Life After Cutbacks

Tracking California's Aerospace Workers

Robert F. Schoeni
Michael Dardia
Kevin F. McCarthy
Georges Vernez

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National Defense Research Institute

Prepared for the
Office of the Secretary of Defense

RAND

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PREFACE

This report is one of a series written as part of a project that investigates the effects of the defense draw-down on California's economy. This report tracks California's aerospace workers (and other durable goods manufacturing workers) during the aerospace industry's contraction in the early 1990s, which was largely due to defense cutbacks. Others in the series examine the effects of military base closures in the state's communities and the impact of declining defense budgets on small suppliers to aerospace manufacturers.

The project was sponsored by the Office of the Undersecretary of Defense (Personnel and Readiness). It was carried out in the Forces and Resources Policy Center of the National Defense Research Institute, a federally funded research and development center sponsored by the Office of the Secretary of Defense, the Joint Staff, and the defense agencies.

This report and its companion pieces (listed below) should interest anyone involved in the interactions between the Department of Defense, its contractors and suppliers, and civilian communities.

Michael Dardia, Kevin McCarthy, Jesse Malkin, and Georges Vernez, *The Effects of Military Base Closures on Local Communities: A Short-Term Perspective,* Santa Monica, Calif.: RAND, MR-667-OSD, 1996.

Georges Vernez, Michael Dardia, Kevin McCarthy, Jesse Malkin, and Robert Nordyke, *California's Shrinking Defense Contractors: Effects on Small Suppliers,* Santa Monica, Calif.: RAND, MR-687-OSD, 1996.

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SUMMARY

THE PROBLEM

This study looked at aerospace workers in California between 1989 and 1994 to gauge whether they suffered disproportionate hardships during the defense budget downturns of the late 1980s and early 1990s.

The end of the Cold War has brought profound changes to the U.S. military and to sectors of the civilian economy that have been linked closely to the armed services. The new political and economic environment of the 1990s is defined by leaner Pentagon budgets, fewer uniformed personnel, and growing closure lists of bases, shipyards, and other facilities.

The aerospace industry has been at the vortex of these contractions. As the Pentagon has become smaller over the past eight or nine years, its need for sophisticated aerospace products has dropped. And for some companies heavily dependent on defense business, minor changes in the Pentagon's budget outlays translate into major dislocations on the factory floor. Nationwide, the aerospace industry's job base has shrunk by 30 percent over the past eight years.

Nowhere have those changes been more apparent than in California and the Los Angeles basin. The state in 1987 was home to one in four U.S. aerospace jobs. In Los Angeles County alone, aerospace jobs accounted for 10 percent of the national total.

Since then, the aerospace industry in California has become a shadow of its former self. The state's aerospace employment rolls are down 33 percent compared with 1987, while in Los Angeles County the industry's job base is only 50 percent of its size eight years ago.

The federal government responded to this industry downturn by setting up programs to assist displaced aerospace workers. While different in scope and focus, these programs all were based on a common assumption that aerospace workers had suffered unique hardships that were directly linked to their industry's defense dependence.

This study tested that broad assumption. It tried to define in quantitative terms aerospace workers' employment experience during the downturn, explore whether that experience differed from that of workers in comparable nonaerospace manufacturing operations, and identify which worker groups were most affected by the downturn.

HOW WE STUDIED THE PROBLEM

We created a unique data base using statistics drawn from two sources: wage files and unemployment income files provided by California's Employment Development Department. These statistics allowed us to track wage, employment, and demographic characteristics of *each individual aerospace worker* who was employed in California in 1989, a group that totaled 517,000 individuals. It also allowed us to assemble the same data for some 315,000 people who were employed in similar durable goods manufacturing jobs in nonaerospace industries in California. Our data allowed us to follow these two sets of workers for the six years during which the state suffered the brunt of the defense downturn.

WHAT WE FOUND OUT ABOUT IT

In general, we found that the labor dislocations that aerospace workers suffered in California were not appreciably different from those of nonaerospace durable goods workers. We found that

- on average, 1989 aerospace workers who were employed at the end of 1994 earned slightly higher inflation-adjusted wages in 1994 than they did before the defense downturn
- the wage gap between 1989 workers in aerospace versus non-aerospace durable goods manufacturing held steady through 1994
- aerospace workers were slightly less likely to use the unemployment insurance (UI) system; however, aerospace workers who drew benefits were on the system slightly longer, on average, than were nonaerospace workers.

Among the 1989 California aerospace workers who were working in 1994, two-thirds remained employed in the industry in 1994. Another 9 percent of these workers moved on to other manufacturing jobs in nonaerospace industries. Real wages for these two groups of workers, who constituted the vast majority of our initial study pool of aerospace employees who were working in 1994, grew an average of 5 percent during the period.

Another 14 percent of 1989 California aerospace workers who were employed in 1987 had moved to service industry jobs by the end of 1994. These workers' wages dropped significantly, but—perhaps because of differences in age and education—they still earned more than other manufacturing workers who also moved into the service sector.

Aerospace workers endured the defense budget downturn in better shape than popular press reports have suggested, particularly when compared to other durable goods manufacturing workers. But a significant share of aerospace workers nevertheless experienced turbulence in the labor market. A quarter of the 1989 pool of aerospace workers who were employed at the end of 1994 saw their wages fall 15 percent or more during the period. In addition, some aerospace workers experienced long periods of unemployment. In most cases, however, labor market turbulence was no greater for aerospace workers than for workers who were employed in other durable goods manufacturing sectors.

ACKNOWLEDGMENTS

We are indebted to Sue Polich, who was intimately involved in constructing the data files and conducting a substantial share of the analyses. Dick Buddin and Jim Dertouzos reviewed the manuscript and provided several important suggestions. Michael Kennedy, Jesse Malkin, and Bob Reville also offered helpful comments. We especially thank Dave Jones and the Employment Development Department of the State of California, without whose assistance the data used in the analyses would not have been available. Finally, Gordon Lee was instrumental in preparing the manuscript.

Chapter One

INTRODUCTION

The aerospace industry in the United States has been hit hard by recent drops in defense spending. Employment levels in that sector fell by more than 25 percent from 1988 through 1994. Employment in places such as California and Los Angeles County in particular, with their high concentrations of aerospace workers, have seen even more dramatic slides.

The federal government has responded to these employment drops by establishing programs to assist workers impacted by defense cuts. While aiming at different populations and possessing different goals, these government programs have been built upon several common assumptions:

- Assistance is needed because the end of the Cold War, not business mismanagement, caused the employment decline.
- Employment declines were unusually rapid, a 20-percent drop over two or three years; therefore, workers may not have foreseen that they needed retraining.
- A large number of displaced aerospace workers hit the market at the same time, driving down wages and lengthening the period of unemployment.
- Aerospace workers are geographically concentrated, with 25 percent of the U.S. total in California and 10 percent in Los Angeles County alone.
- Aerospace employment is not likely to rebound soon, since military spending is not likely to increase significantly.

- Aerospace workers, who typically are more highly skilled than workers in other industries, may not benefit from established government assistance programs that target low-skilled workers.
- Aerospace workers possess specialized skills that are not easily transferred to other industries.

These may be valid reasons to provide government assistance to aerospace workers. However, the extent of the difficulty faced by aerospace workers is unclear; few studies have systematically quantified the changes experienced by aerospace workers. Furthermore, it is uncertain whether aerospace workers have experienced more difficulty than other workers in California, who have been adversely affected by the poor California economy in general.

One reason to expect aerospace workers (and other workers in defense-dependent industries) to fare better than nonaerospace workers is that special programs were established to assist them, and we cannot determine from the data examined in this study whether the worker participated in these programs. However, the primary special assistance given to defense-related industries was an appropriation of $1.6 billion in 1993; $533 million was allocated to personnel assistance programs with $150 million for private-sector workers and the balance for active-duty military personnel. Therefore, relatively little special assistance was given to workers during the period examined in this study.[1]

This report tracks California aerospace workers during the aerospace industry's contraction to assess the difficulties they experienced. Specifically, this study asks the following questions:

- What has been the experience of aerospace workers during the decline of the industry?
- Have their experiences been different from the experiences of workers in other industries?
- Which groups of aerospace workers have suffered the greatest losses?

---

[1]See the study by the Congressional Budget Office (1993) for details on the types of programs available to displaced defense-related workers.

The aerospace industry gives a good indication of the cost of military downsizing for civilian workers. Two-thirds of private-sector defense industry employment in California is in aerospace, and the industry's revenues depend heavily on defense contracts. By examining the aerospace industry in California, which was going through a deep recession at the same time that defense expenditures were cut back, we are likely to find some of the largest effects that defense downsizing can have on the work force of a large civilian industry.

At the same time, this study provides an opportunity to examine displacement of workers from a high-tech industry whose workers are disproportionately highly skilled. In the past 30 years, employment of professional and technical workers in the economy has grown at three times the rate of the entire labor force (Barley, 1993), and projections of the occupational distribution imply that by the year 2000 professional and technical workers will represent 18 to 20 percent of the work force, more than any other occupation (Silvestri and Lukasiewicz, 1989). In designing programs that will facilitate rapid reemployment among displaced workers in the future, it is important to determine whether workers in high-tech industries, who typically have higher skills, have distinct experiences.

To answer these questions we used a unique data source that allowed us to examine the wages and unemployment outcomes of all aerospace workers in California between the first quarter of 1989, just before the declines in employment, and the third quarter of 1994, after many of the large downsizings took place (though further program cancellations may still cause sizable future layoffs). We followed all 517,000 workers who were employed in the aerospace sector in the beginning of 1989 over the subsequent six-year period and compared their labor market outcomes with the outcomes of a random sample of 20 percent of workers in California who, in the beginning of 1989, were in durable goods manufacturing industries excluding aerospace. By examining this group of durable goods manufacturing workers, which consists of 315,000 employees, we were able to determine whether the changes experienced by aerospace workers differed from changes experienced by workers in other industries.

Before turning to the analyses of these data, we begin by providing some background information on the aerospace industry. We de-

scribe the trends in employment and the regional concentration of the industry. In order to understand the burden borne by aerospace workers, we also establish their characteristics (e.g., education, occupational level, age). In Chapter Three we discuss the data and the indicators of labor market stress that were examined. The majority of the report, which is contained in the two subsequent chapters, focuses on the results of our analyses of the unique information that we have compiled from California. Chapter Six integrates findings from previous studies of aerospace workers. A final chapter summarizes our findings.

Chapter Two

BACKGROUND: THE AEROSPACE INDUSTRY

The aerospace industry is unique in several ways. Therefore, as background to the analyses of our administrative data from California, we provide an overview of the industry's key characteristics, including its dependency on defense procurement, regional concentration, employment swings, and worker profile.

DEFENSE DEPENDENCY

The aerospace industry is heavily dependent on defense expenditures. The specific industries that are included in aerospace are missiles and space, aircraft, communications, and instruments. Table 2.1 lists the aerospace sectors and the relevant Standard Industrial Classification (SIC) codes along with estimates of the share

Table 2.1

Defense Dependency of Aerospace Sectors in California, 1990[a]

Industry (SIC code)	Percentage of Revenue That Is Defense-Related	Percentage of Employment That Is Defense-Related
Missiles and Space (376)	84	75
Aircraft (372)	40–43	40–47
Communications (366)	42	42
Instruments (381–382)[b]	18	not available

[a]Estimates of revenue shares and employment shares come from Congressional Budget Office (1992) and Saunders (1993), respectively.

[b]Instruments include search and navigation equipment and measuring and controlling devices.

of revenue and employment attributable to defense contracts. The estimates of industry defense dependence for revenue vary from just under 20 percent for instruments to as much as 84 percent for the missiles and space sector. For aircraft and parts, estimates are slightly over 40 percent. In comparison, defense demand is estimated at six percent of revenue for all manufacturing industries combined. In sum, employment within the aerospace industry as a whole is largely determined by defense expenditures.

CHANGES IN EMPLOYMENT AND GEOGRAPHIC CONCENTRATION

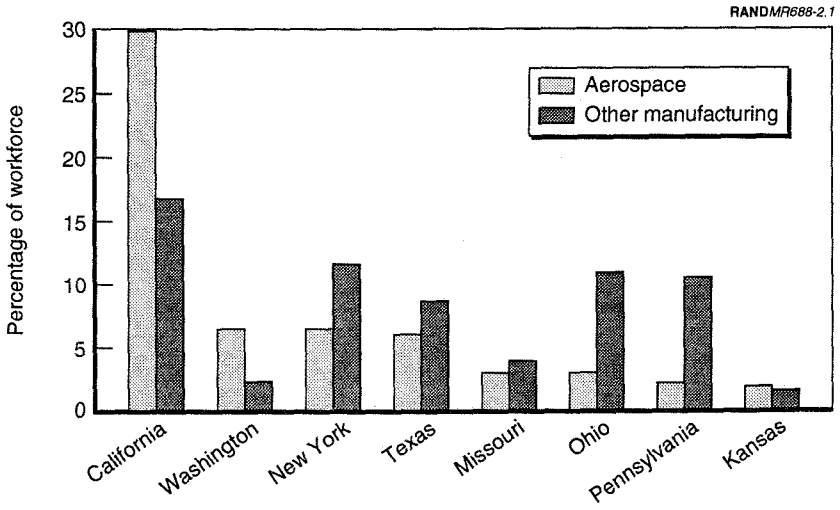
Aerospace employment was not a large share of economywide employment even at its peak; only two percent of U.S. employment was in aerospace in 1987. However, aerospace jobs were a substantial share of manufacturing employment, accounting for 10 percent of all such jobs in the United States in 1987.

Certain regions are much more dependent on aerospace, and in Figure 2.1 we display the share of national aerospace employment located in the eight major aerospace states in 1987.[1] California in particular was home to a disproportionately large number of aerospace workers. Almost 30 percent of the nation's aerospace employment was in California in 1987, even though only 17 percent of all nonaerospace manufacturing jobs were located there. As a result, just over 20 percent of California's manufacturing employment was in aerospace, and this represented 4 percent of total California employment in 1987 (Figure 2.2). Southern California, and Los Angeles in particular, is even more dependent on the success of the aerospace industry, with 28 percent of Los Angeles's manufacturing jobs being in aerospace.[2]

---

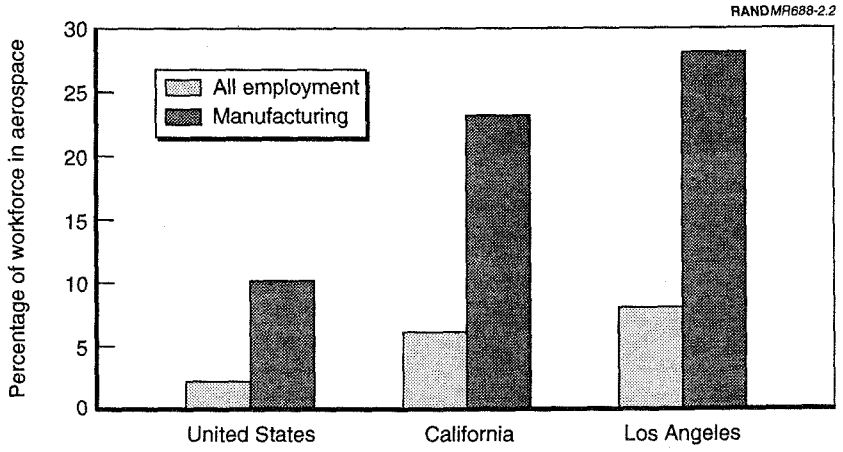
[1]These states accounted for 58 percent of national aerospace employment in 1987.

[2]Other regions' work forces were also disproportionately aerospace in 1987 (Figure 2.1). In particular, 6.4 percent of U.S. aerospace workers lived in Washington, while just 2.2 percent of nonaerospace manufacturing jobs were located in that state. Clearly, the downturn has not affected California alone.



SOURCE: U.S. Department of Labor (1988).

Figure 2.1—Geographic Concentration of Aerospace Workers, 1987

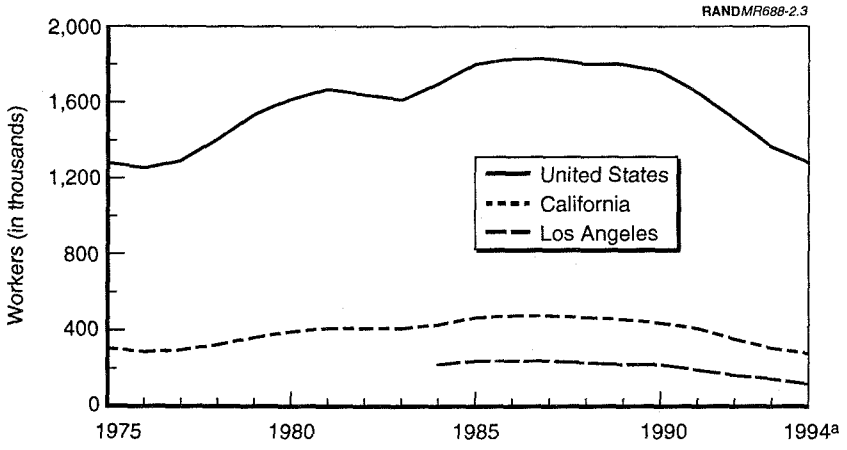


SOURCE: U.S. Department of Labor (1988).

Figure 2.2—Aerospace as Share of Total Employment Base and of Manufacturing Sector, 1987

Nationwide, employment in aerospace has fluctuated substantially in the past 15 to 20 years (Figure 2.3).[3] The aerospace industry grew significantly in the late 1970s. In 1975, employment was 1.29 million, rising to 1.60 million by 1980. After a few years of no growth, employment shot up again starting in 1984, and it reached its peak of 1.83 million in 1987. Since 1989, employment has declined substantially, with the largest declines beginning in 1991. Between 1990 and 1994, employment declined by almost 500,000 nationwide, representing a drop of almost 30 percent in a very short period of time. Although there were substantial changes in aerospace employment in the past 20 years, both in California and the United States, employment in 1994 was at about the same level as it was 20 years earlier.

Because employment declined so rapidly in the early 1990s, it is believed that aerospace workers were not able to foresee the changes



SOURCE: U.S. Department of Labor (1995).

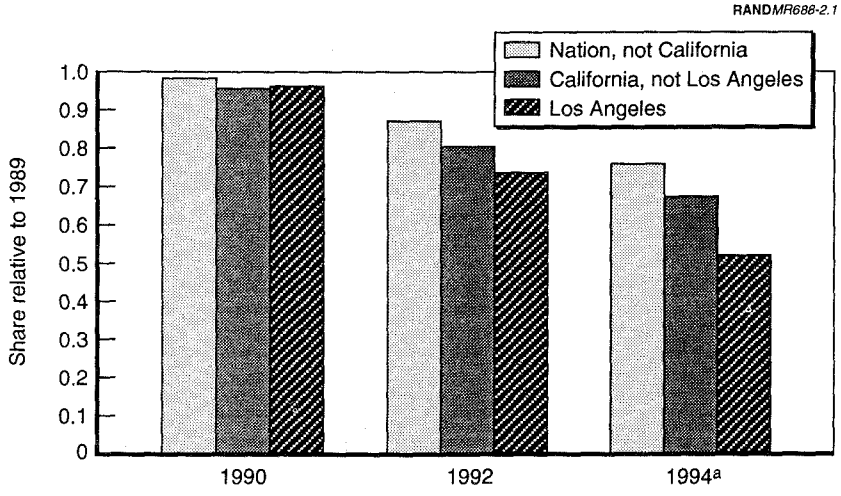
a1994 is for the third quarter.

Figure 2.3—Aerospace Employment in California and the United States, 1975–1994

[3]Aerospace employment estimates prior to 1984 are not available for Los Angeles.

and adjust their skills in anticipation of losing their jobs. And this effect is thought to have been exacerbated by the fact that the aerospace workers were geographically concentrated, flooding labor markets in regions such as Los Angeles, which was itself experiencing its deepest recession in decades.

Exacerbating the situation was the fact that not all regions experienced equal declines in aerospace employment over the past five to eight years. California suffered a decline of 40 percent between 1989 and 1994, while the rest of the nation experienced a drop of 29 percent (Figure 2.4). And within California, Los Angeles received the bulk of the drop, where aerospace employment dropped by almost one-half in just seven years, declining from 239,000 to 121,000.[4]



SOURCE: U.S. Department of Labor (1995).

a1994 is for the third quarter.

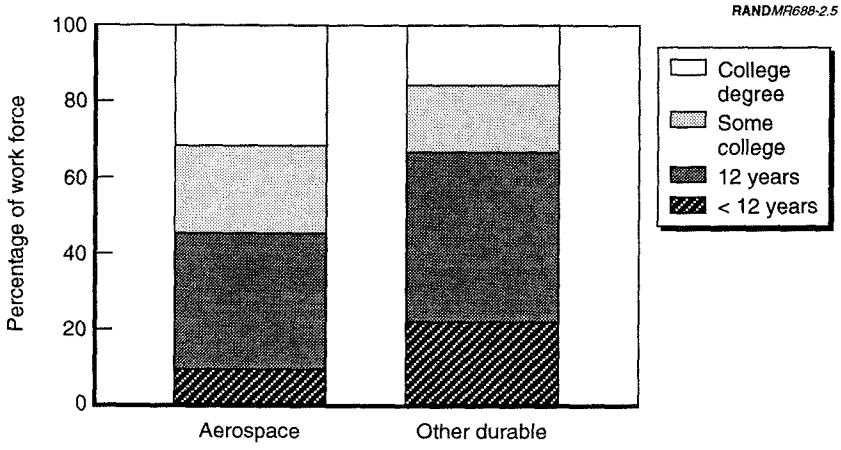
Figure 2.4—Aerospace Employment, 1990–1994, as Percentage of Aerospace Employment in 1989

[4]Recently, McDonnell-Douglas received a contract for additional work on the C-17, which is expected to affect approximately 8,500 jobs. Even with this increase in demand, employment is not likely to rebound substantially.

CHARACTERISTICS OF AEROSPACE WORKERS

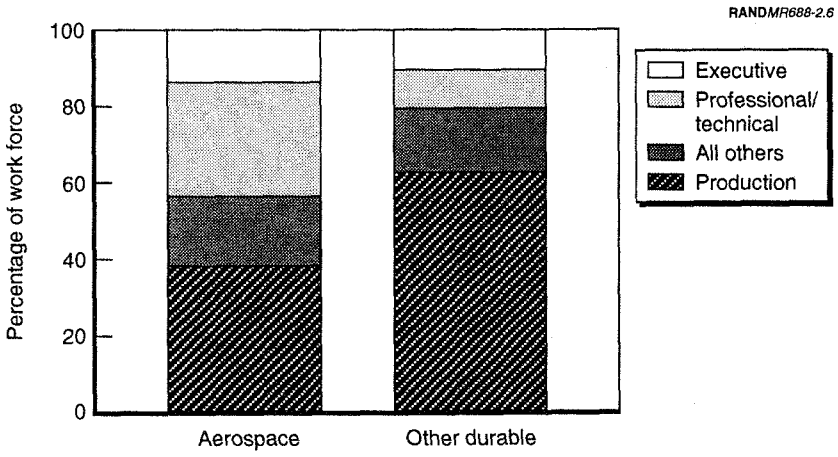
Another reason there is particular concern about the aerospace industry is that its workers are highly skilled and educated. On average, they have 1.3 more years of schooling than their counterparts in other durable goods manufacturing industries, and they are almost twice as likely to have obtained a college degree—32 percent versus 17 percent (Figure 2.5). Aerospace workers are concentrated in professional and technical occupations; many of them are engineers. Among aerospace workers, 30 percent are professionals, while only 11 percent of other durable goods manufacturing workers fall into this occupational category. At the same time, 60 percent of other durable goods manufacturing workers are in production versus 38 percent in aerospace (Figure 2.6).

The educational and skill differences between aerospace workers and other workers translate into differences in wages. The weekly wages of U.S. production workers in aerospace and nonaerospace



SOURCE: Authors' tabulations using the Current Population Survey (annual average of monthly data).

Figure 2.5—Education of Aerospace and Other Durable Goods Manufacturing Workers, 1987



SOURCE: Authors' tabulations using the Current Population Survey (annual average of monthly data).

Figure 2.6—Job Classifications of Aerospace and Other Durable Goods Manufacturing Workers, 1987

durable goods manufacturing are reported in Table 2.2 for 1983, 1987, and 1991.[5] Wages of aerospace workers were 17 percent higher than nonaerospace workers in 1983. That gap increased slightly through 1987 to 18 percent. But the wage advantage did not decline when aerospace took a nose-dive in the early 1990s; it maintained a 20-percent advantage. Multivariate analyses of wages of durable goods manufacturing production workers using the 1987 Current Population Survey (CPS) confirm the aerospace advantage (not shown here). Controlling for education, age, and whether the manufacturing worker lived in California, aerospace workers were

[5]We can examine only production workers, because the CPS's top code for wages truncates the earnings of 17 percent of professional workers in aerospace. For non-aerospace durable goods manufacturing, 12 percent of these workers' earnings were top-coded. This is evidence that wages in aerospace are greater than wages in non-aerospace durable goods manufacturing for higher-skilled workers. However, without the entire distribution of wages, definitive comparisons cannot be made, and this is why the analyses reported above are only for production workers. Among production workers, less than one percent of their wages were top coded, and they constitute 40 percent of aerospace employment.

Table 2.2

Weekly Aerospace and Other Durable Goods Manufacturing Wages for the Nation

Year	Aerospace	Other Durable Goods Manufacturing	Aerospace Advantage
1983	$584	$502	16.3%
1987	$590	$499	18.2%
1991	$573	$479	19.6%

Sample: 30- to 60-year-old production workers in the outgoing rotation group of the Current Population Survey. Weekly wages are expressed in 1994 dollars using the Consumer Price Index for urban consumers.

found to have a 13-percent wage advantage in 1987.[6] This is about two-thirds of the 18-percent unadjusted difference in wages. In sum, aerospace workers are highly skilled and, as a result, highly paid workers; however, much of the "aerospace wage advantage" is not attributable to (observable) differences in skills between aerospace and nonaerospace workers.

Another important difference between workers in aerospace versus other durable goods manufacturing is that aerospace workers are, on average, three years older. This is explained partly by the fact that the aerospace industry's new hires, relative to the new hires in other durable goods manufacturing, are not as likely to be young, less-educated, production workers.

To summarize, the aerospace industry has been heavily dependent on defense procurement. In terms of total national employment, it represented less than 2 percent at its peak in 1987. However, aerospace is geographically concentrated, with aerospace employment in California and Los Angeles representing 6 and 8 percent of total employment in these regions, respectively. Furthermore, as employment has declined rapidly in the past five years, the reduc-

[6]The controls for education include an indicator for whether the respondent's completed education was less than high school, some college, 16 years, or more than 16 years of education, with high school degree as the omitted category. The age controls were indicators for less than 25, 25–35, 55 or greater, with 45–54 as the omitted category. Men 20 to 60 years old were chosen for the analyses.

tions have been larger in California than in the rest of the nation, and particularly large in Los Angeles. Finally, aerospace workers have historically been, and at the peak of employment in 1987 were, more educated and slightly older. They have also earned higher wages, even after adjusting for differences in their age, education, race/ethnicity, and geographic distribution.

Chapter Three

THE DATA AND INDICATORS OF LABOR MARKET SUCCESS

THE DATA

The analysis discussed in the subsequent chapters uses a unique data set that was constructed from administrative information in California. The database consists of all workers in California who were employed in aerospace in the first quarter of 1989 (i.e., 1989:1), which precedes by about one year the beginning of the large-scale decline in aerospace employment; this constitutes a total of 517,148 aerospace workers. In order to compare the experiences of aerospace workers with somewhat similar nonaerospace workers, the database also contains a 20-percent sample of all individuals who worked in nonaerospace durable goods manufacturing as of the first quarter of 1989; this consists of 315,856 workers.

Drawing from administrative files, we follow each of the 833,004 workers over the subsequent six years, through the third quarter of 1994 (i.e., 1994:3). For each quarter in each year, we obtain information on each worker's quarterly wages, employer identification number (scrambled), industry of employment (four-digit SIC code), participation in unemployment insurance (UI), and number of weeks he or she received UI.

Throughout the study, wages are reported in real terms for the fourth quarter of 1994 using the California Consumer Price Index (CPI), which is discussed in Appendix A. Unless otherwise indicated, quarterly earnings are for the job in which the worker earned the most within that quarter; we call this the primary job. In several

analyses we also examine secondary and tertiary jobs. Age, sex, and ethnicity are available for workers who have ever received UI.

In sum, we have constructed a longitudinal database of 833,004 workers in California over the period 1989–1994 that allows us to trace the labor market success/failure of aerospace workers as they are faced with industry downsizing; it also allows us to compare their experiences with the experiences of workers in other industries. (The construction of the data files is discussed in detail in Appendix A. All personal and firm identifiers were scrambled by the Employment Development Department of California so that employers and employees could not be identified.)

The comparison group consists of workers in durable goods manufacturing industries, excluding aerospace. These workers were chosen because they have somewhat similar skills and produce somewhat similar goods as aerospace workers. However, as demonstrated in Chapter Two, aerospace workers are more highly skilled, on average, than workers in other durable goods manufacturing.

It is possible that the decline in the aerospace industry may have spillover effects on the nonaerospace durable goods manufacturing industry in California, causing these workers to be negatively affected by defense downsizing even though they do not work directly in the aerospace sector. However, our definition of aerospace is fairly broad, encompassing SICs 366, 372, 376, 381, and 382, which minimizes the amount of spillover effects that might be experienced by the residual group of other durable workers.[1] However, even this broad definition does not rule out the possibility that some nonaerospace durable goods manufacturing industries were negatively affected by the cutbacks. On the other hand, if the government is considering targeting assistance toward aerospace workers, the appropriate comparison is between the effects on aerospace workers versus all other workers. If it is found that aerospace workers fare no worse than nonaerospace workers, this suggests that special assistance to aerospace workers is not warranted. However, this does not rule out the possibility that both groups of California

[1]Using a broader definition of aerospace does not come without a potential cost, however. It may be that more narrowly defined aerospace sectors experienced greater hardship.

workers suffered substantially during the period and deserve special assistance.

INDICATORS OF LABOR MARKET SUCCESS

Using the longitudinal structure of the data, we examine several indicators of labor market stress among workers. We begin the analysis by examining workers as a whole. In each quarter, we focus on six outcomes for both aerospace workers and workers in other durable goods manufacturing firms (referred to hereafter as "durable workers"):

- Share of workers with earnings in California
- Earnings of those working in California
- Share receiving UI benefits
- Number of weeks UI benefits received
- Share changing employment
- Industry of employment in 1994

In addition, we examine the industries the aerospace workers moved into by 1994 and their associated wages before and after the change.

Our analyses of workers as a whole will provide an overview of the changes experienced by aerospace and other durable workers during the downsizings. However, individual workers in each industry had different experiences. For example, some were continuously employed with the same aerospace firm, some lost their initial aerospace job and were never employed again, and others changed employment several times.

To better understand how various groups of aerospace workers fared, we present separate analyses for four categories of workers who had distinct patterns of employment over the six-year period; these analyses are given in Chapter Five. In each case, we compare their outcomes with those of other durable workers who had the same employment pattern. Where possible, given the data, we also examine the change in wages for each worker and the total number of weeks on UI over the six-year period. Some workers' subsequent

wages and UI participation are not available because, for example, they left California or they retired. The only pieces of information we have for some of these workers are their age, sex, and ethnicity. Drawing on previous studies of worker displacement, we determine whether workers with the characteristics of these aerospace workers are likely to have more- or less-favorable re-employment prospects.

Although the data are unique and are much better than any other data that have been used in previous studies (see the discussion of previous analyses in Chapter Six), they do have limitations. First, and most important, we cannot distinguish between those workers who retire, leave California, have an extended period of unemployment and do not receive UI, become self-employed,[2] or exit the labor force. However, we do calculate estimates of the share of workers who are expected to follow each of these paths. Second, there is limited demographic information for the workers. The only data are age, sex, and ethnicity, which are available only for workers who have ever received UI benefits in California. However, even with these limitations, we feel that the results of the study are robust. The ways that we address these limitations are discussed in the context of the following analyses.

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[2]Self-employed workers, as well as real estate brokers, are not covered by the unemployment insurance system, from which our data is derived.

Chapter Four

AEROSPACE WORKERS AND OTHER DURABLE WORKERS

WAGES OF CALIFORNIA WORKERS

The share of 1989:1 California workers who have wages in each subsequent quarter is displayed in Figure 4.1. Because the sample consists of those people who were working in the first quarter of 1989, the share with wages is 100 percent in the initial quarter. The share of aerospace workers earning wages declined to 63 percent over the six-year period. The decline was approximately constant, so that about 80 to 85 percent were earning wages halfway through the period.

By 1994, approximately the same share of other durable workers were also earning wages in California—64 percent. But the timing of the decline was different; receipt of wages declined rapidly in the first few quarters for other durable workers, and this period was followed by a few years of slower decline. Then, starting in the middle of 1992, the decline was greater for aerospace workers, so that by the end of 1994 the same share of aerospace and other durable workers were receiving wages.

The fact that 35 percent of the 1989 work force did not have wages in California in 1994 does not necessarily imply that these workers experienced turbulence. People leave the California wage work force for several reasons. First, some people retire, and our estimates (discussed in Appendix B) imply that we would have expected 8 to 12 percent of the 1989 work force to retire by 1994. Second, some workers moved out of California. Estimates (discussed in Appendix B) suggest that at least 9 percent of these workers left the state.

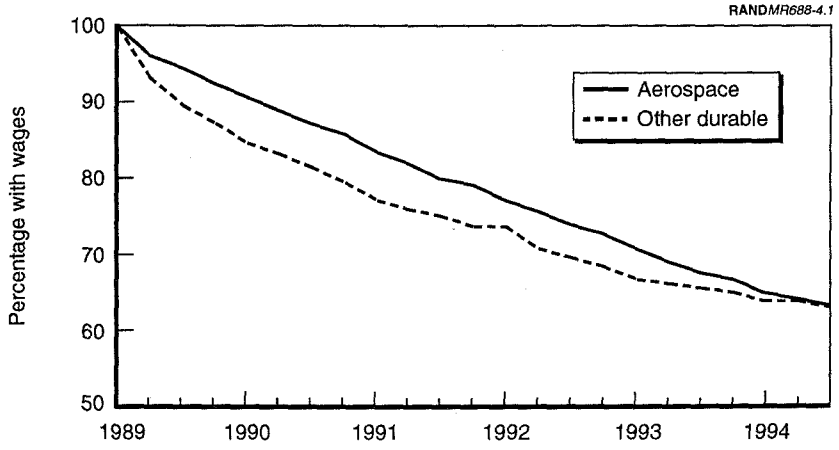


Figure 4.1—Share of 1989 California Work Force Retaining Wages in California

Another 1.6 percent of the workers were not employed but received UI in the third quarter of 1994. This leaves approximately 10 to 15 percent of the 1989 workers who cannot be located. These workers either were unemployed and not receiving UI benefits, withdrew from the labor force, died, or became self-employed. Those who are self-employed are not covered by the UI system and, therefore, are not included in the data available to us. The self-employed are likely to make up the largest share of the 10 to 15 percent who cannot be identified.

Aerospace workers are high wage earners, in general. (All wage and earnings statistics are reported in 1994:3 dollars using the California CPI, as discussed in Appendix A.) They earned $12,000 per quarter in 1989, on average, which is about $48,000 on an annual basis (Figure 4.2). Among those who had earnings in subsequent quarters, wages remained fairly constant over the six-year period, on average, with quarterly earnings of about $12,000 in 1994. Notice in Figure 4.2 that workers' wages increase each fourth quarter, which is associated with bonuses. The increases in the fourth quarters in 1992 and 1993 are particularly large, likely due to early compensation to avoid anticipated tax hikes in the following years.

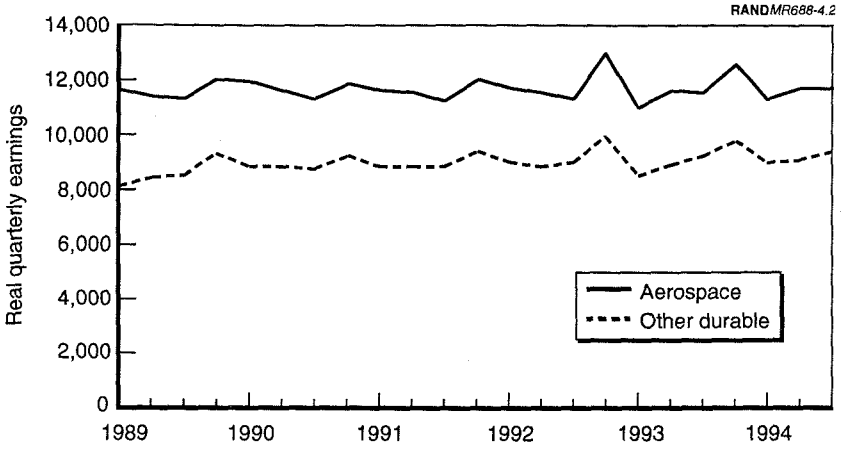


Figure 4.2—Average Quarterly Earnings for 1989 California Work Force

Earnings of other durable workers are substantially lower than aerospace workers; on average in 1989, they earned $8,600 per quarter, or about $35,000 annually. This difference is expected because, as demonstrated in Chapter Two, aerospace workers are more educated and older, and they earn higher wages even after controlling for these differences. The wages of other durable workers are similarly fairly flat over the period. As a result, the gap between aerospace and other durable workers changed very little over the six-year period. This suggests that California aerospace workers who were employed, either in their initial job or with a new employer, have not suffered more than workers in other industries.[1]

[1]If the number of hours worked within the quarter were increasing over time, then the change in *hourly* earnings would be less than the change in *quarterly* earnings, which is shown in Figure 4.2. Although we do not have the hours worked in our data, the Department of Labor obtains estimates of average number of hours worked for the nation for each of the five three-digit industries that aerospace comprises. The changes in average hours between 1993 (the latest year available) and 1989 for industries 366, 372, 376, 381, and 382 are only +1.0, −0.3, −1.6, −0.2, −0.1 hours, respectively. Because a relatively small fraction of aerospace employment is in 366, this suggests that for aerospace workers the change in hourly wages is likely to be slightly more positive than the change in quarterly earnings.

However, it is quite likely that some workers did suffer significant reductions in their wages. In Table 4.1 we report the percentage change in wages between the beginning and end of the period for aerospace and other durable workers.[2] Twenty-five percent of aerospace workers received a reduction in wages of at least 14.8 percent, which is a significant reduction. At the same time, another 25 percent had wage growth of at least 23.8 percent over the period. And 50 percent had growth of at least 4.5 percent. Clearly, some workers did well while others suffered substantial cuts.

It is important, however, that the reductions received by those who were hit the hardest were actually *less* among aerospace workers relative to other durable workers; 25 percent of other durable workers received at least a 21.4-percent reduction, while the lowest quartile of aerospace workers had wage losses of 14.8 percent or more. At the same time, however, among those workers who had large wage *growth*, the other durable workers did better than the aerospace workers.

As shown by Table 4.1, some workers have experienced substantial wage reductions. Using Figure 4.3 we can examine whether low wage workers fared better or worse than high wage workers during

Table 4.1

Distribution of Wage Change Between 1989:2 and 1994:2

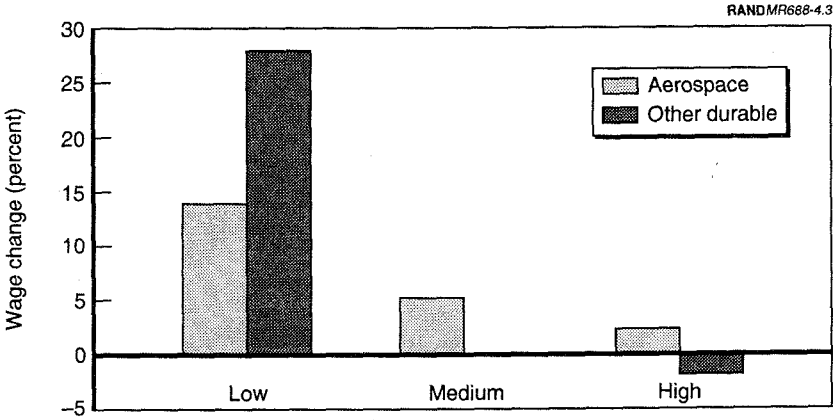
Percentile of Wage Change	Change for Aerospace Workers (n = 327,064)	Change for Other Durable Workers (n = 195,306)
25th percentile (bottom)	-14.8	-21.4
50th percentile	4.5	2.9
75th percentile	23.8	29.6

NOTE: Restricting to those who were employed with the same employer in 1989:1, 1989:2, and 1989:3 and in 1994:1, 1994:2, and 1994:3 leads to 25th, 50th, and 75th percentiles of wage change of -7.8, 6.7, and 24.2 percent for aerospace workers (n=257,034), and -14.6, 4.2, and 26.4 percent for other durable workers (n=132,965).

[2]We report changes between the second quarter of 1989 and 1994 to avoid any biases that might arise due to seasonality in wages. Examining changes between the first quarter of 1989 and the third quarter of 1993, which are the beginning and end points of the study period, leads to the same substantive results.

the contraction. Among aerospace workers, the low wage workers experienced the greatest wage gains; on average, those workers who were among the lowest 20 percent in earnings in 1989:1 experienced a 13-percent wage gain (Figure 4.3). Medium wage workers (those with wages in the middle 20 percent of earners in 1989:1) and high wage workers (those in the top 20 percent of earners in 1989:1) had 6- and 2-percent wage growth, respectively. The pattern by wage level is somewhat expected because, relative to high wage workers, low wage workers are more likely to consist of young workers, and young workers typically have higher growth in earnings.[3] We will return to this issue in Chapter Five.

Although low wage workers had the highest growth among aerospace workers, their wages grew much more slowly than the wages of low wage workers in other durable goods manufacturing. On the other



NOTE: Restricting the sample to those who were employed in same firm in 1989:1, 1989:2, and 1989:3 and in 1994:1, 1994:2, and 1994:3 leads to wage changes for low, medium, and high wage workers of 16.7, 7.4, and 2.9 percent for aerospace workers and 24.6, 3.1, and –0.1 percent for other durable workers.

Figure 4.3—Median Percentage Wage Change Between 1989:2 and 1994:2 for Low, Medium, and High Wage Workers

[3]Unfortunately, information on the age of the worker is not available for all wage earners, so we cannot examine the differences after adjusting for age.

hand, medium and high wage workers in aerospace had higher growth in their wages than did comparable groups in other durable goods industries.

USE OF THE UNEMPLOYMENT INSURANCE PROGRAM

Another measure of difficulty in the labor market is the extent to which workers use the unemployment insurance (UI) program. Figure 4.4 reports the share of workers in each quarter who received UI. Under two percent of the 1989 aerospace work force used UI in the first quarter of 1989. This low share is expected because we intentionally selected aerospace workers who were employed at some point during the first quarter of 1989. The share increased substantially for the subsequent three to four years, with just over nine percent receiving UI at the end of 1992. The rate stayed at around 9 to 10 percent for one to two years, and then it began to decline rapidly, probably because workers began to exhaust their UI benefits, retired, or left the California labor market.

The share of other durable workers who used UI was substantially higher early in the period; four to six percent used UI in 1989. As was

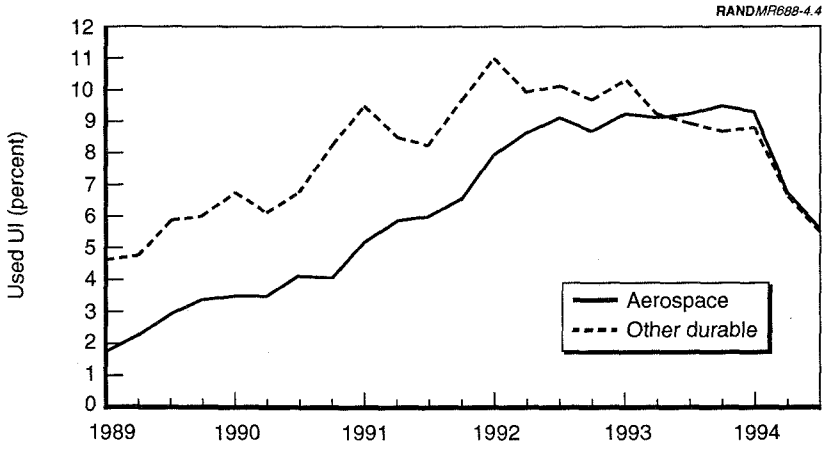


Figure 4.4—Share of 1989 California Work Force Drawing Unemployment Compensation

the case with aerospace workers, the share using UI increased as California's recession deepened in the early 1990s. By 1993 the rates for aerospace and other durable workers were similar, and they followed the same declining pattern through the end of 1994. This finding suggests that aerospace workers do not seem to have suffered more than other durable workers, although the gap that previously existed was eliminated.

Among those workers who use UI, the average number of weeks benefits were received in each quarter is reported in Figure 4.5. The pattern of number of weeks is similar to the pattern of participation. For aerospace workers, the number of weeks increases from six to nine over the five-year period 1989 to 1993. The duration is higher for aerospace workers, throughout the period, and the gap between the two groups, which is just under one week, is fairly constant.[4]

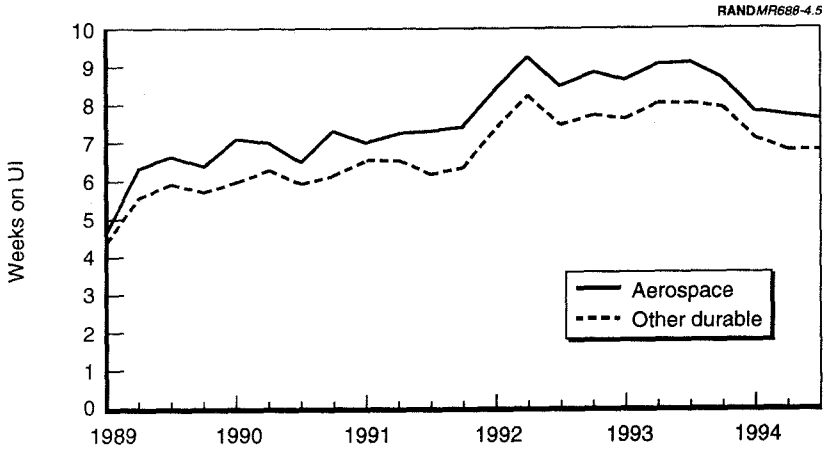


Figure 4.5—Average Weeks on UI Among 1989 California Work Force

[4]The durations reported in Figure 4.5 are based on some people who entered UI at the end of the quarter and have few weeks on UI and some who entered UI at the beginning of the quarter and therefore may have received benefits for a large number of weeks. Moreover, the share of workers who began their UI spell at the beginning or end of the quarter may have changed over time, which may have influenced the change in duration reported in Figure 4.5. In Chapter Five we examine the total number of weeks on UI over the entire six-year period for each worker, which addresses this issues.

CHANGES OF FIRM AND EMPLOYMENT STATUS

Changing employers may be caused by job loss and downsizing, which may lead to difficulties in finding new employment with comparable wages. On the other hand, a job change may be elective, with a worker choosing to move to a more attractive position. For instance, it has been estimated that two-thirds of wage growth among young men is associated with changing jobs; workers move to different employers because they offer higher wages (Topel and Ward, 1992). Therefore, changing firms could lead to either a better or worse situation for the worker, depending on the circumstance. Unfortunately, we cannot determine whether a worker left a firm voluntarily, so we cannot disentangle these different processes. However, because the aerospace industry was downsizing dramatically, the employment of most firms was declining, and most workers were either forced to leave or left in anticipation of being laid off in the future.[5]

For 1989 California workers, in Figure 4.6 we display the share of workers with an employment move between adjacent quarters during the six-year period. We define an "employment move" as either a change in employer or a movement from being employed to not being employed (or vice versa) between adjacent quarters. As demonstrated by the figure, aerospace workers were substantially less likely to experience a change in employment relative to other durable workers. This may be due in part to the fact that aerospace workers are older, and older workers are less likely to experience job changes. Moreover, one change older workers may make is to retire, which eliminates future employment moves and reduces the proportion of moves, in general. The gap decreases significantly over time, however, so that by 1993 the difference is only one to two percentage points.

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[5]Jacobson, LaLonde, and Sullivan (1993a) sought to examine "displaced workers," but had the same problem that we have in separately identifying voluntary and involuntary separations. Given their focus on "displaced workers," they restrict some of their analyses to individuals in firms that experienced a decline in employment of at least 30 percent from several years before separation to one year after.

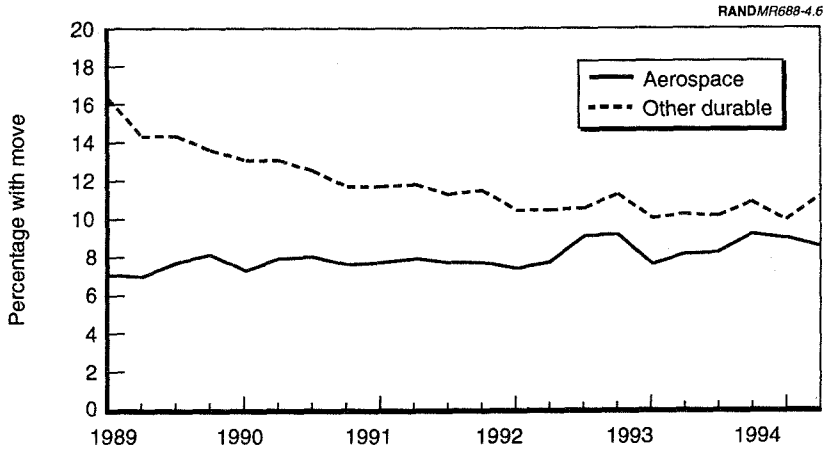

Figure 4.6—Share of 1989 California Work Force with Employment Move

DIFFERENCES IN WAGE GROWTH BY NEW INDUSTRY OF EMPLOYMENT

It is commonly argued that aerospace workers have moved into new industries where their skills are not fully utilized and, hence, their earnings have declined substantially. In Table 4.2 we report the share of the 1989 California aerospace work force who were working in each major industry classification in the third quarter of 1994. Of those who had California wages, the majority, 67 percent, were still working in aerospace five and one-half years later. The workers who remained in aerospace previously averaged higher salaries, $12,474 per quarter, while those not remaining in aerospace earned around $8,000 to $11,000 per quarter in 1989. Those who remained in aerospace experienced real wage gains, with a median percentage wage change of 7.3 percent.

Both aerospace and other durable workers who remained in manufacturing industries fared better in terms of their change in wages. However, aerospace workers were more likely to remain in manufacturing (75.8 percent = 67.3 + 8.5) relative to other durable workers (68.6 percent), which is part of the reason the median change in

Table 4.2

Change in Earnings Between 1989 and 1994 by Industry

Industry in 1994:2	Percentage of 1989:2 Work Force Employed in 1994:2	Average Earnings in 1989:2	Average Earnings in 1994:2	Median Percentage Earnings Growth
Aerospace (n = 327,064)				
Aerospace	67.3	12,474	13,478	7.3
Agriculture & Mining	0.2	7,783	4,886	-37.4
Construction	0.7	8,807	6,388	-25.3
Manufacturing[a]	8.5	9,946	9,839	0.2
Transportation & Public Utilities	1.9	9,497	8,705	-5.2
Wholesale Trade	2.6	9,711	9,615	1.1
Retail Trade	2.3	7,960	4,452	-48.6
Finance, Insurance, Real Estate	1.5	9,158	8,044	-9.2
Services	13.5	10,059	8,310	-17.3
Public Administration	1.1	8,449	7,914	0.1
Not Classified	0.3	10,894	10,010	-12.5
All Industries	100.0	$11,560	$11,844	4.5
Other Durable (n = 195,306)				
Agriculture & Mining	1.1	4,641	3,389	-25.2
Construction	2.2	6,886	6,188	-8.4
Manufacturing	68.6	9,777	10,311	5.1
Transportation & Public Utilities	2.1	7,064	7,094	4.2
Wholesale Trade	5.1	8,503	8,940	5.2
Retail Trade	4.2	5,870	4,519	-17.7
Finance, Insurance, Real Estate	1.6	7,451	6,752	0.1
Services	13.4	7,880	6,882	-12.4
Public Administration	1.2	6,548	7,439	17.6
Not Classified	0.3	9,738	9,373	-5.2
All Industries	100.0	9,034	9,200	2.9

[a]For aerospace workers, manufacturing excludes the aerospace manufacturing industries. Quarterly earnings in Table 4.2 include earnings from the three jobs from which the workers received the most wages within each quarter. The substantive results are unchanged if the analysis is restricted to the primary job.

wages was higher among aerospace workers (4.5 percent) relative to other durable workers (2.9 percent).

Not surprisingly, the sector that attracted the largest number of industry changers was the service industry; 13.5 and 13.4 percent of aerospace and other durable workers ended up in the service sector in 1994, respectively. Workers making this move had substantial declines in earnings, 12.4 percent for other durable and 17.3 percent among aerospace workers.[6] However, aerospace workers in the service sector earned $1,500 more per quarter, on average, than other durable workers ($8,310 versus $6,882).

The remaining workers were spread throughout various industries and, depending on the industry of new employment, received substantial wage reductions. For example, the 2.3 percent of aerospace workers in retail trade experienced a decline of 48.6 percent in their quarterly earnings. However, relatively few workers end up in this sector.

The analyses in this chapter imply that, *in general,* aerospace workers have not suffered much more—if any more—during the decline than workers in other durable goods manufacturing concerns. Aerospace wages have historically been higher, and this gap does not appear to have diminished. And, among aerospace workers, the lower-wage workers were the ones who received the *lowest* reductions in earnings. The share participating in the UI program has been lower among aerospace workers, although the gap was eliminated by 1993. However, aerospace workers enrolled in UI use it for slightly longer periods.

However, the contraction of the aerospace industry has not come without pain for some of its workers. Twenty-five percent of the 1989 aerospace work force employed in 1994 experienced a reduction in quarterly earnings of at least 14.8 percent. The distributional impact was, in part, dependent on workers changing industries. Substantial earnings advantages were reaped by those who retained their

[6]The differential change in wages suggests that aerospace workers had experienced larger industry-specific (or firm-specific) human capital returns. However, the differential may be confounded by the fact that aerospace workers are older, on average, and older workers may have more difficulty finding new jobs with comparable wages.

aerospace jobs or found new employment within the manufacturing sector. Fortunately, workers remaining in manufacturing accounted for 75.8 percent of all workers employed in 1994. However, significant shares of the work force, both aerospace and other durable, received substantial reductions in quarterly earnings, and these earnings changes were related to the industry of final employment. In particular, workers moving into the service sector, which consisted of 13.5 percent of aerospace workers, received reductions in earnings of 17.3 percent, on average.

Although aerospace workers have fared no worse than other durable workers, on average, the analyses suggest that there was significant variation among these aerospace workers in the burden they bore. This finding is expected because of the distinct paths they have followed over the past six years. Some workers remained employed with the same aerospace firm throughout the period, some changed employers frequently, some were not able to find new employment after losing their aerospace job, while others retired, exited the labor market, or moved out of California. In the next chapter, we take a closer look at several of these subgroups of workers in order to better understand the groups most affected by the contraction.

Chapter Five

EFFECTS ON SPECIFIC GROUPS OF WORKERS

We divided our sample into four major groups of workers, which are listed in Table 5.1.

- The first group consists of those workers who remain employed with the same firm throughout the six-year period. This consists of 32 percent of the aerospace workers and 20 percent of the other durable workers.
- The second group of workers are those who had wages in each of the 23 quarters but who changed firms at least once. This represents 15 percent of aerospace workers and 18 percent of other durable workers.
- The third group consists of those who left their 1989 job and never worked again in California during the study period. This is 20 and 16 percent of aerospace and other durable workers, respectively. Within this group, we separate out those who we know are age 62 or older in the quarter they last had wages; we assume these people are retired.[1] (Recall from Chapter 3 that we know the age of some workers.) Those not 62 or older are further separated into those who did and did not use UI in any quarter during the period.

[1]Workers can begin receiving substantial Social Security benefits at age 62, which is why 62 was chosen as the retirement age. Probably some workers younger than 62 retired early with retirement packages offered by firms, but they cannot be identified, so we placed them in categories 3B and 3C of Table 5.1.

Table 5.1

Major Worker Categories

Category	Number of Quarters Employed	Number of Employment Moves	Share of Total Workers (%)	
			Aerospace	Other Durable
1. Continuously employed with same firm	All 23	0	32.0	20.0
2. Employed in each quarter but not with same firm	All 23	≥1	15.0	18.0
3. Left initial job and never worked again in California wage sector			[20.5]	[16.2]
A. Retired[a]	<23	1	2.2	1.1
B. Not retired, used UI	<23	1	6.4	5.0
C. Not retired, did not use UI	<23	1	11.9	10.1
4. Not employed in every quarter and changed employment status more than once			[32.5]	[45.9]
A. Employed in 1994:3	<23	>1	16.6	24.2
B. On UI and not employed in 1994:3	<23	>1	1.6	1.7
C. Retired, and not in 4A or 4B[a]	<23	>1	1.3	1.0
D. All other workers	<23	>1	13.0	19.0

[a]Those who are 62 or older when they stopped working in their last job are considered retirees.

- The fourth group consists of those who were not employed the entire period and who, after separating from the first employer, had wages in at least one subsequent quarter. We divided these workers into four subgroups: those who were employed at the end of the study period (i.e., the third quarter of 1994), those who

were not employed but were on UI at the end of the study period, those who were 62 or older, and all others.[2]

The analyses in the remainder of this chapter examine each of these four groups of workers separately, comparing the outcomes of aerospace and other durable workers. However, in assessing the overall burden experienced by aerospace versus other durable workers it is important to keep in mind the share of workers falling into each group, as reported in Table 5.1. As we find below, workers in group 4 experienced the greatest turbulence, and the difference between aerospace and other durable was greatest for these workers. At the same time, aerospace workers were substantially less likely to be in this predicament; 32.5 percent of aerospace versus 45.9 percent of other durable workers fall into category 4.

Although it is difficult to definitively rank the four groups in terms of "good" versus "bad" outcomes, most would agree that retaining employment with the same firm is advantageous; in fact, these workers received the greatest wage growth of the four groups of workers, on average. Therefore, the fact that aerospace workers were 50 percent more likely to fall into this group (32 versus 20 percent) is a "good" outcome for aerospace workers. Workers who avoided long periods of unemployment, even if it meant switching jobs (i.e., group 2), were also likely to have better outcomes than those who did not. Aerospace and other durable workers are about equally likely to fall into group 2 (15 versus 18 percent, respectively). It is more difficult to rank the outcomes experienced by the remaining workers. We simply note that the distribution of workers across these four groups must be considered when assessing the burden borne by aerospace versus other durable workers; we return to this issue at the end of this chapter.

WORKERS CONTINUOUSLY EMPLOYED IN SAME FIRM

Figure 5.1 demonstrates that aerospace earnings were fairly steady throughout the period for those who remained employed with the same firm, with an increase of about 8 percent between 1989 and

[2]We did not separate out retirees initially because we preferred to let them self-identify their employment and UI status.

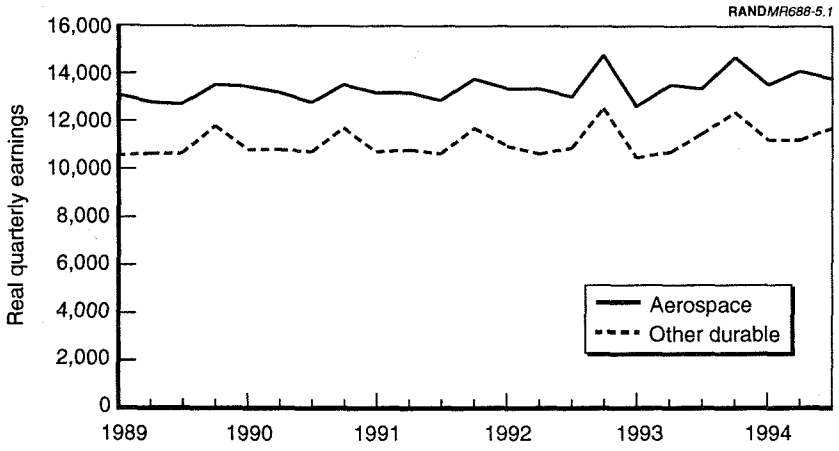

Figure 5.1—Average Quarterly Earnings for Workers Continuously Employed with Same Firm

1994.[3] Wages typically rose with the number of years workers were employed with a firm (i.e., tenure); therefore, in the absence of the economic difficulty faced by California workers, we would have expected quarterly earnings to increase among those who remained employed. Previous studies have estimated real returns to tenure of 1 to 2 percent per year.[4] Therefore, we would have expected quarterly earnings to grow by 6 to 12 percent over the six-year period, which is similar to the 8-percent growth experienced by aerospace workers who were continuously employed with the same firm.

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[3]The changes in earnings between the first, second, and third quarters of 1989 and 1994 and between the fourth quarters of 1989 and 1993 were 2.4, 10.8, 8.7, and 9.0 percent, respectively. The average of these four changes is 7.7 percent.

[4]There is a fairly wide range of estimates of returns to tenure (e.g., Altonji and Shakotko, 1987; Abraham and Farber, 1987; Topel, 1991; Medoff and Abraham, 1980). Some of the larger estimates imply returns of about 2 percent per year. For example, using data from two firms, Medoff and Abraham (1980) estimated real returns to experience of about 1.4 percent per year for a worker with 10 years of experience (based on regressions 1 and 4 in Table II of their paper). We use the high estimates to provide an upper bound on the amount of wage growth that might have been expected.

Aerospace workers earn substantially more than other durable workers, and the gap between the groups has remained steady throughout the period, at about $2,000 to $3,000 per quarter. This implies that this group of aerospace workers is not suffering more than other workers who also remained employed with the same firm.[5]

High Versus Low Wage Groups

Although this group of aerospace workers on average does not appear to have experienced wage losses, it may be that the experiences of low and high wage workers are distinct. We grouped the workers who were continuously employed with the same firm into three categories: those who were among the lowest, middle, and highest 20 percent of earners in the first quarter of 1989. This procedure was done separately for the aerospace and other durable workers. We then followed these groups of workers over the subsequent six years and calculated the average earnings for each group in each quarter; this is displayed in Figures 5.3 through 5.5 for aerospace and other durable workers.

The low wage aerospace workers earned substantially more than the low wage workers in other durable goods manufacturing. At the start of the period, aerospace workers earned $2,400 more per quarter, which is about a 50-percent advantage (Figure 5.2). Quarterly earnings of aerospace workers grew over the six-year period, so that earnings in 1994 were 20 to 25 percent higher than they were in 1989, on average. Wages also grew for other durable workers, however,

[5]We would actually expect wage growth to be higher among the other durable workers because they are younger, on average, and the returns to experience are greater for younger workers. Therefore, the experience-adjusted difference in the aerospace and other durable worker wage profiles is likely to increase more over time than is depicted by Figure 5.1. This is reinforced by the fact that the (annual earnings) returns to experience are likely to be greater for lower-educated workers (Mincer, 1974), and other durable workers have fewer years of schooling than aerospace workers.

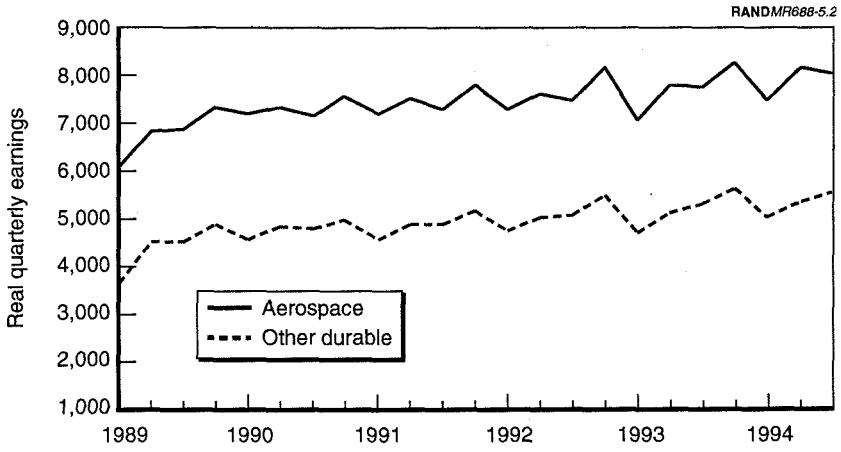

Figure 5.2—Average Quarterly Earnings for Workers Continuously Employed with Same Firm: Bottom Wage Group in First Quarter of 1989

and the quarterly wage gap between aerospace and other durable workers remained at about $2,400.[6]

Quarterly wages did not grow as much for the middle wage group (about 5 to 10 percent from 1989 to 1994) as it did for the low wage group (Figure 5.3). The gap between aerospace and other durable workers was slightly higher for the middle wage workers: $3,000 versus $2,400. However, as a share of average wages, the aerospace gap is substantially higher for low versus middle wage workers: 50 to 55 percent versus 30 to 35 percent. As was the case for low wage workers, however, the wage gap between aerospace and other durable workers did not diminish over time.

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[6]Note that Figure 5.2 does not necessarily contradict the observation that real wages of low wage workers have been declining recently (Karoly, 1993, Table 2.5; Bound and Johnson, 1992, Table 1) As stated above, we would expect wages of workers to rise between 1989 and 1994 because earnings, in general, increase with experience. Moreover, many of the low wage workers are young workers, and younger workers have higher returns to experience than older workers.

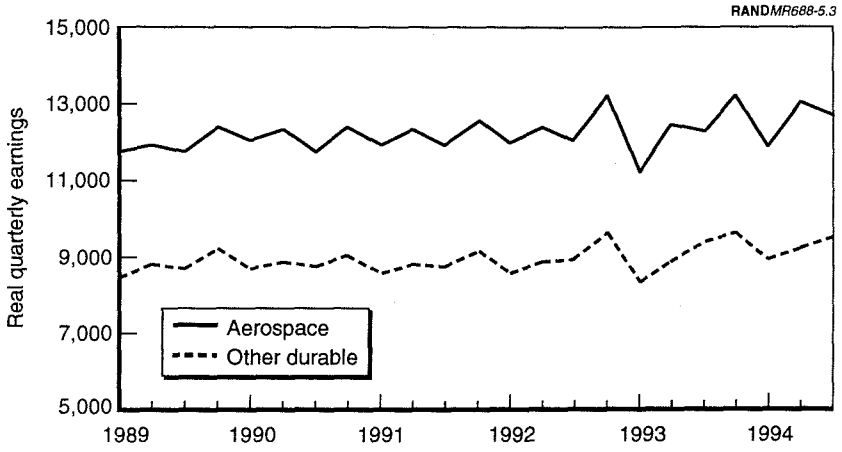

Figure 5.3—Average Quarterly Earnings for Workers Continuously Employed with Same Firm: Middle Wage Group in First Quarter of 1989

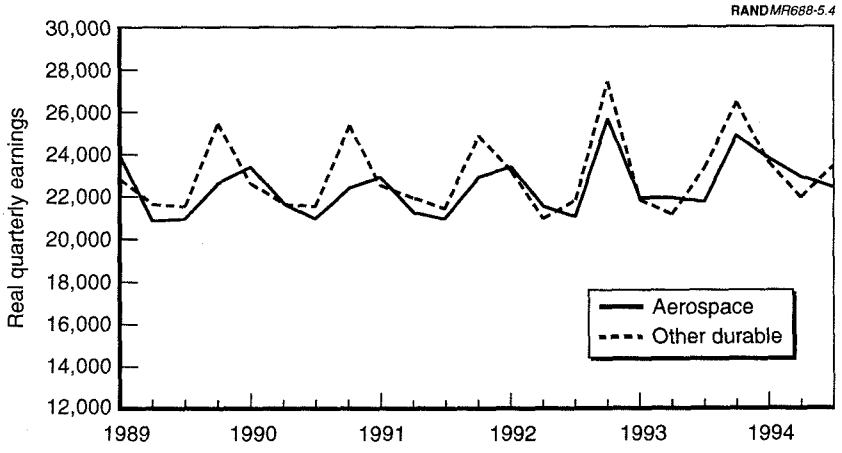

Figure 5.4—Average Quarterly Earnings for Workers Continously Employed with Same Firm: Top Wage Group in First Quarter of 1989

The average earnings of the highest wage group is displayed in Figure 5.4. As was the case with the low and middle wage groups, the earnings of the high wage workers did not diminish over time. We also see that among high wage workers, aerospace workers did not earn more than other durable workers, as was the case with low and middle wage workers. In fact, on an annual basis, other durable workers actually earned more than aerospace workers. However, the difference between the two groups did not changed substantially over time.

WORKERS EMPLOYED IN EACH QUARTER BUT NOT WITH SAME FIRM

Some workers were able to find employment in each quarter, but they did not remain employed with the same firm. We examined their wages before and after their change in employers. We then determined whether workers who separated from their firms starting in 1991, when the contraction accelerated, experienced more difficulty. In addition, we determined whether the wage changes were any larger for low versus high wage workers.

Wages Before and After Separations

To assess the success or failure of workers who made these changes, we examined their wages before and after they separated from a firm (Figure 5.5).[7] All workers analyzed in this section changed firms at least once. We aligned all workers by the quarter of their *first* employment move. So regardless of the date that they experienced their first move, their wages in that quarter are reported as their wages in quarter 0 in Figure 5.5. Depending on the date they experienced the employment move, we know their wages up to 22 quarters before the move or 22 quarters after the move. We would know, for example, a person's wages for 22 subsequent quarters if he or she changed employers between the first and second quarters of 1989. At the other extreme, we would know a person's 22 prior quarters if he or she changed jobs between the second and third quarters of 1994, but we

[7]Appendix A discusses the treatment of mergers, acquisitions, and other changes in firm structure in determining workers' separations from firms.

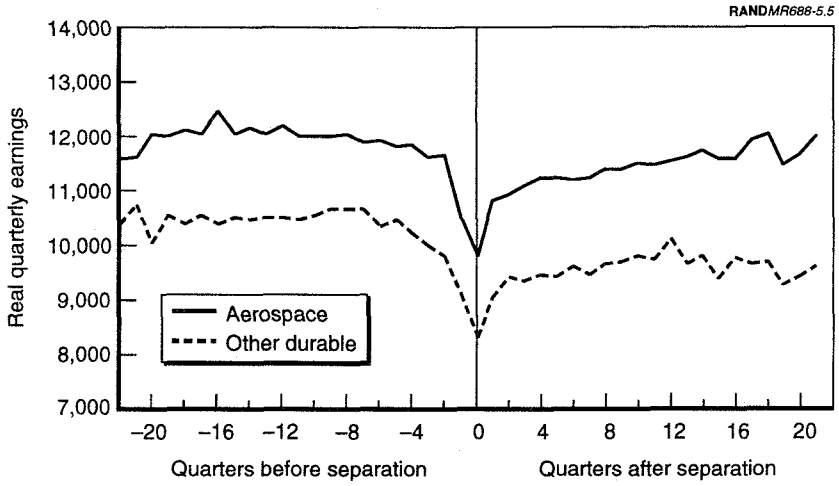

Figure 5.5—Average Quarterly Earnings Before and After Separation for Workers Employed Each Quarter

would not have data for wages after the job separation.[8] (A discussion of the potential biases of this procedure is presented in Appendix C, where it is demonstrated that if Figure 5.5 is biased, it is biased such that it *underestimates* the amount of wage growth following the job change. Moreover, it is shown that the bias does not substantially alter the difference in wage change between aerospace and other durable workers depicted in Figure 5.5.)

We found that quarterly earnings declined in the quarter that the worker separated; this is partly due to the fact that there may be weeks between jobs in which the worker was not earning wages. Earnings increased quickly, but in the short run the earnings were below what they were previously; earnings 2 to 6 quarters after the separation were 6 to 8 percent lower than the earnings 8 to 12 quar-

[8]The quarter of job change is the first of the two quarters between which the primary employer changes, where the primary employer is the employer paying the workers the greatest quarterly wages in that quarter. Therefore, if the worker changes employers between the 22nd and 23rd (i.e., the last and second-to-last quarters), the quarter of separation is the 22nd quarter; therefore, there are only 21 quarters of pre-separation wages.

ters prior to the change. The earnings continued to increase in the quarters following the separation, but there was still a long-run reduction in earnings. The earnings 8 to 12 quarters after the separation were 4 to 5 percent lower than earnings 8 to 12 quarters prior to the change.

Other durable workers earned less than aerospace workers prior to separation. Their wages declined in the quarter of displacement and increased more slowly than the wages of aerospace workers, so the gap increased slightly after the separation. Also, wages of other durable workers declined substantially *before* the separation, which is consistent with Jacobson, LaLonde, and Sullivan (1993a, 1993b), who found earnings declining as many as three years prior to job displacement among workers in various industries in Pennsylvania. Firms that anticipate releasing workers may reduce the workers' hours and weeks worked before letting them go, and they also may reduce their hourly wages. The earnings of workers in aerospace did not decline as much prior to the separation. This may be because the contraction of the aerospace industry was so rapid, with relatively little forewarning. In sum, within this group of workers, the aerospace workers did just as well or better than other durable workers.[9]

Timing of Job Changes

The large-scale reductions in aerospace employment began in 1991–1992, as depicted by Figure 2.4. To test whether workers changing employers in these years had a more difficult time finding new jobs with comparable earnings, we plotted the wage profiles for those whose initial separation was in 1989–1990, 1991–1992, or 1993–1994 (Figure 5.6). We found that those changing employment in 1993–1994 had higher earnings before the change, about $1,000 more per quarter than those changing employment in 1991–1992. There is also some evidence that the wages of workers experiencing employ-

[9]Some workers experienced more than one separation during the period. Among the aerospace workers in group 2, the percentage experiencing one, two, three, and more than three separations is 54.0, 25.3, 10.7, and 10.0 percent, respectively. Although these four groups have distinct patterns of pre- and post-separation earnings (not shown here), the substantive differences between aerospace and other durable workers is the same.

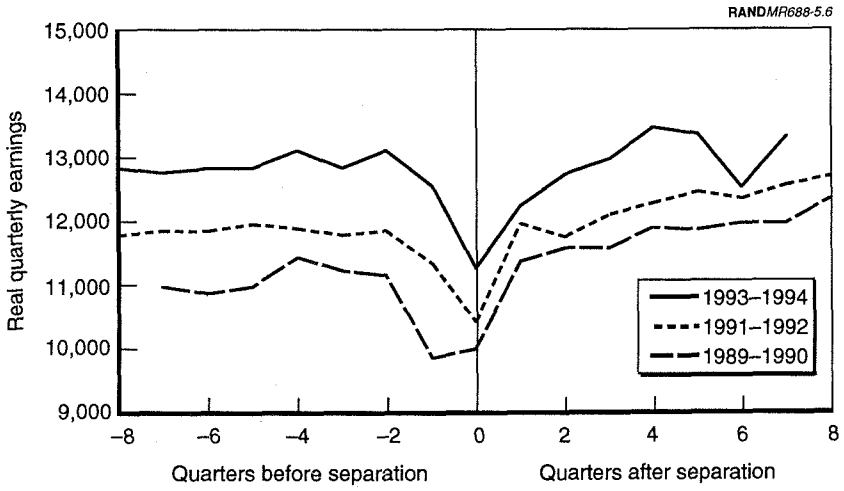

Figure 5.6—Average Quarterly Earnings Before and After Separation: Aerospace Workers Employed Each Quarter Who Separated in 1989–1990, 1991–1992, or 1993–1994

ment changes in 1993–1994 did not rebound as quickly as the earnings of those experiencing separation in the earlier years.

High Versus Low Wage Groups

In targeting government assistance, it is important to know whether high or low wage workers were suffering more during the downsizings. To address this issue, we ranked all workers by their earnings in the first quarter of 1989, as was done in the previous section. We then followed the workers in the bottom two, middle two, and top two earnings deciles over the subsequent six years. We compared the wage change between aerospace and other durable workers, and these results are displayed in Figures 5.7 through 5.9.

The middle wage aerospace workers' wages were higher than those of other durable workers both before and after the job separation,

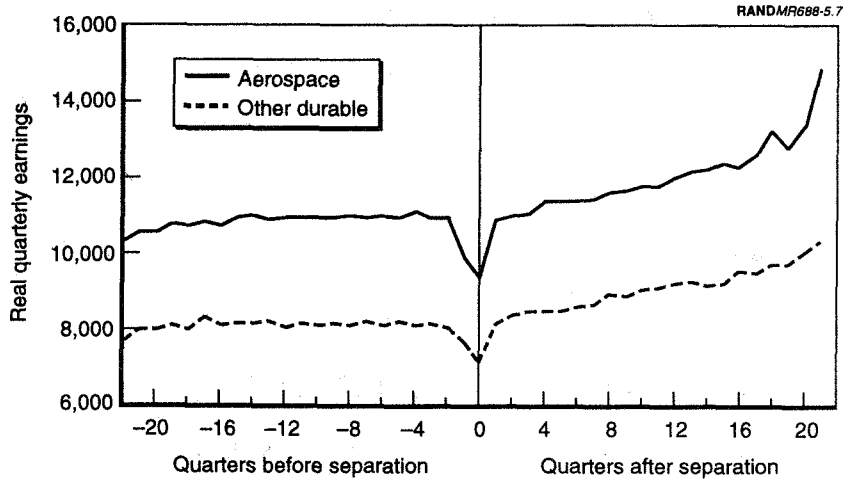

Figure 5.7—Average Quarterly Earnings Before and After Separation: Workers Changing Jobs Once Who Occupied Middle Wage Group in 1989

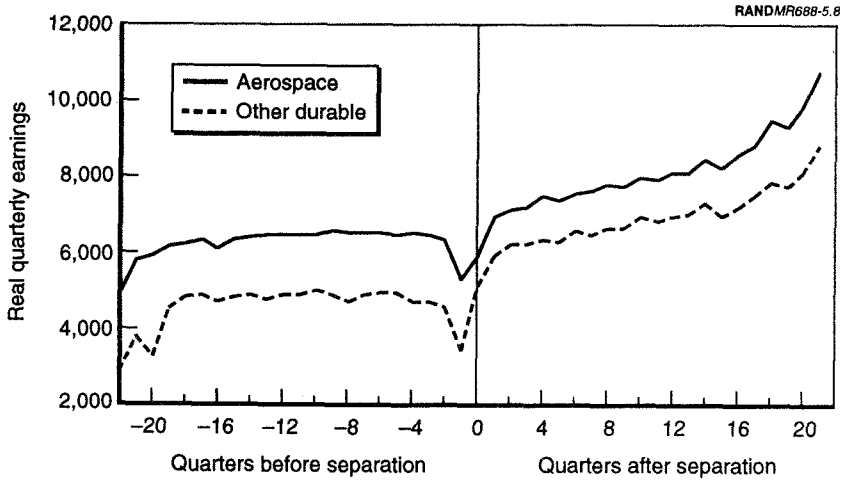

Figure 5.8—Average Quarterly Earnings Before and After Separation: Workers Changing Jobs Once Who Occupied Bottom Wage Group in 1989

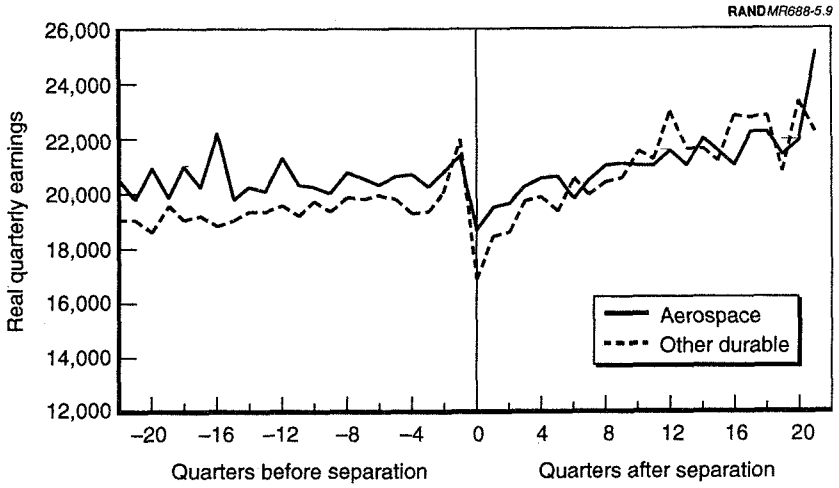

Figure 5.9—Average Quarterly Earnings Before and After Separation: Workers Changing Jobs Once Who Occupied Top Wage Group in 1989

and the gap did not shrink (Figure 5.7). Moreover, even just one to two quarters after the employment move, their earnings were at least as great as they were before the separation.

The low wage workers experienced the greatest wage growth following the separation (Figure 5.8). Their earnings were about $1,000 higher one year after the employment move relative to one year prior to the move. This is not surprising given the fact that two-thirds of wage growth among young men is associated with changing jobs (Topel and Ward, 1992), and many low wage workers are young. The gap between low wage aerospace workers and low wage other durable workers remained substantial following the separation, although it was reduced by about one-third.

The high wage aerospace workers had earnings following the separation that were no higher than they were before the move, at least the first one to two years after the change (Figure 5.9). In general, the change in their wages was not any more favorable than the change experienced by the middle and low wage workers. Moreover, the gap between the high wage aerospace and other durable workers was

quite small, much smaller than the gap for middle and low wage workers. In addition, the gap that did exist before separation was reduced or eliminated after the move. Finally, the wages of the higher earners increased substantially in the quarter *before* the employment change; this increase most likely represents severance payments.[10]

WORKERS LEAVING INITIAL JOB AND NEVER WORKING AGAIN IN CALIFORNIA WAGE SECTOR

For workers who leave the wage sector in California and never return, there is very little information to assess the extent to which they were affected by the downsizings. What we can examine are the following pieces of information:

- Earnings before separation relative to other durable workers' earnings
- Share who use UI and the number of weeks on UI
- Demographic characteristics of aerospace and other durable workers

In the last instance, we drew on research literature to determine whether workers with characteristics like these workers have a more- or less-difficult time finding employment with comparable wages after losing a job.

We find that the earnings difference between aerospace and other durable workers did not change during the quarters leading up to the employment move. Aerospace workers earned more, and the gap did not diminish. This result holds regardless of the number of quarters that the workers were employed in California. Thus, there is no

[10]Some studies of job loss examine change in wages between the period just prior to the employment change and shortly after starting at the new job. The existence of severance payments, if included as compensation on the prior job, suggests that these studies would understate wage losses, especially among high wage workers. This issue is similar but opposite in effect to the one stated by de la Rica (1995), who notes that if wages decline well in advance of the job loss, the wage change associated with the job change may be understated. Of course, this depends on whether one "assigns" the pre-displacement wage decline to the job change.

evidence that this group of aerospace workers suffered more *before* experiencing the job separation.

Using information on the age of the workers for whom it is available, we identified workers who were retirement age (62 or older) at the time they lost employment. We call these "retirees." This is a conservative estimate of retirees because some workers retired early with buy-out packages. We find that a larger share of aerospace workers fall into this category, although it is still only 2.2 percent of 1989 California aerospace workers (see Table 5.1).

One measure of labor market stress that can be examined among these workers is their use of the UI program. The share of nonretirees using UI was about the same for aerospace and other durable workers: 35 percent for aerospace versus 33 percent for other durable (Figure 5.10). The number of weeks among those using UI was higher for aerospace, 32.5 versus 28.0, on average over the entire period. Long periods of UI could be a signal of a more difficult time finding employment. However, longer spells may also allow these workers to find new jobs with better wages.

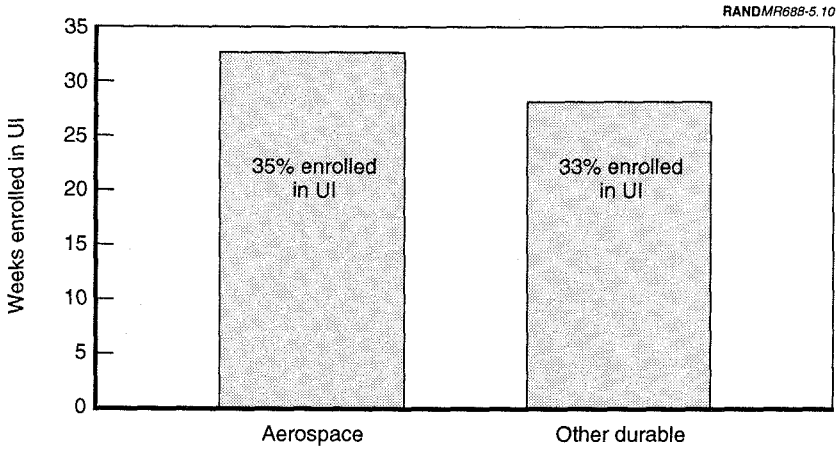

Figure 5.10—Proportion of Workers Using UI and Average Number of Weeks Enrolled: Workers Losing 1989 Job with No Subsequent California Earnings

Although the evidence is mixed, some literature on job displacement suggests that white workers have an easier time and older workers have a more difficult time finding new employment with comparable wages. Aerospace workers are much more likely to be white, and they are substantially older (see Table 5.2). On the other hand, some of the older workers in aerospace were receiving early retirement packages; thus, being older may not be a liability. In sum, the evidence is mixed as to whether, based on the demographic characteristics of workers, we would expect aerospace workers in this group to have had a more difficult experience. In general, there is very little information about the experiences of these workers. Additional data would be needed to draw firm conclusions.[11]

Table 5.2

Demographic Characteristics of Workers Who Lost 1989 Job with No Subsequent California Earnings: Those Who Ever Participated in UI (percent)

Characteristic	Aerospace (n = 33,106)	Other Durable (n = 15,736)
Sex		
Male	63	64
Female	37	36
Race/Ethnicity:		
Non-Hispanic White	72	51
Non-Hispanic Black	9	5
Hispanic	12	36
Other specified	7	8
Age:		
50–61	30	21
35–49	40	41
20–35	30	38

NOTE: We excluded individuals with missing data; no more than five percent of the cases had missing information for age, sex, or ethnicity.

[11]It is quite likely that a large share of these workers either left the state or retired, and we cannot identify them as having done so because of the limited information on age. We are investigating the possibility of linking these data to Social Security earnings and benefits data that would allow these issues to be addressed.

WORKERS NOT EMPLOYED IN CALIFORNIA IN EACH QUARTER AND CHANGING EMPLOYMENT STATUS MORE THAN ONCE

The last group of workers consists of almost one-third of aerospace workers and one-half of other durable workers. These are the workers who have changed employment the most and are likely to be the ones who have had the most difficulty during the contractions.

Workers Employed at the End of the Period

We begin by examining workers who were employed in the final quarter of the study period; these workers accounted for 16.6 percent of all aerospace workers (see Table 5.1). Most of the analyses thus far have exclusively examined earnings for workers on their primary job, where the primary job is the one in which the worker receives the greatest wages within each quarter. Because the workers discussed thus far had relatively few job changes, only a small share of workers ever had more than one job within a quarter. However, the workers examined in the rest of the analyses were more likely to switch jobs during the period; therefore, quarterly earnings reported in the remaining tables (Tables 5.3–5.5) are earnings in all jobs combined.[12]

Before turning to these analyses, one issue should be clarified. We report the change in quarterly earnings between first and last quarters employed. Some workers are not employed on all days (or hours) within these quarters; therefore, a portion of the change in quarterly earnings is due to changes in the number of days worked and a portion is due to changes in hourly wage rates. Hours or weeks worked within each quarter are not available in the data, so we cannot separate out these two variables. However, we do know that those who were on UI at some time during the period were not working the full quarter; therefore, we also report in Tables 5.3–5.5

[12]As it turns out, the analyses reported in Tables 5.3–5.5 lead to the same basic conclusion if we look at only the primary job. For example, looking at only the primary job, in Table 5.3 the mean earnings in 1989:1 and the last employed quarter would be $9,790 and $7,720, respectively, instead of $9,808 and $7,911, respectively. In addition, the median wage change would be –18 percent instead of –16 percent. Total earnings are wages from the top three earning jobs in each quarter. Very few workers had more than three jobs within a quarter.

Table 5.3

Labor Market Profile of Workers Employed in Third Quarter of 1994 Without Continuous California Earnings

	Aerospace		Other Durable	
	All (n = 85,853)	Not on UI (n = 75,492)	All (n = 76,610)	Not on UI (n = 65,445)
Mean quarterly earnings:				
1989:1	$9,808	$10,100	$7,106	$7,477
Last quarter fully employed[a]	$7,911	$8,392	$6,861	$7,280
Percentage wage change: 1989:1 to last fully employed quarter[a]				
Median	-16	-13	-1	0
25th percentile	-57	-52	-1	-37
75th percentile	18	20	52	48
Mean quarters with wages	19.2	19.1	18.7	18.7
Mean employment moves	4.0	3.9	4.7	4.5
Percentage ever using UI	68.0	63.6	67.3	62.1
Mean weeks on UI among users	39.7	37.6	37.7	34.2

[a]Last quarter fully employed was 1994:3. The "Not on UI" columns include only those who were not receiving UI in 1989:1 or the last quarter fully employed. Earnings are the total from the three jobs in the quarter for which the workers earned the greatest wages.

the changes in wages among those who were not on UI in either of the two quarters being compared.[13]

Our analyses of these workers' labor market stress are reported in Table 5.3. Their average earnings were $9,808 in the first quarter of 1989, which is $2,700 more than the average earnings of other durable workers in a similar circumstance. Aerospace workers'

[13]An alternative strategy is to restrict the comparisons to those who were employed with the same firm in the quarters surrounding the beginning and ending quarters; that is, to compare wages in 1989:2 with 1994:2 and require that the worker be employed with the same firm from 1989:1–1989:3, and the same firm from 1994:1–1994:3. We have conducted these analyses, and some of the results are reported in the footnotes to Tables 5.3–5.5. The disadvantage of this strategy is that the selection is quite restrictive, eliminating many workers, and it is exactly these workers who we would expect to have the most difficulty. Therefore, we have elected to report the results with the selection on UI participation in Tables 5.3–5.5.

Table 5.4

Labor Market Profile of Workers Receiving UI in Third Quarter of 1994 Without Continuous California Earnings

	Aerospace		Other Durable	
	All (n = 8,270)	Not on UI (n = 5,843)	All (n = 4,935)	Not on UI (n = 3,336)
Mean quarterly earnings:				
1989:1	$9,428	$9,679	$6,521	$6,863
Last quarter fully employed[a]	$8,009	$8,957	$6,007	$6,657
Percentage wage change: 1989:1 to last fully employed quarter[a]				
Median	–11	–5	–7	–3
25th percentile	–46	–32	–42	–32
75th percentile	16	19	40	41
Mean quarter of last employment	93:1	93:1	93:1	93:1
Mean quarters with wages	18.9	18.9	18.1	18.2
Mean employment moves	4.0	3.8	5.2	4.8
Percentage ever using UI	100	100	100	100
Mean weeks on UI among users	51.2	45.0	53.7	45.8

[a]Last quarter fully employed is the quarter prior to the last quarter employed; this is done to address the problem that a substantial share of these workers changed employment in the last quarter employed and, therefore, only worked part of the quarter. Note that not all workers were employed in the quarter prior to the last quarter; therefore, the wage change and wage level in the last quarter fully employed are based on only those with wages in this quarter. For columns 1, 2, 3, and 4, the number of observations of this group for these calculations is 7,381, 5,538, 4,493, and 3,152, respectively. The "Not on UI" columns include only those who were not receiving UI in 1989:1 or the last quarter fully employed. Earnings are the total from the three jobs in the quarter for which the workers earned the greatest wages.

wages declined by $1,900, on average, representing about a 20-percent drop in average wages. The decline in average wages for other durable workers was just 5 percent, from $7,106 to $6,660.

An alternative, more appropriate measure of wage loss is the percentage of wage reduction for each individual worker. Thus, Table 5.3 shows the median, 25th, and 75th percentile of this measure. For the group of workers employed at the end of the period, the wage reduction as measured by this indicator is quite similar to the reduction measured by the earlier indicator: 16 percent versus 1 percent, evaluated at the median for aerospace and other durable workers. However, it is also clear that a substantial share of workers

Table 5.5

Labor Market Profile of Nonretired Workers Without Continuous California Earnings Who Were Not Employed or on UI in 1994:3

	Aerospace		Other Durable	
	All (n = 67,098)	Not on UI (n = 55,299)	All (n = 56,951)	Not on UI (n = 46,527)
Mean quarterly earnings:				
1989:1	$10,954	$11,466	$6,537	$6,847
Last quarter fully employed[a]	$8,010	$8,509	$5,857	$6,261
Percentage wage change: 1989:1 to last fully employed quarter[a]				
Median	-14	-10	-8	-5
25th percentile	-63	-57	-52	-47
75th percentile	18	19	45	43
Mean quarter of last employment	92:3	92:3	92:3	92:3
Mean quarters with wages	12.7	12.5	11.4	11.5
Mean employment moves	3.7	3.7	4.3	4.2
Percentage ever using UI	53	42	56	46
Mean weeks on UI among users	36.9	32.3	33.3	28.5

[a]Last quarter fully employed is the quarter prior to the last quarter employed; this is done to address the problem that a substantial share of these workers changed employment in the last quarter employed and, therefore, only worked part of the quarter. Note that not all workers were employed in the quarter prior to the last quarter; therefore, the wage change and wage level in last quarter fully employed are based on only those with wages in this quarter. For columns 1, 2, 3, and 4, the number of observations of this group for these calculations is 42,322, 39,149, 42,322, 35,026, respectively. The "Not on UI" columns include only those who were not receiving UI in 1989:1 or the last quarter fully employed. Earnings are the total from the three jobs in the quarter for which the workers earned the greatest wages.

received large reductions in earnings; 25 percent of aerospace workers had wage cuts of at least 50 percent. A significant share of other durable workers also received wage cuts, but a larger share of aerospace workers received large reductions. Furthermore, a larger share of other durable workers experienced significant wage gains relative to aerospace workers.

Although aerospace workers received larger wage reductions, the number of quarters they were employed over the 23-quarter period

was higher: 19.2 quarters versus 18.7 quarters for other durable workers. Aerospace workers also had fewer employment moves: 4.0 versus 4.7, on average. The final indicator of labor market stress is the share ever using UI. Virtually the same share of aerospace and other durable workers used UI: 68 versus 67 percent. Among those who used UI, however, aerospace workers had slightly longer spells on UI: two weeks longer.

Workers Not Employed at the End of the Period but Receiving UI

Some workers who were in the labor force were not employed at the end of the period—they were seeking employment. Some of those seeking employment were participating in the UI program; these are the workers we examine next.

There were relatively few of these workers: just 1.6 percent of aerospace workers and 1.7 percent of other durable workers. These aerospace workers earned $2,900 more than other durable workers in the first quarter of 1989 (see Table 5.4). Because these workers were not employed in the last quarter of the study period, we examined their wages in the quarter before the last quarter they received wages. We did this because the last quarter they received wages was not a full quarter of employment; these workers made a change of employment sometime during the last quarter they were employed. Note, however, that because these workers had more than one employment move, their employer in the quarter before the last quarter they were employed is not the same as their initial employer.[14]

These aerospace workers received wage reductions of 11 percent, on average. However, the difference between aerospace and other durable workers was smaller than it was for workers employed in the last quarter (Table 5.3), with other durable workers receiving reductions of 7 percent.[15] In addition, among those who received

[14]However, not all workers were employed in the quarter before the last quarter they were employed, and the number of people affected by this selection is reported in the notes to Tables 5.4 and 5.5.

[15]Note that the number of quarters between the first quarter and the second-to-last quarter of employment is not different, on average, between aerospace and other

substantial wage reductions, the wage reductions were not appreciably greater for aerospace workers. On the other hand, among those who had significant wage gains, other durable workers fared better.

Restricting our analysis to those who were not on UI in the two quarters in which wages were compared reduces the estimated wage loss substantially: from 11 percent to 5 percent for aerospace workers. Similarly, the wage loss was 3 percent instead of 7 percent for other durable workers, implying only a small aerospace differential. This suggests that a large share of the reduction in quarterly earnings is attributable to reduced hours and weeks worked as opposed to reduced hourly wages, at least among these workers.

As was the case for workers employed in the last quarter, aerospace workers were employed for more quarters and had fewer employment moves. However, among these workers, aerospace workers had fewer weeks on UI, on average.

Retirees

Another relatively small subgroup that we examined were those who were of retirement age; only 1.3 percent of our sample could be identified as being 62 or older when they were last employed. Combining these retirees with the other retirees identified above gives just 3.5 percent retiring. This is likely to be a substantial underestimate for several reasons. First, we do not have information on age for all workers, only those who participated in UI in California. Also, some workers retired before age 62. To gauge the underestimate, we calculated an expected share of retirees, as described in Chapter Four. Using the 1990 census, we estimated that 8 to 12 percent of workers should have retired between 1989 and 1994. (See Appendix B for a description of how this rate was calculated.)

The number of workers in this group is small, and it is quite likely that these workers did not experience substantial hardship because they moved into retirement at a reasonable age upon leaving their jobs. In addition, we do not have very useful information with which

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durable workers (Table 5.4). Therefore, the difference in wage change is not due to differential time between wage observations.

to assess their experiences. For these reasons, further analyses are not reported for these workers.

All Other Workers

The final group of workers constitutes 13 percent of the 1989 California aerospace work force. These are the workers who were not employed or on UI in the last quarter. Some may have retired, but we were not able to verify this action. Others were unemployed but were not receiving UI, and some decided to exit the labor market. Still others may have left California. Our profile of the labor market experiences of these workers is reported in Table 5.5.

These aerospace workers are relatively high earners; on an annual basis, they earned $44,000 on average in 1989, which is $16,000 more than other durable workers. The reduction in wages they experienced was large, however: 14 percent for aerospace versus 8 percent for other durable workers. Restricting our analysis to those who were not on UI reduced the wage reduction substantially, from 14 to 10 percent for aerospace and from 8 to 5 percent for other durable workers. Again, this suggests that a substantial share of the reduction in quarterly earnings is due to fewer hours and weeks worked.

As was the case with other groups of workers, aerospace workers were employed a greater share of the study period, and they experienced fewer employment moves. The two worker groups were equally likely to use UI, although aerospace workers used UI for a larger number of weeks when they did use it.

SUMMARY OF THE FOUR WORKER GROUPS

We examined four primary groups of workers. Those workers who remained employed with the same aerospace firm, who constitute 32 percent of the entire 1989 aerospace workforce, experienced an 8 percent rise in real wages, on average, and they maintained the gap between themselves and other durable workers. The group of aerospace workers who were continuously employed but changed employers experienced a decline in real wages relative to pre-separation earnings of about 7 percent in the first year, and about 4

percent thereafter. Moreover, the difference between them and other durable workers did not diminish following the separation, in general. In sum, these two groups, who constitute 47 percent of the 1989 California aerospace workforce, did not suffer substantially during the downsizings, and they did not experience losses any larger than workers in non-aerospace durable goods manufacturing.

Another 20 percent of aerospace workers never earned wages in California once they left their initial 1989 aerospace employer. We have little information about the labor market experiences of these workers following their job loss. However, the evidence that exists does not suggest that they suffered greater losses than other workers; the gap between their earnings and the earnings of other durable workers did not diminish leading up to the point of job separation. Aerospace workers were also not any more likely to use UI, although they were enrolled for a somewhat longer period if they did participate.

The final group of aerospace workers consists of those who have experienced the greatest turbulence. Of these workers who were employed in the final quarter of the study period, the median reduction in quarterly earnings was 13 to 16 percent for aerospace workers versus 0 to 1 percent for other durable workers. On the other hand, these aerospace workers were employed a greater share of the period and changed employment less frequently than other durable workers in the same category. Similarly, among those workers who were employed after losing their initial job but who were not working in the final quarter, the wage reduction of aerospace workers was larger, i.e., 10 to 14 percent for aerospace versus 5 to 8 percent for other durable workers. But other indicators of labor market stress, such as the share using UI and the number of quarters without earnings, suggest that aerospace workers fared better than other workers.

One final point should be reiterated. As discussed at the beginning of this chapter, the distribution of workers across the four groups is, itself, an important outcome. In general, relative to other durable workers, aerospace workers were more highly concentrated in the groups that had the least difficulty, especially in group 1.

Chapter Six

EVIDENCE FROM RELATED STUDIES OF AEROSPACE WORKERS

There are many anecdotal accounts of the experiences of aerospace workers during the industry's contraction, many of which have appeared often in the popular press. For the most part, the picture painted by these stories is bleak. However, there has been a reliance on anecdote partly because of a lack of hard evidence. Before summarizing the overall results to our study, it is useful to discuss the few studies that have attempted to address this issue.

Using data from the Mass Layoff Statistics program, the Congressional Budget Office (1993) found that the share of those workers who exhausted their unemployment benefits was no higher for defense-related workers than for non-defense-related workers. Furthermore, using data reported by Job Training and Partnership Act (JTPA) offices, it found that defense-related workers were no more likely to experience wage reductions than were non-defense-related workers who participated in JTPA. However, not all displaced workers participate in JTPA activities; therefore, these analyses may be biased. Furthermore, the analyses include all workers in defense-related industries, not just aerospace workers.

A study prepared for California's Employment Development Department also looked at the experiences of aerospace workers in California, yet the researchers reached significantly different conclusions: ". . . few laid off aerospace workers have been able to gain meaningful work, with a majority remaining out of work and an increasing number running out of unemployment benefits. Many of those working have been forced to work in the low-wage sector. (Ong and Lawrence, 1993, p. 5.)"

Although the study provides some interesting estimates using a unique data set, the study has limitations. It was restricted to a sample of workers who claimed UI benefits at any time in 1989 or in the second quarter of 1992. It also linked the 1989 UI users to their California earnings data in the second quarter of 1992. Unfortunately, no comparison group was included in order to assess how the aerospace workers' experiences differed from those in less defense-dependent industries.[1] Moreover, they only examined the experiences of the aerospace workers whom we would expect to have suffered the worst outcomes—those who had to use the UI system.

In recent RAND research using a national sample of "displaced workers," Robert Schoeni found that the wages of displaced aerospace workers did not decline any more than the wages of workers displaced from nonaerospace industries. Moreover, relative to workers displaced from industries other than aerospace, displaced aerospace workers were at least as likely to retain health insurance coverage following displacement, were equally likely to relocate after displacement, and were at least as likely to remain in the same broad occupational category. One of the weaknesses of Schoeni's study is that the sample sizes were quite small—only about 800 aerospace workers who had been displaced between 1982 and 1993.

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[1]The authors compare some of their estimates of UI duration for California aerospace workers with external estimates of UI duration for all U.S. workers. However, it is difficult to compare these estimates because they presumably come from very different reporting sources. (The source of 1992 U.S. estimates is not referenced.) In addition, it appears that the U.S. estimate is for people unemployed, not people using UI, as is the case for the California aerospace data. Many people have periods of unemployment that do not lead to use of the UI system, and it is exactly these spells that are more likely to be short. In addition, the U.S. comparison is for all industries, and there are likely to be differences across industries in UI duration.

Chapter Seven

SUMMARY OF FINDINGS

The aerospace industry nationwide and throughout California has contracted dramatically since 1987. As defense outlays declined, aerospace employment plummeted. Compared with its peak year in 1987, the industry's work force today is off 25 percent nationwide. In California, aerospace employment has dived 30 percent; while in Los Angeles the industry's work force is only half as large as in 1987.

To gauge the impact of the defense downturn on aerospace workers, this study compiled a unique data set that tracked earnings and use of the unemployment insurance program among all aerospace workers who were employed in California in 1989—some 517,000 individuals. It also tracked the same information for 315,000 workers in comparable jobs in nonaerospace durable goods manufacturing operations in the state. The study followed these workers over the subsequent six years, the period that encompassed the bulk of the aerospace industry's defense-sector contraction (although additional reductions are likely to occur).

In general terms, the evidence suggests that aerospace workers fared no worse than other durable goods manufacturing industry employees. On average, the earnings of workers employed in 1994 who were in the aerospace sector in 1989 are slightly higher today, measured in constant dollars, than before the defense downturn. Moreover, the earnings gap between workers who were in aerospace versus other durable goods manufacturing in 1989 has remained fairly constant over the period, averaging about $12,000 annually among those who were employed. Aerospace and nonaerospace workers are about

equally likely to participate in the unemployment insurance system, but aerospace workers have slightly longer spells when they do use it.

These trends held for most of the subpopulations that we studied. Aerospace workers who were continuously employed at one firm or at several firms—a group that accounted for 47 percent of the workers—earned the same in constant dollars in 1994 as in 1989. Moreover, the gap between these workers' wages and earnings for comparably employed workers in nonaerospace durable goods manufacturing jobs did not change much over the six-year period.

Aerospace workers who frequently changed jobs fared less well. They still earned more than their nonaerospace counterparts, but both their adjusted earnings and their pay differential declined somewhat between 1989 and 1994. Moreover, although aerospace and nonaerospace workers were equally likely to use unemployment insurance, when aerospace workers used the program they were typically enrolled slightly longer.

Appendix A

COMPARISON OF ADMINISTRATIVE INFORMATION WITH EXTERNAL SOURCES

CONSTRUCTION OF DATA FILES

The data that we examined were drawn from two files: the base wage file and the single claimant (UI) file. In each quarter, all employers covered by the UI system are required to report the total wages that they paid to each employee. The state maintains a data file that contains the wage information as well as, for each employee, employer identification number (EIN), the employee's Social Security number (SSN), the employer's four-digit standard industrial classification (SIC) and the number of employees of the firm. The UI file contains, for each quarter and each SSN, the number of weeks that benefits were received, the amount of the benefits, and the SSN. In addition, UI claimants are asked to voluntarily report their age, sex, and ethnicity, and this information is available in the UI file.

Drawing on these two files, the construction of the data sets proceeded as follows:

Step 1. We determined EINs for all employers in durable goods manufacturing as of the first quarter of 1989. A file was created that contained two variables for all employers in durable goods manufacturing:

- EIN
- SIC

Step 2. From the base wage file in the first quarter of 1989, all workers whose EINs were selected in Step 1 (i.e., employers in durable

goods manufacturing) were chosen. From these workers, we chose all workers who were employed in aerospace industries (SIC codes 366, 372, 376, 381, and 382), and a random sample (based on the last digit of each worker's Social Security number) of 20 percent of all nonaerospace workers. For these two groups of workers, which consisted of 517,148 aerospace and 315,856 other durable workers, a file was created that contained three variables:

- EIN
- SIC
- Social Security number

Step 3. In each quarter, from 1989:1 through 1994:3, the base wage record for each of the individuals identified in Step 2 was selected using their Social Security number. (Workers who held jobs in more than one firm had multiple records.) This file contains all of the information available on the base wage file for each quarter, that is:

- Social Security number
- Quarter and year
- Wages paid to the employee in the quarter
- EIN
- SIC
- Number of employees in the firm

Step 4. In each quarter, from 1989:1 through 1994:3, we obtained the single client (i.e., UI) records for the individuals identified in Step 2. This file contains all information available on the single client file for each quarter, that is:

- Social Security number
- Quarter and year
- Race
- Sex
- Ethnicity

- Benefits paid
- Number of weeks benefits were received

Step 5. The final step was to apply a consistent scrambling code for the SSN and EIN for each of the three files (i.e., files created in Steps 2, 3, and 4) so that individuals and firms could be linked across the three files.

COMPARISON OF EMPLOYMENT, WAGES, AND DEMOGRAPHIC COMPOSITION WITH EXTERNAL DATA

The number of workers in each subindustry within the aerospace sector as estimated for 1989 by the Bureau of Labor Statistics (BLS) is reported in Table A.1. This estimate is an annual average, while the estimate from our administrative data is the total number of people ever working in aerospace during the first quarter of 1989. Therefore, we would expect the BLS estimate to be lower, which it is for industry-wide employment, although for two industries the BLS estimate is higher.

The 1990 census estimate of annual wage and salary income for aerospace workers in California was $37,566 in 1989 dollars. Inflating

Table A.1

Aerospace Employment Estimates for California in 1989, BLS Versus Administrative Data

Industry	BLS:[a] Annual Average for 1989	Administrative Data: Ever Employed in 1989:1
Communications equipment (366)	33,652	28,404
Aircraft and parts (372)	170,025	135,729
Guided missiles and space vehicles and parts (376)	79,958	105,669
Search and navigation (381)	110,982	166,422
Measuring and controlling devices (382)	73,699	80,924
Total aerospace	468,226	517,148

[a]SOURCE: U.S. Dept. of Labor, 1990.

to 1994 dollars using the CPI, this amounts to $44,462—i.e., 37566 × (151.5/128). For nonaerospace durable goods manufacturing, average wages were $27,656 in 1989 dollars. Inflating leads to an estimate of $32,733 in 1994 dollars. The estimates from the administrative data from California are comparable; the mean wages for aerospace workers in the first quarter of 1989 (in 1994 dollars) is $11,674, which is $46,696 in annual terms. For nonaerospace durable goods manufacturing, the average wage in 1989:1 is $8,134 or $32,536 annually. The estimates from the census and the administrative data are extraordinarily close. One reason the administrative estimates are higher, at least for aerospace workers, is that the census has a top code for earnings of $140,000 while the administrative data has no top code.

Information on age is reported by only a subset of the administrative sample. To determine whether this information is reported disproportionately by older or younger workers, we compared the age distribution of workers in the administrative data with those in California in the 1990 census, both for aerospace and other durable workers. In the census, the mean age for aerospace workers is 40.3 years (39.2 years is the median), and the mean age for other durable workers is 37.5 (36.3 years is the median). The average ages for these two groups in the administrative data are 42.1 years (39.5 years is the median) and 37.1 years (35.8 years is the median), respectively, for aerospace and other durable goods manufacturing. Therefore, there is no evidence of substantial differences in age.

QUARTERLY PRICE ADJUSTMENTS

Quarterly price indices were used to express all currency in 1994:3 dollars. The indices were constructed from three-month simple averages of the Consumer Price Index for California as reported by the California Department of Industrial Relations. Its estimates are based on estimates from the U.S. Department of Labor. They are weighted averages of indices from three metropolitan areas: Los Angeles–Anaheim–Riverside, San Francisco–Oakland–San Jose, and San Diego. The weights are based on the populations in each of the three areas.

NUMBER OF WEEKS ON UNEMPLOYMENT INSURANCE

The number of weeks on UI, which was computed by the Employment Development Department in California, is calculated by adding up the "weekly action payment records." These include "paid" and "unpaid" weeks, where paid weeks are simply the weeks that benefits were paid.[1] The following reasons are counted as unpaid weeks:

1. Waiting periods
2. Under appeal
3. Waiting period credit
4. Refused suitable work
5. From PH2 record
6. Disqualifications
7. Desk certification
8. False statement
9. Overpayment offset

CHANGES IN THE EMPLOYER IDENTIFICATION NUMBER

Changes in a worker's EIN are used to identify changes in a worker's firm. Therefore, it is important to understand when a firm's EIN may change. The reasons for change include, for example, business failure, the sale of the business to another entity, merger with another firm, and incorporation of the firm. In the case of mergers, acquisitions, and splits, the guiding principle in determining whether a new EIN is established (or two EINs are merged) is "continuity of control," as defined by the California Unemployment Insurance Code (Division 1, Part 1, Chapter 1, Article 2, 135).

Although all of the analyses that rely on identification of firm separations depend on this definition of EIN, we did estimate the number of workers who appeared to have been part of a merger or an acquisition as opposed to a "true" firm separation. Recall that we used the population of aerospace workers in 1989, not a sample, which allowed us to examine movements of all 1989:1 coworkers. We first calculated the number of each worker's coworkers in quarter t who were also their coworkers in period $t-1$, when the EIN for the workers' employer at t and $t-1$ were different. Among all aerospace work-

[1]Note that adjustment payments are not included as a week of benefits.

ers, 15.3 percent experienced the same employer change between adjacent quarters as did at least one coworker. However, in most cases the number of coworkers who made the same change was very small; 39 percent were moves of 10 or fewer coworkers. On the other hand, 30 percent of the workers moved with at least 100 coworkers.

It is quite likely that coworkers separating from one firm were hired by the same new firm in the subsequent quarter without a merger or acquisition, although this is not as likely to explain the cases in which a large number of coworkers moved simultaneously. However, it may be that small firms are being purchased or spun off. Therefore, we also examined the *share* of coworkers at time *t* who were coworkers at time *t+1*. Of those making the same employer change with at least one coworker in adjacent quarters sometime between 1989:1 and 1994:3, 48.6, 10.1, 13.2, 5.5, 15.3, and 15.1 percent of the workers made the same employer move as 1–10, 11–30, 31–50, 51–70, 71–90, and 90–100 percent of their coworkers at time *t*.[2]

Although it is not possible to definitely identify a merger, acquisition, or spin-off, as a last step we assumed that such an event occurred if at least 50 coworkers or 50 percent of the firm's work force made the same EIN change. Among those workers who experienced the same change in EIN with at least one coworker, 59 percent fell into this category. This represents 9 percent of the full sample of 517,148 aerospace workers; therefore, the general results are not likely to be affected by this phenomenon. In future analyses, however, we plan to investigate this issue in more depth.[3]

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[2]If a worker shared more than one employer move with coworkers, the one which that worker shared with the greatest number of coworkers was chosen for calculation of these rates. Also, because new workers entered the industry after 1989:1, the worker may have had more coworkers make the same employment change than is estimated with these data. Technically, we estimate the number of coworkers making the same change between *t* and *t+1 among those who were working in aerospace in 1989:1.*

[3]Jacobson, LaLonde, and Sullivan (1993b) discussed this issue in their analysis of administrative data from Pennsylvania. Because the central objective of their analysis was to examine workers before and after job separations, this issue is even more salient for their study.

Appendix B

ESTIMATES OF RETIREMENT AND MIGRATION OUT OF CALIFORNIA

ESTIMATES OF THE SHARE OF WORKERS RETIRING BETWEEN 1989 AND 1994

Based on the age distribution of workers in the 1990 census and assuming a stable population in 1990, we estimate that at least 8.04 percent of the aerospace workers in California would retire over a five-year period. For all workers over the age of 60, we calculated the difference between the number of workers age a and age $a + 5$. The sum of these differences is the number of workers expected to retire in the subsequent five years, and the share is determined by dividing this number by the total number in the 1989 California aerospace work force. This is likely to be a lower bound because a substantial number of workers received early retirement packages in the 1990s. The likely range for the share retiring is 8 to 12 percent.

ESTIMATES OF THE SHARE OF WORKERS LEAVING CALIFORNIA BETWEEN 1989 AND 1994

Out-migration rates are not available for our sample over the study period; therefore, we base our estimates on out-migration between 1985 and 1990 using the 1990 census. According to the 1990 census, there were 1,008,145 workers in the labor force outside California in 1990 who were residing in California in 1985. The estimated labor force in California in 1985 was 12,937,00. Therefore, approximately 7.8 percent of the labor force in 1985 was residing in another U.S. state on April 1, 1990. We do not know how many 1985 California workers left the United States.

We assume that the probability of leaving the state between 1989 and 1994 is the same as estimated by the census between 1985 and 1990. (If anything, evidence suggests that out-migration has accelerated over time, suggesting that our estimate is low.) However, our study period is five and three-quarters years (January 1, 1989, to September 30, 1994), not five years as covered by the census (April 1, 1985, to April 1, 1990). Adjusting the five-year rate from the census leads to an estimate for our data of 8.96 percent.

Appendix C

POTENTIAL BIASES IN THE PRE- AND POST-SEPARATION WAGE COMPARISONS

Not all workers can be used to calculate the mean wages reported in each quarter of Figure 5.5. Figure C.1 reports the number of workers whose wages are used in each quarter to construct Figure 5.5. Obviously there are more workers who contribute to observations close to the quarter of separation, and the quantity of workers declines on either side of that point in time. However, even at the tail ends of the distribution there are still at least 1,000 workers contributing to the average wage.

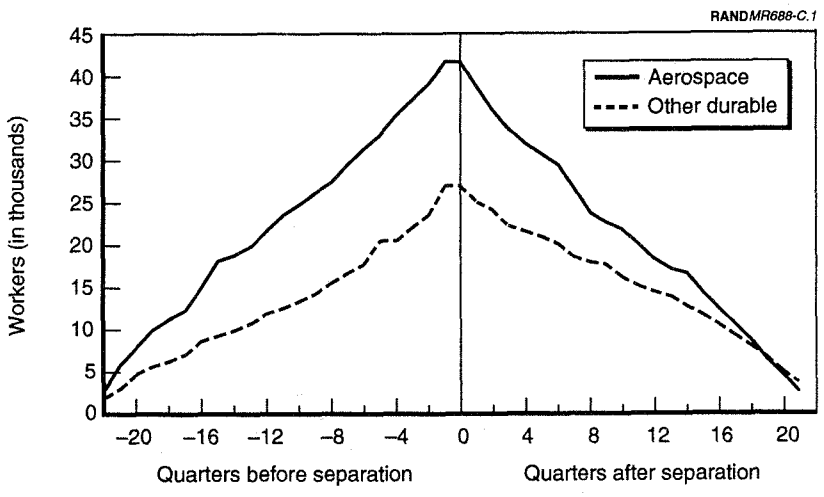

Figure C.1—Number of Workers Used to Calculate Average Earnings in Each Quarter in Figure 5.5

The other important aspect of Figure 5.5 is to note that there are systematic differences between the workers whose wages are available in the different quarters. Most notably, workers who changed employment at later dates are higher-wage workers relative to those changing jobs early in the period. This is demonstrated in Figure C.2, where we report the mean wages earned in the first quarter of 1989 (when all workers were employed) for those workers used in each of the quarters, –22 to +22, in Figure 5.5. As shown in Figure C.2, the workers with separations in 1989 and 1990 had lower wages in the first quarter of 1989 than did workers who separated in 1993 and 1994.

This implies that the pattern of wages in Figure 5.5 is biased. The average wages in quarters leading up to the separation are biased upward because they are disproportionately based on high wage workers. And the average wages after the separation are biased downward because high wage workers are less likely to contribute observations in this range. This implies that the "true" wage pattern would show less wage loss following the separation—the profile should be more positively sloped. In addition, the extent of the bias

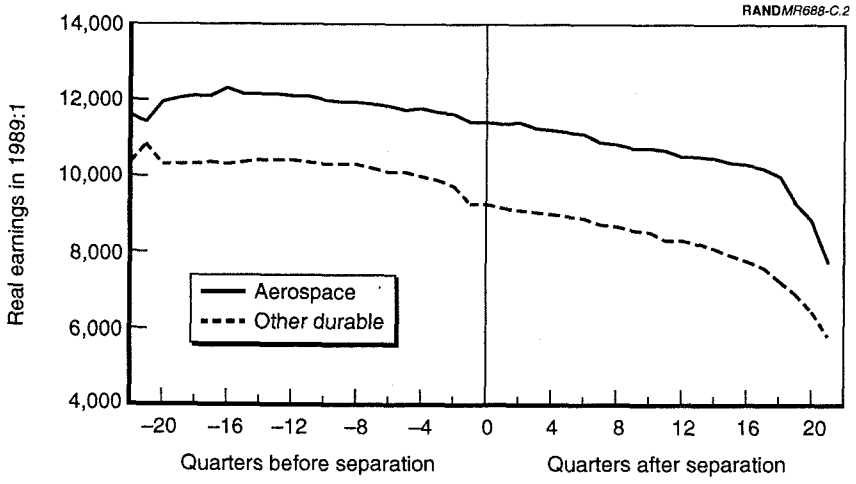

Figure C.2—Average Earnings in First Quarter of 1989 for Workers in Figure 5.5

is larger further away from the quarter of separation. Therefore, the wages in quarters more than 3 to 4 years away from the quarter of separation should be interpreted with caution.

Another important factor is that the amount of the bias is about the same for aerospace and other durable workers. The two wage profiles in Figure C.2 have similar shapes, and the gap is fairly constant across all quarters. Therefore, the *differences* among the profiles in Figure 5.5 are not substantially influenced by the bias.

REFERENCES

Abraham, K. G., and H. S. Farber, "Job Duration, Seniority, and Earnings," *American Economic Review,* Vol. 77, No. 3 1987, pp. 278–297.

Altonji, J. G., and R. A. Shakotko, "Do Wages Rise with Job Seniority?" *Review of Economic Studies,* 1987, pp. 437–459.

Barley, Stephen R., "What Do Technicians Do?" Cornell University, mimeo, May 1993.

Bound, John, and George Johnson, "Changes in the Structure of Wages in the 1980's: An Evaluation of Alternative Explanations," *American Economic Review,* Vol. 82, No. 3, 1992, pp. 371–392.

Congressional Budget Office, *The Economic Effects of Reduced Defense Spending,* Washington, D.C., 1992.

Congressional Budget Office, *Reemploying Defense Workers,* Washington, D.C., 1993.

de la Rica, Sara, "Evidence of Preseparation Earnings Losses in the Displaced Worker Survey," *Journal of Human Resources,* Vol. 30, No. 3, 1995, pp. 610–621.

Dertouzos, James N., and Michael Dardia, *Defense Spending, Aerospace, and the California Economy,* Santa Monica, Calif.: RAND, MR-179-RC, 1993.

Jacobson, Louis S., Robert J. LaLonde, and Daniel G. Sullivan, "Earnings Losses of Displaced Workers," *American Economic Review*, Vol. 83, No. 4, 1993a, pp. 685–709.

Jacobson, Louis S., Robert J. LaLonde, and Daniel G. Sullivan, *The Costs of Worker Dislocation*, Kalamazoo, Mich.: W.E. Upjohn Institute, 1993b.

Karoly, Lynn A., "Trends in Inequality Among Families, Individuals and Workers in the United States: A 25-Year Perspective," in Peter Gottschalk and Sheldon Danziger, eds., *Uneven Tides: Rising Inequality in America.* New York: Russell Sage Foundation, 1993, pp. 19–97.

Medoff, James L., and Katharine G. Abraham, "Experience, Performance, and Earnings," *Quarterly Journal of Economics*, 1980, pp. 703–735.

Mincer, Jacob, *Schooling, Experience, and Earnings*, New York: National Bureau of Economic Research, 1974.

Ong, Paul M., and Janette R. Lawrence, *The Unemployment Crisis in Aerospace*, mimeo, University of California, Los Angeles, Graduate School of Architecture and Urban Planning, 1993.

Silvestri, George, and John Lukasiewicz, "Projections of Occupational Employment: 1988–2000," *Monthly Labor Review*, Vol. 112, No. 11, 1989, pp. 42–65.

Saunders, Norman C, "Employment Effects of the Rise and Fall in Defense Spending," *Monthly Labor Review*, Vol. 116, No. 4, 1993, pp. 3–10.

Topel, Robert H. and Michael P. Ward, "Job Mobility and the Careers of Young Men," *Quarterly Journal of Economics*, Vol. 107, No. 2, 1992, pp. 439–479.

Topel, Robert H., "Specific Capital, Mobility, and Wages: Wages Rise with Job Seniority," *Journal of Political Economy*, Vol. 99, No. 1, 1991, pp. 145–176.

U.S. Department of Labor, Bureau of Labor Statistics, *Employment, Hours, and Earnings: United States*, various issues, Washington, D.C.: Government Printing Office.

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