California crop production wages analysis

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The Los Angeles Times conducted an analysis of the Quarterly Census of Employment and Wages (https://www.bls.gov/cew/datatoc.htm) from the U.S. Bureau of Labor Statistics to evaluate pay for crop workers in California.

The analysis found that wages for crop production in California have increased by 13% from 2010 to 2015, twice as fast as average pay in the state. It also found that workers in some parts of the state earn much more than others. Napa County, home to many of the state's wineries, pays workers the most.

Those results were published in a March 17, 2017 story "Wages rise on California farms. Americans still don't want the job" (http://www.latimes.com/projects/la-fi-farms-immigration/).

How we did it

Download 25 years of annual data files from the Bureau of Labor Statistics

In [16]:
```
%%capture
%run 01-download.ipynb
```

Combine the files and merge together the statistics for two key industry groups ("Crop production" and "Support activities for crop production")

In [17]:
```
%%capture
%run 02-transform.ipynb
```

Use the combined files to develop our key findings below.

Finding 1: Wages for California crop workers are rising faster than the average job

In [18]:
```
# Import Python tools
import calculate
import pandas as pd
```

In [19]:
```
%matplotlib inline
```

In [20]:
```
# Read in state-level data
state_df = pd.read_csv("./data/transformed_state.csv", dtype={"area_fips": "str"})
```

In [21]:
```
state_df.head()
```

Out[21]:

	year	area_fips	area_title	industry_group	annual_avg_emplvl	total_annual_wages_2015	avg_
0	1990	01000	Alabama -- Statewide	crops	4206	9.879806e+07	
1	1990	01000	Alabama -- Statewide	total	1600920	5.943713e+10	
2	1990	02000	Alaska -- Statewide	crops	124	3.102915e+06	
3	1990	02000	Alaska -- Statewide	total	233887	1.266902e+10	
4	1990	04000	Arizona -- Statewide	crops	20405	4.448223e+08	

In [22]:
```
# Filter that down to just California crop workers
ca_state_df = state_df[state_df.area_fips.str.startswith("06")]
```

In [23]:
```
ca_state_crops = ca_state_df[ca_state_df.industry_group == 'crops'].set_index("year")
```

The average crop worker now earns nearly $30,000 a year.

In [24]:
```
ca_state_crops.at[2015, "avg_annual_pay_2015"]
```

Out[24]: 29631.585333499999

That number has increased 13% from 2010 to 2015 after adjusting for inflation

In [25]:
```
ca_state_crops.at[2010, "avg_annual_pay_2015"]
```

Out[25]: 26156.526136099998

In [26]:
```
calculate.percentage_change(
    ca_state_crops.at[2010, "avg_annual_pay_2015"],
    ca_state_crops.at[2015, "avg_annual_pay_2015"]
)
```

Out[26]: 13.285629671609525

And it's twice as fast as the growth of the average wage in the state.

In [27]:
```
ca_state_overall = ca_state_df[ca_state_df.industry_group == 'total'].set_index("year")
```

In [28]:
```
ca_state_overall.at[2010, "avg_annual_pay_2015"]
```

Out[28]: 57908.716991100002

In [29]:
```
ca_state_overall.at[2015, "avg_annual_pay_2015"]
```

Out[29]: 61698.114887400006

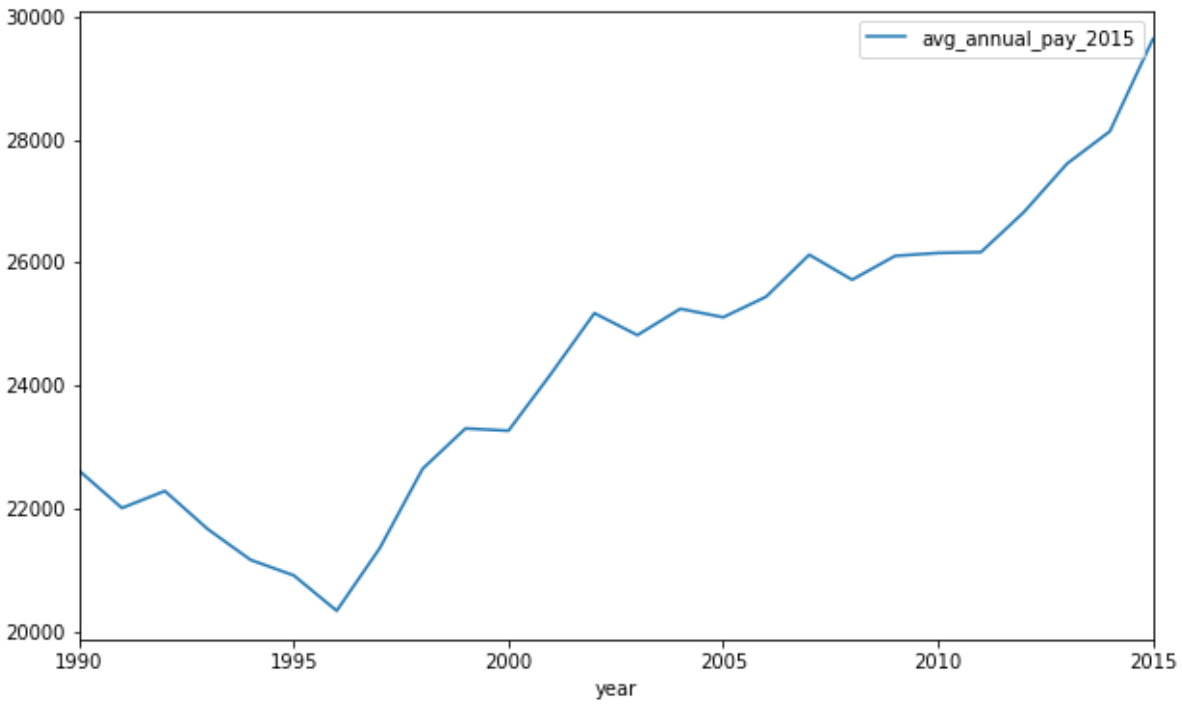
In [30]:
```
calculate.percentage_change(
    ca_state_overall.at[2010, "avg_annual_pay_2015"],
    ca_state_overall.at[2015, "avg_annual_pay_2015"]
)
```

Out[30]: 6.543743486636731

Here's the longer term trend of crop worker pay

In [31]:
```
ca_state_crops.reset_index().plot(kind='line', x='year', y='avg_annual_pay_2015', figsize=(10, 6))
```

Out[31]: <matplotlib.axes._subplots.AxesSubplot at 0x7fcc7731c490>



In [32]:
```
ca_state_crops.reset_index()[[
    'year',
    'avg_annual_pay_2015'
]]
```

Out[32]:

	year	avg_annual_pay_2015
0	1990	22621.979520
1	1991	22012.462730
2	1992	22288.953037
3	1993	21669.356598
4	1994	21168.324207
5	1995	20918.440775
6	1996	20343.258272
7	1997	21357.007077
8	1998	22649.556758
9	1999	23305.440398
10	2000	23268.408525
11	2001	24203.468920
12	2002	25178.036134
13	2003	24822.359000
14	2004	25249.503371
15	2005	25111.887847
16	2006	25447.114956
17	2007	26128.224959
18	2008	25721.811659
19	2009	26109.344215
20	2010	26156.526136
21	2011	26170.521379
22	2012	26821.415449
23	2013	27606.013021
24	2014	28133.086063
25	2015	29631.585333

Which we output for a graphic

In [33]:
```
ca_state_crops.reset_index()[[
    'year',
    'avg_annual_pay_2015'
]].to_csv("./data/crops-wages-by-year.csv", index=False)
```

Finding 2: Napa County has the highest paid farmworkers in California

In [34]:
```
# Read in county-level data
county_df = pd.read_csv("./data/transformed_county.csv", dtype={"area_fips": s
tr})
```

In [35]:
```
county_df.head()
```

Out[35]:

	year	area_fips	area_title	industry_group	annual_avg_emplvl	total_annual_wages_2015	avg_
0	1990	01001	Autauga County, Alabama	total	7871	2.626825e+08	
1	1990	01003	Baldwin County, Alabama	crops	583	1.196884e+07	
2	1990	01003	Baldwin County, Alabama	total	27710	7.644913e+08	
3	1990	01005	Barbour County, Alabama	total	9356	2.872729e+08	
4	1990	01007	Bibb County, Alabama	total	3923	1.053530e+08	

In [36]:
```
# Filter it down to crops
county_crops = county_df[county_df.industry_group == 'crops']
```

In [37]:
```
# Filter it down to the latest year of data
trimmed_county_crops_2015 = county_crops[county_crops.year==2015]
```

In [38]:
```
# Filter it down to California
trimmed_california_county_crops = trimmed_county_crops_2015[trimmed_county_cro
ps_2015.area_fips.str.startswith("06")]
```

Napa County has the highest ranking pay of any county in the state

In [39]:
```
trimmed_california_county_crops.sort_values("avg_annual_pay_2015", ascending=False).head(60)
```

Out[39]:

	year	area_fips	area_title	industry_group	annual_avg_emplvl	total_annual_wages_201
132278	2015	06055	Napa County, California	crops	4944	2.073536e+0
132234	2015	06011	Colusa County, California	crops	1617	6.648710e+0
132298	2015	06075	San Francisco County, California	crops	99	3.988242e+0
132272	2015	06049	Modoc County, California	crops	186	7.420400e+0
132230	2015	06007	Butte County, California	crops	2818	1.122079e+0
132308	2015	06085	Santa Clara County, California	crops	3522	1.370775e+0
132225	2015	06001	Alameda County, California	crops	231	8.751965e+0
132264	2015	06041	Marin County, California	crops	177	6.589747e+0
132244	2015	06021	Glenn County, California	crops	1018	3.773587e+0
132286	2015	06063	Plumas County, California	crops	20	7.286920e+0
132292	2015	06069	San Benito County, California	crops	1662	6.017700e+0
132316	2015	06093	Siskiyou County, California	crops	416	1.477448e+0
132326	2015	06103	Tehama County, California	crops	1520	5.335091e+0
132260	2015	06037	Los Angeles County, California	crops	4139	1.437871e+0
132318	2015	06095	Solano County, California	crops	1600	5.493875e+0
132336	2015	06113	Yolo County, California	crops	5687	1.950016e+0
132320	2015	06097	Sonoma County, California	crops	4917	1.671798e+0

	year	area_fips	area_title	industry_group	annual_avg_emplvl	total_annual_wages_201
132276	2015	06053	Monterey County, California	crops	52532	1.775466e+0
132310	2015	06087	Santa Cruz County, California	crops	8185	2.753654e+0
132236	2015	06013	Contra Costa County, California	crops	618	1.998422e+0
132296	2015	06073	San Diego County, California	crops	7825	2.512324e+0
132246	2015	06023	Humboldt County, California	crops	405	1.290666e+0
132322	2015	06099	Stanislaus County, California	crops	11190	3.564161e+0
132232	2015	06009	Calaveras County, California	crops	37	1.170458e+0
132338	2015	06115	Yuba County, California	crops	708	2.237436e+0
132306	2015	06083	Santa Barbara County, California	crops	20436	6.433053e+0
132250	2015	06027	Inyo County, California	crops	30	9.337200e+0
132304	2015	06081	San Mateo County, California	crops	1514	4.696883e+0
132334	2015	06111	Ventura County, California	crops	25916	7.972466e+0
132300	2015	06077	San Joaquin County, California	crops	15163	4.631388e+0
132284	2015	06061	Placer County, California	crops	258	7.875692e+0
132258	2015	06035	Lassen County, California	crops	664	2.021304e+0
132340	2015	06999	Unknown Or Undefined, California	crops	1179	3.569092e+0

	year	area_fips	area_title	industry_group	annual_avg_emplvl	total_annual_wages_201
132282	2015	06059	Orange County, California	crops	2173	6.559736e+0
132302	2015	06079	San Luis Obispo County, California	crops	4634	1.398815e+0
132324	2015	06101	Sutter County, California	crops	3939	1.140642e+0
132290	2015	06067	Sacramento County, California	crops	2284	6.440734e+0
132270	2015	06047	Merced County, California	crops	10911	3.027400e+0
132288	2015	06065	Riverside County, California	crops	11690	3.183831e+0
132242	2015	06019	Fresno County, California	crops	44767	1.211988e+0
132238	2015	06015	Del Norte County, California	crops	140	3.781894e+0
132268	2015	06045	Mendocino County, California	crops	1154	3.101592e+0
132294	2015	06071	San Bernardino County, California	crops	1225	3.270520e+0
132262	2015	06039	Madera County, California	crops	9572	2.550314e+0
132254	2015	06031	Kings County, California	crops	3365	8.870874e+0
132252	2015	06029	Kern County, California	crops	56883	1.491404e+0
132256	2015	06033	Lake County, California	crops	237	5.978368e+0
132330	2015	06107	Tulare County, California	crops	32989	7.985706e+0
132248	2015	06025	Imperial County, California	crops	12395	2.984266e+0
132228	2015	06005	Amador County, California	crops	165	3.908808e+0

	year	area_fips	area_title	industry_group	annual_avg_emplvl	total_annual_wages_201
132240	2015	06017	El Dorado County, California	crops	194	3.545384e+0
132280	2015	06057	Nevada County, California	crops	28	4.548690e+0
132274	2015	06051	Mono County, California	crops	9	1.132860e+0
132266	2015	06043	Mariposa County, California	crops	0	0.000000e+0
132312	2015	06089	Shasta County, California	crops	0	0.000000e+0
132314	2015	06091	Sierra County, California	crops	0	0.000000e+0
132328	2015	06105	Trinity County, California	crops	0	0.000000e+0
132332	2015	06109	Tuolumne County, California	crops	0	0.000000e+0

Output the data for a graphic

In [40]:
```
trimmed_california_county_crops.sort_values("avg_annual_pay_2015", ascending=False).to_csv("./data/map.csv", index=False)
```