East and West coasts of the United States will be available in Anchorage and its suburbs (with a few adjustments for climate) while the distinctly Alaskan life-style, which requires much land area per person or family, will still be attainable in Alaska's still relatively uninhabited hinterlands.

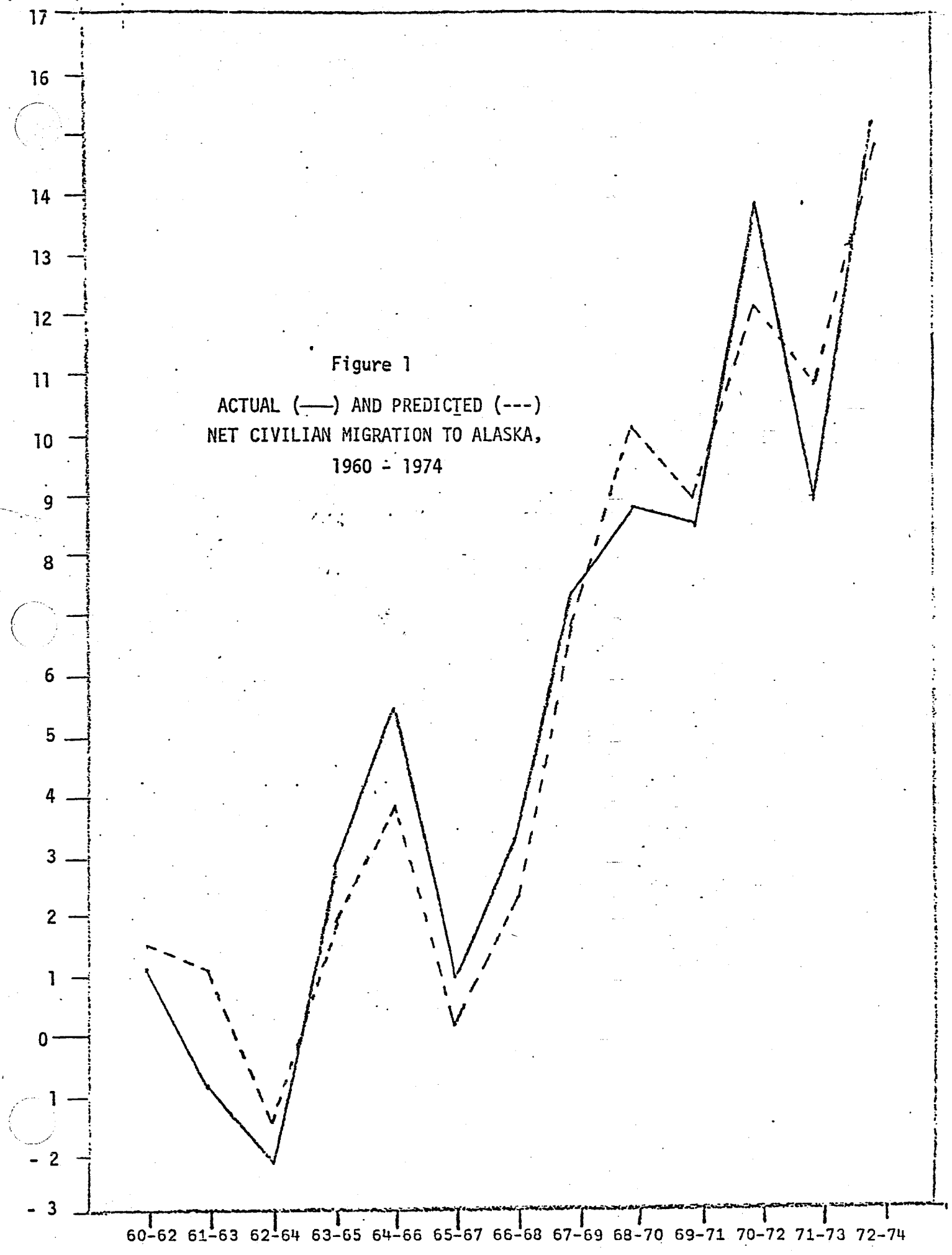


Figure 1

ACTUAL (——) AND PREDICTED (---)
NET CIVILIAN MIGRATION TO ALASKA,
1960 - 1974

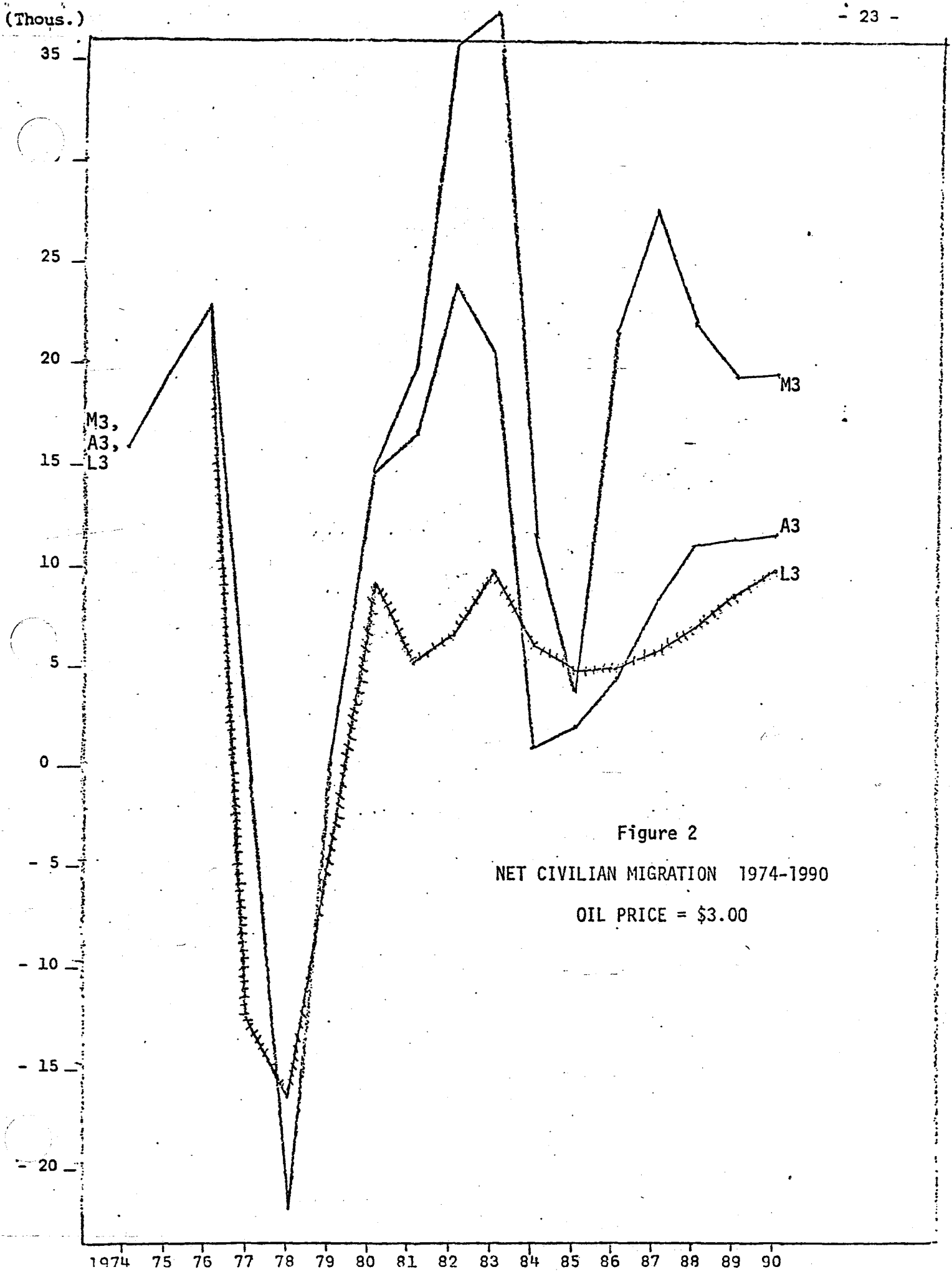


Figure 2

NET CIVILIAN MIGRATION 1974-1990

OIL PRICE = $3.00

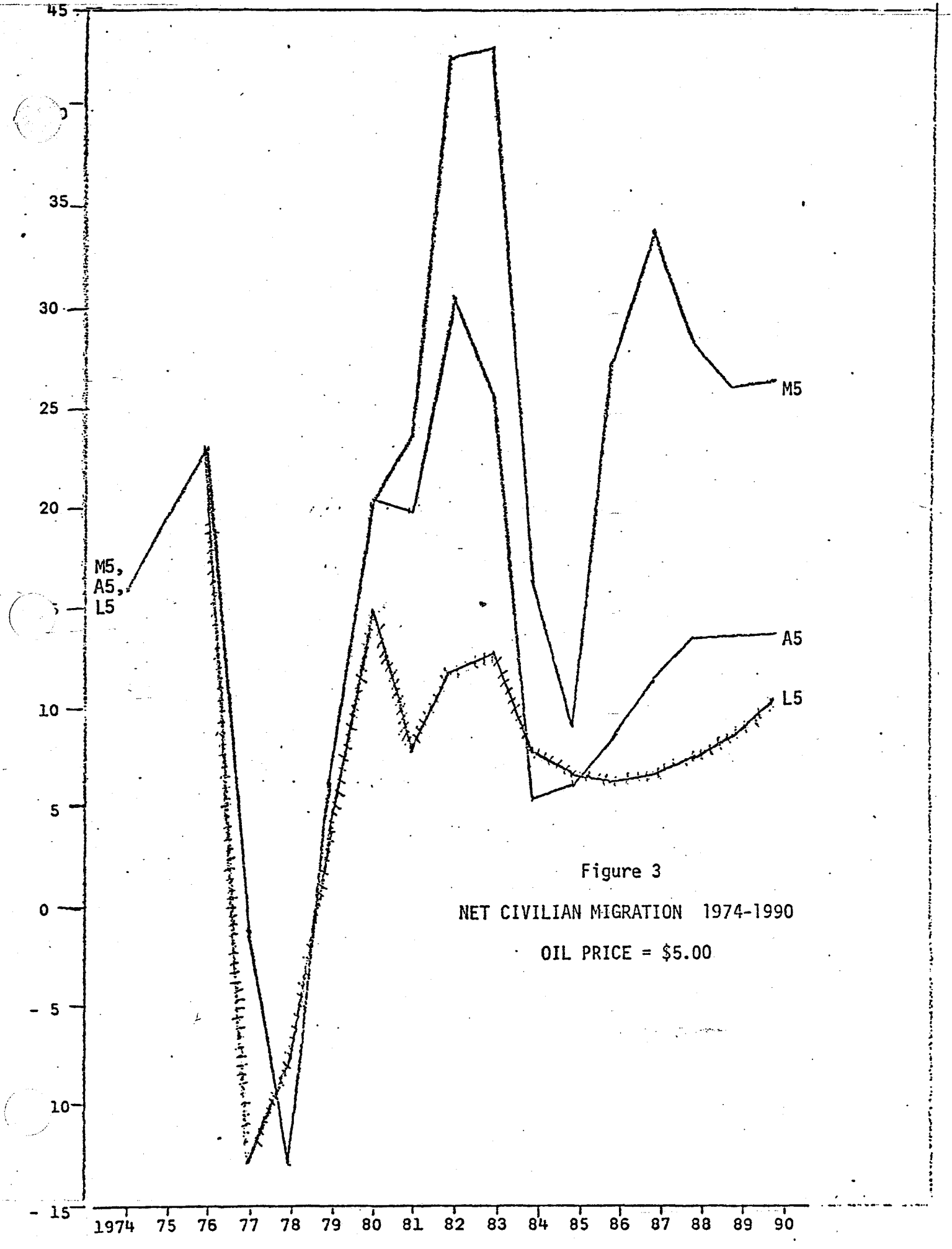


Figure 3

NET CIVILIAN MIGRATION 1974-1990

OIL PRICE = $5.00

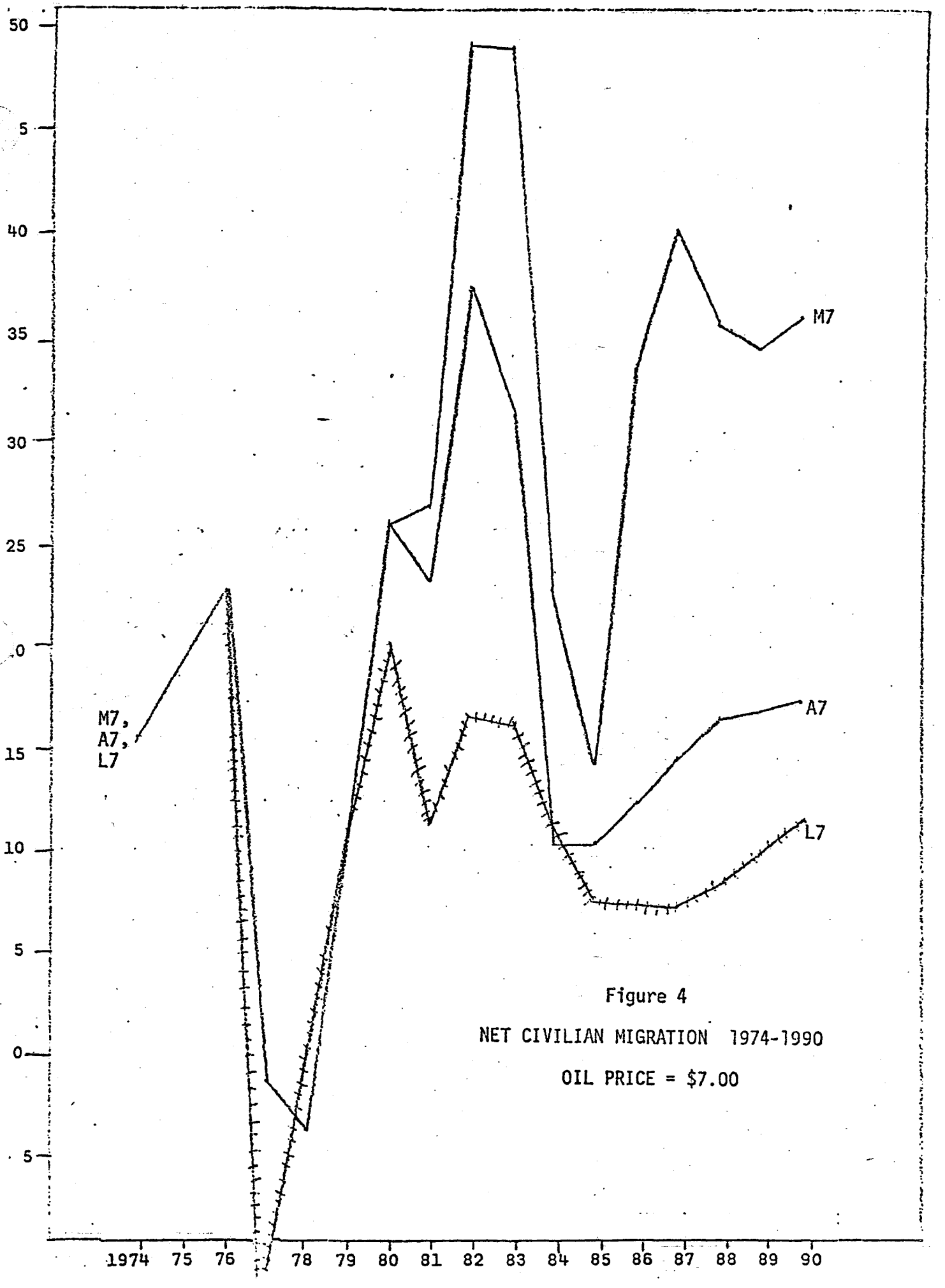


Figure 4

NET CIVILIAN MIGRATION 1974-1990

OIL PRICE = $7.00

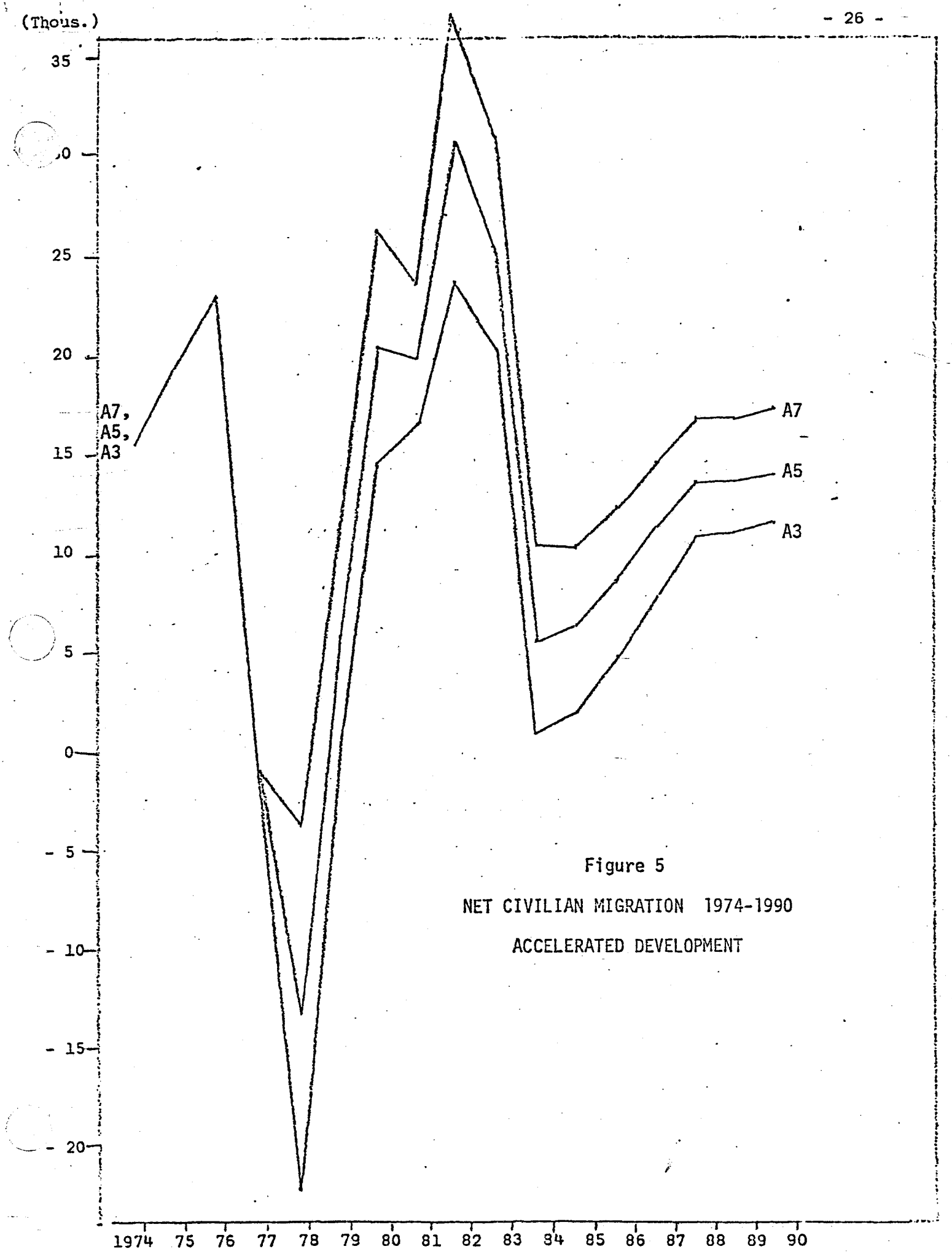


Figure 5

NET CIVILIAN MIGRATION 1974-1990

ACCELERATED DEVELOPMENT

A. 1974

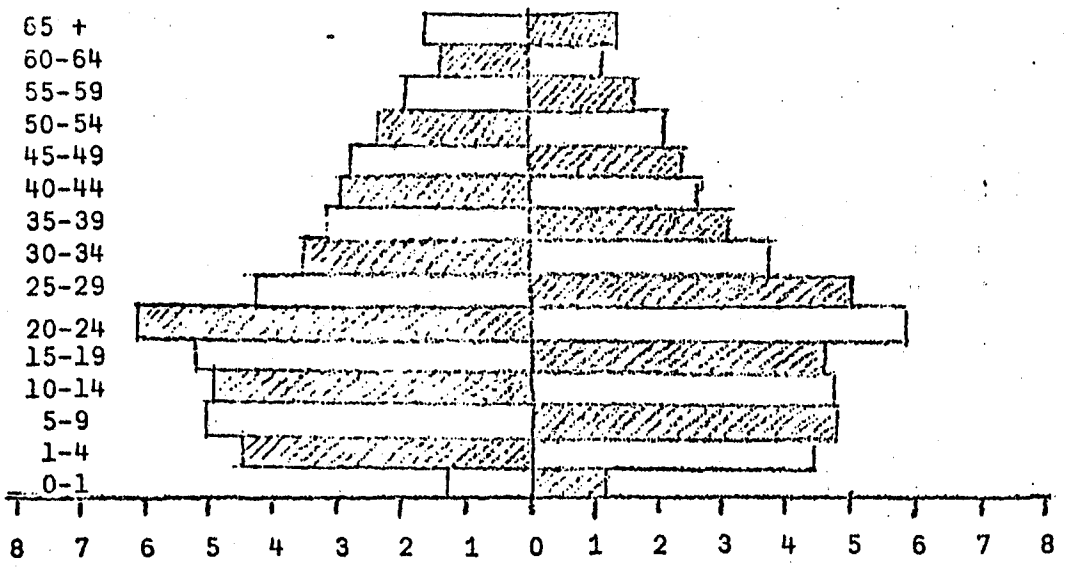
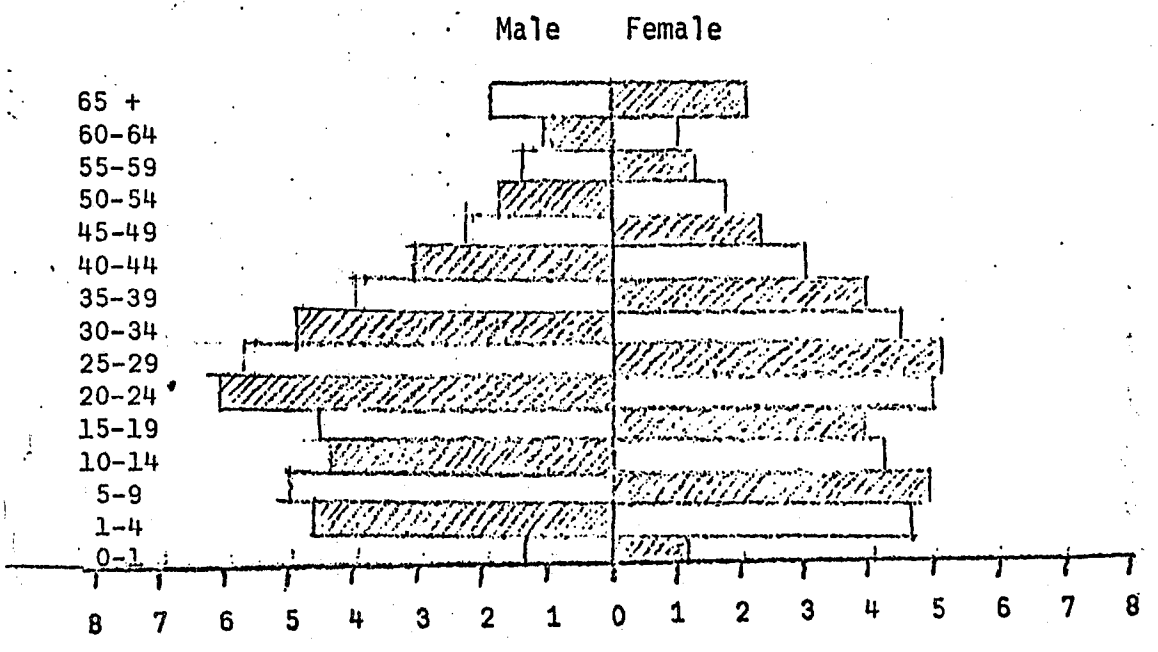


Figure 6

ALASKA AGE-SEX DISTRIBUTION

B. 1990 - L5



A. 1990 - A5

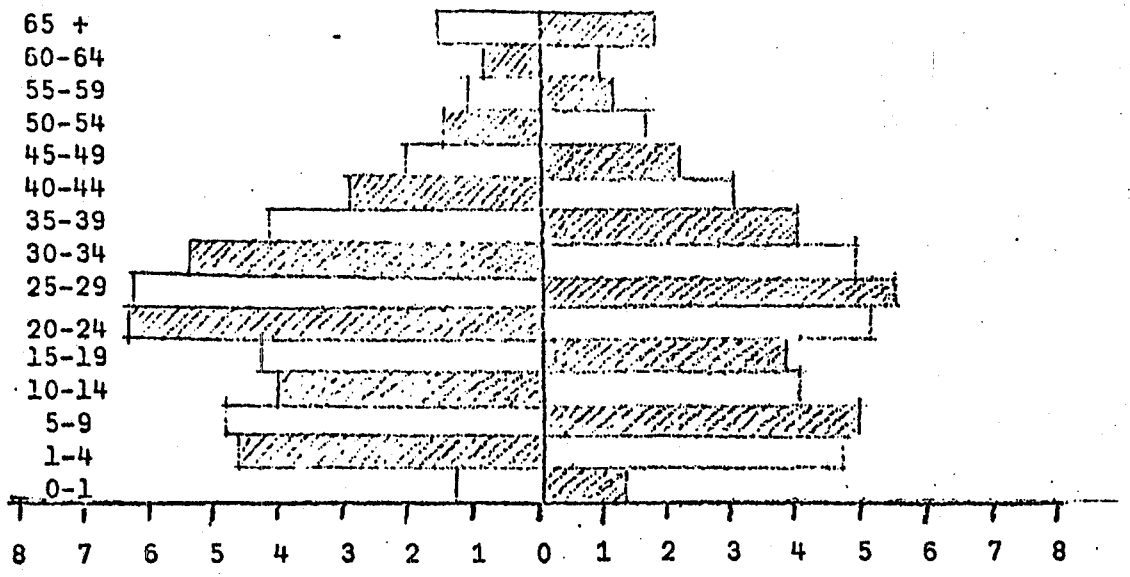
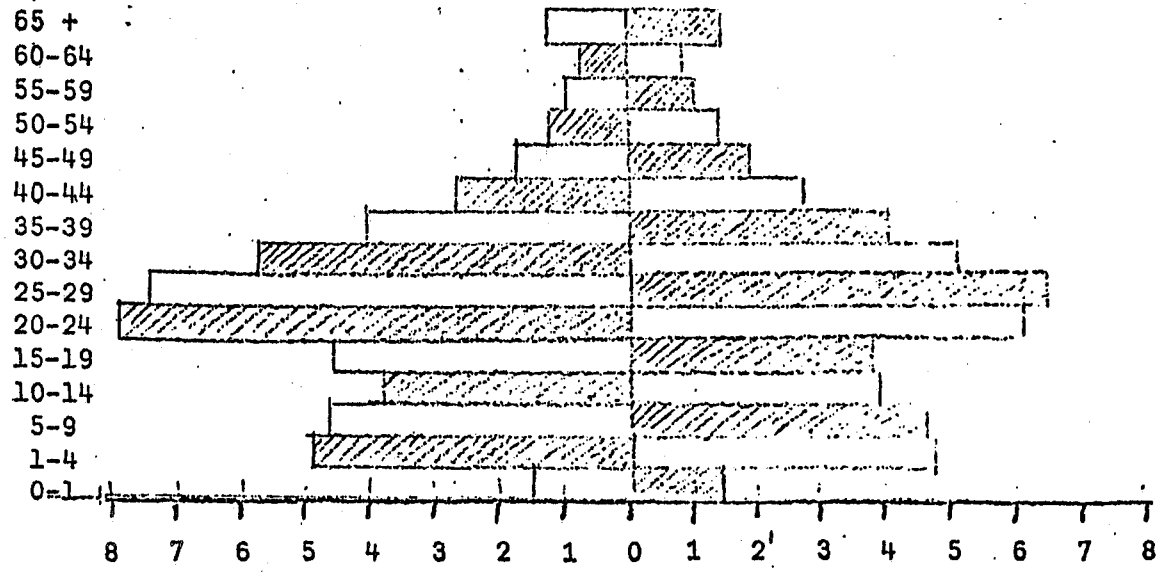


Figure 7

ALASKA AGE-SEX DISTRIBUTION

B. 1990 - M5



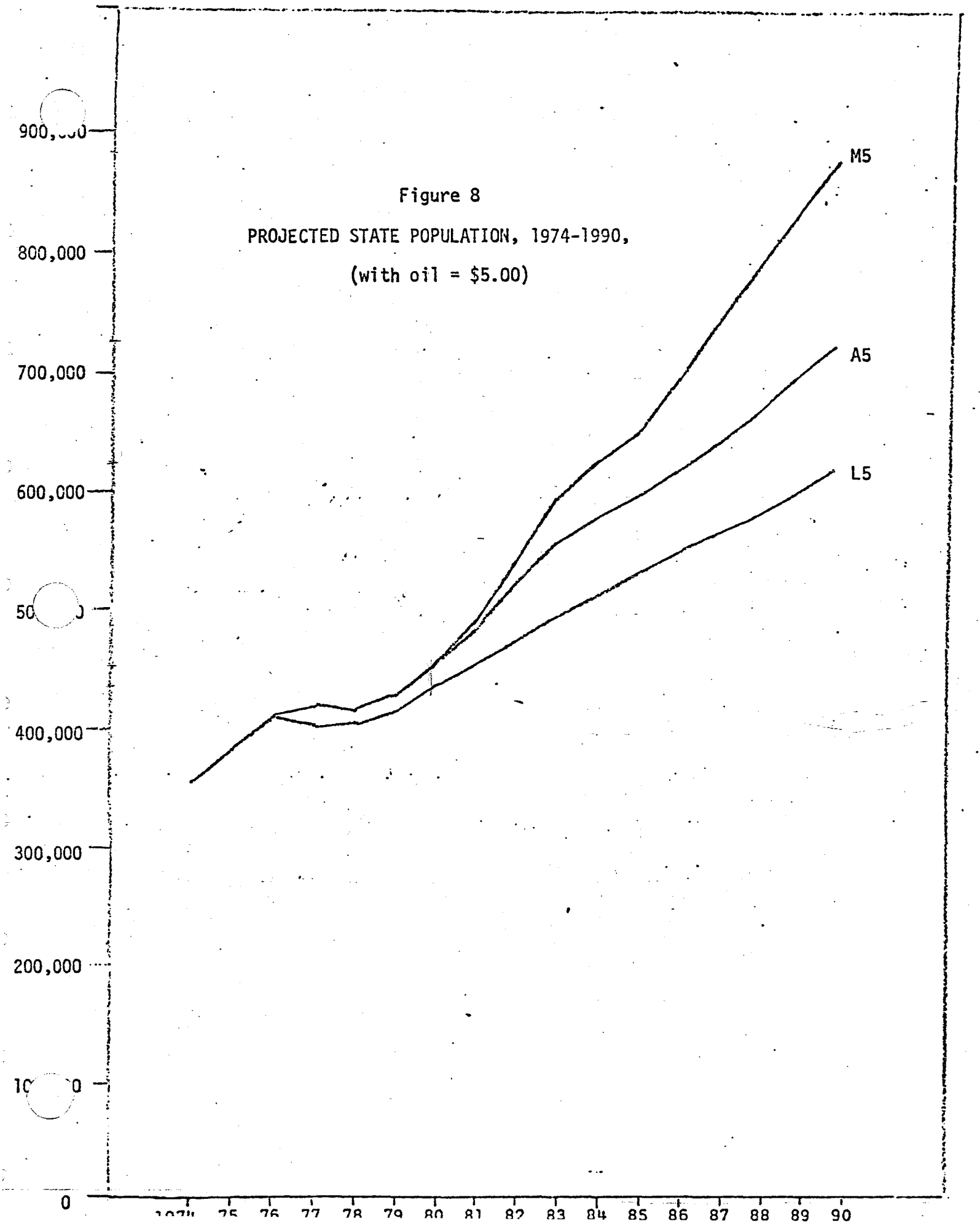


Figure 8

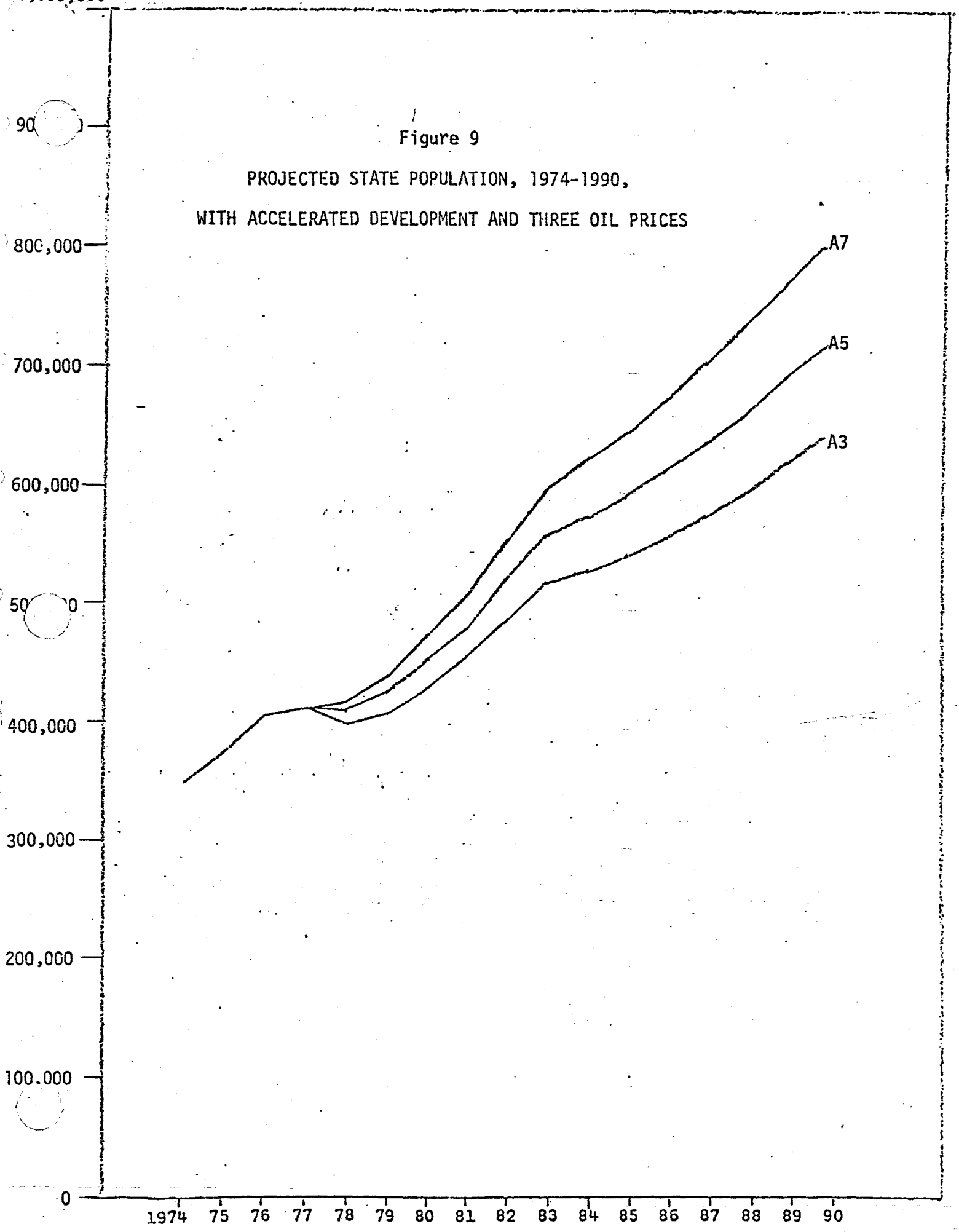
PROJECTED STATE POPULATION, 1974-1990,

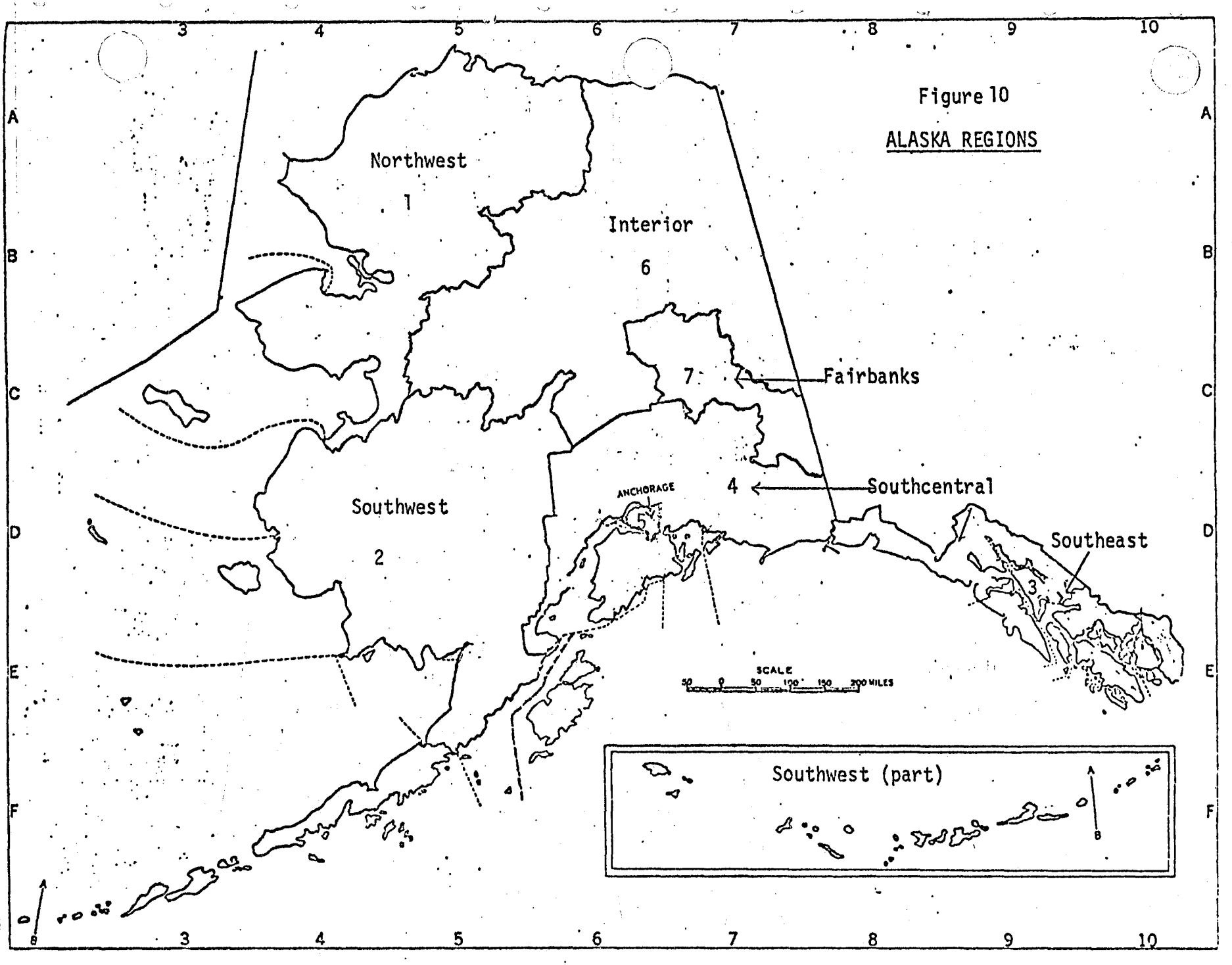
(with oil = $5.00)

Figure 9

PROJECTED STATE POPULATION, 1974-1990,

WITH ACCELERATED DEVELOPMENT AND THREE OIL PRICES





Source: State map in U.S. Bureau of the Census, op. cit., pp. 3-81.

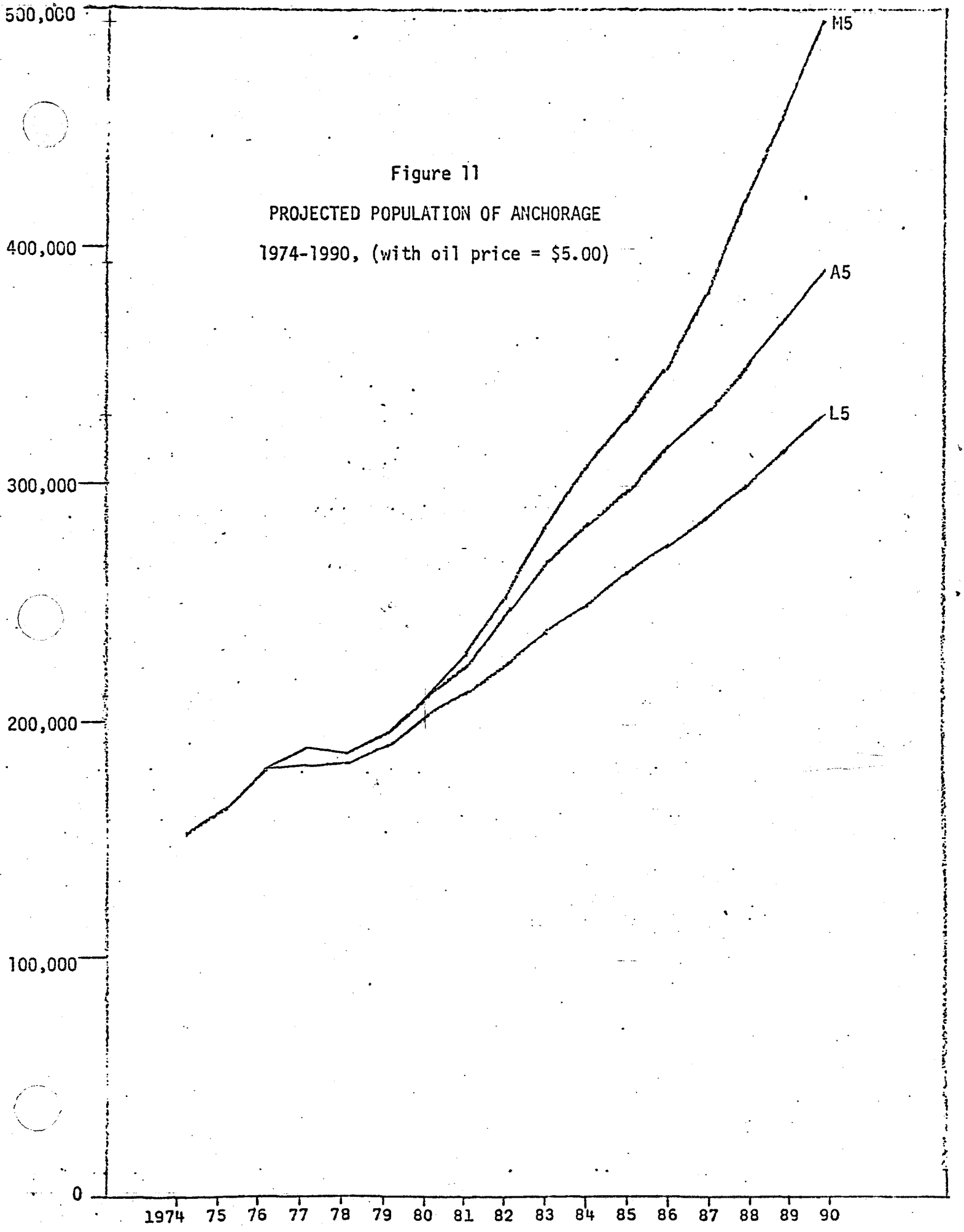


Figure 11

PROJECTED POPULATION OF ANCHORAGE

1974-1990, (with oil price = $5.00)

Figure 12

REGIONAL EMPLOYMENT 1974 - 1990

A5 CASE

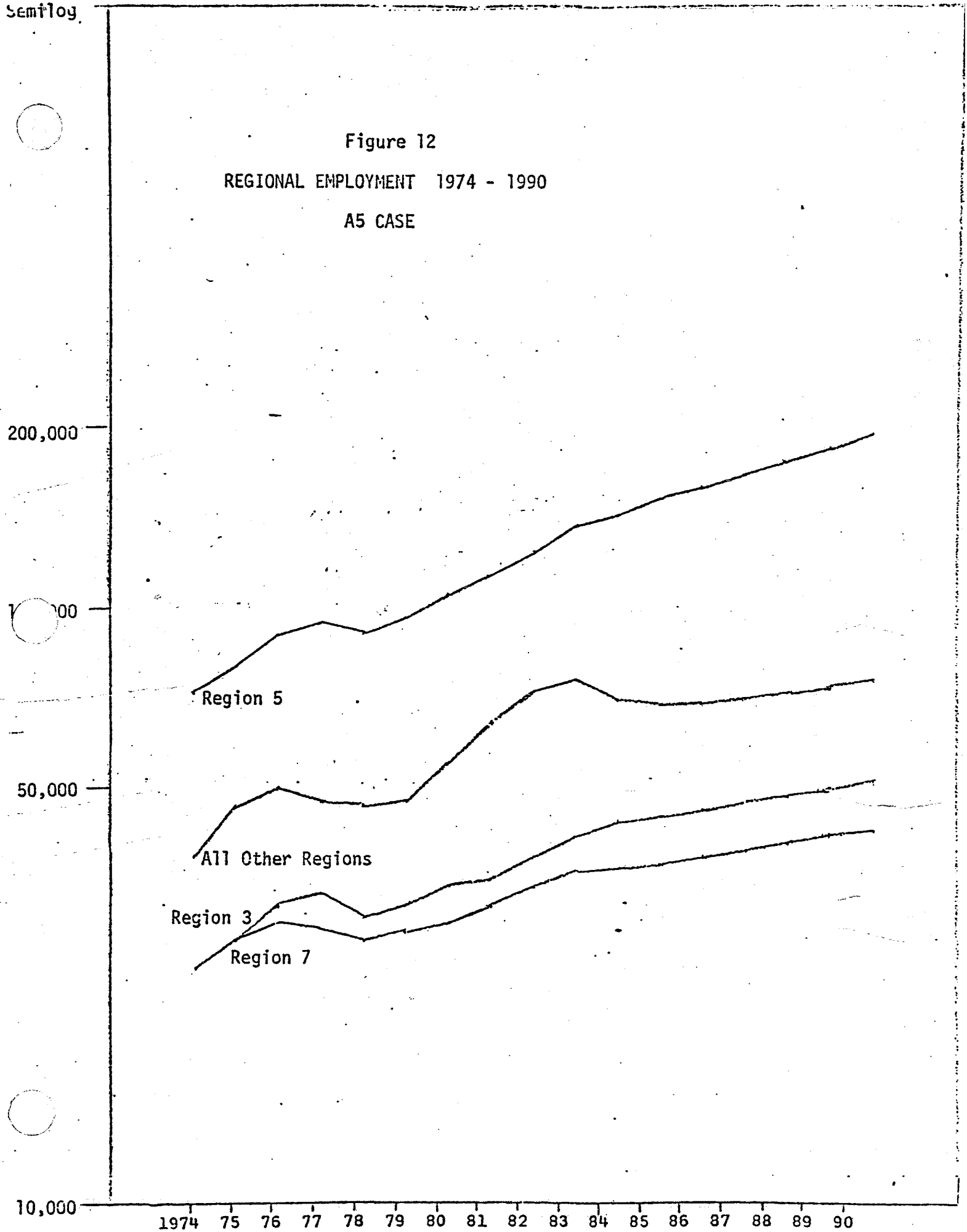


Figure 13

REGIONAL POPULATIONS 1974 - 1990

A5 CASE

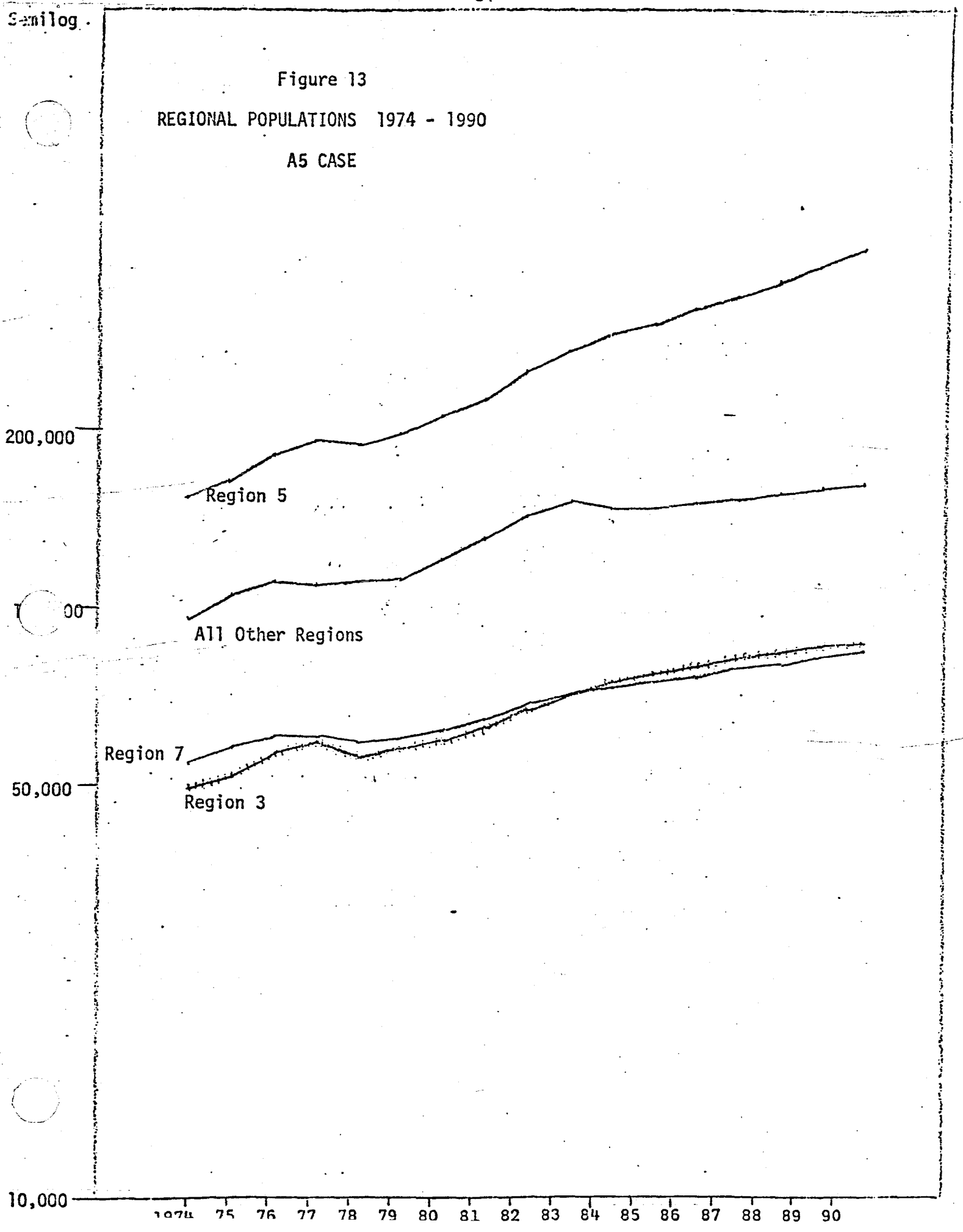
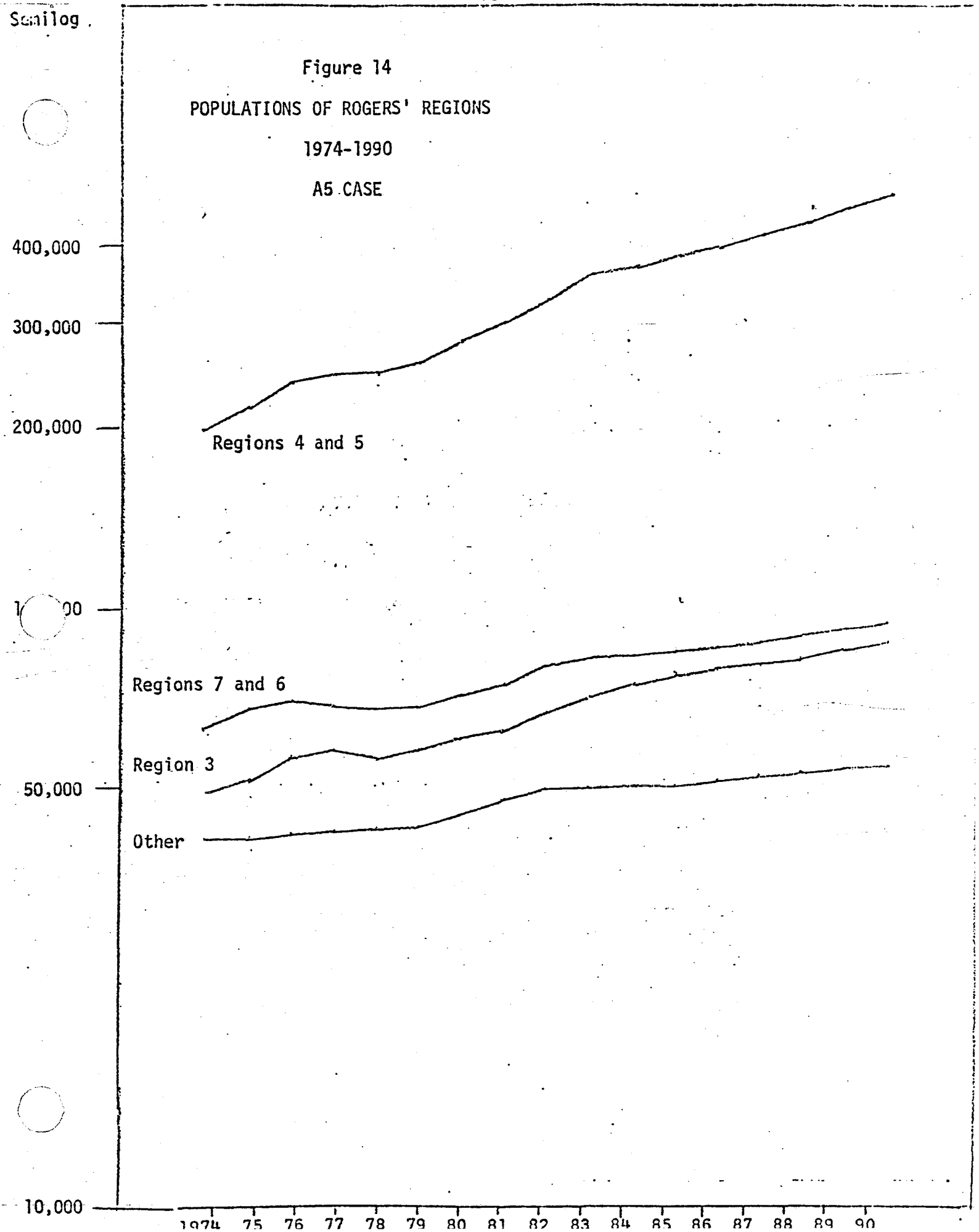


Figure 14

POPULATIONS OF ROGERS' REGIONS

1974-1990

A5 CASE



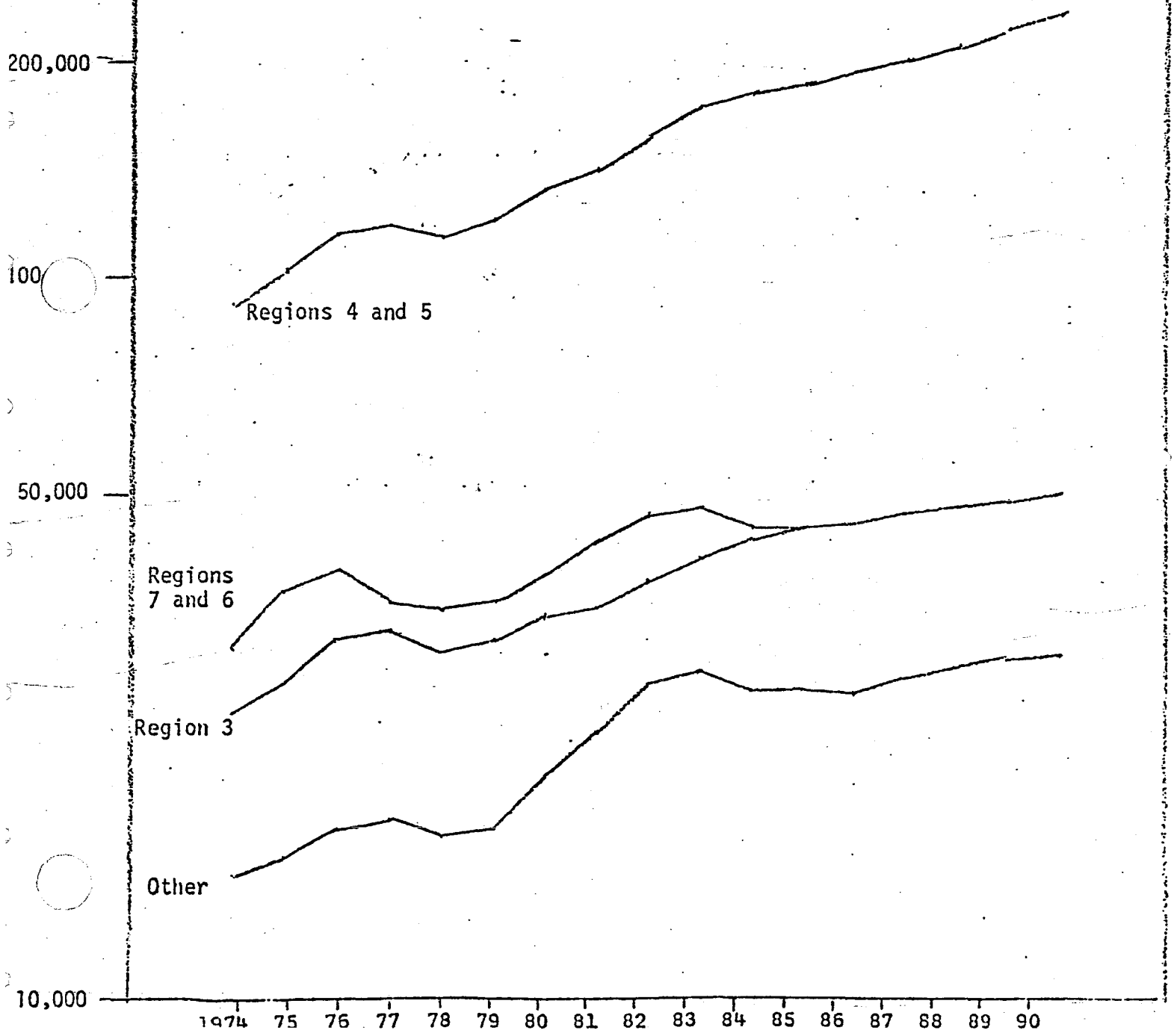
Semilog

Figure 15

EMPLOYMENT IN ROGERS' REGIONS

1974 - 1990

A5 CASE



FOOTNOTES

1. R. Paul Shaw, Migration Theory and Fact (Philadelphia, 1975), and Michael J. Greenwood, "Research on Internal Migration in the United States: A Survey," Journal of Economic Literature (June, 1975), pp. 397-433, provide comprehensive bibliographies of the migration literature.

2. A more sophisticated denominator would take into account the effects of distance on information flows and the propensity to migrate, thus using a U. S. average, weighted by distance from Alaska, of the major regions of the U. S.

3. This local supply will vary directly with the unemployment rate and the skill level of the population.

4. Arlon Tussing, et, al., Alaska Pipeline Report (Fairbanks, 1971), p. 11.

5. The relative income term has another equilibrating effect: if employment growth does not call forth sufficient labor supply (partly supplied by migration), then the real wage schedule will tend to rise faster, raising the RELINC term and inducing more migration.

6. Larry Long, "New Estimates of Migration Expectancy in the United States," Journal of the American Statistical Association (March, 1973), pp. 37-43.

7. U. S. Bureau of the Census, Census of Population: 1970, Mobility for States and the Nation (Washington, 1973).

8. Thus, the aggregate Alaska table shows net outmigration in the 25-29 age category, which is unacceptable on a priori grounds.

9. For details of the MAP model, see David Kresge, "Projections of Alaska's Growth to 1990," Alaska Review of Business and Economic Conditions, forthcoming.

10. This rate exceeds the negative rate for the period 1973-1975, and falls short of the rate achieved in the 1960-1968 period in the United States. Both of these periods are perhaps abnormal for the United States economy. The 10-year 1966-1975 growth rate is about 1.5 percent, which, if substituted in the model, makes little difference in the projections.

11. Kresge, loc. cit. in fn. 9.

12. Projections of oil production and employment are based on Thomas Morehouse, "The Future of Alaskan Petroleum Development," unpublished manuscript.

13. This scenario is dependent upon optimistic assumptions about economically recoverable reserves and the availability of the capital and technology necessary to develop these reserves.

14. The A5 (Accelerated Development - $5/barrel oil) case has been chosen as the "base case" for this analysis and thus has been analyzed in much greater detail. The Technical Appendix discusses other special assumptions made for these computer runs of the MAP regional model.

15. This age-sex distribution is an estimate based on the actual 1970 age-sex distribution of the civilian, non-Native, non-military dependent population. It is assumed that the numbers and age structure of the military and military dependent population are unchanged over the projection period. The Native population is assumed to grow at 2.0 percent per year, the recent growth rate. By 1990, the civilian non-Native non-military-dependent population comprises about 80 percent of the total.

16. George W. Rogers, Alaska's Population and Economy (College, 1963), vol. I.

17. The effects of a capital move from the Southeast region to the Southcentral region have not been modeled. The capital move will clearly result in a much lower 1990 population for Southeast and a much higher one for Southcentral. Anchorage's population would also be increased.

18. A good deal of caution must be used in analyzing the results, however, since the Census data on mobility have a number of weaknesses, and the Census data must be compared to employment growth calculations based on Alaska's Department of Labor data which is not strictly comparable to Census data.

19. These calculations are based on Table 119 of General Social and Economic Characteristics, U. S. Census of Population: 1970, Alaska, PC(1) - C3.

20. The mobility data is based on residence in 1965, so many migration streams are not measured, for instance, an interstate migrant arriving after 1965 and moving intrastate in the 1965-1970 period. Multiple moves (including return moves) are also not measurable. The distribution of net interstate migration cannot be measured precisely either.

21. Rates of natural increase do not vary that much by region. The rate used (1.7 percent) is an estimate of the Alaska rate of natural increase for 1975.

22. The calculation of population-employment elasticities is discussed in detail in the Technical Appendix.

TECHNICAL APPENDIX

I. Special Assumptions*

The behavior of Native regional corporations has not been explicitly modeled. For the computer runs discussed in this report, it was assumed that the only link between state personal disposable income and Alaska Native Fund payments would be the 10 percent minimum dividend to be paid to shareholders. The exogenous income (DNCS) for the years 1974-1990 is presented in Table A1. The assumed schedule of exogenous local government borrowing (RBOLX) is also shown in Table A1. This series declines to zero as local government revenues begin exceeding expenditures in the early 1980's.

II. The Migration Equation

The estimate of net civilian migration to the state in any one year can be subject to substantial error. To reduce the effects of errors in measurement, two-year moving sums of the net migration, employment, and relative income series were constructed which reduce the amount of erratic fluctuation in the dependent variable, at the cost of one degree of freedom.

* These assumptions resulted from consultation with Mr. Paul Engleman of F.S.L.U.P.C.

Table A1

DNCS and RBOLX

YEAR	DNCS (Million $)					RBOLX (Million $)
	L3	A3,M3	L5	A5,M5	L7,A7,M7	
1974	8.1	8.1	8.1	8.1	8.1	60
75	8.5	8.5	8.5	8.5	8.5	65
76	7.9	7.9	7.9	7.9	7.9	45
77	2.1	2.1	2.1	2.1	2.1	30
78	2.5	2.5	2.6	2.7	2.8	20
79	3.0	3.0	3.2	3.3	3.5	10
80	3.4	3.5	3.9	4.0	4.4	0
81	3.9	4.0	4.6	4.7	5.2	0
82	4.3	4.5	5.2	5.3	6.1	0
83	4.7	4.8	5.7	5.9	6.5	0
84	5.0	5.2	6.3	6.5	6.5	0
85	5.3	5.6	6.5	6.5	6.5	0
86	5.6	6.1	6.5	6.5	6.5	0
87	6.0	6.5	6.5	6.5	6.5	0
88	6.3	6.5	6.5	6.5	6.5	0
89	6.5	6.5	6.5	6.5	6.5	0
90	6.5	6.5	6.5	6.5	6.5	0

Figure 1 graphs the two-year sum variable against its predicted value. The complete statistics for the migration equation are reported below:

$$(A1)\quad NETMIG_t = -52.557 + 1.236 \times EMPGRO_t + 57.557 \times RELINC_{t-1} - 3.541 \times DUMMY$$

$$(S.E.)\qquad\qquad (0.114)\qquad\qquad (18.234)\qquad\qquad (1.128)$$

$$R^2 = .948 \qquad F(3,9) = 55.0$$

Each coefficient in (A1) is highly significant, as is the entire set of coefficients. Most of the variance in the dependent variable is "explained" by the independent variables.

Sources of the data are as follows: net migration - annual estimates of Alaska Department of Labor; employment - MAP data bank; relative income - Alaska-Neville Beharie, "Alaska Disposable Personal Income," ISEGR mimeo, Alaska relative price index from MAP data bank, and population from Department of Labor. United States - Economic Report of the President, February, 1975, Tables C-18 and C-45.

III. Regional Allocation of Population

A series of loglinear regressions of total population on total employment, one for each region, was estimated for the period 1965 - 1973. For estimation purposes, regions 1, 2, and 6 were combined, with the constants in all cases adjusted to fit the final historical observation. The equations are listed, by region, below:

(A2) REGION 1: POP = 2.1344 + 0.3360 x EMP R^2 = .9284
(S.E.) (.028)

2: POP = 2.5203 + 0.3360 x EMP R^2 = .9284
(S.E.) (.028)

3*: POP = 1.5438 + 0.7508 x EMP

4: POP = 1.3176 + 0.9185 x EMP R^2 = .7668
(S.E.) (0.153)

5: POP = 1.1389 + 0.9236 x EMP R^2 = .9852
(S.E.) (.034)

6: POP = 1.5723 + 0.3360 x EMP R^2 = .9284
(S.E.)

7: POP = 1.5903 + 0.7595 x EMP R^2 = .6940
(S.E.) (.152)

POP = Population

EMP = Employment

* An average elasticity based on Census data was substituted in the Southeast region.

Given that the equations are loglinear, the coefficients of the employment variables represent elasticities. These vary in accordance with expectations, with the Anchorage and Southcentral regions approaching 1.0, Fairbanks and Southeast somewhat lower, and the other regions much lower.

In each year of the projection period, employment is calculated for each region, as is total state population. The employment figures are "plugged in" to equations (A2) to give first-round estimates of regional population; the sum of these regional estimates is also calculated. Each regional population estimate is then divided by the sum of the regional population estimates to give the "population percentage" for each region implied by equations (A2). These percentages are then multiplied by the state total population, giving the regional populations. This process is summarized in equation A3:

$$(A3) \qquad POP_{t,r} = STPOP_t \times \frac{f(EMP_{t,r})}{\sum_r f(EMP_{t,r})}$$

where $Pop_{t,r}$ = region r population in year t

$STPOP_t$ = state population in year t

$f(\ )$ = population-employment equations (A2)