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Paradoxes of the Sprouts: Impacts of Labor Law Evolution on Agriculture's Industry Landscape and Strategy

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Paradoxes of the Sprouts: Impacts of Labor Laws Evolution on Agriculture's Industry

Landscape and Strategy

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The research documented by this paper represents the work of a student and does not necessarily reflect the view of the UC Center of Sacramento or the University of California, Riverside. I have no conflict of interest to disclose.

Abstract: While being the leader, California's agriculture industry still faces similar problems to other regions in the United States due to years of limited agriculture productivity-focused research and development in the country caused by years of perfect competition. In 2016, California passed AB 1066 (Gonzalez, 2016) as a mechanism to ensure fair labor practices for agriculture activities by removing the legal exceptions from Labor Code sections 500-556 and 558.1 that were previously granted for the industry. The paper will use pre/post analysis as a primary mechanism to observe the impact of AB1066 on the competitive landscape of California's agriculture commodities producers. Findings suggest a negligible correlation between California's agriculture labor market and the overall labor market in California between 1990 and 2022 and California's agriculture employment to employment ratio remains relatively stable both before and after AB1066. I observed a moderate positive correlation between the value of agriculture production and agriculture employment, regions with a smaller proportion of agricultural activities experience greater fluctuations in their agricultural gross production value, and correlation strength between agriculture/non-agriculture employment varies according to the role of agriculture in economic activity when looking at the region-level from 2012 to 2022. Due to the unreliable nature of pre/post analysis caused by difficulties in controlling for exogenous factors, this paper will focus mostly on communicating the state of California's agriculture industry around the law passage rather than implying the existence of any causal relationship. Final recommendations include strengthening record-keeping, timely introduction of supporting mechanisms, and further studies on how agriculture-related policies interact with each other.

Keywords: Agriculture, California, labor market, AB1066 (2016)

Paradoxes of the Sprouts: Impacts of Labor Laws Evolution on Agriculture's Industry Landscape and Strategy

1. Introduction

California is the leading producer of agricultural products in the country with a gross value of agricultural commodities production of \$64,677,990 or 11.5% of the United States total (USDA Economics Research Service, 2024). However, agriculture is relatively small in California's economic context when the industry's production only accounts for 2.5 percent of the total state GDP in 2022 (University of Kansas Division of Agriculture, n.d.). Years of limited agriculture productivity-focused research and development in the United States (Alston 2014) due to years of perfect competition (Moon 2022) have greatly compromised the competitiveness of agriculture production across the country. In 2016, California legislators passed AB 1066 (Gonzalez) to ensure that agriculture laborers receive similar protections to the remaining of California's labor market by removing the legal exceptions from Labor Code sections 500-556 and 558.1 that were previously granted for the industry (California Department of Industrial Relations, 2023). One notable policy alteration that was made through this bill is the phase-in of the overtime compensation provision which mandates overtime pay at one and one-half times the regular rate for all agriculture after forty hours of work in one during a week to employees by 2025. The implementation schedule is as follows:

Schedule for Changes to Daily and Weekly Hours After Which Agricultural Workers Receive Overtime Pay		
Effective date for employers with 26 or more employees:	Effective date for employers with 25 or fewer employees	Overtime (1.5x regular rate of pay) required after the following hours per day / hours per workweek:
Jan. 1, 2019	Jan. 1, 2022	9.5 / 55
Jan. 1, 2020	Jan. 1, 2023	9.0 / 50
Jan. 1, 2021	Jan. 1, 2024	8.5 / 45
Jan. 1, 2022	Jan. 1, 2025	8.0 / 40

Figure 1: Data from the Department of Industrial Relations

While the full impact of the policy changes remains ambiguous, one thing is certain: the substantial policy changes made by AB 1066 will have both immediate and long-term consequences on the industry. This paper seeks to present a dynamic overview of California's agriculture industry competitive landscape by examining the labor market for agricultural production activities data and existing literature. More precisely, do labor law changes enacted by AB 1066 to preserve formal workers' rights have a major influence on output value or the quantity and proportion of agricultural employment relative to the population as a whole?

2. Significance

Whether agriculture commodities could or should be relied exclusively on import remains debatable due to the land and labor-intensive nature of many agricultural productions (Khan and Hardiman, 2004), one thing for certain is that a robust agriculture industry plays an important role in stabilizing the price agricultural commodities both within California and across the country.^[1] This paper will assume the need for California to preserve its agricultural sector

^[1] Khan and Hardiman (2004) note that California's focuses on fruits and nuts, vegetables and melons, and horticultural specialties (FVH) production leads to it having the largest and most complex agricultural labor market in the United States due to the resource-intensive nature of these commodities' production.

robustness to counteract external political headwinds such as rising regionalization and industrial policies, or internal economic uncertainty such as lingering inflationary pressures.

While AB 1066 is a step forward in protecting Californians' rights in the labor market, the impact of it on labor incentives and businesses' behaviors remains largely unstudied. Following the passage, an observable drop in the labor market ensued amidst no economy-wide headwinds (fig.2). This along with the ongoing compositional changes in California's labor market has introduced significant headwinds to the agriculture industry labor in recent years. California's labor force participation rate has dropped to around 5 p.p. during the same period and is hovering near 62 percent today.^[2] Subsequently, it is certain that agriculture will also see a decrease in employment quantities due to a shrinking labor force and increasing in the attractiveness of other sectors' labor market. In theory, AB 1066 should alleviate the problem of incentives whereby increasing wages and benefits would increase the attractiveness of working within the industry. However, the reality is that there are industry-specific characteristics such as years of low investment into productivity-focused research and development, which might negatively contribute to the efficacy of these policies. Thus, efforts to observe the labor market for agriculture activities on its own will provide policymakers with better insights when addressing market inefficiencies.

²¹ La Fortune et al. (2024) note that "labor force participation has fallen from over 67 percent in 2000, to nearly 62 percent today. Among adults aged 25–54 ("prime" working years) it has hovered around 80 percent in recent decades."

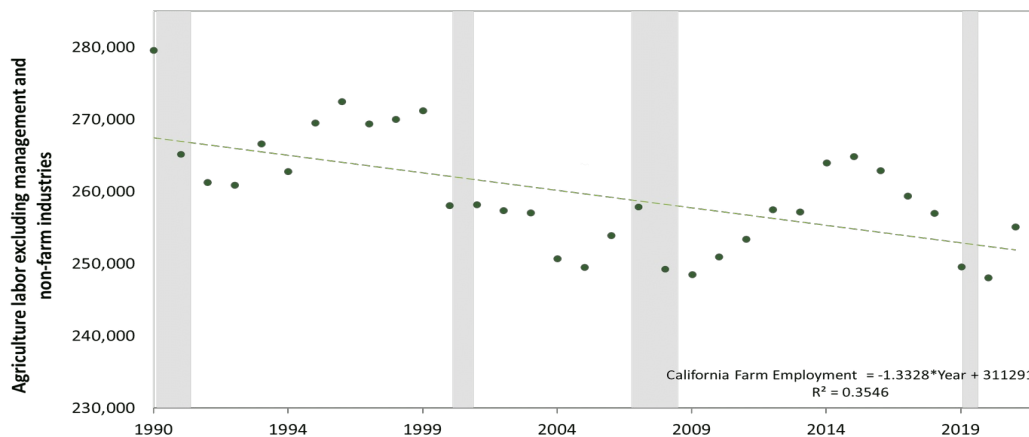


Figure 2: *Quantity of Agriculture Labor (NAICS 111, 112, 1151, 1152). Shaded areas indicate U.S. recessions*

3. Literature

Contrary to popular belief, long-term labor patterns are driven by socioeconomic conditions rather than cyclical economic factors. While being a multidimensional issue, an aging population is believed to be the driving factor of this trend in California (Lafortune et al., 2024). In short, not all Californians want to work in the agriculture industry. Given the market conditions and the large scale and complexity of the state’s agriculture labor market, prudent policies will play a key role in increasing the agriculture sector’s appeal to the next generation of laborers while mitigating the consequences of labor loss due to age demographic changes. Since it is difficult to single out unemployed individuals’ preferences in the labor market, this study will use the employment-to-population ratio as the primary indicator for the labor market’s well-being. Employment-to-Population ratio—or employment rate—matters because it is one of the primary gauges of the interaction between individuals and the economy. It is the ratio of employed individuals in the labor force to the total number of people who are eligible to work.

Previous attempts to study the declining employment rate point to the strong shift in labor demand against less-skilled workers, and stagnation in earnings mobility as a significant factor in

explaining the labor trend. Autor (2014) provides the mismatching in supply and demand as a potential answer to lower labor participation rates among the younger male population.^[3] This conclusion might explain the low attractiveness of agricultural jobs among people in the labor force due to the relationship between these positions' scarcity, capabilities, and productivity requirements. Conventional economics theory suggests that an individual's competitiveness depends on cost, the value added through their labor, and the scarcity of their labor. While not all farm jobs necessarily have an education requirement, many still require a certain level of familiarity with farming operations and relevant crops beyond the typical physical requirements. Furthermore, harsh working conditions associated with many agriculture operations raise the scarcity of labor demand, which also drives up the cost of labor for these activities in the formal market. For instance, strawberry harvesting has historically employed both men and women who are recent undocumented immigrants while certain less physically demanding jobs like packing lettuce and celery are typically performed by legal residents and citizens (Guthman, 2017). Usage of illegal labor suggests that some agribusinesses believe the cost of opportunities to hire labor in the formal market exceeds the cost of hiring unlawful labor and risk getting fined. This relationship can be explained through the imbalance of bargaining power and agribusinesses' monopsony power. Monopsony power is the market ability that gives employers a degree of control over wages and benefits. Employers can exercise such power within the illicit labor market through collusion to keep the labor cost artificially low, well exceeding the marginal revenue product relative to formal market laborers. Additionally, the impacts of recent increases

^{3]} Autor's research highlights that an increasing number of individuals with lower education attainment population got priced out of the labor market as physical labor demand are replaced by cognitive labor due to technology advancements and other most cost-efficient alternatives.

in border enforcement have ambiguous effects on illegal immigration trends. Historically, the deterrence effect of illicit migration was small even after accounting for endogeneity in enforcement (Massey et al., 2002; Gathmann, 2008). A more recent study suggests that new border measures significantly reduce immigrants from Mexico to the United States, but the quantity of potentially undocumented residing in the United States immediately responds to these changes (Feigenberg, 2020). When considering the already high cost of legal laborers, existing regulations might harm employment quantity by increasing the barrier of entry by raising the opportunity costs of hiring formal workers for these jobs relative to the illegal markets. I will not study the impact of illicit labor on agriculture labor market equilibrium due to its complexity and limited data attributed to businesses and workers' reluctance to participate in labor surveys due to potential retaliation and legal implications. Instead, I will accept that no significant change in the illegal labor supply in the short run and take it as a given parameter when presenting my descriptive evidence.

Some studies on employment in the United States attribute exogenous factors as a potential driving mechanism for the trends. Some research papers cite trade competition as a major contributing factor to the decline in employment quantities across the economy (Autor et al., 2015^[4]; Abraham and Kearney, 2020). Additionally, the United States' domestic agriculture commodities market provides little incentives for further research and development investments in productivity due to it is nearly perfectly competitive with little dynamic competition for decades (Moon, 2022). Given that middle-income nations are now the primary innovators in

^{4]} Autor, Dorn and Hanson (2015) notes that markets with greater exposure to trade competition saw greater changes in skill demands and growing polarization of labor-market outcome. They also found that the impact of technology change and trade on labor markets are not uniform across industries.

agricultural science research due to their higher dependency on agriculture (Alston and Pardey, 2014; Moon, 2022), producers in California and the rest of the country are less competitive on the global market due to higher production input cost. As a result, AB 1066 might interact with the industry poorly as it will further increase the already relatively high input cost for agriculture activities. Therefore, it is worthwhile to investigate how production value and business cycle have changed before and after the policy changes.

While SNAP expansion, public health insurance expansions, more generous earned income tax credits, and lack of family leave were found to be insignificant factors in explaining a change in the overall employment-to-population ratio (Abraham and Kearney, 2020) might have a negative impact on the quantity of labor supply for agriculture activities as these policies might alter laborers' preferences in the labor market. Pardey and Alston (2021) hypothesized that there is a shift in labor off farms due to nonfarm employment being relatively more attractive. This would force firms to adopt labor-saving methods and labor substitution. Whether a change in the labor market dynamic will reverse the decline in productivity research and development \ trend remains unknown, the market for farm workers is more vulnerable to disruptions than its non-farm counterparts in its current state. Given the literature, employment in agriculture entails issues both on the supply and demand side. The introduction of AB 1066 (2016) aims to address the existing market failure by increasing the attractiveness of farm jobs. My study will focus exclusively on whether these labor law changes are enough to reverse the secular trends toward lower employment count in the industry, as well as its externalities in the industry's business cycle.

4. Theoretical Framework

Assuming the production function of California's agriculture industry is as follows:

$$Y = y(L, K, A)$$

Where Y is the aggregate output of the industry, K is the capital requirement, L is the labor requirement, and A is the land resources requirement. Assuming A is constant due to its long-run fluctuation remains relatively low within California. The relationship between capital and labor resources remains ambiguous and could introduce some uncertainties in this analysis. This paper will assume labor and capital have a partial substitutional effect where an increase in investment in technology and infrastructure may decrease the need for labor to a certain extent. This paper will assume the base case of capital stock where the investment rate is only enough to replace all depreciated capital (investment $I = \text{depreciation } \delta$) based on the existing literature (Alston and Pardey, 2014; Pardey and Alston, 2021; Moon, 2022). Therefore, this paper only attempts to observe the impact of labor input on agricultural activities.

From an economic perspective, many problems can be categorized into either supply-side or demand-side issues. Literature suggests that the inefficiencies within the agriculture labor market are both a supply-side (Moon, 2022) and a demand-side problem (Guthman, 2017). AB1066 might alleviate supply-side weaknesses in the market for agricultural labor by increasing the standard of compensation in the industry. However, it might also have implications for the demand due to the industry's existing features.

The supply curve will shift upward if AB 1066 as the bill functions as an encouraging mechanism to incentivize more laborers to work in the labor market. Assuming all else equal, this

will decrease the aggregate cost and increase the quantity of labor supplied within the market (figure 3). On the other hand, AB 1066 might shift the demand curve inward due to the nature of for-profit companies. As businesses' primary goal is to maximize shareholders' value, businesses may shrink their operations or merge with each other to achieve efficient size. Such tactics might be employed by impacted economic actors to maintain their profit margin. If this happens, then the new equilibrium would have a lower quantity of labor and price of labor than the original equilibrium (figure 4).

The effect of these policies on the industry's aggregate quantity of labor remains ambiguous and would depend on the magnitude of shifts on each side of the equilibrium when considering both shifts within the market side by side. However, one thing for certain is that the cost of labor in the new equilibrium is lower than the initial equilibrium regardless of their magnitude and which shift is more dominant. Such a result arises because both shifts would result in a lower price of labor when standing alone (figures 5 and 6).

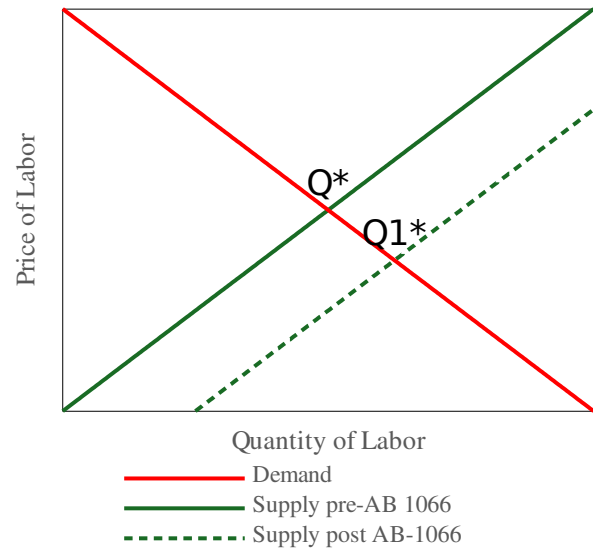


Figure 3: Supply-side shift

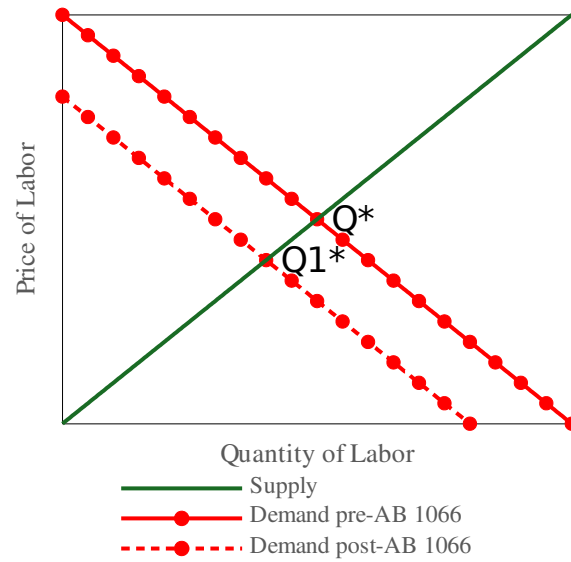


Figure 4: Demand-side shift

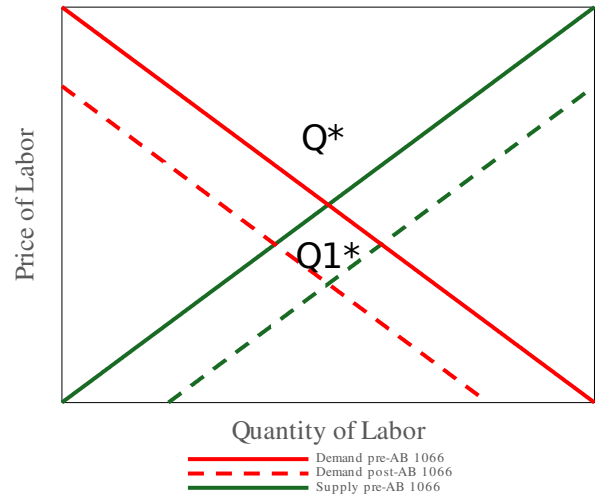


Figure 5: Supply and Demand side shift of equal magnitude

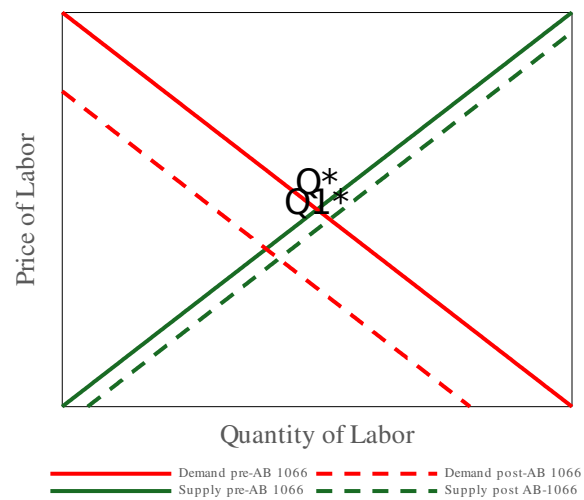


Figure 6: Supply and Demand shift where Demand side dominated Supply side shift

In summary, AB 1066 would move the labor supply curve upward and the demand curve downward at an ambiguous magnitude assuming all else is equal. Based on existing literature and labor trends within the industry following 2016 (figure 2), the change in demand has a higher magnitude than in supply. Theoretically, the data implies AB 1066 as a possible trigger

mechanism for lower production growth and an increase in business and employment cycle fluctuations.

5. Observation Design and Data Sources

Based on the proposed theory, AB 1066 is expected to negatively impact the labor market for agriculture activities due to the lack of supporting mechanisms. More specifically, the new policies will result in stagnation in production growth and an increase in fluctuation between agricultural labor relative to the general labor market as well as agriculture production relative to the overall economy. To better visualize the impact of AB 1066 on California's agricultural sector within the limitations of inadequate information, the study will be conducted at the state and regional level using various time horizons. The purpose of this approach is to preserve as much variation within the data as possible and limit the use of imputation as much as possible. For this study, agriculture employment is defined as employment classified under NAICS 111, 112, 1151, 1152 less management. NAICS 111 encompasses all establishments engaged in growing crops, plants, vines, or trees and their seeds such as farms, orchards, groves, greenhouses, and nurseries, primarily engaged in growing crops, plants, vines, or trees and their seeds. NAICS 112 includes all entities that operate in animal production and aquaculture subsector products. NAICS 1151 and 1152 comprise companies that operate to assist in agricultural activities. I only considered employment classified under these NAICS codes due to being directly involved in agricultural production output.

The state-level study will focus on the long-term relationship between California agriculture employment and its non-agricultural counterpart. Monthly California employment

data from 1990 to 2022 was collected through the state's Employment Development Department (EDD) (n.d.-b). The independent variable is non-agriculture, and the dependent variable is agricultural labor. Studying the long-term correlation between the labor market could provide a benchmark for the study, ensuring consistency within the experimentation.

The region-level study will focus on how the industry dynamic has changed following AB 1066. County-level data was clustered into 6 regions based on the EDD's designation (figure 7). Regional employment data was collected through EDD's Agricultural Employment in California (n.d.-a). County-level GDP was from the Bureau of Economic Analysis (BEA) (n.d.-a, n.d.-b). Real GDP was estimated using a GDP deflator where 2017 = 100. Since GDP data at the county level only goes back to 2011, the study will observe how business fluctuations have evolved between 2011-2016 and 2016-2022. Various metrics will be used as proxies for fluctuations which include the standard variation of log aggregate employment to the standard deviation of log aggregate real GDP, correlation coefficients between employment to the standard deviation of log aggregate real GDP ratio, standard deviations of log of aggregate real GDP to standard deviations of log gross production-value from agriculture. Independent variables are the two aforementioned periods, and the dependent variables are the fluctuation proxies.

County-level data on agriculture production value was collected from the annual California Department of Food and Agriculture report (CDFA) (n.d.) and USDA's National Agricultural Statistics Service California Field Office (NASS) (n.d.). Data imputation was used for county-level gross production value to ensure all variation in gross production value at the county was properly accounted for. This would enhance accuracy when the data get clustered into region-level. Raw data was converted into natural log figures before getting imputed through the

indirect use of lasso-linear-regression method (Deng et. al, 2016). While there are some limitations to using this method such as the assumption of *ceteris paribus* and no major regional changes, omitting these counties' data might introduce biases to regions with smaller agriculture footprints.



Figure 7: Regions based on EDD's designations

6. Result

Monthly statewide employment data between 1990 and 2022 suggest a negligible correlation (Pearson's R: -0.079 when using log data) between agriculture employment and general employment (figures 8 and 9). Additionally, a p-value of 0.12 indicates that the quantity of employment across California is not a statistically significant predictor of the state's agriculture employment at the 0.05 significant level. The result may suggest that the substitution effect between agriculture and non-agriculture labor employment is not intense. Additionally, agriculture production data highlights a moderate positive correlation (Pearson's R= 0.58) between the value of agriculture production and agriculture employment. This suggests some level of dependency on employment quantity for agriculture productions.

Regression Statistics	
Multiple R	0.07862
R Square	0.00618
Adjusted R Square	0.00366
Standard Error	0.03922
Observations	396

	Coefficients	Standard Error	t-stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	7.48	0.17	42.87	1.93E-150****	7.14	7.82	7.14	7.82
log_ag_emp	-0.05	0.03	-1.57	0.12	-0.11	0.01	-0.11	0.01

Figure 8: Statistics Table

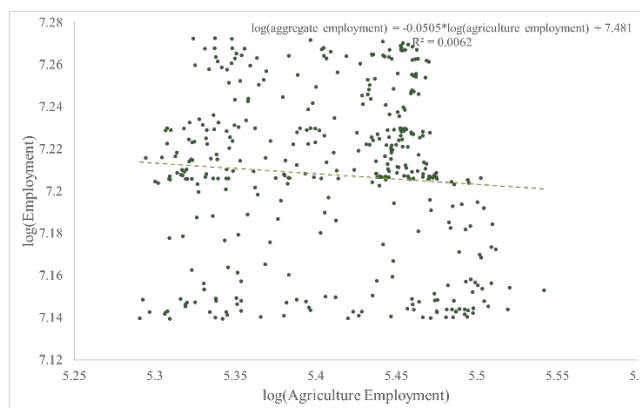


Figure 9: Relationship between Employment and Agriculture Employment

Data from 2012 to 2022 highlights that employment in agriculture is independent of the economic business cycle both before and after AB 1066. While the overall economy between 2016 and 2020 saw a lower fluctuation, the employment in agriculture ratio remains stable (figure 10). The same data set also suggests that California agriculture production experienced higher fluctuation relative to the entire economy following the policy change. However, agriculture experienced lower fluctuation relative to the rest of the economy when observing each region independently. Regions with smaller agriculture production tend to have a larger drop in fluctuation than their bigger counterparts except in the South Coast region (figure 11). Lastly, the correlation between agriculture and non-agriculture labor analysis suggests that correlation strength between the two employment groups varies according to the role of agriculture in economic activity before AB 1066. More specifically, regions with higher dependency on

agriculture production have a lower correlation figure (figure 12). However, this relationship does not hold following the law changes. The correlation increases in all regions except in the Desert region. However, this finding contradicts the initial observation of the labor market from the longer-term, more granular approach mentioned earlier (figures 8 and 9). This might suggest that the model that was used for this analysis might be overfitted. Subsequently, results from the regional-level study between 2012 and 2020 provide an ambiguous outlook into how AB 1066 impacts agriculture employment and sectoral business cycles within California, and further study is needed for a more concrete conclusion.

Lastly, analysis of production data suggests that production value growth shows signs of production growth following the law passage. Growth in real gross value of agriculture production among counties ranges between -51.2% to 68.2% between 2012 and 2016 with Plumas, Modoc, and Serria as the top three counties with the highest growth in gross value production. On the other hand, the same data ranges between 100% to 46% between 2016 and 2020 with El Dorado, Napa, and Lake as the top three counties with the highest growth in gross production value and San Francisco ceasing to have reported agriculture production within the county (CDFA, 2021; CDFA, 2022). Additionally, California's top producers of agriculture commodities were able to maintain their production level whereas the impact on the remaining counties varied. In other words, some unmentioned factors might determine the effectiveness of AB 1066 at the county level. However, this result might not be reliable due to reasons that will be discussed in the next section.

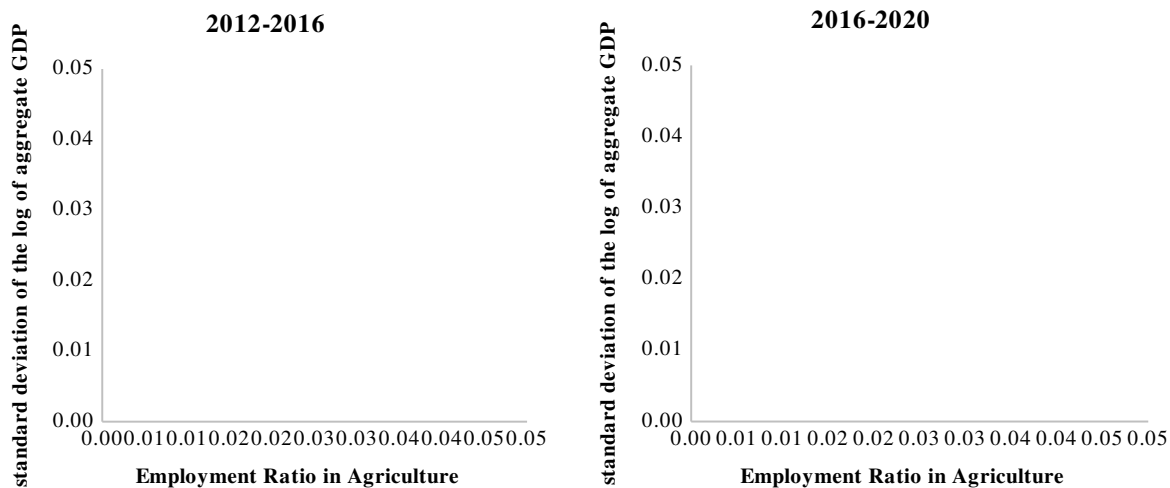


Figure 10: Relationship between Economic Fluctuation and Agriculture Employment

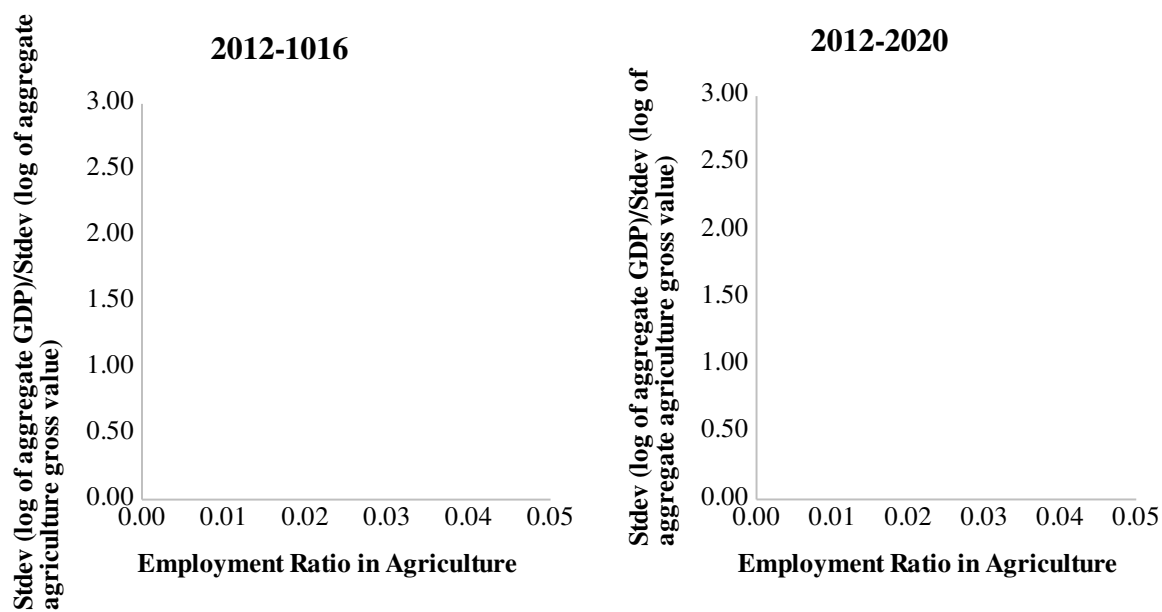


Figure 11: Relative Agriculture Production Fluctuations and Agriculture Employment

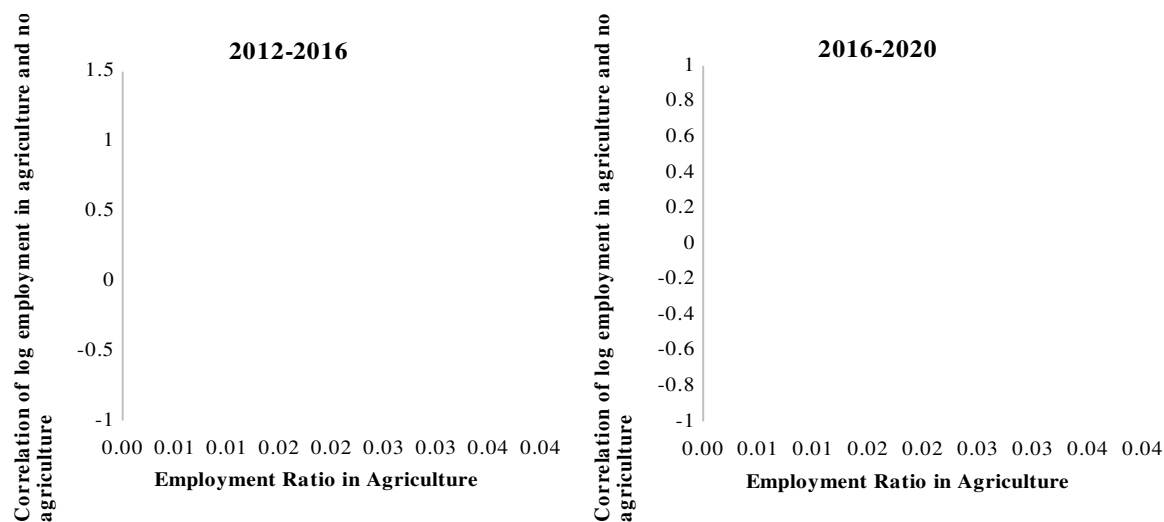


Figure 12: Relationship between employment and agriculture employment

7. Implications and Acknowledgements

Pre/post analysis is unreliable by nature as most variables show signs of correlations with a long enough horizon. One better approach to answering my research questions is through using a Difference-in-Difference experiment. Difference-in-Difference would allow research to observe AB 1066's impacts among California counties more accurately as well as compare these counties to areas with similar productions but without strict labor protection laws. Furthermore, difficulties in controlling exogenous factors due to time and data availability constraints could impact the findings' reliability. For instance, omitting temporary workers and illicit labor in my analysis might lead to an overestimation of labor demand as both sources are substitutions for domestic workers. Therefore, introducing these variables into the model provides more accurate observations of the demand side. Lastly, more reliable publicly accessible data would facilitate multidimensional policy evaluation in the future. This would eliminate the need for using various time horizons for comprehensive examinations of how policies interact with one another. Therefore, future attempts to observe the agriculture labor market should focus on developing

robust datasets and record-keeping methodology to ensure consistency among metrics and observation accuracy.

Due to the aforementioned limitations, I will refrain from establishing any causal relationship. Instead, I will focus on communicating the state of California's agriculture industry around the law passage rather than implying the existence of any causal relationship. Final recommendations include strengthening record-keeping, timely introduction of supporting mechanisms, and further studies on how agriculture-related policies interact with each other.

8. Conclusion

While being the leader, California's agriculture industry still faces similar problems to other regions in the United States due to years of limited agriculture productivity-focused research and development in the country caused by years of perfect competition. This dynamic means agribusinesses have relatively limited tools at disposal to navigate around drastic policy change. The result of this study suggests that agriculture's market dynamics will be defined by stagnant patterns in output growth and a contracting labor market for the foreseeable future. Prudent policies are needed to mitigate the impact of an aging population and the skill-compensation gap within the market for agriculture labor. While potentially having a positive impact on the supply side of agriculture production, AB 1066 might harm the demand side of labor production. Possible policies to alleviate this weakness include expanding market access through international corporation partnerships to encourage further production. As for increasing the value of California agriculture production, innovation-oriented policies might alleviate existing efficiency constraints. Initiatives such as productivity research and development-focused grants would incentivize more emphasis on technology by the public and private sectors. A

robust technology base would provide agribusiness with a cushion against disadvantaged development within California's labor market. Future studies should focus on how existing policies interact with each other. Additionally, studies on how the United States federal policies impact the composition of agriculture employment would yield insightful information into how agricultural productions have evolved throughout the twenty-first century.

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