Appendix I

Case Studies and Research Reports

Prepared for the

Commission on Agricultural Workers

1989 — 1993

To Accompany the Report of the Commission

The Effect of IRCA on Farm Employment and Wages

Intervention Analysis

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Abstract

This paper applies the statistical technique of intervention analysis to examine the effects of the Immigration Reform and Control Act (IRCA) of 1986 on the agricultural labor market. Results provided no evidence that IRCA had a significant impact on U.S. farm employment or wages. There was no indication that employer sanctions issued under IRCA reduced the farm labor supply. At the same time, empirical findings do not suggest that the farm labor supply increased significantly after the passage of IRCA.

The Commission on Agricultural Workers was created by the Immigration Reform and Control Act (IRCA) of 1986 at section 304, Public Law 99-603. The Commission, through a series of mandated questions, has been charged by Congress with determining the effects of various provisions of IRCA on seasonal agricultural workers. The Commission is required to report their findings and recommend appropriate changes to Congress by November 6, 1992. The U.S. Department of Agriculture (USDA) collects farm labor data that can help provide information directly related to the Commission's mandate. This study develops a systematic approach to examine this data for possible impacts associated with IRCA.

Immigration Reform

The Immigration Reform and Control Act of 1986 established penalties for employers who knowingly hire undocumented workers, instituted an amnesty program for certain illegal aliens, and provided special programs for agricultural workers. Under IRCA, employers must verify that anyone hired after November 6, 1986, was eligible to work in the United States. Any employer who knowingly hires a worker not authorized to work in the United States may be fined up to $10,000 for each unauthorized worker employed and imprisoned for six months. Employers must complete and sign form I-9, provided by the Immigration and Naturalization Service (INS). This form indicates that the employer checked proper employee documents that show each person hired is authorized to work in the United States.

IRCA instituted an amnesty program to minimize economic and social disruptions, and avoid huge enforcement costs of deporting illegal aliens. This program permitted those who had resided in the United States continuously since before January 1, 1982, to apply for legal U.S. resident status. About 1.7 million persons were approved and are eligible to become U.S. citizens.

It was thought that many farmworkers would not qualify for the amnesty program because of the seasonal nature of farmwork. Many unauthorized farmworkers are temporarily employed because labor is needed for only a few weeks during the harvest. Thus, many undocumented farmworkers would not be in this country year-round and would not meet the residency requirement for legalization under the general amnesty program. Some growers argued that failure to give legal status to a majority of the large number of undocumented workers in agriculture would cause labor shortages and serious disruptions in farm pro-

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duction of labor-intensive crops. Recognizing that agriculture's needs might not be met by the amnesty program, Congress added the Special Agricultural Worker (SAW) Program to the new immigration law (Coltrane). The SAW Program was designed for agricultural producers of perishable commodities, who have traditionally relied on undocumented workers to adjust to a legal workforce. It gives farmers additional time to make labor adjustments and helps maintain an adequate U.S. seasonal workforce for perishable commodities until the program ends in fiscal year 1993.

The SAW program included three provisions aimed at producers of perishable crops. First, the enforcement of employer sanctions in agriculture was phased in more slowly than in other sectors of the economy. Sanctions enforcement was deferred in most crop agriculture until December 1, 1988, while they became fully enforceable in June, 1988 for all other employers. Second, the program legalized about one million workers who had jobs in the United States performing seasonal agricultural services. Third, in case seasonal labor shortages occur, the program allows for "replenishment agricultural workers" to come into the United States.

If some workers quit working in SAW Program crops, the law requires that a portion of those who quit be replaced by new immigrants each fiscal year from 1990 through 1993. New "replenishment" agricultural workers (RAW's) must work in SAW Program crops for at least 90 days per year in each of the first three years of their U.S. residence to keep from being deported and must work an additional two years in these crops to qualify for U.S. citizenship. Thus far, no work visas have been issued under the RAW Program.

Possible Effects of IRCA

The employer sanctions established under IRCA penalize employers who continue to hire unauthorized workers. Farm employers that once hired unauthorized workers are expected to rely on the legal workforce, including a large number of SAWs. Since SAWs are not required to stay in agriculture, employers fear that many will eventually find higher-paying jobs in the nonfarm sector. Over time, the seasonal labor supply could shrink, causing wages to rise as employers offer higher wages and/or increase worker benefits to encourage workers to stay. Higher wages could increase production costs and lower net revenue for growers of labor-intensive crops.

In the above scenario, wages are driven up because undocumented workers are excluded from the workforce. This viewpoint was widely accepted among farm labor experts and policymakers when IRCA became law in 1986. However, as time passed, a second scenario emerged. Many farm labor experts argued that immigrant laborers were still coming into the country illegally and working in agriculture. Employer sanctions have been difficult to enforce because undocumented workers are able to obtain jobs with fraudulent documents which are hard to detect and readily available.

Some observers argue that more undocumented workers than usual are crossing the border and remaining in the United States in the hope of another amnesty program or an extension of the SAW program. Also, a significant number of the 700,000 illegal aliens who have applied for RAW visas are likely living in the United States. Adding these potential workers to the one million that were legalized under the SAW program could result in a substantial increase in the farm labor supply. Consequently, some experts surmise that IRCA stimulated unauthorized immigration, and caused a labor surplus in the United States. A labor surplus would likely drive wages down.

These scenarios can be summarized in two alternative outcomes concerning the expected effects of IRCA on farm labor supply and wages: (1) IRCA reduced the farm labor supply causing wages to rise, and (2) IRCA increased the farm labor supply causing wages to fall. This paper investigates whether there is any evidence that the changes of the kind expected in these scenarios have actually occurred since the passage of IRCA.

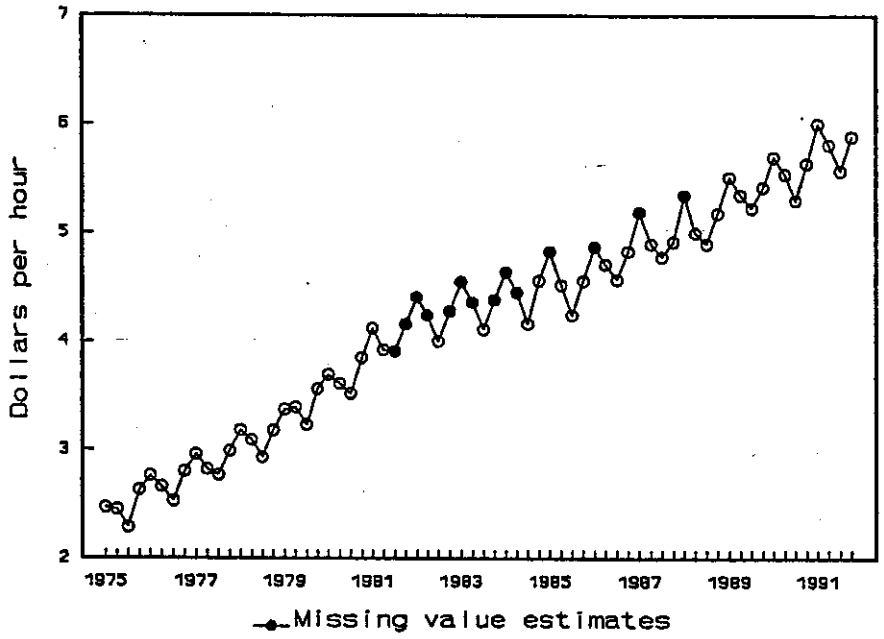
Method of Measuring Program Impacts

Ideally, we would like to identify changes in the farm labor market exclusively related to IRCA. Unfortunately, this would require information on many economic and social variables that are difficult to obtain or unavailable. We can examine wage and employment data over time, however, to see if the observed values deviate from normal trends after the passage of IRCA. Unusual increases or decreases in the data during the relevant time period would suggest that IRCA had some impact on the farm labor market.

A plot of actual observations on farm employment and wages over time might indicate a potential impact resulting from IRCA. However, other factors can cause movements in these data series that may mask any effects associated with IRCA. For example, a plot of U.S. farm wages in Figure 1 shows an obvious trend, i.e., farm wages have been rising throughout the period 1975-1991.

Changes in GNP, agricultural productivity, inflation, and minimum wage requirements are just some of the factors that may have contributed to this trend. In addition, a recurring pattern within each year is also apparent from

Figure 1 – U.S. Wage for Hired Workers in January, April, July and October*



Source: USDA, NASS, *Farm Labor*.

*Missing values are present in quarters when NASS did not conduct the survey.

Figure 1. This pattern is associated primarily with seasonal ch- in agricultural production.

presence of trend and seasonality in the data might obscure any inflection point associated with a policy such as IRCA. Therefore, these movements must be removed or filtered from the observed data to identify any changes in the series which may have been caused by IRCA. Once trend and seasonality are removed, the next step is to identify and remove any autoregressive and moving average components in the data. These components are predictable patterns in the time series related to the dependence of one time period to another. This can be accomplished by using a time-series technique known as ARIMA analysis (Box and Jenkins).

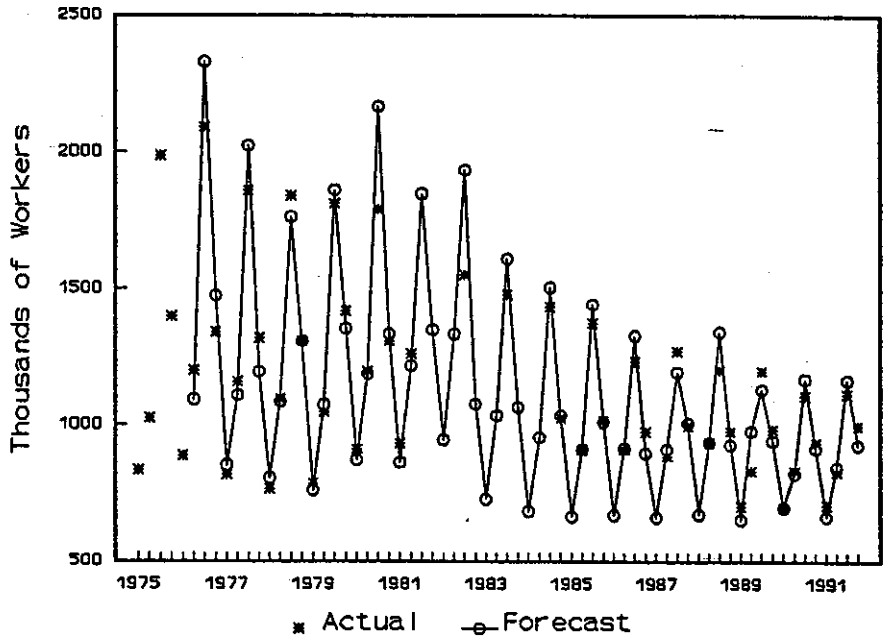
ARIMA (autoregressive-integrated-moving-average) models are fit to a collection of successive observations ordered through time known as a time series. A time series plot shows the actual observed data points which are generated by an underlying time series process. The ARIMA approach consists of extracting the predictable movements from the observed data to obtain a concise description of this process and constructing a model to explain the behavior of the time series. The procedure involves removing the mathematically definable patterns from the series until you are left with a series which is random, and thus unpredictable. These models often have the ability to generate an estimated data series very similar to the actual data. For example, Figure 2 shows how well forecasts generated from an ARIMA model replicate actual farm employment numbers for the United States.

Intervention Analysis

This study employs an extension of the ARIMA time series procedure know as intervention analysis to investigate whether IRCA had a significant impact on farm employment and wages. Intervention analysis tests whether or not "a postulated event caused a change in a social process measured as a time series" (McCleary and Hay, p. 142). The technique has been used for a variety of social science applications as a means of assessing the impact of government policies (Abraham; Bhattacharyya and Layton; Canto, et al.; Cauley and Im; Kuchler and Vroomen).

The first step in intervention analysis is to develop an ARIMA model that adequately describes the behavior of the time series under study. The second step is to add intervention components to the ARIMA model to construct the full intervention model. The intervention components are chosen to fit the observed or theoretical response of the time series under study. The theory of intervention developed in this analysis is based on the impact patterns discussed by Box and Tiao. These patterns can be described

Figure 2 – U.S. Farm Employment in January, April, July, and October*



Source: USDA, NASS, *Farm Labor.*

*The actual employment data are not continuous because the NASS Survey was not conducted every quarter.

by two characteristics, onset and duration. The onset of an intervention can be either abrupt or gradual, whereas the duration can be either permanent or temporary.

Individuals in the agricultural labor market do not respond instantly to changes in government policy. If changes in labor supply resulting from IRCA influence farm employment and wages, these changes would be realized gradually over a long period of time (Duffield). Although crop producers were not subject to the employer sanctions until December, 1988, we expected them to start making labor adjustments shortly after the passage of IRCA. Thus, we hypothesized that, if IRCA had an impact on farm employment and wages, the intervention was of the gradual and permanent type. IRCA was enacted in November, 1986. Consequently, the intervention component was introduced into the model at the first observation following enactment, the first quarter of 1987.

While we are interested in measuring the potential effects of IRCA on agricultural labor supply, data are available only on the actual number of farmworkers employed. Employment data provide an indirect measurement of IRCA's impacts and in some cases may be insensitive to changes in labor supply. For example, suppose that no labor shortage existed and the supply of farmworkers doubled. Without a simultaneous increase in agricultural production to create new jobs, we might observe only a small increase in farm employment. Since available data includes only employed workers, the increase in the labor supply would not show up in our data. However, if farm labor supply were to increase dramatically, we should observe a fall in the wage resulting from the oversupply of farmworkers.

Also, a decrease in the labor supply could occur without a corresponding decrease in the employment data. The employer sanctions imposed by IRCA were delayed and the SAW program was developed to give crop producers the opportunity to adjust to a legal workforce. Employers had an incentive to attract and retain legal workers because there would be too much risk in routinely hiring unauthorized workers. Employers could attract and retain legal workers by offering them higher wages and more hours of work. Although worker turnover would decrease markedly, the number of workers employed could remain about the same. Thus, we would expect to see an increase in the farm wage data, but little change in the number of farmworkers employed.

In summary, if IRCA resulted in a surplus of farm labor as some analysts have surmised, the data should show an increase in employment, a decline in wages, or both. Similarly, if IRCA reduced the farm labor supply by controlling illegal immigration, we would expect to find a decrease in the employment data, an increase in wages, or both. Applying the characteristics of onset and duration to

the expected effects of IRCA results in two hypotheses to be tested with intervention analysis:

I: IRCA reduced the supply of farm labor. This would be reflected in the data by a gradual decline in employment and/or a gradual increase in wages beginning the first quarter of 1987. These changes are expected to be permanent, leveling off over time.

II: IRCA increased the supply of farm labor. In this case, we expect a gradual increase in the employment data and/or a gradual decline in wages beginning the first quarter of 1987. These changes are also expected to be permanent.

NASS Farm Labor Data

Employment and wage data were provided by the National Agricultural Statistics Service (NASS) of the U.S. Department of Agriculture (USDA). These data are published in the *Farm Labor* report issued quarterly and a compilation of farm labor data reported from 1910-1990 is also available (USDA). Before 1975, a nonprobability mail survey was the source of farm labor information. Estimates were based on panels of volunteers who reported the number of workers on their farm and information about the prevailing wage rate. Since 1975, the wage and employment estimates reported in the *Farm Labor* publication have been based on regional probability surveys. Each year the surveys collect information, pertaining to one week, every January, April, July, and October. The statistical procedures used in the current surveys provide more reliable data than previous methods. To avoid any inconsistencies in the data, the time series used in our analysis begins in 1975.

NASS also reports wage and employment estimates by type of worker and region. Workers are classified by hired, self-employed, and unpaid workers. Wages paid to hired workers are broken down further into field and livestock workers but a similar breakdown is not available for employment. We use the hired classification in our analysis to maintain consistency between the wage and employment time series data.

Data are collected in all states except Alaska. Aggregate labor estimates for the United States are computed from 18 regional estimates and both are reported each quarter. Estimates from the California and Florida surveys are reported as separate regions and survey data from the other states are grouped into 16 additional regions. Our analysis includes a U.S. aggregate model and 4 regional models: (1) California, (2) Florida, (3) the Pacific (Oregon and Washington), and (4) the Southern Plains (Texas and Oklahoma). The regions were chosen because of the proportionally high number of SAW applicants in these areas—over 75 percent of the SAW applicants live in these six states.

Each time series analyzed begins in January, 1975 and ends in October, 1991. However, NASS cut back the labor surveys in 1981 because of budget reductions. Thus, the data series on both employment and wages contain some missing observations. The *Farm Labor* report only published estimates for January and April in 1981. Only the July surveys were conducted in 1982-1983, and the July and October surveys were conducted in 1984. From 1985-1988, 3 quarters of data were collected (excluding January) for most regions. Four quarters of data were collected in a few regions starting in 1985 and the rest of the regional surveys were restored to 4 quarters in 1989.

An intervention analysis of the type proposed requires the observations to be equally spaced in time over the entire time series. Therefore, estimates of NASS's wage and employment values were used in the quarters when data were not collected. The method used to derive the estimates is similar to the ARIMA procedure described earlier. (For details on the estimation procedure see the SAS/ETS Users Guide.) There is no way of knowing how close these estimates would be to the actual values if the data had been collected by NASS. However, they conform to the trend, seasonality, and other predictable components identified in the time series models, making them consistent with the observed data. Adding the missing data estimates to the NASS farm labor time series provides continuous data sets from 1975 to 1991 for the United States and the 4 regions considered.

Results of the Intervention Models

The intervention models estimated provided no evidence that IRCA had a significant impact on farm employment or wages in the United States or the 4 regions considered.[1] None of the intervention components representing the impacts of IRCA were statistically significant, indicating that established trends in available farm labor data were not significantly disrupted by the program. Thus, the findings provide no evidence that employer sanctions issued under IRCA resulted in a reduction of agricultural labor. Similarly, the findings do not support the hypothesis

1 A complete description of the intervention models will be presented in a forthcoming Economic Research Service report.

that IRCA increased the farm labor supply by stimulating unauthorized immigration.

To account for possible behavioral lags in the farm labor market, the original interventions were expanded to include different starting points. We conducted an exploratory analysis by allowing the onset of IRCA's impacts to vary sequentially from the second quarter of 1987 to the fourth quarter of 1989. Results of the exploratory analysis were consistent with the intervention models which designate the onset of IRCA's impacts as occurring in the first quarter of 1987. Even when allowing the onset of any potential adjustments in the labor market to vary from 1 (April 1987) to 12 (October 1989) quarters, we found no evidence that IRCA had a significant impact on farm employment and/or wages of the type expected under hypotheses I or II.

Since the intervention analysis did not uncover any significant impacts in either the employment or wage data, the remainder of this section will focus on a visual description of time series plots of the data. Any such description is limited by the shortcomings discussed earlier. Time series plots of the quarterly employment and wage series for the United States and the 4 regions considered are shown in Figures 1 and 5-13.

Consistent with the intervention analysis, most of the plots show no evidence that either employment or wages deviated significantly from their historical trends in the periods following IRCA. To see U.S. annual employment trends more clearly, a plot of July observations are shown in Figure 3. Without the seasonal fluctuations, it is easy to see the downward trend in the U.S. time series. This trend does not appear to deviate after the passage of IRCA in 1986. The regional data in Figure 4 show a slight upward change in direction for July employment in California from 1986-89, but employment trends remain fairly constant in the other regions after 1986.

Looking closely at the quarterly employment data, it appears that the employment trends in California (Figure 5) and in the Southern Plains (Figure 6) changed prior to the enactment of IRCA. Employment in California declined in the earlier years and became relatively constant beginning in 1984, while employment in the Southern Plains remained fairly constant until 1985 when it took a noticeable dip downward. However, these trends do not appear to be altered significantly following IRCA's enactment. A large spike in the Florida employment data occurs in the first quarter of 1988 (Figure 7), but it appears to be a temporary shock which does not have the gradual and permanent shape of our expected interventions. Large spikes in the employment data may be related to unusually high production during a survey period, which would result in increased labor demand.

Figure 3 – U.S. Farm Employment in July, 1975-1991

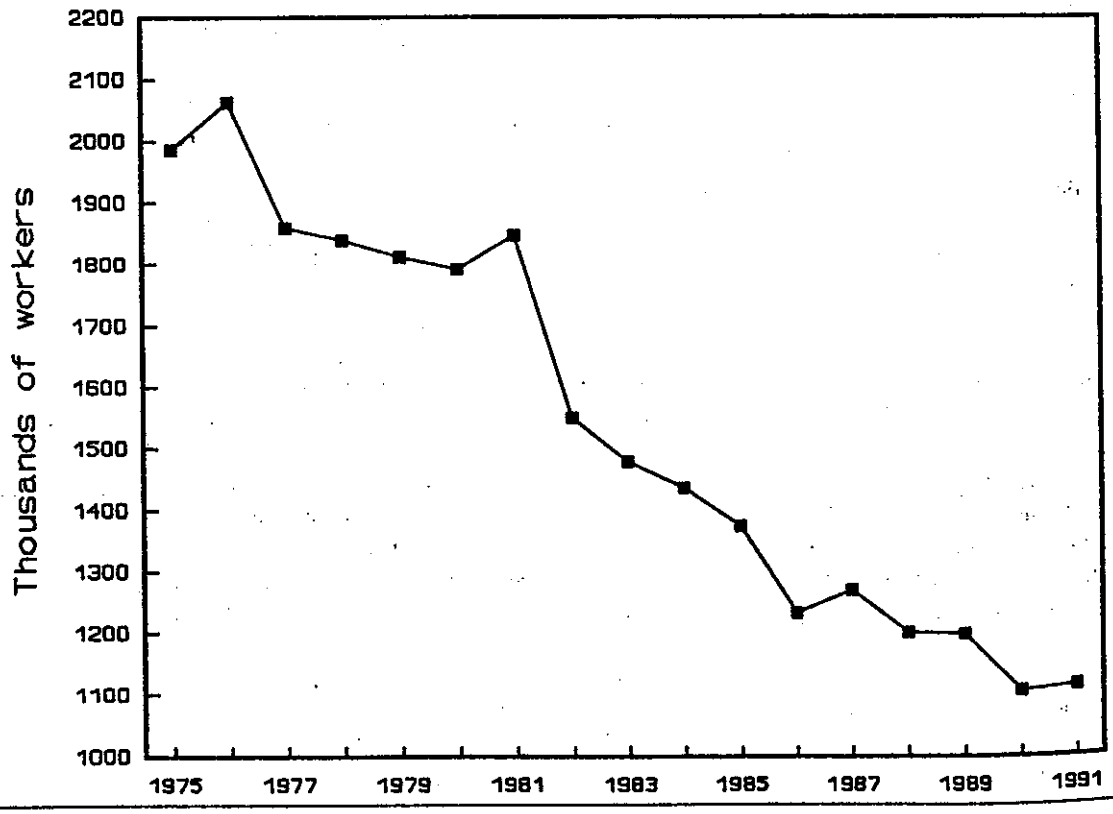


Figure 4 – Regional Farm Employment in July, 1975-91

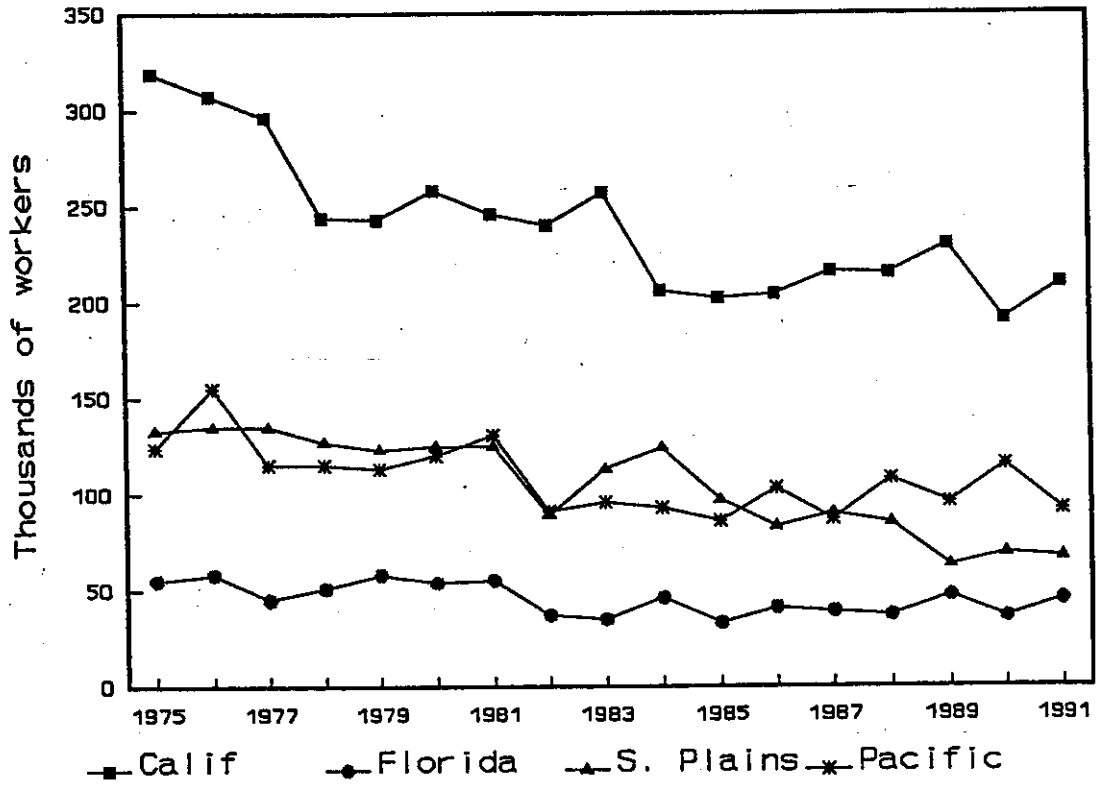


Figure 5 – California Farm Employment in January, April, July and October

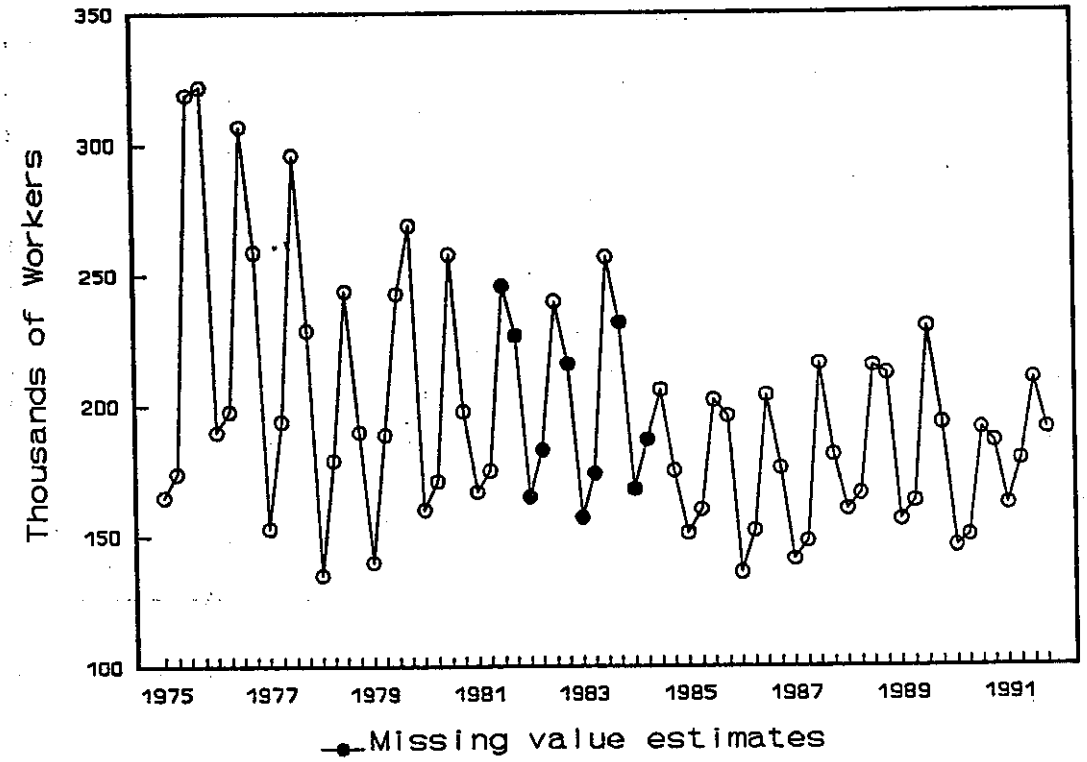


Figure 6 – So. Plains Farm Employment in January, April, July, and October

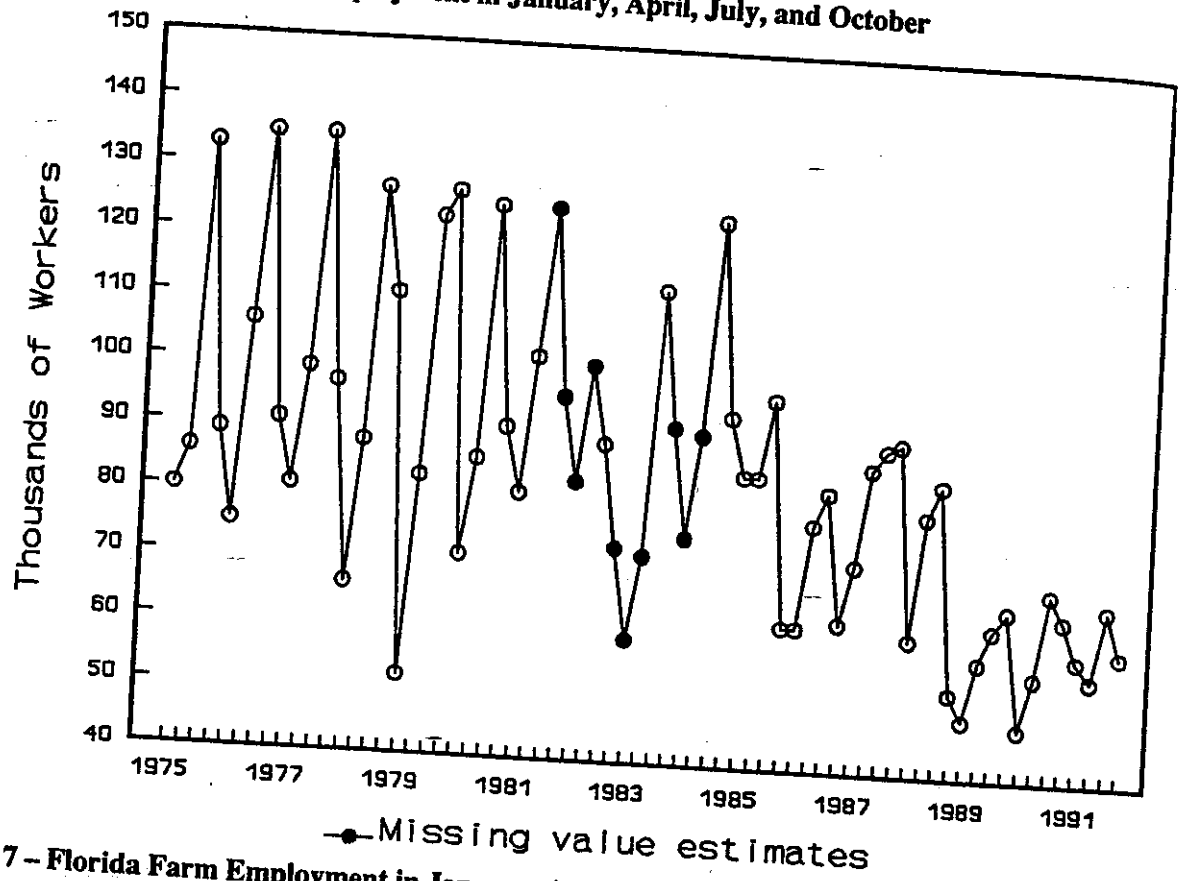


Figure 7 – Florida Farm Employment in January, April, July, and October

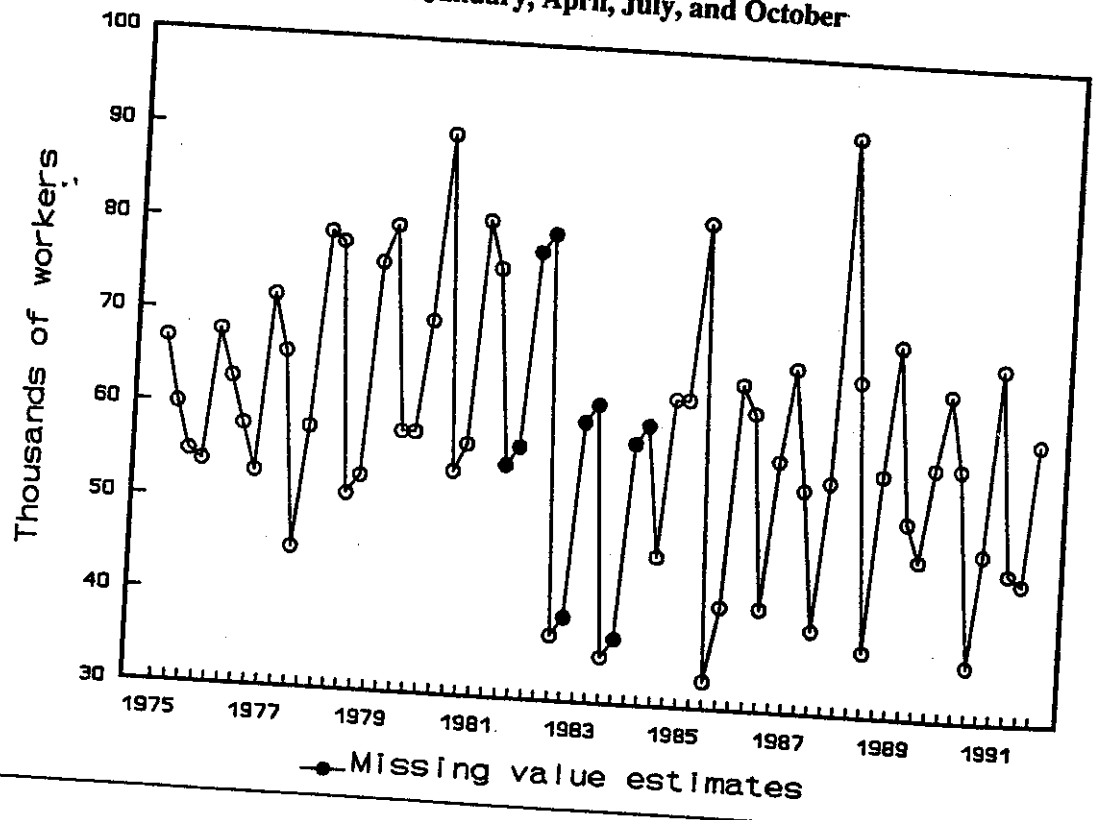
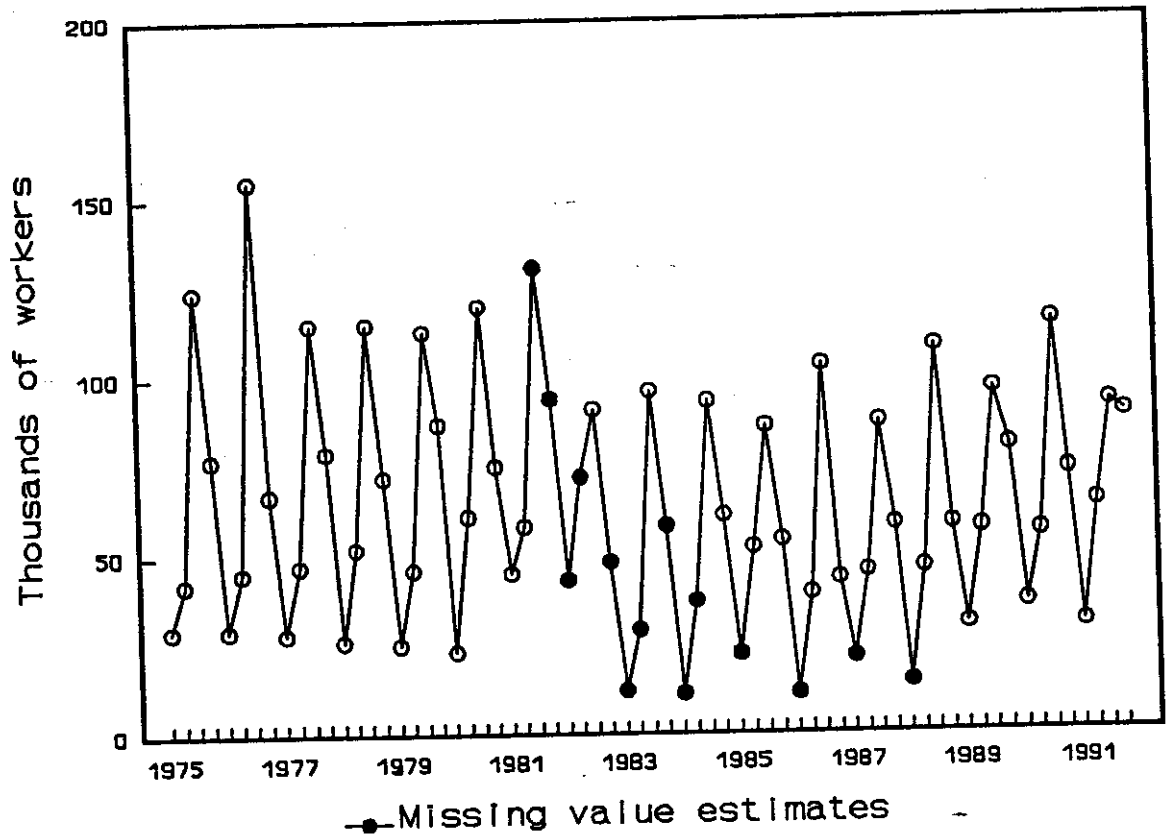


Figure 8 – Pacific Farm Employment in January, April, July and October



ure 9 – U.S. Farm Employment in January, April, July, and October

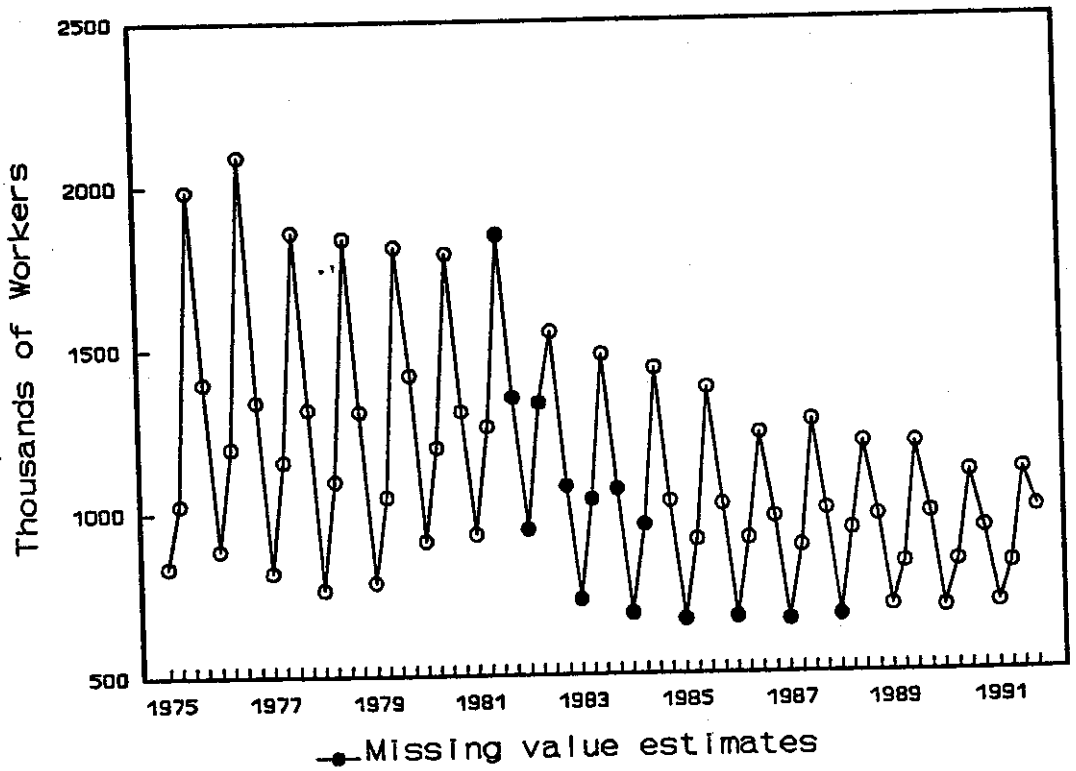
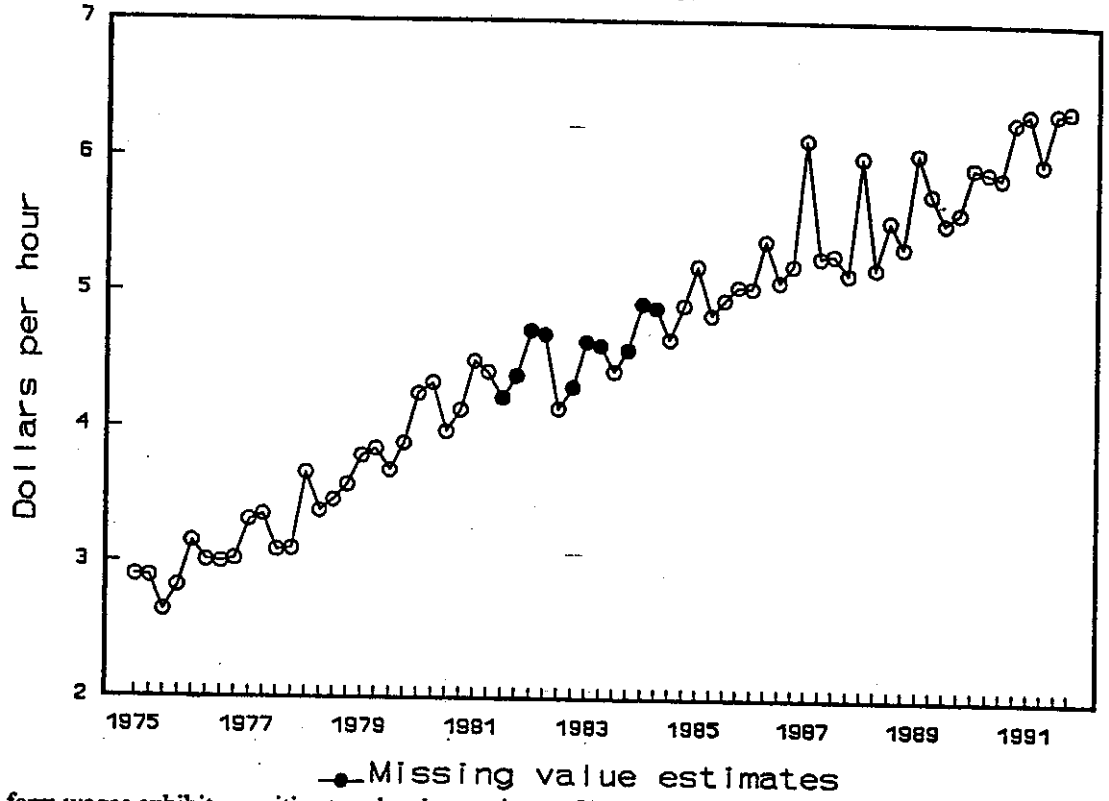


Figure 10 – Florida Hired Farm Wage in January, April, July, and October



U.S. farm wages exhibit a positive trend and a consistent seasonal pattern throughout the study period (Figure 1). The U.S. farm wage falls to its lowest levels in April and July of each year, when low paying temporary workers dominate the workforce. The regional data show a similar seasonal pattern, with the exception of Florida where the demand for labor peaks at the beginning of the year. Florida is the nation's largest winter vegetable producer and many temporary workers preparing for winter production are included in the October survey. Therefore, the Florida wage does not take as big a jump in October as in the other regions (Figure 10).

With the exception of seasonal dips, the farm wage rises consistently throughout each data series. However, the rise in wage appears to be getting less steep over time, i.e., increasing at a decreasing rate. This may be more apparent in the Southern Plains and the Pacific regions (Figures 11 and 12). The trend in wage rates does not appear to be affected after the passage of IRCA in any of the regions considered. However, some large spikes in the wage data following IRCA are apparent in several regions. July wages in 1987 and 1990 in the Southern Plains look unusually low (Figure 11), while January wages in Florida look unusually high from 1987-1989 (Figure 10). Wages in the Pacific region also dip noticeably between the third quarter of 1985 and the fourth quarter of 1987 (Figure 12). However, as reported earlier, the results from the intervention analysis did not find these disturbances to be statistically significant.

Conclusions

Intervention analysis provided no evidence that IRCA had a significant impact on farm employment or wages. Established patterns in farm employment and wage data for both the United States and four U.S. regions did not appear to be influenced significantly by the program. We found no empirical evidence that IRCA caused farmers to adjust to a smaller workforce. At the same time, the statistical findings did not suggest that farm employment increased significantly due to a labor surplus.

While our findings show that IRCA had no effect on employment or wages for the United States or selected regions, IRCA may have had an impact on farm employment and/or wages in local areas within certain regions. The data used in this study were aggregated to describe the U.S. and regional labor markets and any local impacts may be overwhelmed by a lack of significant effects in the rest of the region. Thus, the results of this study may not apply to some local labor markets.

Figure 11 – So. Plains Hired Farm Wage in January, April, July, and October

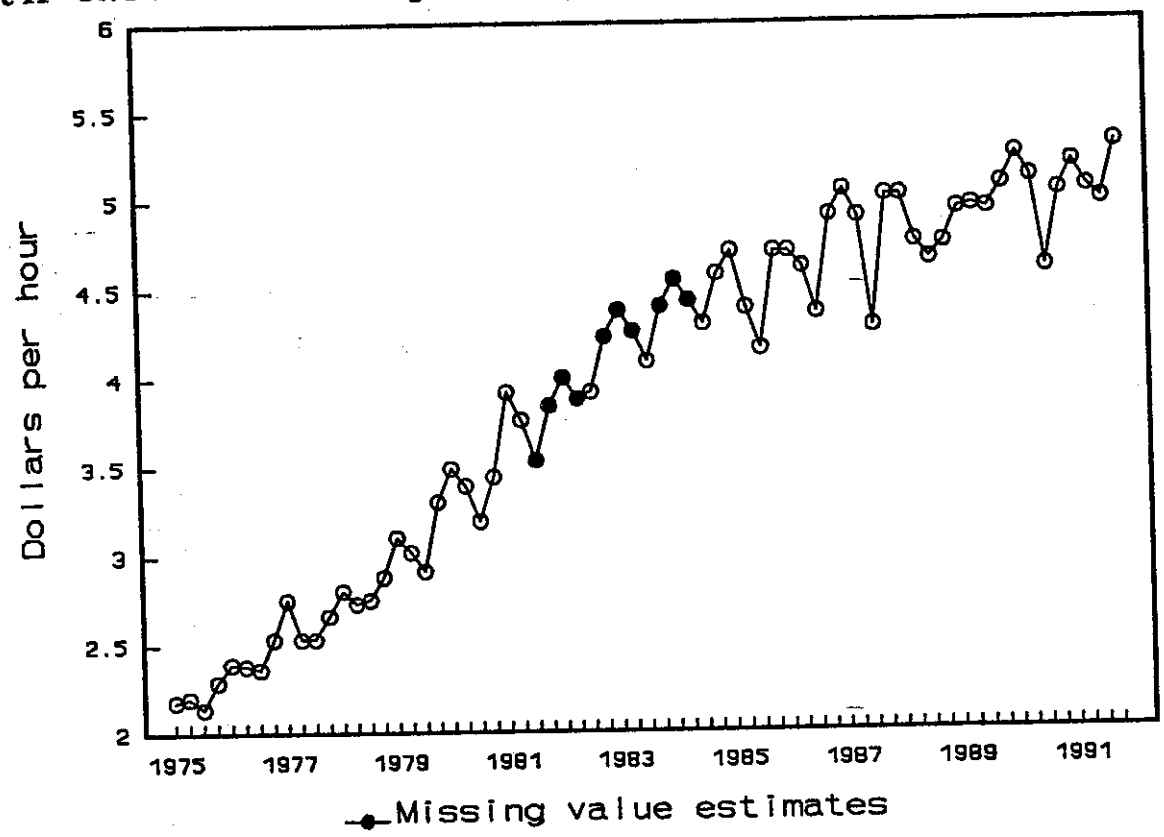


Figure 12 – Pacific Hired Farm Wage in January, April, July, and October

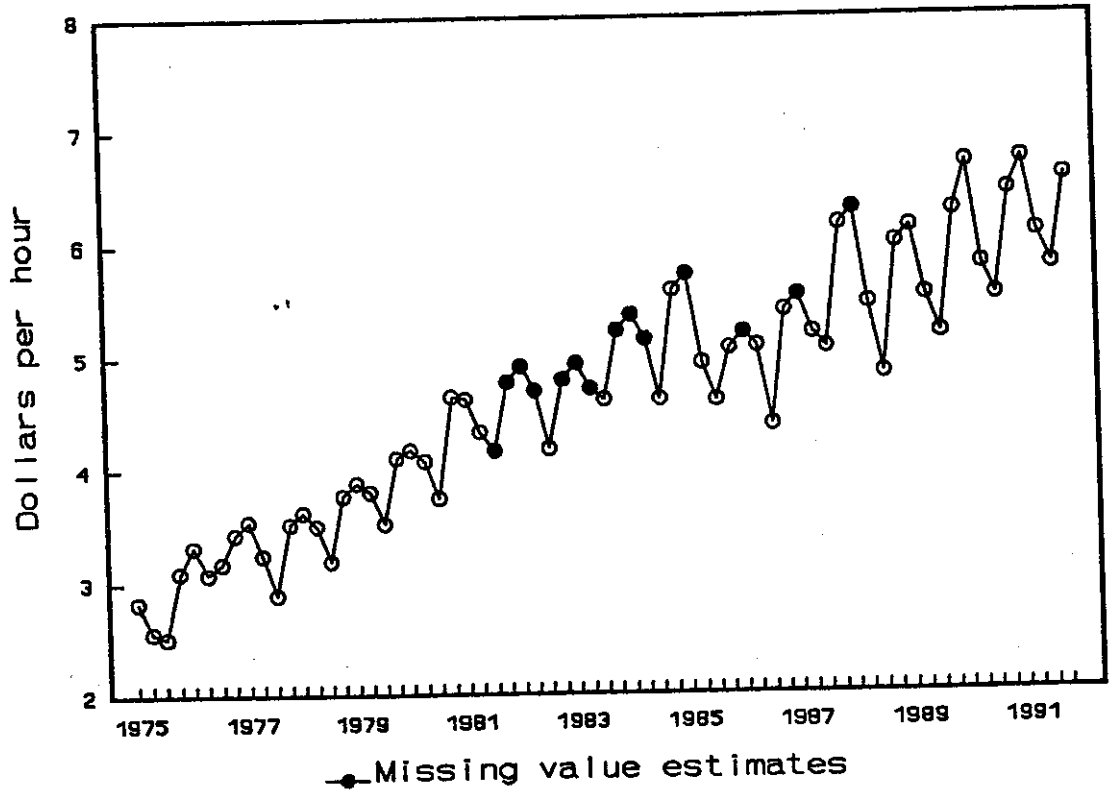
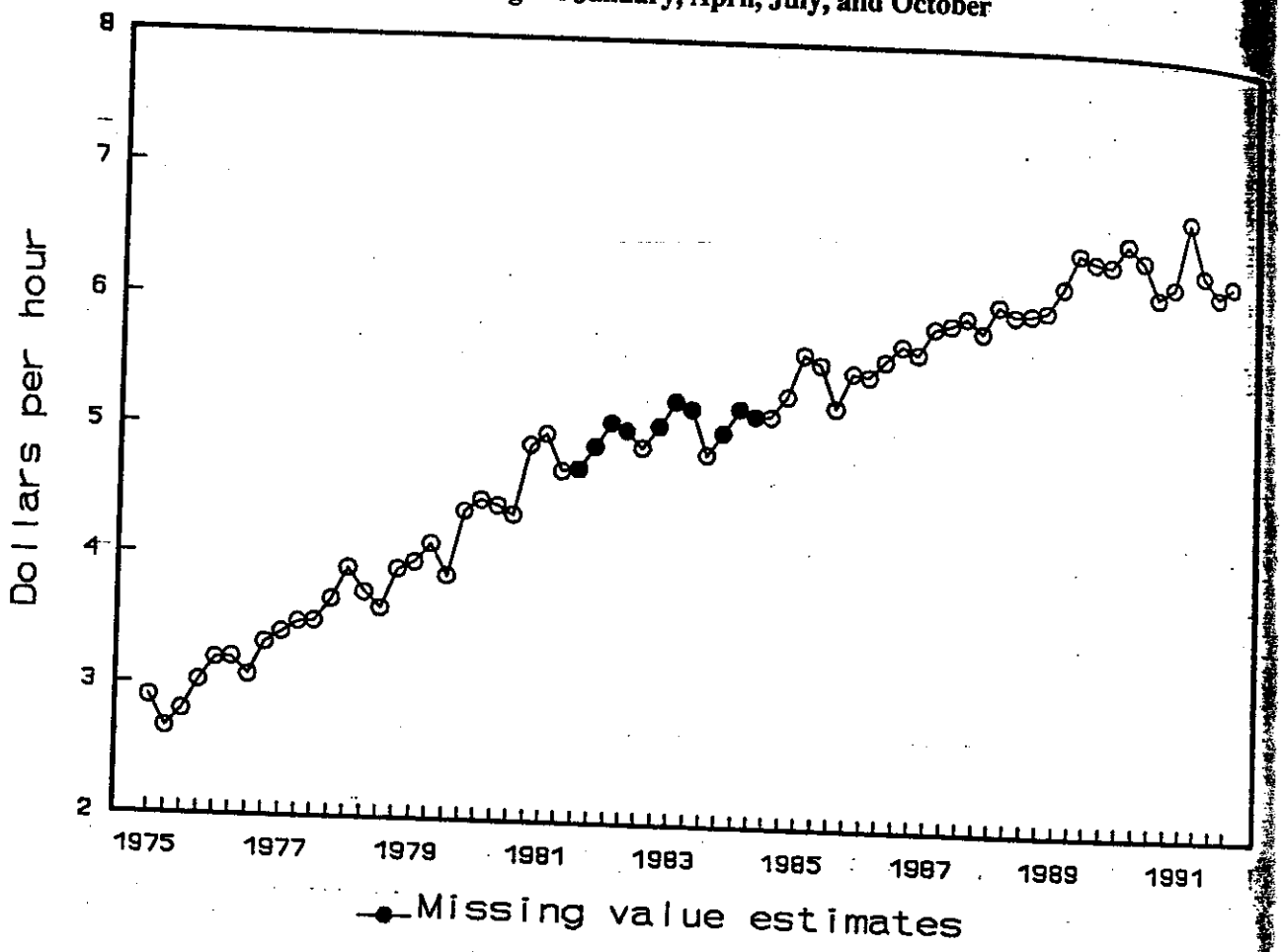


Figure 13 – California Hired Farm Wage in January, April, July, and October



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