LABOR MARKET DYNAMICS DURING A PERIOD OF STRUCTURAL CHANGE: CALIFORNIA IN THE EARLY 1990s

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Abstract

This paper contributes to the literature on labor market dynamics in four ways. First, unlike most of the existing literature, it uses the Survey of Income and Program Participation (SIPP). This panel survey, with a 32 months window of observation, allows a more precise measure of employment flows than other data sources. We find that one out of three workers experiences a job transition during the observation period. Second, it focuses on the state of California during an economic cycle. According to our estimates, the net decline in employment represents just 2.6 percent of all job rotations (separations offset by accessions), and gross job flows were as important during the downturn as they were during the economic expansion. Third, it estimates gross flows by sector, and finds significant variation in gross flows relative to employment across sectors of economic activity. Fourth, it examines the coexistence of cyclical and structural changes of California in the early 1990s. The results suggest a labor market link between structural changes and economic cycles.

I Introduction

The California economy went through a deep recession in the early 1990s. The annual unemployment rate climbed from 5.8% in 1990 to 9.4% in 1993. From 1990 to 1993, total employment declined by 455,000. In part, California's economy was sharing in the national recession that was occurring at this point in time. However, the sharp decline in federal defense expenditures that took place at this same time had a disproportionate impact on the California economy, since a large number of important defense contractors were located in the state.

About 60 percent of the drop in state employment from 1990 to 1993 was in the manufacturing sector. In the aerospace sector alone, over 100,000 jobs were lost during this period. Furthermore, many of these job separations were expected to be permanent, reflecting a permanent drop in demand for defense-related hardware. Thus, the California economy in the early 1990s was undergoing a profound structural change.

Table 1: Wage and Salary Workers in Nonagricultural Establishments by Major Industry, California 1990-1995 c/

(In thousands)

Year	Total	Mining	Construc-tion a/	Manufac-turing	Trans-portation and utilities	Whole-sale trade	Retail trade	Finance, insurance and, real estate	Services	Govern-ment b/
1990	12,499.9	37.7	561.8	2,068.8	612.2	768.9	2,223.8	808.8	3,343.1	2,074.8
1991	12,359.0	37.0	514.0	1,970.9	613.3	741.7	2,180.5	799.4	3,411.7	2,090.6
1992	12,153.5	35.4	471.7	1,890.5	607.4	713.5	2,121.4	791.9	3,426.3	2,095.6
1993	12,045.3	34.9	445.7	1,805.1	610.6	686.7	2,125.2	794.2	3,462.4	2,080.6
1994	12,159.5	31.9	464.3	1,777.3	619.0	701.6	2,143.5	770.6	3,558.2	2,093.2
1995	12,433.8	29.8	488.1	1,790.4	630.1	735.5	2,191.6	736.7	3,730.2	2,101.6

a/ Includes employees of construction contractors and operative builders; does not include force-account and government construction workers.
b/ Includes all civilian employees of Federal, State, and Local governments regardless of the activity in which the employees are engaged.
c/ Does not include employers, own-account workers, unpaid family workers, domestic servants, and agricultural workers.
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Table 1 reports aggregate employment by sector for the period 1990-95. In three years, the aggregate distribution of employment had changed considerably, and continued to change in the same direction in the years that followed. The manufacturing sector, which represented 16.6 percent of total employment in 1990, comprised only 14.3 percent of total employment by 1995. On the other hand, the services sector share of total employment rose from 26.7 percent of total employment in 1990, to 30 percent in 1995. The services sector is a heterogeneous group of industries, including business and repair services; personal services; entertainment and recreational services; and professional and related services.

This paper uses panel data to characterize the dynamics of the California labor market during this period of structural change. The picture that emerges from the analysis of panel data suggests that these major structural changes are just part of much larger flows of workers across jobs and across sectors during the same period. We find net employment flows to constitute only a tiny fraction of gross employment flows, even during this period of severe recession. The decline in net employment is found to correspond to only a small (but persistent) increase in the rate of job separations over the rate of job accessions. In addition, we find that these labor market flows are concentrated within a small segment of the labor market, since about 2/3 of the labor force measured in our sample consists of individuals with no change in employment status throughout the time period measured. This examination of the behavior of gross labor market flows provides a richer picture of the dynamics of a region's labor market.

There have been a number of studies that focus on the question of flows in the labor market, and we survey that literature in section II. The major features of the data are described in section III. Section IV summarizes the gross flow estimates, examines the month to month variations in these flows, and their link to the business cycle. Section V looks at employment flows from a longitudinal point of view, and offers an indicator of average employment rotation based on a 32-month window of observation. This section presents estimates of gross flows by sector, looks at employment flows in the context of structural change, shows that employment rotation varies significantly by sector, and suggests a labor market link between structural changes and economic cycles. Section VI summarizes the paper.

II. Structural Change and Gross Labor Market Flows

Our paper examines the behavior of gross labor market flows during the California recession. This is a new perspective on the labor market effects of structural change. Previous studies, such as those by Kodrzycki (1996), and Schoeni and Dardia (1998), have tended to focus fairly narrowly on the impact of structural change on displaced workers in certain industries (e.g., the durable goods manufacturing sector.)

Our approach will be to examine structural change from a broader perspective. We take into account the fact that the displacement of aerospace workers occurred in the context of a densely populated and dynamic labor market. Our work will illustrate the relative importance of flows in and out of durable goods manufacturing in relation to flows in the overall labor market, or gross labor market flows, over this period.

Researchers have investigated the question of gross flows in labor markets using a number of different data sources and focussed on different questions. One of the most widely cited papers, Davis and Haltiwanger (1992), uses data from the Census Bureau's Longitudinal Research Datafile (LRD), a series of contiguous five-year panels with annual data on employment in US manufacturing establishments with five or more employees. Their results pointed out at the fact that small enterprises create a lot of jobs

but also destroy many, contributing moderately to aggregate employment growth. Ritter (1993) employs the BLS Current Employment Statistic (CES) survey, using industry-level data to analyze gross labor market flows.

The basic approach taken by researchers using establishment data, is to measure gross rates of job creation and destruction according to the following:

$$\text{Gross Job Creation} = (1/Et) \sum_{I=1}^{Nt} \delta it^{(+)} \Delta Eit$$

$$\text{Gross Job Destruction} = (1/Et) \sum_{I=1}^{Nt} \delta it^{(-)} \Delta Eit$$

Where Et is total employment in all industries (or in all establishments, using firm-level data), ΔEit is the change in total employment between period t and period t-1, Nt is number of industries (establishments) in the sample, $\delta it^{(+)} = 1$ if $\Delta Eit>0$ and 0 otherwise, and $\delta it^{(-)} = 1$ if $\Delta Eit<0$, and 0 otherwise.

When using household data, the focus is on individuals that experience job changes during the period of observation. While looking at the same phenomenon, the point of view is different, and it requires the use a slightly different terminology. For example, when an individual experiences a job separation, this may or may not correspond to the destruction of a job at the establishment level. Some workers may choose voluntarily to quit a position, or may retire or leave the labor market for other reasons. Therefore, when referring to studies using household data we refer to rates of "job accessions" and "job separations," which are defined as gross flows of workers into and out of employment, again as a fraction of total employment.

The question of comparability of results from the various data sources has been recently addressed by researchers examining long term trends in job stability. For example, Jaeger and Stevens (1998) compare estimates from the Current Population Survey (CPS) and the Panel Study of Income Dynamics (PSID). They find that the two data sets provide similar results for the 1980s and 1990s, and argue that the differences observed in the previous period are likely to be driven by survey design. Gottschalk and Moffitt (1998) extend the comparison to include the Survey of Income and Program Participation (SIPP). The probability that a sample member in the PSID was in a different job roughly one year after the interview date was around 18 percent throughout the period 1981-1993. Estimates from the SIPP, for the period 1984-1993 are slightly lower but "within PSID confidence bounds in almost all years." It is clear that comparability can be achieved, but at the expense of losing information. For example, in Gottschalk and Moffitt (1998), the PSID and SIPP data sets are made comparable by restricting the samples to employed married males and by focussing the analysis on transitions between jobs a year apart.

The challenge of summarizing the literature on labor flows is that different studies use different data sources over different periods of time. Some look at job closings and openings from the establishment perspective, others look at job accessions and separations from the individual perspective. Due to differences in questionnaire design, the time frame over which flows are calculated is sometimes annual, quarterly, or monthly. Therefore, one must use caution in comparing the values of gross flows calculated in the various studies. Nonetheless, we think it is useful to outline the types of calculated flows that have been found in various studies to date, and we summarize them in Table 2.

The first set of estimates is based on household data. Blanchard and Diamond (1990) found, using household (CPS) data, monthly rates of job accessions of 3.4% and job separations of 2.9% of employment, using data averaged over the period 1968-86. Ritter (1993) found rates of monthly job accessions of 4.2% and job separations of 4.2% using the same data source, over the months of April and May, 1993. Ryscavage (1992) used several SIPP surveys to estimate the average rate of job accessions to be 1.2% of working-age-population over the period 1987-98. The second set of estimates is based on establishment data, and is based on comparisons of employment levels in consecutive quarters. The third set provides estimates of annual gross flows. The estimates by Hall (1982) and Davis and Haltiwanger (1992) are based on the CPS, but they use different methodology. Finally, the numbers provided by Hamermesh (1993) are based on averages from estimates of a series of studies generally based on establishment data.

Table 2: Employment Flows: Estimates from various studies.

Estimates made using:	Type of Data	Time period	Authors
A. Monthly data (flows calculated on a month-to-month basis)			
accessions=3.4% separations = 2.9%*	household (CPS)	avg. 1968-86	Blanchard and Diamond (1990)
accessions = 1.2 %	household (SIPP)	avg. 1987-98	Ryscavage(1992)
accessions = 4.2% separations = 4.2%	household (CPS)	April-May, 1993	Ritter (1993)
B. Quarterly data (flows calculated on a quarter-to-quarter basis)			
job creation = 5.4% job destruction= 5.6%	manufacturing establishments	avg. 1973-86	Davis and Haltiwanger (1992)
job creation = 2% job destruction = 2%	industry (CES)	1986 Q1	Ritter (1993)
C. Annual Data (flows calculated on a year-to-year basis)			
accessions = 28.2%**	households	1978	Hall (1982)
separations = 8.6%	household (CPS)	avg. 1968-87	Davis and Haltiwanger (1992)
job creation = 9.5% job destruction = 8.5%	average of 11 studies (mostly establishment data)	1970s and 80s	Hamermesh (1993)

*Flow estimates adjusted by the Aboud-Zellner method

** Unlike the other studies, this calculation includes all workers in the sample with tenure of less than a year, which would include both employment accessions and job to job transfers.

III. Our Data

We use the 1990 and 1991 SIPP (Survey of Income and Program Participation) made public by the Bureau of Census, to examine employment data from October of 1989 to August of 1993. The key reason for using the two panels is to stretch the time frame through the period of the California recession. The universe of the survey is the resident population of the United States, excluding persons living in institutions and military barracks. The core questions of the survey include, among others, monthly labor force activity, employment status, employer "ID," sector of economic activity and occupation, hours worked, and wages. The survey can be used to study month-specific characteristics; such as poverty or employment status; or it can be used to examine longitudinal questions, such as movements from job to job, and in and out of work. We do both.

The variables "age" and "state of resident" are used to restrict our sample to 16 year old or older individuals that are resident of California in the first interview. Table 3 shows the sub-sample sizes from each survey, and the breakdown of month observations by month of reference. As it is shown, the 1990 panel covers the period October 1989 to August of 1992; and the 1991 panel covers October 1990 to August of 1993. Individuals are interviewed eight times, every four months, and each interview produces records with reference to the four months preceding the month of the interview. For example, the first set of interviews for the 1990 panel take place in February of 1990, and collect data for the period October 89-January 90.

Table 3: Number of Observations by Reference Month: Sub Sample of SIPP files
(California residents, age 16 years or older at the time of first interview)

Reference Month	SIPP 90	SIPP91
October 89	1329	0
Nov 89	2633	0
Dec 89	3924	0
Jan 90	5278	0
Each month from Jan 90 to Sept 90	5278	0
Oct 90	5278	813
Nov 90	5278	1675
Dec 90	5278	2548
Jan 91	5278	3427
Each month from Jan 91 to May 92	5278	3427
May 92	5278	3427
Jun 92	3949	3427
July 92	2645	3427
August 92	1354	3427
Each month from Sept 92 to May 93	0	3427
May 93	0	3427
June 93	0	2614
July 93	0	1752
August 93	0	879

Source: SIPP files

The SIPP data come with two types of weights; those to be used for specific period analysis and those to be applied for panel analysis. The panel weight takes the value zero for all individuals that miss one or more waves of interviews. Both sets of weights balance observations with low probability of being observed, against observations with high probability of being observed, and are designed to generate a total count that represents the United States Population. Since we use a sub-sample of the SIPP data, we do not know how the weights provided affect this sub sample. At various stages of the work, we compared proportional breakdowns with and without weights, and we did not find significant differences in the results. We decided to continue our analysis without weights. This means that the results we report are based on a sample taken from the population living in California during the first wave of interviews, which is not necessarily a random sample of the California population.

In the next two sections we report our analysis looking at the data month-to-month, and examining longitudinal questions. The samples used to do these two types of analysis are not the same. There are two key differences.

(1) The analysis of month-to-month changes eliminates the first and last three months of data in each panel. These months of data contain only part of the sample. The survey is designed so that approximately one quarter of the sample (a rotation) is interviewed each month. Because February 1990 is the first month of interviews for the 1990 SIPP, it contains approximately 25 percent of the sample, and the reference month October 89 contains data recalled as the first month of the reference period by those interviewed. We have to go to the reference month January 1990 to find data recalled as the first, second, third, and fourth month of the reference period. Individuals are more likely to report changes in the last month of their reference period (month four). Because we are interested in changes, we are careful in taking only those reference months that contain data recalled from the four rotations.
(2) The longitudinal panel eliminates a number of individuals for whom part of the 32 months period is missing.

IV. Month-to-Month Employment Flows

We first use the data to examine worker flows on a month-to-month basis. To do this, each observation -- defined according to month of reference—is seen as an independent interview about jobs in that month plus a retrospective question about jobs in the previous month. The survey contains an employer identifier. We use this variable to define a job as "employment with a given employer." The comparison of employment status in two consecutive months captures changes.[i] We distinguish three types of change. When a person previously out of work becomes employed, there is a job accession. When a person previously working changes employer or becomes self-employed, there is a job transition. When a person previously employed becomes unemployed, or leaves the labor force, there is a job separation. Based on these

definitions, we obtain a count of the number of workers who made labor market transitions in a given month.

Since our sample has varying number of observations, we scale the variable "job change" to the total number of potential changes. This variable can be the labor force, the working-age population, or total employment. We worked with all of them, and the results for the major categories are not significantly different. We finally used employment as a scale factor, in order to make the results comparable to previous studies on job flows. The 1990 and 1991 SIPP files overlap for a period of a year. We examined the month to month flows on the two data sets separately and we found consistent patterns for the overlapping period (Jan 91-May92). We chose to combine the data from the two panels and report here the month to month flows that result from aggregating the data.

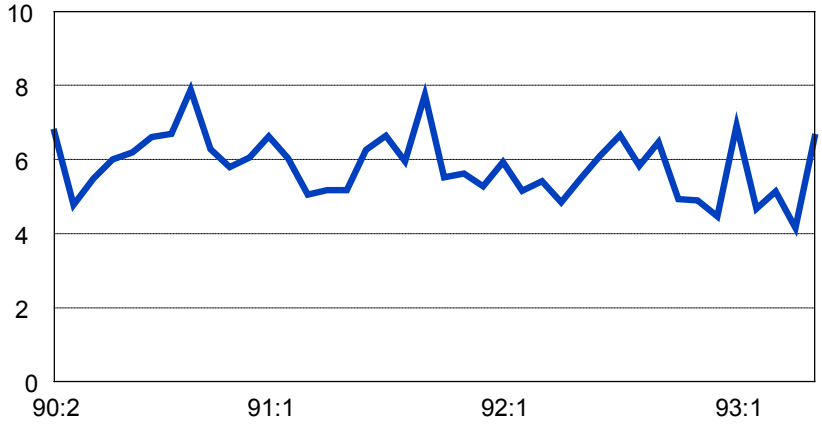
In measuring employment flows, we define gross job creation and gross job destruction in a manner consistent with the approach of Davis and Haltiwanger (1992) described above. However, when using household data, it is necessary to use a slightly different terminology. For example, when an individual experiences a job separation, this may or may not correspond to the destruction of a job at the establishment level. Therefore, when referring to studies using household data we refer to rates of "job accessions" and "job separations," which are defined as gross household flows into and out of employment, again as a fraction of total employment. Using the household data, we can also define job-to-job transfers, which occur when individuals change employers without any period of unemployment in between. We can define total job changes, then, as the sum of job-to-job transfers, job accessions, and job separations.

Job changes are a relatively important phenomenon. We find that between 4.2 and 7.9 percent of each month's labor force experiences a job-related change.[ii] Figure 1 shows the magnitude of gross flows on a month-to-month basis, as estimated from the 1990 and 1991 SIPP files. It is interesting to note that, in spite of the tremendous changes in the structure of employment and the net level of employment in California during this period, total job changes as a percent of total employment were relatively stable. They trend down only slightly over the sample period, which includes one pre-recession year, and two and a half years of recession.

The patterns of job flows are somewhat jagged month-to-month. We examined this feature of the data in an effort to establish if these patterns were "real" or were caused by the characteristics of the survey. For example, the fact that individuals are interviewed every four months, and they are asked questions regarding the entire four-months period, leads to answers about changes that are likely to be bunched up at the end points. Yet, even if respondents have a tendency to date changes at the end of the interview periods, this effect would be spread across time, because the interviews are sequenced. Approximately one quarter of the sample is interviewed each month. There was also the possibility of these being seasonal effects, and we experimented with seasonal adjustments but the data does not follow patterns that are clearly defined within 12 months periods.

Figure 1: Total Job Changes

(Percent of Total Employment)



As Figure 2 indicates, job-to-job transfers did decline as a percent of total employment over the period, as the recession lengthened. On the other hand, job accessions and job separations show no similar cyclical trend. As Figure 3 indicates, the ratios of job accessions to total employment and job separations to total employment display no apparent cyclical pattern. Rather, during most of the period, job separations exceeded job accessions as a percentage of total employment.

Figure 2: Job-to-Job Transfers

(Percent of Total Employment)

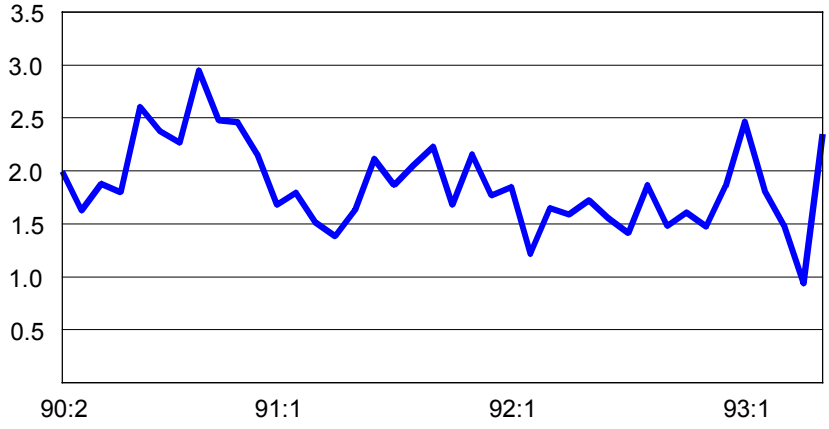
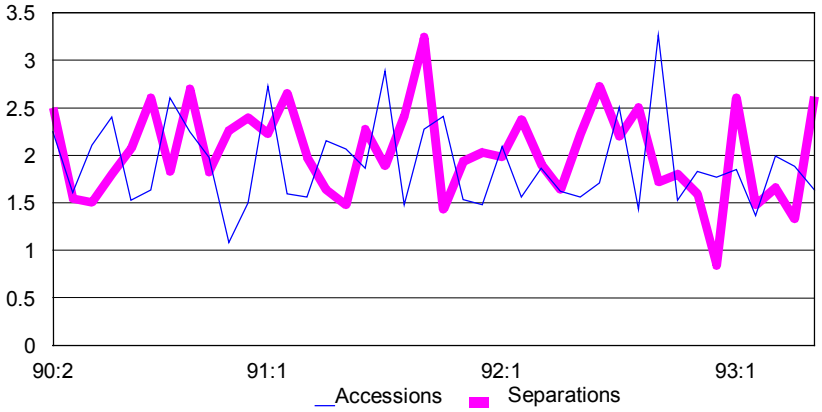


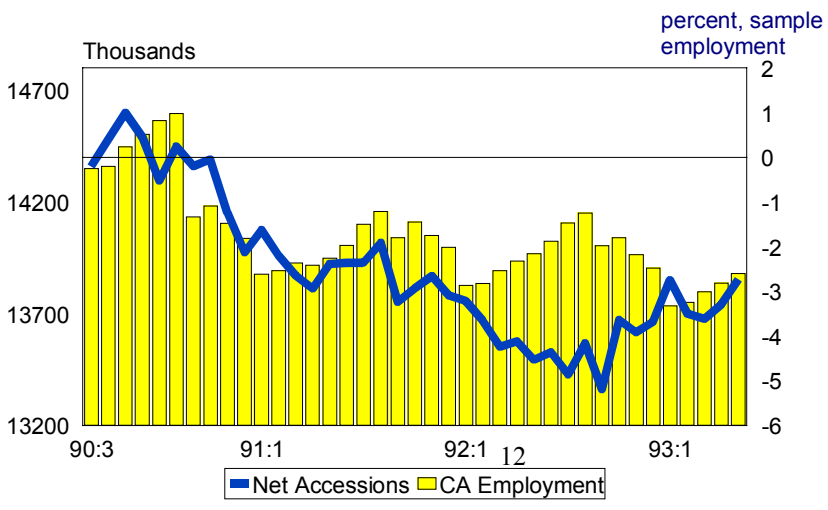
Figure 3: Job Accessions and Separations

(Percent of Total Employment)



The difference between accessions and separations represents a net addition to the number of jobs –if positive—or a net reduction to the number of jobs – if negative. Adding these net changes over time, starting in March 1990, we obtained a new variable, "accumulated net accessions". We present this variable as a percent of total employment in Figure 4, and compare it with the trend in total California employment. Accumulated net job accessions turned negative in mid-1990. From February 1990 until late 1992, these accumulated separations contributed to a total of 5 percent of employment. The ratio of accumulated net accessions to employment began to rise in late 1992, and by the end of the period analyzed, employment was about 3 percent below the February 1992 level. Thus, it is not that job accessions or job separations are cyclical, as many authors have suggested. The trend in aggregate employment appears to be determined by a small one-sided-persistent difference between the average number of job accessions and job separations. Such difference, if negative, will lead to a sizable drop in employment if it persists for any length of time.

Figure 4: Accumulated Net Accessions and CA Employment



A longitudinal view of labor market dynamics

In this section we examine job flows from their longitudinal perspective. The combined panels contain 6,266 individuals observed throughout 32 consecutive months (3,636 from the 1990 panel, and 2,630 from the 1991 panel). The longitudinal dimension of our data allows us to establish, for example, that only *34 percent of the individuals observed continuously made a change and that 66 percent of this sample population never changed labor force status or job* (see Table 4). We find that, of the population that changed labor force status during the period of observation, each of these individuals made about 2.6 moves, on average. Thus, we have 2,139 movers and a total of 5,630 observed moves.

TABLE 4: Basic Characteristics of Panel Sample

Characteristics	Sample Counts	Sample Proportions
Population 16 or older, living in California during the first interview and remaining in the sample throughout the 32 months.	6,266	100
No change in labor force status or employer during the 32 month's period	4,127	65.9
At least one change in labor force status and/or employer during the 32 month's period	2,139	34.1

Source: Calculated from 1990 and 1991 SIPP Panels.

The panel sample is a subset of the SIPP data set, given the fact that some observations are lost due to people moving without notification. It is important to keep in mind that the window of observation is 32 months, although the entire period covered is longer because some individuals are followed early in the period and some are followed later. The unit of observation is the individual who experiences job separations and accessions. Thirty-two months is a period long enough to allow individuals to move from job to job, and enterprises to replace personnel that move voluntarily or turn out to be a poor match. Firm closings and openings can also drive job changes.

The SIPP follows individuals that change state as long as interviewers are able to reach them in their new location. In fact, close to 10 percent of our studied moves are associated to changes in state. There are some missing fields in the data, so we know the state of destination in only 2/3 of the cases where changes of state coincide with job changes. The destinations with highest frequency are; Texas, Oregon, Nevada , and Colorado.

The analysis of the previous section suggests that the recession can be characterized by a persistent negative difference between accessions and separations. This implies that during the recession, unemployed individuals will take more time to get back to jobs than before the recession. We take the sub sample of individuals that

experience a spell of unemployment, for whom we know the month in which they lost their job. We count the duration of the unemployment spell, and organize the results by month of job accession.

Table 5: Duration of unemployment prior to job accession.

(percent of individuals accessing jobs in a quarter who had experienced prior unemployment)

Date	>2 mo.	>3 mo.	>4 mo.	>5 mo.	>6 mo.
1990:2	86	74	58	33	23
1990:3	84	69	55	40	36
1990:4	77	61	53	39	34
1991:1	73	51	40	21	18
1991:2	86	80	71	52	40
1991:3	84	71	62	52	47
1991:4	85	73	61	46	43
1992:1	84	71	63	48	43
1992:2	86	78	70	57	52
1992:3	84	74	62	48	45
1992:4	90	77	70	54	50
1993:1	87	73	68	56	48
1993:2	86	81	75	59	50

Source: Author's based on SIPP data.

Table 5 shows the fraction of unemployed individuals that spent at least two, three, four, five and six months out of work prior to the job accession. We classified the data according to the quarter in which the person accessed a job. The proportion of individuals unemployed 5 months or more prior to accessing a job rises sharply during the recession, indicating an increase in the average duration of unemployment over this time. By mid-1992, half of those individuals who were entering jobs had been unemployed for at least 6 months.

A job-change cycle starts in the month a person leaves an initial job and ends in the month a person is observed working again. We define the time interval between job separation and job accession as the "job change duration." A complete job change cycle can have a duration of 0 (zero) months, if the person is observed leaving a job and getting into another one in the following month, or be a positive number if the person stays out of work for some time. In many cases, we observe only part of the job change cycle. This would be the case if a person is out of work when first interviewed, and becomes employed afterwards, or if a person leaves a job and is not observed working again by the end of the follow-up period.

Table 6: Number of Moves Over Sample Period

Population of Movers by Number of Moves	Sample Counts	Sample Proportions
One	752	35.2
Two	533	24.9
Three	328	15.3
Four	186	8.7
Five	152	7.1
Six	87	4.1
Seven	53	2.5
Eight	22	1.0
Nine	13	0.6
nine or more	13	0.6
Total	2,139	100.0

Source: Calculated from 1990 and 1991 SIPP panels.

Table 6 classifies movers according to number of moves, and Table 7 describes all moves observed according to their duration and completeness. As shown, during the 32 months window of observation 77.6% percent of the moves can be classified as job-to-job transitions, 45 percent with interruption and 32.5 percent with no interruption. Naturally, a fraction of the observed transitions are incomplete in the sense that we observe a person accessing a job and we do not know if he/she had originally been employed, and we observe individuals leaving employment and we do not know if they return to work.

Table 7: Sample of all Moves: Censored and Uncensored
(some individuals move more than once)

Moves	Sample Counts	Sample Proportions
Total Job Changes	5,630	100
Accessions: Out of Work to Work (left censored)	585	10.4
Separations: Work to Out of Work	1,265	22.5
Separations + Accessions: Work to Work w/o interruption	1,833	32.6
Accessions: Out of Work to Work	1,265	22.5
Separations: Work to Out of Work (right censored)	682	12.1

Source: Calculated from 1990 and 1991 SIPP Panel

Table 7 uses the SIPP sample of movers (2,139 individuals), and classifies the moves observed from one period to the next. There are a total of 3,683 accessions. Of these, 585 are left censored, so we do not know the duration or origin of those moves. 1,833 accessions are part of moves completed within a month, and we call them job-to-job transitions. 1,265 accessions are part of a move that has more than a month's duration, and is completed within the 32 months window of observation. There are also 3,780 separations captured in the data. Of these, 682 are right censored, so we do not know the duration or destination of those moves. In our sample, 1,833 separations end in

accessions within a month. The other 1,265 separations are immediately followed by a non-work period, but they end in job accessions within the 32 months period of observation.

We turn to examine the sector of origin and destination of these moves.[iii] Table 8 classifies all the moves that are initiated from a job (3,780 moves) by sector of origin. The first column gives us the sectoral distribution of job separations. The second column shows the number of those separations that ends in a job accession, and column three shows the sub-sample of separations that end in a job accession in the same sector. These numbers can also be seen as transition probabilities, (although the data are censored because some job transitions are incomplete by the end of the sample period.) The aggregate counts indicate that about 82 percent (3,098/3,780) of the moves from a job end in another job, and that about 49 percent (1,837/3,780) end in the same sector of origin. The probabilities of moving from a job to another job are similar for all sectors. The probability of returning to the same sector is relatively high in primary activities (agriculture, fishing & forestry and mining), construction, and skilled services[iv], and much lower in other sectors, with public services being an extreme low turnover sector. There are some obvious reasons for these differences; chief among them is the seasonality in primary activities and the normal contract cycle around tasks in construction.

Job interruptions, even when they are followed by a return to the same employer, are classified as changes with our methodology. Thus, some of the differences in rotation across sectors may be caused by short unemployment spells followed by a recall by the same employer. The literature on unemployment insurance has shown that the imperfect system of experience-rating in funding unemployment insurance generates an incentive to rely on short employment interruptions and claim unemployment insurance, rather than reduce hours, when production slows down temporarily (see Feldstein, 1976).

Table 8: Moves initiated from a job, by sector of origin

Sector of origin	Moves Initiated from a job	and ending in a job	and ending in the original sector
Primary	211	177	119
Construction	273	244	152
Non Durable Manufacturing	167	129	54
Durable manufacturing	379	311	137
Transportation	161	127	58
Trade	795	649	351
Other Services (unskilled)	407	302	138
Other Services (skilled)	1375	1150	826
Public Administration	12	12	2
Total	3,780	3,098	1,837

Source: Calculated from 1990 and 1991 SIPP Panels.

We then examine all the moves that end on a job (3,683), and the corresponding sector of destination. The results, shown in Table 9, describe the sectoral distribution of job accessions during the sample window. Of all the job accessions initiated from a job (3,098), close to 60% were originated from within the same sector. In the specific case of durable manufacturing, 48% of job accessions originated from that same sector. We examined the sectoral distribution of those workers that made job transitions out of durable manufacturing. We found that 36 percent returned to durable manufacturing and 19 percent went to skilled services.

Table 9: Moves ending in a job, by sector of destination

Sector of destination	Moves ending in a job	and initiated from a job	and initiated in the same sector	and initiated in durable manufacturing
Primary	213	172	119	9
Construction	243	224	152	13
Non Durable Manufacturing	162	132	54	13
Durable manufacturing	322	286	137	137
Transportation	165	142	58	15
Trade	768	604	351	33
Other Services (unskilled)	444	333	138	20
Other services (skilled)	1,359	1,199	826	71
Public Administration	7	6	2	0
Total	3,683	3,098	1,837	311

Source: Calculated from 1990 and 1991 SIPP Panels.

Notice that these distributions represent flows out of or into sectors, and are not representative of the allocation of employment by sector (stock of jobs) in a particular moment. Yet, flows into and out of sectors constitute net employment changes as seen from the point of view of a sample of individual workers. Thus, the left side columns of numbers in tables 8 and 9 can be combined to calculate both gross flows and the net change in employment by sector. This is done in Table 10. Column (3) is the sum of the absolute number of job separations (column (1) of Table 8) and absolute number of job accessions (column (1) of Table 9). Column (4) on Table 10 represents the net change in employment in each sector. For example, durable manufacturing lost 57 jobs throughout the 32 months period, while unskilled services gained 37.

Table 10 illustrates the relative dimension of net flows and gross flows across sectors. We use as a benchmark for gross flows, the number of month-jobs in each sector for the entire period. We define a job as a position held during a given month, and we calculate that 6.8 out of 100 existing jobs see a change on any given month.[v] Sector averages vary a bit around the mean. The highest relative volume of gross flows is seen in primary sectors and construction, where as many as 11 out of every 100 monthly positions change workers. Trade and unskilled services follow, with about 10 out of 100

monthly positions changing workers. The lowest relative rates of gross flows are in public administration, followed by transportation and durable manufacturing, where about 2.3 out of every 100 monthly positions change workers.

Table 10: Gross and Net Flows as a percentage of Number of Jobs

Sector	Total Month-Jobs	Gross Flows	Net Flows	Rotations	Month-to-month rotation rate (%)	Net Flows relative to monthly jobs (%)	Net Flows relative to rotations (%)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Primary	3,781	424	+ 2	211	5.6	0.05	+0.9
Construction	5,494	516	-30	243	4.4	-0.55	-12.3
Non Durable Manufacturing	5,738	329	- 5	162	2.8	-0.09	-3.1
Durable manufacturing	15,624	701	-57	322	2.1	-0.36	-17.7
Transportation	7,758	326	+ 4	161	2.1	0.05	+2.5
Trade	18,169	1,563	-27	768	4.2	0.15	-3.5
Other services (unskilled)	8,717	851	+37	407	4.7	0.42	+9.1
Other services (skilled)	43,881	2,734	-16	1359	3.1	-0.04	-1.2
Public Administration	824	19	- 5	7	0.8	-0.61	-71.4
Total	109,986	7,463	-97	3713	3.38	-0.09	-2.6

Source: 1990 and 1991 SIPP Panels.

We define the number of *job rotations* as the number of job separations which are offset by job accessions. Job rotations can be estimated for the aggregate or for a given category of employment, such as sector. The gross flow (the sum of all job separations and accessions) will equal two times the number of job rotations plus the absolute value of net flows. If the net flow is zero, then, the overall gross flow would be divided in an equal number of separations and accessions.

$$\text{Job rotations} = \frac{\text{gross flow} - |\text{net flow}|}{2}$$

We define the month-to-month job rotation rate as:

$$\text{Month-to-month rotation rate} = \frac{\text{Total number of job rotations}}{\text{Total month-jobs}}$$

We can also express the net flow as a percentage of job rotations. For example, in the case of construction, the net flow is -30 and the gross flow is 516. There were 243 complete rotations (243 job accessions and 243 offsetting job separations) and 30 additional job separations. Relative to the level of employment in the sector, we calculate that there was a 4.4 percent rotation per month, and a net separation of 0.55 jobs for every 100 each month. The ratio of these two numbers is a measure of the depth of the net effect relative to the normal rotation of the sector.

In the aggregate, we find that during the period 1990-93, there was typically a rotation (separations offset by accessions) of 3.38 for every 100 jobs each month. In addition, there were a small and persistent number of separations not offset by accessions. We calculate those separations to be equivalent to 0.09 per cent of jobs per month. These net separations (or net changes) can also be compared to the average rotation per month. We estimate that this net change in the number of workers in jobs was equivalent to 2.6 percent of the total rotation of jobs. In short, it takes a small difference between job accessions and job separations in one direction or the other, for the overall level of employment to rise or fall.

The small net change in employment for the overall sample masks important differences across sectors. For example, in the public sector there is a much lower rate of month-to-month rotation than in the other sectors, resulting in rapid accumulation of job separations or job accessions when flows move in any direction. The idea that an expansion or contraction in the number of workers employed in a given sector has more or less of a cyclical effect is worth further study. It means, for example, that if there are reductions in public sector employment, they tend to have a larger marginal impact on the overall level of employment that same size reductions in employment in private services or construction. During the period in question we calculate that out of every 100 jobs in the public sector, there were 0.8 separations offset by 0.8 job accessions, plus 0.61 additional jobs separations without equivalent accessions each month. These flows resulted in a relatively fast accumulation of net separations throughout the period. But public administration is a relatively small sector and its impact does not have much influence over the aggregate level of employment.

Durable manufacturing is characterized by a relatively low rotation rate but, unlike the public sector, it represents more than 14 percent of total employment. The combination of low rotation and large size -relative to total employment- suggests that the employment reductions in durable manufacturing are likely to have a more lasting impact on the labor market than the same employment reduction in other sectors. We calculate that in a typical month of our survey, there were 2.1 accessions for every 100 jobs in durable manufacturing. But, during the period in question, there were 2.46 separations for every 100 jobs, leaving 0.36 separations per 100 jobs not offset with a corresponding accession. The accumulation of these separations through time, given the size of the sector, made it a major contributor to the overall cycle of the region. If we add the monthly separations for a 32-month period, this gives us a decline of 11.5 percent of durable manufacturing employment, or a 1.6 percent of total employment. This finding is

consistent with Ritter's (1994) observation based on establishment data, that job creation and destruction in manufacturing has contributed disproportionately to fluctuations in aggregate employment.

Although it is beyond the scope of this paper to find explanations for the differences in rotation by sector, the literature on labor dynamics can illuminate this issue. The variables that determine the costs of adjusting employment are the first candidates to include as possible explanations. Hamermesh (1993) cites a number of studies and suggests that unionization, penalties against dismissals, and training costs tend to slow adjustment. These factors are known to vary significantly by sector. Adjustment costs are also likely to vary with labor-market tightness, which is a function of the type of skill and the local labor market in question.

The rate of month-to-month rotation shown in column (6) of Table 10, can be used to gauge the significance of month to month job accessions and separations by sector. In durable manufacturing, for example, we should expect that job separations of the order of 2.1 percent of total employment would be typically offset by equivalent job accessions. But, job separations beyond 2.1 percent of total employment will contribute to an overall reduction in employment, unless they are offset by above normal accessions or net expansion in other sectors.

VI. Conclusions

This paper analyzes the specific case of California in the early 1990s, when aggregate employment levels suffered a sharp decline. What we find is that these changes in the aggregate level of employment were just the tip of a much larger movement of workers across jobs, and into and out of employment. In fact, we find large gross flows in the California labor market over the entire period studied, which includes pre-recession months in 1989 and 1990, as well as the period of downturn, which continued through the end of our sample period in mid-1993.

We find that the recession had the most visible impact on the overall rate of job-to-job transfers (employment changes without any period of unemployment in between). These types of job change (many of them probably voluntary) declined sharply as the recession lengthened. The duration of unemployment also rose sharply during the recession. By the second quarter of 1993, over 50 percent of individuals acquiring new jobs in our panel had been unemployed for 6 months or longer.

Finally, we suggest the use of a measure that we call average *job rotations* (defined as the number of job accessions in a sector which are offset by job separations) to help characterize the gross flows of employment within a particular sector. For a sector, the gross flow (the sum of all job openings and all job closings) will equal two times the number of average job rotations plus the absolute value of net flows. Looking across sectors, we find some differences in average rotation rates. These rotation rates are

lowest in the manufacturing, public administration, skilled services, and transportation sectors. In these sectors characterized by low rotation rates, job closings have a relatively larger marginal effect on total employment.

As expected, we find that for California in the early 1990s, net separations from durable manufacturing are substantial in absolute number. The combination of increases in the rate of job separations and a low average rate of job rotation accounts for the big observed decline in employment for that sector. However, to put this in another perspective, we can compare net exits from durable manufacturing to the total rotation in one of the faster rotating sectors - skilled services. We find that net exits from durable manufacturing represent only about 4 percent of the total rotation in skilled services during the same period. This suggests that those that exited durable manufacturing had significant room to move into skilled services, and that those in transition from skilled services had more competition for the sector's jobs than normal.

Our results make a contribution to the growing literature on labor market turnover, and in particular we are able to put the structural changes in employment that occurred in California in the early 1990s within the broader context of the state's labor market dynamics. The story of aggregate employment in California in the early 1990s is well known: cutbacks in defense expenditures led to large layoffs in durable goods manufacturing, causing a severe recession marked by an unusually severe decline in total employment. However, what our study suggests, is that while these declines in aggregate employment were impressive, they represented only 2.6 percent of all job separations over this period! What this means is that, even during the recession, the vast majority (i.e., 97.4 percent) of all job separations were offset by job accessions elsewhere in the economy. These results call for a careful examination of the data to establish how the labor market experience of individuals exiting durable manufacturing compared to that of individuals exiting other sectors, such as skilled services. Such analysis can help improve the focus of government programs designed to help workers adjust to structural changes.

References

Abowd, John and Arnold Zellner. 1985. "Estimating Gross Labor Force Flows." Journal of Economic and Business Statistics, Vol. 3, pp.254-283.

Blanchard, Olivier Jean, and Peter Diamond. 1990. "The Cyclical Behavior of the Gross Flows of US Workers." Brookings Papers on Economic Activity, Vol.2, pp.85-155.

Blanchflower, David G. and Simon. M. Burgess. 1996. "Job Creation and Job Destruction in Great Britain in the 1980s." Industrial and Labor Relations Review, Vol.50, No.1 (October), pp.17-38.

Borland, Jeff. 1996. "Job Creation and Job Destruction in Manufacturing Industry in Australia." The Economic Record, Vol.72, No. 216 (March), pp.46-62.

Davis, Steven J. and John Haltiwanger. 1992. "Gross Job Creation, Gross Job Destruction, and Employment Reallocation." Quarterly Journal Of Economics, Vol. 107, No.3 (August), pp.819-863.

Feldstein, Martin (1976): "Temporary Layoffs in the Theory of Unemployment." *Journal of Political Economy,* 84: 937-58.

Gottschalk Peter, and Robert Moffitt (1998): "Changes in Job and Earnings Instability in the Panel Study of Income Dynamics and the Survey of Income and Program Participation." (Manuscript) June.

Hamermesh, Daniel S. 1993. Labor Demand. Princeton, NJ: Princeton University Press.

Jaeger, David A. and Ann Huff Stevens (1998) "Is Job Stability in the United States Falling? Reconciling Trends in the Current Population Survey and Panel Study of Income Dynamics." Cambridge, MA: National Bureau of Economic Research. Working Paper #6650. July.

Kodryzcki, Yolanda K. 1996. Laid-Off Workers in a Time of Structural Change," New England Economic Review, July/August, p.3-26.

Poterba, James and Lawrence Summers. 1986. "Reporting Errors and Labor Market Dynamics," Econometrica, Vol. 65, pp.1319-1338.

Mortensen, Dale T. 1994. "The Cyclical Behavior of Job and Worker Flows," Journal of Economic Dynamics and Control, vol.18, pp.1121-42.

Ritter, Joseph A. 1993. "Measuring Labor Market Dynamics: Gross Flows of Workers and Jobs." Review of the Federal Reserve Bank of St. Louis (Nov./Dec.), pp.39-57.

Ritter, Joseph A. 1994. "Job Creation and Destruction: The Dominance of Manufacturing," Review of the Federal Reserve Bank of St. Louis, (Sept./Oct.), pp.3-11.

Ryscavage, Paul. 1992. Job Creation During the Late 1980s. US Bureau of the Census. Current Population Reports, Series P70, No.27. Washington D.C.:GPO.

Schoeni, Robert F. and Michael Dardia. 1998. "Special Government Assistance to Defense-Department Industry Workers: The Case of the Aerospace Industry," Contemporary Economic Policy, Vol. 16 no. 3 (July) pp. 251-267.

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[i] This definition is applied to all panel observations (individuals that are followed the entire period). In those cases where individual observations are missing for some of the 32 months, we measure changes comparing only the observed pairs of consecutive months.

[ii] These numbers can be compared to other estimates of monthly flows summarized in Table 2.

[iii] The sector composition of month-jobs captured in the panel is not entirely consistent with the sector composition of employment reported by the EDD for 1992, which corresponds to the midpoint of the period examined. This is because the objective of the Survey of Income and Program Participation is to do poverty-related research, and the survey oversamples the poor population (see Allen et.all., 1993). This oversampling is one of the factors that affect the sector distribution of employment captured.

[iv] We used the three-digit occupation classification to create the skilled-unskilled job categories. Our definition of skilled aimed at capturing "marketable skills." All professionals, administrators/supervisors, and service occupations that require entry qualifications beyond high-school were considered skilled-jobs. In farming, fishing, and forestry, administrators, supervisors, specialized workers, and inspectors are considered skilled. Most precision production, craft, and repair occupations were classified as skilled, except apprentices and non-specialized workers. Machine operators were classified as unskilled because their training is typically machine or firm' specific. Truck drivers were considered skilled, but taxi drivers were considered unskilled. Jobs in the construction sector except in supervision, administration, mechanics, and repair, were considered unskilled.

[v] In spite of the fact that this average number is estimated out of the SIPP panel, which is a sub sample of the SIPP data set, the estimate is within the range of monthly gross flows presented in Figure 1, which are estimated from the SIPP data set.