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Authors

Khan, Akhtar
Martin, Philip
Hardiman, Phil

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Expanded production of labor-intensive crops increases agricultural employment

Akhtar Khan
Philip Martin
Phil Hardiman

The production of labor-intensive fruit, vegetable and horticultural specialty crops increased in the 1990s, as did the employment of farmworkers: average annual employment or roughly the number of year-round equivalent jobs rose about 20%, to almost 400,000. Far more individuals, however, are employed on California farms during the year. Agricultural employers reported 1.1 million individuals (unique Social Security numbers) when they paid unemployment insurance taxes in 2001. We analyzed the jobs and earnings of these farmworkers in 1991, 1996 and 2001. About three individuals were employed for each year-round equivalent job in the 1990s, and there was a shift to farmers hiring workers via farm labor contractors. The findings suggest that it may be possible to employ a smaller total farm workforce, with each worker employed more hours and achieving higher earnings.

California has the largest and most complex agricultural labor market in the United States, reflecting seasonal employment demands, the predominance of immigrant workers and the significant role of labor contractors in matching workers and jobs. Whether measured in sales, production or acres, California agriculture expanded in the 1990s (table 1). Farm sales reached \$27 billion in 2000, with about 77 million tons of crops produced on 8.8 million acres. More than half of these sales (with 49 million tons of produce on 3.8 million acres) were in fruits and nuts, vegetables and melons, and horticultural specialties (FVH), such as flowers and nursery products. Rising yields



Labor-intensive crops such as fruits and nuts, vegetables and melons, and horticultural specialties now account for more than half of California farm sales. An analysis found that 1.1 million workers are doing the equivalent of 400,000 year-round agricultural jobs in California. In Watsonville, farmworkers harvest strawberries.

meant that more tons of vegetables were produced from the same acreage, while acreage of fruits and nuts rose from 2 million acres in 1990 to 2.4 million acres in 2000, a 19% increase over the 1990s.

Many FVH commodities are labor intensive, with labor accounting for 15% to 35% of production costs. Most of the workers employed on FVH farms are immigrants from Mexico, and a significant percentage are believed to be unauthorized (fig. 1).

In recent years, several proposals have aimed to reduce unauthorized worker employment in agriculture (see page 4). In September 2001, Mexican President Vicente Fox called for a U.S.-Mexico labor migration agreement so that "there are no Mexicans who have not entered this country [U.S.] le-

gally, and that those Mexicans who come into the country do so with proper documents. Regularization does not mean rewarding those who break the law. Regularization means that we give legal rights to people who are already contributing to this great nation." President George Bush agreed: "When we find willing employer and willing employee, we ought to match the two. We ought to make it easier for people who want to employ somebody, who are looking for workers, to be able to hire people who want to work" (Migration News 2001).

The United States and Mexico appeared close to agreement on a program to legalize farm and other workers before September 11, 2001. However, after the war on terror was declared, the momentum for a new

TABLE 1. Harvested acres of California crops, 1991–2000

Year	Field crops		Fruits and nuts		Vegs and melons	
	Acreage	Production	Acreage	Production	Acreage	Production
		tons		tons		tons
1990	5,233,715	25,141,401	2,002,650	13,051,525	1,185,790	21,149,460
1991	4,750,498	24,245,313	1,998,900	11,053,475	1,099,764	21,770,010
1992	4,926,284	24,731,653	2,012,500	13,492,350	1,061,976	18,659,660
1993	4,693,600	24,238,996	2,047,700	13,403,875	1,223,556	21,795,467
1994	4,913,800	25,980,008	2,092,350	13,748,800	1,327,502	25,047,912
1995	4,910,200	25,353,756	2,094,470	12,474,300	1,289,906	23,556,849
1996	5,029,000	25,276,521	2,155,050	13,112,150	1,382,228	25,252,871
1997	5,292,499	28,096,228	2,211,070	15,419,680	1,243,758	23,377,219
1998	5,161,274	26,875,266	2,249,650	13,359,825	1,351,526	28,028,170
1999	5,160,073	28,652,304	2,321,400	12,791,700	1,459,396	34,543,286
2000	5,035,220	28,528,069	2,383,760	15,486,300	1,380,064	33,077,470
1990–96	-3.9%	0.5%	7.6%	0.5%	16.6%	19.4%
1996–00	0.0%	13.0%	11.0%	18.0%	0.0%	31.0%

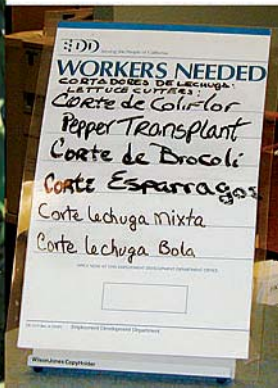
Source: CASS 2002.



Edwin Remsburg/CSREES-USDA



Edwin Remsburg/CSREES-USDA



The authors argue that the efficiency of the farm labor market could be improved so that fewer workers are each employed more hours and achieve higher earnings. *Left*, begonia bulbs are produced in Marina. *Center*, Angelberto

Sanchez prunes orange trees at the UC Lindcove Research and Extension Center in Exeter. *Right*, the California Employment Development Department (EDD) connects workers with jobs in Calexico, free of charge.

guest-worker program and the legalization of immigrants already in the country slowed. In summer 2003, there were several new proposals for a migration agreement with Mexico to legalize the status of currently unauthorized workers and allow some to earn immigrant status by working and paying taxes in the United States. There is little agreement, however, on what impacts such a program would have on California's farm labor market.

We used a unique database to examine farm employment trends in California agriculture. The data suggests that: (1) about three individuals are employed for each year-round equivalent job, helping to explain low farmworker earnings; (2) there was a shift in the 1990s from crop farmers hiring workers directly to farmers hiring via farm labor contractors (FLCs); and (3) there is considerable potential to improve farm-labor market efficiency, by using a smaller total workforce with each worker employed more hours and achieving higher earnings.

Average, peak and total employment

California employers who pay \$100 or more in quarterly wages are required to obtain an unemployment insurance (UI) reporting number from the California Employment Development Department (EDD). The EDD then assigns each employer or reporting unit a four-digit Standard Industrial Classification (SIC) or, since 2001, a six-digit North American Industry Classification System (NAICS) code that reflects the employer's major activity (US Census Bureau 2002). Major activities are grouped in increasing levels of detail;

for example, agriculture, forestry and fisheries are classified as a major industrial sector and, within this sector, SIC 01 is assigned to crops, 017 to fruits and nuts and 0172 to grapes.

We defined "farmworkers" as unique Social Security numbers (SSNs) reported by farm employers to the EDD, and then summed their California jobs and earnings. This enabled us to answer questions such as how many farm and nonfarm jobs were associated with a particular SSN or individual in 1 year, and in which commodity or county a person had maximum earnings.

We adjusted the raw data before doing the analysis. Farm employers have reported their employees and earnings each quarter since 1978, when near-universal UI coverage was extended to agriculture. Although it is sometimes alleged that farm employers, especially FLCs, do not report all their workers or earnings, there is no evidence that underreporting of employees or earnings is more common in agriculture than in other industries that hire large numbers of seasonal workers, such as construction. We excluded from the

analysis SSNs reported by 50 or more employers in 1 year (there were 602 such SSNs and 59,776 wage records [jobs] in 2001). We also excluded wage records or jobs that had less than \$1 in earnings and jobs, or that reported earnings of more than \$75,000 in one quarter. These adjustments eliminated from the analysis 2,750 SSNs, 62,571 wage records or jobs and \$803 million in earnings. These exclusions were about 0.25%, 2.7% and 6.1% of the totals, respectively, and are documented more fully in Khan et al. (2003).

There is no single explanation for the outlier data we excluded. In some cases, several workers may share one SSN, while in others our suspicion that a SSN had "too many" jobs may represent data-entry errors.

During the 1990s, the Social Security Administration cleaned up SSNs, including threatening to fine and reject tax payments from employers with too many mismatches between SSNs and the names associated with those SSNs, which should have reduced the number of SSNs reported by employers. We think the rising number of SSNs reflects

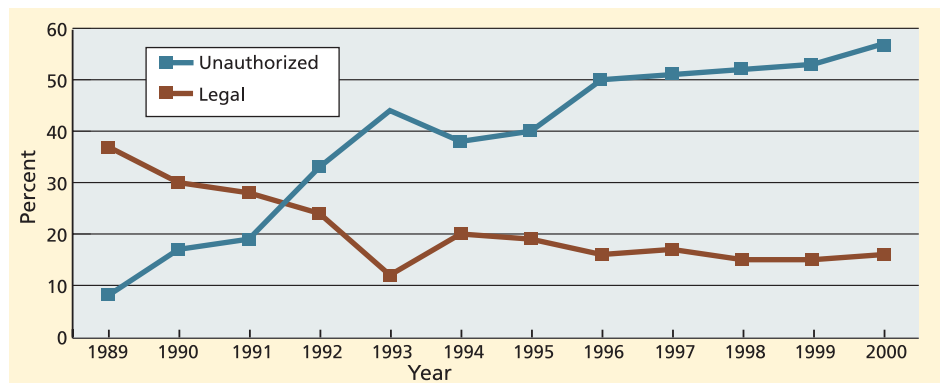


Fig. 1: Legalized and unauthorized farmworkers, 1989–2000. Source: NAWS 2001.

TABLE 2. Average agricultural employment, unique SSNs and jobs held: 1991, 1996, 2001

	1991	1996	2001
Average agricultural employment*	342,000	408,300	388,000
Unique SSNs	907,166	966,593	1,086,563
SSN/employee ratio	2.7	2.4	2.8
SSNs with one job	54%	56%	53%
Two jobs	26%	25%	26%
Three jobs	12%	12%	12%
Four jobs	5%	5%	5%
Five or more jobs	3%	2%	4%

* Monthly employment summed and divided by 12 months, drawn from EDD Current Employment Statistics (CES) program. Source: CES estimates and analysis of wage records by EDD (2003) Labor Market Information Division.

more individuals employed in agriculture, not more noise in the data.

Employees, jobs and earnings

Agricultural employment can be measured in three major ways: at a point in time, as an average over time or by counting the total number of individuals employed over some period of time. In the nonfarm labor market the three employment concepts yield similar results. If 100 workers are employed during each month and there is no worker turnover from month to month, then point in time, average and total employment is 100. However, agricultural employment during the six summer months may be 150, versus 50 during the six winter months, meaning that point, average and total employment counts differ.

We began with all SSNs reported by agricultural employers (SIC codes 01, 02 and 07), summed the jobs and earnings of these SSNs within each SIC code, and assigned each SSN to the four-digit SIC code in which the worker had the highest earnings. This means that a SSN reported by a grape employer (0172) as well as by an FLC (0176) would be considered a grape worker if his highest-earning job was in grapes.

The number of individuals or unique SSNs reported by California agricultural employers has been stable over the past decade — 907,166 in 1991, 966,593 in 1996 and 1,086,563 in 2001 (table 2). However, average agricultural employment peaked in 1996 and then fell to 388,000, suggesting that more workers shared fewer jobs in 2001. (It is possible, but not likely, that the increased number of individual

TABLE 3. Farmworkers and farm jobs: 1991, 1996, 2001

SIC	Industry title	Jobs	Employees	Earnings	Average earnings	Average earnings
					\$ millions	\$/job
1991						
01, 02, 07	Agriculture	1,540,769	907,166	8,558	5,555	9,434
01	Production (crops)	684,130	482,511	3,943	5,763	8,171
02	Production (livestock)	59,428	55,535	893	15,035	16,089
07	Services	794,948	524,344	3,711	4,669	7,078
071, 072, 076	Farm services	646,215	432,794	1,986	3,074	4,590
074, 075, 078	Nonfarm services	148,733	136,902	1,725	11,597	12,600
Subtotal	All nonag	407,449	376,480	2,585	6,344	6,866
50-59 & 70-89	Trade and services as % of all nonag jobs	57.8%	56.8%	52.0%		
Total	Ag and nonag	1,948,218	1,283,646	11,143	5,720	8,681
1996						
01, 02, 07	Agriculture	1,705,616	966,593	9,236	5,415	9,555
01	Production (crops)	694,238	498,268	4,026	5,800	8,081
02	Production (livestock)	54,496	51,368	830	15,224	16,151
07	Services	953,261	589,032	4,369	4,584	7,418
071, 072, 076	Farm services	786,422	489,633	2,428	3,088	4,960
074, 075, 078	Nonfarm services	166,839	152,422	1,941	11,634	12,734
Subtotal	All nonag	453,000	408,265	2,718	6,000	6,657
50-59 & 70-89	Trade and services as % of all nonag jobs	60.3%	58.8%	55.5%		
Total	Ag and nonag	2,158,616	1,374,858	11,954	5,538	8,695
2001						
01, 02, 07	Agriculture	1,809,503	1,086,563	11,128	6,150	10,241
01	Production (crops)	630,428	474,195	4,027	6,388	8,493
02	Production (livestock)	68,575	63,854	945	13,774	14,792
07	Services	1,107,796	721,655	6,144	5,546	8,514
071, 072, 076	Farm services	817,708	507,231	2,530	3,094	4,987
074, 075, 078	Nonfarm services	290,088	264,366	3,614	12,459	13,671
Subtotal	All nonag	697,334	609,746	4,629	6,638	7,592
50-59 & 70-89	Trade and services as % of all nonag jobs	59.7%	57.9%	55.0%		
Total	Ag and nonag	2,506,837	1,696,309	15,757	6,286	9,289

Source: Analysis of wage records by EDD (2003) Labor Market Information Division.

workers needed to produce the increased tonnage worked only outside the pay periods containing the 12th of each month in a given quarter. The 12th of the month is the pay period for which employers are asked to report employee numbers.) Farmworkers had a total of 1.5 million farm jobs in 1991, 1.7 million in 1996 and 1.8 million in 2001. One-quarter also had at least one nonfarm job — about 407,000 workers were both farm and nonfarmworkers in 1991, 453,000 in 1996 and 697,000 in 2001 (table 3).

The total California earnings of persons employed in agriculture were \$11.1 billion in 1991, \$12.0 billion in 1996 and \$15.8 billion in 2001 (all in 2001 dollars). (We converted earnings in 1991 and 1996 to 2001 earnings using the Employment Cost Index [ECI] for private industry in the western region, for wages and salaries only. We adjusted earnings using the ECI rather than the Consumer Price Index [CPI]

because the ECI measures changes in the price of labor including wages and salaries, while the CPI measures changes in the price of goods and services. Because the ECI specifically measures wage changes, the U.S. Bureau of Labor Statistics [1997] strongly recommends using the ECI when converting nominal wages to real wages.) The share of total earnings for farmworkers from agricultural employers was 77% in 1991, 77% in 1996 and 71% in 2001, indicating that in the late 1990s, farmworkers tended to increase their supplemental earnings via nonagricultural jobs.

Average earnings per job were highest in livestock, \$13,800 per job in 2001. There was little difference between average earnings per job in agricultural services (\$5,500) and crops (\$6,400). Average earnings per job were higher for the nonfarm jobs of agriculture workers (\$6,600) than for agriculture jobs (\$6,200).

TABLE 4. Earnings of primary employees (\$), 2001

Industry	SIC	Primary workers	Mean earnings	Std. dev.	Median earnings	Hours worked \$8.02/hr*	25th percentile earning	Hours worked \$6.25/hr	75th percentile earning	Hours worked \$10/hr	Total earnings
							\$		\$		\$ millions
Cotton	0131	7,409	15,156	15,705	12,243	1,527	3,692	591	21,622	2,162	112
Vegs and melons	0161	55,052	11,518	13,721	8,107	1,011	3,036	486	15,226	1,523	634
Berry crops	0171	32,018	7,958	8,756	6,735	840	3,486	558	10,029	1,003	255
Grapes	0172	66,199	8,799	13,287	4,662	581	1,518	243	10,572	1,057	583
Tree nuts	0173	12,453	10,654	13,084	6,278	783	2,160	346	15,274	1,527	133
Citrus fruits	0174	5,367	11,923	13,612	7,597	947	2,665	426	17,480	1,748	64
Deciduous tree fruits	0175	23,220	6,116	8,082	3,960	494	1,530	245	7,633	763	142
Fruits and tree nuts†	0179	12,523	9,275	11,237	5,972	745	2,226	356	12,960	1,296	116
Ornamental nursery	0181	49,635	17,753	19,872	13,357	1,665	5,410	866	21,252	2,125	881
Food crops grown under cover	0182	6,109	22,764	18,227	20,504	2,557	9,491	1,519	29,465	2,947	139
General farms, primarily crop	0191	41,211	9,633	13,176	5,444	679	1,710	274	13,274	1,327	397
Beef cattle feedlots	0211	1,120	17,205	16,281	14,796	1,845	5,678	908	22,985	2,299	19
Dairy farms	0241	20,167	17,767	12,099	18,030	2,248	7,990	1,278	25,150	2,515	358
Soil prep services	0711	2,630	21,069	23,021	12,886	1,607	5,684	909	29,740	2,974	55
Crop prep svcs/market	0723	54,416	12,707	17,608	7,445	92	2,92	467	15,432	1,543	691
FLCs	0761	225,934	4,385	6,171	2,650	330	634	101	6,172	617	991
Farm manage svcs	0762	15,974	11,991	16,304	6,724	838	2,265	362	16,500	1,650	192
Lawn/garden svcs	0782	109,402	14,454	15,131	11,264	1,404	4,615	738†	18,934	1,893	1,581

* USDA-NASS (2003) reported that annual average earnings of field and livestock workers in 2001 were \$8.02 per hour; California minimum wage was \$6.25 per hour in 2001.

† Not elsewhere classified.

Source: Analysis of wage records by EDD (2003) Labor Market Information Division.

Primary farmworkers and jobs

In 2001, California's farmworkers held 2.5 million jobs, including 1.8 million jobs with agricultural employers. These agricultural jobs included 630,000 in crops, 69,000 in livestock and 1.1 million in agricultural services. The agricultural services sector includes both farm and nonfarm activities, such as veterinary and lawn and garden services; FLCs accounted for 70% of the employees reported by farm agricultural services. Fruits and nuts accounted for 53% of the crop jobs, dairy for 39% of the livestock jobs and FLCs for 58% of the agricultural services jobs. The major change between 1991 and 2001 was the drop of 54,000 jobs in crop production and increase of 313,000 jobs in agricultural services.

We placed SSNs in the detailed commodity or SIC code that reflected the maximum reported earnings for the worker, and considered workers to be primarily employed in the SIC with maximum earnings. In 2001, there were 877,000 primary farmworkers, and they included 322,000 reported by crop employers, 50,000 reported by livestock employers and 504,000 reported by agricultural service employers. Fruit and nut employers accounted for 47% of the crop-reported workers, dairy for 40% of the livestock-reported workers and

FLCs for 44% of the agricultural services-reported workers.

The major change between 1991 and 2001 was the increase in number of SSNs with their primary (highest earning) job in agriculture — from 758,000 to 877,000. There was a slight drop in the number of workers reported by crop employers, a slight increase in livestock workers and a sharp 135,000 increase in agricultural services workers, anchored by a 59,000 increase (to 226,000) in workers reported by FLCs in 2001.

Most farmworkers had only one job. In 2001, 53% of the SSNs were reported by only one employer to the EDD, 26% were reported twice, 12% three times, 5% four times and 4% five or more times. During the 1990s, about 65% of farmworkers (SSNs) were reported by one agricultural employer only, 17% to 21% by two agricultural employers, 5% by at least two agricultural employers and one nonfarm employer, and 9% to 12% by one farm and one nonfarm employer.

In the three-digit SIC codes representing more detailed commodity sectors, 60% to 83% of the employees had only one job. For example, in 2001 79% of the employees reported by dairy farms had one dairy farm job, while 7% also had a second agricultural job — 3% had a dairy job, a second farm job

and a nonfarm job, and 11% had a nonfarm job in addition to the dairy job. About two-thirds of the employees of FLCs and farm management companies had only jobs with one such employer; 22% had another farm job; 6% had an FLC job, another farm job and a nonfarm job; and 6% had a nonfarm job in addition to the FLC job.

Even more detailed four-digit SIC codes showed the same pattern: the commodities or SICs most likely to offer year-round jobs such as dairies and mushrooms (food crops grown under cover) had 70% to 80% of employees working only in that commodity, while commodities or SICs offering more seasonal jobs, such as deciduous tree fruits and FLCs, had 53% to 63% of employees working only in that commodity. At the four-digit, SIC-code level, the five largest SICs (FLCs, ornamental nursery products, crop preparation services [custom harvesters], grape employers, and vegetable and melon employers) accounted for about 45% of the agricultural wages reported.

Earnings, estimates of hours worked

Agricultural employers (SIC 01, 02 and 07) paid a total of \$11 billion in wages in 2001, an average of \$10,200 per worker (table 3). Earnings were highest for the 64,000 workers primarily employed in livestock; they aver-

aged \$14,800, followed by those primarily employed by crop employers (\$8,500) and those employed by agricultural farm services, custom harvesters and FLCs (\$5,000). There was considerable variation in earnings among workers in agricultural farm services: workers in soil preparation services (SIC 0711) averaged \$21,100 in 2001, versus \$12,700 for crop preparation services for market (custom harvesters; SIC 0723) and \$4,400 for FLC employees.

The average earnings of primarily farmworkers varied significantly, even within detailed four-digit SIC codes — in most cases, the standard deviation exceeded the mean wage (table 4). Median earnings were generally less than mean earnings, reflecting that higher-wage supervisors and farm managers pulled up the mean.

It may be possible to employ a smaller total farm workforce, with each worker employed more hours and achieving higher earnings.

If the workers in detailed commodities are ranked from lowest-to-highest paid, the lowest 25% of earners in an SIC category generally earned less than \$4,000 a year. For example, among workers primarily employed in vegetables and melons in 2001 (SIC 0161), the first quartile or 25th percentile of annual earnings was \$3,000. This reflects relatively few hours of work — if these workers earned the state's minimum wage of \$6.25 an hour in 2001, they worked 480 hours. The 25th percentile earnings cutoff was lowest for those employed primarily by FLCs, only \$634, suggesting that FLC employees receiving the minimum wage worked 101 hours. The highest 25th percentile mark was in mushrooms (food grown under cover), \$9,491, which reflects 1,519 hours at minimum wage.

The 75th percentile marks the highest earnings that a nonsupervisory worker could normally expect to achieve — 75% of workers reported earning less than this amount and 25% earned more. The 75th percentile varied widely by commodity: \$6,172 for those primarily employed by FLCs, \$10,572

for those in grapes and \$29,465 for those in mushrooms.

More labor-intensive crops, jobs

The number of individuals and jobs reported by agricultural employers increased in the 1990s, reflecting increased production of labor-intensive fruit and vegetable crops and, the data suggests, more farmworkers each worked a fewer number of hours. With the state's minimum wage at \$6.25 per hour after Jan. 1, 2001 (and \$6.75 per hour since Jan. 1, 2002), the earnings reported by employers suggest that most farmworkers are employed fewer than 1,000 hours per year (about half-time).

FLCs increased their market share in the 1990s, but dependence on them varied by commodity. For example, FLCs rather than citrus growers reported many citrus workers, while dairy employers reported most dairy workers. FLCs are associated with low earnings, which suggests few hours of work — the median earnings reported by FLCs for their employees in 2001 were \$2,650, or 400 hours if workers earned the state's

\$6.25 minimum wage.

California's farm labor market has large numbers of workers searching for seasonal jobs; FLCs are matching an increasing share of these workers with jobs, resulting in lower earnings for FLC employees. Workers who avoid FLCs experience higher earnings in agriculture or in the nonfarm labor market. If FLCs are most likely to hire recently arrived and unauthorized workers, as the National Agricultural Worker Survey (NAWS 2001) suggests, FLCs serve as a port of entry for immigrant farmworkers.

The impact of guest workers, legalization and earned legalization will depend on the details of any new program. If the status quo continues, the percentage of unauthorized workers is likely to rise. Alternatively, if there were a legalization program, farmworkers might more quickly exit the farm workforce. However, an earned legalization program could slow this exit if workers were required to continue working in agriculture to earn full legal status.

The next step in this analysis is to ex-

amine the mobility of individual farmworkers over time and geography, examining where workers migrate during 1 year and patterns of entrance to and exit from the farm workforce (Moore et al. 2002). Do farmworkers who increase their earnings by moving to nonfarm jobs stay in nonfarm jobs, or do they sometimes return to agriculture? Are geographic and economic mobility linked for workers who get nonfarm jobs? Answers to these questions will help to determine the trajectory of the farm labor market.

A. Khan is Research Program Specialist, Labor Market Information Division, California Employment Development Department (EDD); P. Martin is Professor of Agricultural and Resource Economics, UC Davis; and P. Hardiman is Research Manager, Labor Market Information Division, EDD. The views expressed are those of the authors and do not necessarily reflect the policies of the EDD or the State of California.

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