A Regional and Industry Analysis of the Complexity of the Regulatory Environment Affecting Agricultural Producers in California

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Introduction

Regulations have been studied from many different vantage points in the past. Carter, Chalfont, and Goodhue (2002) have studied how a particular regulation will affect a particular crop, while Antle (2000) and Cash and Swoboda (2003) have investigated the effect of a regulation on an industry. Kaplan, Johansson, and Peters (2004) have investigated the marginal costs and benefits of regulations. Attempts have been made by the federal government to obtain the total cost of the regulatory environment (Office of Information and Regulatory Affairs, 1997), while Hurley and Noel (2006) have attempted to develop a baseline cost of regulations for California agricultural producers. Quite a few studies have examined how regulations have affected productivity (Bynoe, 2004, Hazilla and Kopp, 1990; Christiansen and Haveman, 1981; Gray, 1987). Crain and Hopkins (2001) have examined which businesses bear the heaviest burden of a regulation. There are studies that have taken into consideration the issue of how regulatory policy affects competitiveness (Colyer, 2004; Metcalfe, 2002; Palmer, Oates, and Portney, 1995; Porter and van der Linde, 1995). Some studies have examined producers' perceptions and attitudes towards regulations (Coppock, 1996; Esseks, Kraft, and McSpadden, 1998).

One area in the literature that is lacking is an analysis of how the complexity of the regulatory environment is perceived by producers, especially at an industry and regional level. Complexity of the regulatory environment affects the production function and can lead to increased costs, both cash related and non-cash related, which in turn could affect producers' competitiveness. As the complexity of the regulatory environment increases, producers can see their transactions and operational costs increase requiring a greater allocation of financial and time resources in order to be in regulatory compliance.

Hurley (2005) provided a broad overview of the web of regulatory bodies affecting California agricultural producers. He found that California producers must comply with multiple regulations from local, state, and federal government agencies. Regulations from these agencies encompass a wide variety of issues including: labor, worker safety, environmental quality, marketing, food safety, pesticide use, biosecurity and others.

California has a large number of local, state, and federal regulatory bodies; many with overlapping regulatory authority and often differing and sometimes conflicting regulatory goals and objectives. Thus it is a natural choice for studying how producers perceive the complexity of the regulatory environment. What makes California agriculture relatively unique is that it has one of the most diverse agricultural economies in the United States, if not the world.[1] Hence, when a regulation is adopted that affects California producers, it can potentially affect each commodity—some in a minor way and others in a major fashion.

Complexity issues do not necessarily stem from the regulations themselves, but also how they are enforced. In some instances, the agency that has regulatory authority in California is clear-cut, while in other instances the authority is not so clear adding to the level of complexity of the regulatory environment California producers must face.

Regulations can have many different effects on producers—both positive and negative. Regulations can improve marketability of the crop and increase worker's safety; but, regulations can also increase producers' cost of production by mandating that producers use more costly or less efficacious inputs. Regulations can reduce competitiveness by restricting producers to using certain technologies.[2] As global competition becomes fiercer, it is imperative that states and the

[1] California produces approximately 300 commodities.
[2] In California, producers are not allowed to use inputs that are available to both domestic and global competitors (Federighi and Brank, 2001).

federal government attempt to make the regulatory environment as manageable as possible while trying to meet its regulatory goals in order for producers to maintain competitiveness.

This paper provides results from a producer's survey that enquired about the complexity of the regulatory environment in California. The primary objective of this paper is to examine the relationship between the complexity of the regulatory environment, agricultural industries in California, and different regions in California. This objective will be achieved by taking information gathered from a producers' survey and applying an ordered logit econometric model using complexity of the regulatory environment as the dependent variable. A secondary objective of this study is to develop a motivation why the complexity of the regulatory environment is important issue to consider. To achieve this goal, the perception of the complexity of the regulatory environment will be examined with potential management options that producers can take including increasing and decreasing their size of operation, leaving agricultural production, and moving out of the state.

In the next section a brief discussion of the survey instrument and survey methodology is given. The third and fourth sections provide general results of the distribution of the level of complexity of the regulatory environment related to nine California regions and twenty-one different agricultural industries. Sections five presents the ordered logit model and the resulting estimation of the model. A motivation for why studying the complexity of the regulatory environment is important is given in the sixth section. The final section ends with summary, conclusions, and future research needed regarding the complexity of the regulatory environment.

Producer's Survey

To obtain producers' perceptions of the California regulatory environment, a survey instrument was developed. The survey was categorized into five major areas—general demographic

information, the regulatory environment, regulatory compliance cost, technological choice, and managerial issues.

From the general demographic section of the survey, producers were asked to identify the top three commodities they produced. The responses to this question were categorized into twenty-one agricultural industries.[3] This categorization of these industries and the number of respondents in each industry are presented in Table 1. The commodities represented in this research as well as how they were categorized across the twenty-one industries can be found in Table A-1 of the appendix.

The other primary question in the survey pertinent to this research was the location of production. Producers were asked to identify the primary county they produced in. For this research, these counties were categorized into nine different regions that were used by Johnstone (2003). These nine regions are: Region 1, North Coast; Region 2, North Mountain; Region 3, Northeast Mountain; Region 4, Central Coast; Region 5, Sacramento Valley; Region 6, San Joaquin Valley; Region 7, Sierra Nevada; Region 8, South Coast; Region 9, South Desert. Each of these regions is distinct from each other and has there own set of regulations they must comply with. The sets of regulations that each region must comply with may not have elements that are mutually exclusive to the respective regions. Table A-2 of the Appendix lists each of the fifty-eight counties categorized into these nine regions.

The second section of the producer's survey covered topics related to the regulatory environment and is the heart of this research. In this section of the survey, producers were asked their perception of the level of complexity of the regulatory environment. Producers were

[3] These industries are related to the major categories of commodities rather than agricultural industries along the agricultural marketing chain.

requested to indicate whether they believe the regulatory environment in California is 1) Not Complex, 2) Somewhat Complex, 3) Complex, or 4) Very Complex.

The last section of the survey investigated how the regulatory environment is affecting the producers' ability to manage their operations. The last set of questions in this section of the survey asked producers if they considered the following options due to the regulatory environment: 1) move their operation outside of California, 2) increase the size of their operation, 3) decrease the size of their operation, and 4) leave agricultural production altogether. These options were chosen because they could potentially have the greatest effect to the agricultural industry. The responses of these questions will be cross tabulated with the responses regarding the complexity of the regulatory environment to provide a motivation why examining the complexity of the regulatory environment is important.

The survey was administered by the California Agricultural Statistical Service (CASS). CASS is the California branch of the USDA—National Agricultural Statistic Service. CASS ran a random sample of 10,000 producers in the state giving each producer approximately a one in eight shot to be a part of this study. The survey was sent out by CASS in early March 2005 to producers. Two follow-up post cards were sent out to remind producers of the survey. CASS handled all data input from the survey and returned a data file of producers' responses to the researchers. The total usable surveys from this study were 1323, which gives a response rate of 13%.

Producers Views of the Regulatory Environment by Region

Table 2 presents the distribution of producers' views of the complexity of the regulatory environment. It also presents the distribution of level of complexity broken up by different regions in California. Over 44% of producers classified the regulatory environment in California

as either Complex or Very Complex. Only 26% of the producers classified the regulatory environment as Not Complex. The two largest agricultural production regions in California, the San Joaquin Valley and the Sacramento Valley, have a higher percentage of producers indicating that the regulatory environment in California is complex or very complex in comparison to the average. The South Desert region of the state appears to have the least difficulty understanding the regulatory environment with over 40% of its producers indicating that the regulatory environment is not complex. Using a test of independence presented by Ott and Longnecker (2001), the null hypothesis of independence between the perception of the complexity of the regulatory environment and the location of the producers can be rejected at the 0.005 level of significance (χ^2=50.63).[4] This implies that the perceived complexity of the regulatory environment is not independent of the regions.

While the test for independence examines whether all the distributions of each region are all equal, the test of homogeneity presented by Ott and Longnecker (2001) compares distributions from subsets of regions to see if they are statistically different from each other.[5] Table 3 presents the chi-squared statistics for homogeneity of distributions for each pairwise comparison. A chi-square statistic greater than 7.815 using three degrees of freedom would imply that the distributions between the two regions are significantly different. There are three regions that have distributions that are significantly different from each other and all other regions. These are the Sacramento Valley, the San Joaquin Valley (except the comparison between the San Joaquin Valley and the North Coast), and the South Desert. The rest of the production regions in the state do not have significantly different distributions.

[4] The null hypothesis for this test is written as $(p_{11},p_{21}, \ldots, p_{c1}) = (p_{12},p_{22}, \ldots, p_{c2}) = \ldots = (p_{1r},p_{2r}, \ldots, p_{cr})$ where p_{cr} is defined as the c^{th} proportion for the r^{th} region.

[5] If two distributions are homogeneous, then the distribution across complexity will statistically match-up. The null hypothesis for this test is written as $(p_{11},p_{21}, \ldots, p_{r1}) = (p_{12},p_{22}, \ldots, p_{r2})$, where p_{ij} is defined as the i^{th} proportion for the j^{th} region.

Producer's Perception of Complexity of the Regulatory Environment by Industry

Table 4 provides a view of how each industry viewed the level of complexity of the regulatory environment. There were eleven out of the twenty-one industries that had over 50% of their producers identify the regulatory environment as either Complex or Very Complex. Only one industry, the vegetables-other industry, had 50% or greater of their producers indicating that the regulatory environment was not complex.[6] Twelve of the industries had less than 25% of their producers indicating that the regulatory environment was not complex. The industry that had the highest percentage of producers who indicated the regulatory environment was very complex was the melon industry. The berry industry had the second highest percentage of producers that believed the environment was very complex. The aquaculture and deciduous fruit industries had the lowest percent of producers indicating very complex.

Estimation with an Ordered Logit Model

A close examination of Tables 2 and 4 above show that different regions and different agricultural industries have different perceptions of the complexity of the regulatory environment. To investigate the relationship between the complexity of the regulatory environment, the different agricultural production regions, and the different agricultural industries in the state, an ordered logit econometric model is estimated. Letting CRE equal the producer's perception of the complexity of the regulatory environment which takes on one of four possibilities—not complex, somewhat complex, complex, or very complex—the ordered logit model can be written as:

(1) $\mathbf{CRE^* = \alpha'C + \beta'R + \nu'M + u}$

where, CRE = 0 if CRE* < 0, i.e., the participant chose Not Complex;

[6] This vegetable-other industry was made up of Indian and sweet corn producers, water cress, artichokes, and what CASS defines as other vegetables.

1 if $0 \leq CRE^* \leq \mu_1$, i.e., the participant chose Somewhat Complex;

2 if $\mu_1 \leq CRE^* \leq \mu_2$, i.e., the participant chose Complex;

3 if $CRE^* > \mu_2$, i.e., the participant chose Very Complex.

Equation 1 can be considered a latent utility function where CRE* is the unobserved utility caused by the regulatory environment. The term CRE is the producer's categorical realization of the complexity level of the regulatory environment. It is assumed that **u** is distributed as a standard logistic distribution. The term μ_i is an unknown threshold parameter that is estimated with the explanatory values. The matrices **C, R,** and **M** are the explanatory variables for region, industry, and income respectively and the vector **α, β,** and **ν** are the sets of corresponding estimated coefficients.

The first set of explanatory variables, **C**, is related to the industry/industries that the producer is in.[7] The second set of explanatory variables, **R**, is based on the different regions in the state. Since these regions are identified with dummy variables, the South Desert region is excluded to use as a basis for comparison. The third set of variables used in this model is related to producers' farm income, **M**. Income is categorical data that is categorized into six different classifications: 1) Less than $10,000, 2) $10,000 to $49,999, 3) $50,000 to $99,999, 4) $100,000 to $249,999, 5) $250,000 to $499,999, and 6) $500,000 and More. The basis for this categorical data is income level of less than $10,000. This income variable is being used to measure size of the operation.

Table 5 present the estimated coefficients of the ordered logit equation and the marginal effects of each coefficients. There are eight out of the twenty-one industries investigated that have a significant impact on explaining the perceived level of complexity of the regulatory environment at the 0.05 level of significance. These industries are: 1) citrus, 2) nuts, 3) berries,

[7] Since producers can be in multiple industries, it is not necessary to drop one of the industries to use as a basis.

4) grapes, 5) melons, 6) stone fruit, 7) grass, grains, seeds, and fiber that are not for human consumption, and 8) poultry. All of these variables except melons had negative marginal effects when predicting the categories not complex and somewhat complex, and had positive marginal effects when predicting the categories complex and very complex. The melon industry only had a positive marginal effect on predicting the very complex category. While not significant, all the vegetable industries examined consistently have positive marginal effects on predicting the not complex and somewhat complex categories and negative marginal effects for the complex and very complex categories.

There were five out of the eight regions estimated that had a significant effect on predicting the level of complexity at the 0.05 level of significance when using the South Desert region of the state as the basis for comparison. These regions were: 1) North Coast, 2) Sacramento Valley, 3) San Joaquin Valley, 4) Sierra Nevada, and 5) South Coast. Each of these coefficients had negative and decreasing marginal effects when predicting the not complex and somewhat complex categories. The marginal effects were positive and increasing when predicting the complex and very complex categories.

Examining the income variables shows that all the estimated coefficients are positive, increasing as income increases, and significant at the 0.001 level of significance. The marginal effects are negative for each variable when predicting the not complex and somewhat complex categories and are positive and increasing for each variable when predicting the complex and very complex categories. These results strongly suggest that the perceived level of complexity is increasing with the size of the operation as would be expected.[8]

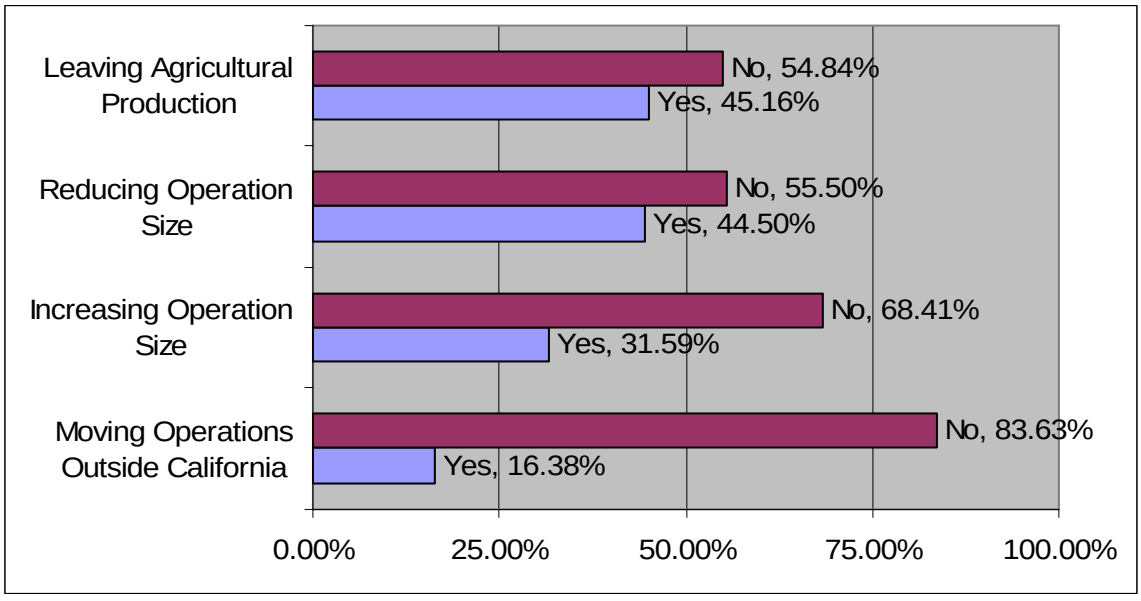
[8] The income of an operation is highly correlated with the size of an operation and the number of commodities produced. The producers at the higher income level have a higher likelihood of producing multiple crops. This causes these producers to have to understand a larger set of regulations than a producer of a single commodity.

Using a likelihood ratio test with 34 degrees of freedom to test for significant explanatory power of the model coefficients, the ordered logit model estimated for equation 1 had significant explanatory power at the 0.001 level of significance ($\chi^2 = 223.89$). Table 6 provides the actual and predicted categories for the ordered logit model. The model was able to predict approximately 38% of the realizations correctly with each category having a positive proportion of complexity levels predicted correctly. At over 56%, the model was most accurate predicting the somewhat complex category. At just under 9%, the model had difficulty predicting the complex category correctly.

The Importance of Considering the Complexity of the Regulatory Environment

To motivate the importance of examining producers' perception of the regulatory environment, participants in the study were asked to indicate whether they have considered a few management options due to the regulatory environment. The management options presented were to leave agriculture production altogether, reduce operation size, increase operation size, and leave California to produce in another state/country. Figure 1 presents the results of this enquiry.

Figure 1: Management Options Considered Due to the Regulatory Environment in California



While no option received more than 50% of the producers indicating they had considered each of them, the options of leaving agriculture and the reducing operational size garnered approximately 45% of the producers indicating they considered these options. It appears that reducing operational size was considered a better option compared to increasing the size. What these results imply is that producers are more likely to exit the industry or prepare to exit the industry rather than increase their operational size to potentially gain economies of scale. Somewhat surprisingly, a large majority of the producers, 83%, have not considered leaving California indicating that producers have a strong regional preference to produce in California if they are going to produce at all.

Table 7 demonstrates the importance of examining the complexity of the regulatory environment in terms of management options considered. This table presents a contingency table of the people who identified that they had considered the respective options given in Figure 1 by the level of complexity of the regulatory environment. For three of the four options, i.e., leaving agricultural production, reducing the size of their operation, and moving their operations outside of California, the percentage of producers indicating they had considered the respective options is increasing with the perceived level of complexity. This would imply that there is a positive correlation between perceived levels of complexity of the regulatory environment and the options considered.

It is clear from the results in Table 7 that increasing the complexity level increases the probability that a producer would consider an option that would reduce the size of the number of producers in the agricultural industry in the state. While it is clear that increasing complexity will lead to less operations because producers would either reduce their size, leave the state, or leave agricultural production altogether. It is less clear whether this would cause the agricultural

industry in California to shrink. The more likely outcome of increasing complexity of the regulatory environment is that consolidation would occur in the industry causing the remaining producers in the state to get larger. Although, the results in Table 7 imply that there may be an upper limit on complexity before some operations decide not to increase operation size to adjust for complexity levels. This is seen in the result where 19.39% of producers who would increase operational size drops to 14.88% when producers perception of the regulatory environment increases from complex to very complex.

Summary and Conclusions

This study was meant to identify how California producers perceive the complexity of the regulatory environment. This issue was investigated using contingency tables and an ordered logit model utilizing data collected from a producers' survey that was handled through the California Agricultural Statistics Service. The survey examined producers' perceptions and attitudes regarding the regulatory environment.

A large percentage of producers find some level of complexity in the California regulatory environment. Approximately 74% of California producers classify the regulatory environment at a minimum as somewhat complex. Over 21% indicated that the regulatory environment is very complex, while nearly 30% of the respondents found the regulatory environment somewhat complex. Approximately 23% identified the regulatory environment as complex.

Using the ordered logit model, it was found that over half the industries examined and over half the regions examined had significant variables in explaining the perceived complexity level of the regulatory environment. It is clear that some agricultural commodities and some regions perceive the regulatory environment as more complex than other industries and regions.

All of the income variables were highly significant and had increasing marginal effects as perceived complexity level was increasing.

Results showed that the regulatory environment in California is driving producers in the state to consider either downsizing their operations or leaving agriculture altogether. The option that was considered most by producers was leaving agricultural production. Over forty-five percent of producers have considered leaving agriculture because of the regulatory environment. Results from the survey imply that producers are more likely to exit the industry or prepare to exit the industry rather than increase their operational size to potentially gain economies of scale. This implies that the complexity of the regulatory environment could have a consolidating effect to the industry.

Future Research

While this research has brought many facts to light on the producer's view of the complexity level of the regulatory environment in California, it opens the door to many research questions that need further examination. With so many producers indicating that the regulatory environment is at a minimum somewhat complex, there are many questions that need to be explored about the complexity of the environment. It would be valuable to first know the sources of the complexity and the marginal effect of each of these sources. This paper was able to identify which regions and industries perceive the regulatory environment as complex, but it did not identify the sources of the complexity. Is the regulatory environment in California complex due to the number of regulations? Or is it the number of government agencies producers must handle? Is it how the regulations are written? Is it a combination of the above three questions? These questions should lead into an investigation of whether the regulatory environment is overly complex in terms of meeting the goals of society.

Since the survey examined perceptions of producers and asked producers if they considered certain management options, statistics should be developed to back-up these perceptions. An investigation should take place to find out if producers are actually decreasing their operation size, getting out of agricultural production, or leaving the state due to the regulatory environment.

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Table 1: Categories of Commodities Collected from the Producers' Survey

Industry	Number of Respondents	Industry	Number of Respondents
Aquaculture	3	Fruit-Citrus	129
Fruit-Deciduous	58	Tree Nuts	208
Horses	66	Grass, Grains, Seeds, and Fiber-Nonhuman	132
Fruit-Other	156	Timber	17
Cattle, Hogs, and Dairy	288	Vegetables-Vines	34
Grass, Grains, Seeds, and Fiber-Human	33	Poultry	20
Vegetables-Other	14	Vegetables-Leafy	15
Other Animals & Insects	70	Fruit-Stone	67
Horticulture	39	Berries	17
Vegetables-Roots	13	Fruit-Melons	4
Grapes	229		

Table 2: Perceived Complexity of Regulatory Environment Broken-Up by Region

		Complexity of Regulations			
Region	Total Respondents	Not Complex	Somewhat Complex	Complex	Very Complex
All Regions	1194	26.05%	29.82%	22.86%	21.27%
Sierra Nevada	82	30.49%	32.93%	23.17%	13.41%
South Desert	69	40.58%	36.23%	8.70%	14.49%
Northeast Mountain	13	7.69%	46.15%	30.77%	15.38%
North Mountain	34	26.47%	41.18%	14.71%	17.65%
South Coast	177	31.07%	31.64%	18.64%	18.64%
Central Coast	248	29.84%	28.23%	22.58%	19.35%
North Coast	35	25.71%	34.29%	17.14%	22.86%
San Joaquin Valley	394	21.57%	28.93%	24.87%	24.62%
Sacramento Valley	142	17.61%	22.54%	32.39%	27.46%

Table 3: Chi-Square Statistics for the Test of Homogeneity between Regions*

Region	North Coast	North Mountain	Northeast Mountain	Central Coast	Sac. Valley	San Joaq. Valley	Sierra Nevada	South Coast
North Mountain	**3.452**							
Northeast Mountain	**4.191**	**6.086**						
Central Coast	**2.795**	**4.691**	**5.429**					
Sac. Valley	15.387	17.283	18.021	16.626				
San Joaq. Valley	**6.677**	8.573	9.311	7.916	20.508			
Sierra Nevada	**4.049**	**5.945**	**6.683**	**5.288**	17.880	9.170		
South Coast	**4.646**	**6.542**	**7.280**	**5.885**	18.477	9.767	**7.139**	
South Desert	14.875	16.771	17.509	16.114	28.706	19.996	17.368	17.965

* The numbers in bold indicate that the comparison between the distribution of complexity for the two regions are not statistically significantly different at the 0.05 level of significance using the chi-squared test for homogeneity presented by Ott and Longnecker (2001).

Table 4: Perceived Complexity of Regulations Broken-Up by Industry

		Complexity of Regulations			
Industry	**Number of Respondents**	**Not Complex**	**Somewhat Complex**	**Complex**	**Very Complex**
Aquaculture	3	0.00%	0.00%	100.00%	0.00%
Fruit-Deciduous	58	22.41%	39.66%	24.14%	13.79%
Horses	66	37.88%	30.30%	15.15%	16.67%
Fruit-Other	156	25.64%	35.90%	21.15%	17.31%
Cattle, Hogs, and Dairy	288	35.42%	25.69%	18.06%	20.83%
Grass, Grains, Seeds, and Fiber-Human	33	21.21%	30.30%	27.27%	21.21%
Vegetables-Other	14	50.00%	7.14%	21.43%	21.43%
Other Animals & Insects	70	35.71%	28.57%	12.86%	22.86%
Horticulture	39	20.51%	30.77%	25.64%	23.08%
Vegetables-Roots	13	23.08%	23.08%	30.77%	23.08%
Grapes	229	13.97%	34.50%	27.95%	23.58%
Fruit-Citrus	129	24.81%	31.01%	18.60%	25.58%
Tree Nuts	208	15.38%	26.44%	32.21%	25.96%
Grass, Grains, Seeds, and Fiber-Nonhuman	132	20.45%	25.76%	25.76%	28.03%
Timber	17	35.29%	11.76%	23.53%	29.41%
Vegetables-Vines	34	29.41%	29.41%	11.76%	29.41%
Poultry	20	15.00%	15.00%	40.00%	30.00%
Vegetables-Leafy	15	26.67%	20.00%	20.00%	33.33%
Fruit-Stone	67	8.96%	20.90%	31.34%	38.81%
Berries	17	17.65%	11.76%	29.41%	41.18%
Fruit-Melons	4	0.00%	0.00%	25.00%	75.00%
All Industries	1183	25.53%	30.01%	22.99%	21.47%

Table 5: Ordered Logit Estimation of the Level of Complexity of Regulations

	Model Estimation			Marginal Effects*			
Variable	**Coeff.**	**t-ratio**	**P-value**	**Y = 0**	**Y = 1**	**Y = 2**	**Y = 3**
Intercept	-0.469	-1.708	0.088				
CITRUS	0.610	2.977	0.003	-0.093	-0.058	0.049	0.103
NUTS	0.670	3.616	0.000	-0.103	-0.062	0.054	0.112
BERRIES	1.012	1.977	0.048	-0.132	-0.114	0.052	0.193
GRAPES	0.670	3.574	0.000	-0.104	-0.061	0.055	0.111
TIMBER	0.827	1.620	0.105	-0.114	-0.090	0.052	0.152
HORT	0.500	1.587	0.113	-0.076	-0.048	0.040	0.084
VEGOTHR	-0.572	-0.968	0.333	0.115	0.016	-0.062	-0.069
VEGLEAF	-0.013	-0.023	0.982	0.002	0.001	-0.001	-0.002
VEGROOT	-0.583	-0.970	0.332	0.117	0.016	-0.063	-0.070
VEGVINES	-0.020	-0.055	0.956	0.004	0.001	-0.002	-0.003
MELONS	2.521	2.043	0.041	-0.205	-0.274	-0.072	0.551
STNFRT	0.846	3.285	0.001	-0.118	-0.090	0.055	0.153
GGSFNOHM	0.540	2.655	0.008	-0.084	-0.050	0.044	0.090
GGSFHUMN	-0.170	-0.486	0.627	0.031	0.010	-0.017	-0.024
DECIDFRT	0.105	0.416	0.678	-0.018	-0.008	0.010	0.016
FRUITOTH	0.197	0.971	0.331	-0.033	-0.016	0.019	0.030
AQUACULT	0.334	0.374	0.708	-0.053	-0.030	0.029	0.054
LVSTKCHD	0.048	0.290	0.772	-0.008	-0.003	0.005	0.007
HORSES	0.196	0.763	0.446	-0.033	-0.016	0.018	0.030
PLTRY	1.184	2.788	0.005	-0.146	-0.137	0.049	0.234
ANIMINS	0.153	0.598	0.550	-0.026	-0.012	0.014	0.023
REGN1	0.810	1.983	0.047	-0.113	-0.087	0.052	0.147
REGN2	0.625	1.519	0.129	-0.092	-0.063	0.046	0.109
REGN3	0.780	1.397	0.162	-0.109	-0.084	0.051	0.142
REGN4	0.513	1.807	0.071	-0.082	-0.045	0.045	0.082
REGN5	0.938	3.108	0.002	-0.133	-0.097	0.062	0.168
REGN6	0.606	2.268	0.023	-0.100	-0.049	0.055	0.094
REGN7	0.736	2.246	0.025	-0.107	-0.075	0.052	0.130
REGN8	0.612	2.191	0.028	-0.095	-0.057	0.050	0.102
INCMCT2	0.478	3.428	0.001	-0.079	-0.040	0.043	0.075
INCMCT3	1.084	5.855	0.000	-0.147	-0.116	0.063	0.201
INCMCT4	1.112	5.468	0.000	-0.148	-0.122	0.060	0.210
INCMCT5	1.683	5.648	0.000	-0.182	-0.197	0.025	0.353
INCMCT6	1.771	7.985	0.000	-0.200	-0.201	0.037	0.364
Mu(1)	1.531	25.977	0.000				
Mu(2)	2.766	35.626	0.000				
Log likelihood function		-1474.011		Restricted log likelihood			-1585.959
N = 1152		DF = 34					$\chi^2 = 223.8949$

* Y = 0, 1, 2, 3, represents respectively "Not Complex", "Somewhat Complex," "Complex," and "Very Complex."

Table 6: Predicted and Actual Outcomes and Ordered Logit Model

	Predicted				
Actual	Not Complex	Somewhat Complex	Complex	Very Complex	Row Sum
Not Complex	127	148	5	10	290
Somewhat Complex	80	198	20	54	352
Complex	27	136	23	80	266
Very Complex	27	109	20	88	244
Column Sum	261	591	68	232	1152

Table 7: Options Considered by Producers Due to the Regulatory Environment in California in Relationship to the Level of Complexity

	Options			
Level of Complexity	Leave California	Increase Operation Size	Reduce Operation Size	Leave Agriculture
Not Complex	10.83%	7.31%	13.96%	21.98%
Somewhat Complex	14.39%	10.42%	24.02%	40.15%
Complex	32.42%	19.39%	38.29%	55.50%
Very Complex	51.05%	14.88%	59.57%	71.63%

Appendix

Table A-1: Categorization of Industries

Industry	Industry	Industry
Fruit-Citrus	**Vegetables-Leafy**	**Horticulture**
Tangelos	Cabbage; fresh	Bedding/garden plants
Citrus; other	Cilantro	Horticultural specialties
Mandarins	Cucumbers for pickles; processed	Potted flowering plants
Tangerines	Kale	Horticulture; other
Limes	Lettuce; head	Holiday trees
Grapefruit	Lettuce; romaine	Nursery crops
Lemons	Spinach; fresh	Flowers; cut and cut florist greens
Oranges; Valencia	Cauliflower	Loquats
Oranges; Other than Valencia	Broccoli	
	Lettuce; other	**Vegetables-other**
Tree Nuts	Herbs; fresh	Indian corn
Chestnuts		Sweet corn; fresh
Pecans	**Vegetables-Roots**	Vegetables; other
Macadamia nuts	Beets	Watercress
Pistachios	Garlic	Artichokes
Walnuts	Onions; dry	
Almonds	Onions; green	**Grass, Grains, Seeds, and Fiber-Nonhuman**
	Carrots	Bermuda grass seed
Berries	Sugarbeets for sugar	Grass silage
Blackberries	Sweet potatoes	Forage and greenchop
Berries; all other	Potatoes	Sorghum-sudan crosses
Raspberries	Leeks	Hay; wild
Blueberries; tame		Sod/turfgrass
Strawberries	**Vegetables-Vines**	Wheat; all; for seed
	Okra	Cotton; pima
Grapes	Chinese peas; sugar; snow	Alfalfa seed
Currants	Cucumbers; fresh	Barley; grain for feed
Grapes; dry	Peppers; other	Corn; grain
Grapes; fresh	Squash; winter	Silage & haylage (except corn & sorghum)
	Tomatoes; processed	Hay; small grain
Timber	Pumpkins	Cotton; upland
Timber/Trees/Woodland/Wood (except holiday trees & nursery)	Squash; summer	Corn; silage
	Beans; dry edible	Grasses; other than clover & sudan
	Peppers; bell	Hay; alfalfa and alfalfa mixtures
	Tomatoes; fresh	Hay; other

Table A-1 Cont.: Categorization of Industries and Industries Represented in Producer's Survey

Industry	Industry	Industry
Fruit-Melons	**Grass, Grains, Seeds, and Fiber-Human**	**Horses**
Melons; miscellaneous	Peppermint	Mules; burros; donkeys
Watermelons	Rice; wild	Llama
Cantaloupe	Rye	Horses and ponies
	Sugarcane for sugar	
Fruit-Stone	Wheat; other spring	**Poultry**
Nectarines	Oats	Geese
Apricots	Rice	Pigeons
Cherries; sweet	Wheat; winter	Poultry; other
Prunes	Sunflower Seed; Non-Oil Variety	Chicken pullets; laying flock
Plums	Safflower	Turkey poults; meat type
Peaches		Turkeys; other
	Fruit-Deciduous	Ducks
Aquaculture	Figs	Game birds
Aquaculture; All other	Pears	Chickens; other meat type
Sport or Game Fish	Apples	OTHER Eggs; table market
Fish; Other	Pomegranates	
Sponges	Persimmons	
Catfish	Cherimoyas	
Fruit-Other	**Other Animals & Insects**	
Guava	Livestock; other fur bearing	
Kumquats	Rabbits	
Noncitrus fruits; other	Wool	
Dates	Bees	
Kiwifruit	Honey	
Olives	Lambs	
Avocados	Goats	
	Sheep; except lambs	
Cattle, Hogs, and Dairy		
Cattle; Dairy herd replacements		
Feeder Cattle		
Milk and Dairy Products		
Cattle; all other		
Cattle for Breeding Stock		
Buffalo or Bison		
Hogs; Farrow to Finish		
Other hogs and pigs		

Table A-2: Counties Broken-Up By Agricultural Regions of the State

Region 1: North Coast	**Region 2: North Mountain**	**Region 3: Northeast Mountain**
Del Norte	Shasta	Lassen
Humboldt	Siskiyou	Modoc
Mendocino	Trinity	Plumas
Region 4: Central Coast	**Region 5: Sacramento Valley**	**Region 6: San Joaquin Valley**
Alameda	Butte	Fresno
Contra Costa	Colusa	Kern
Lake	Glenn	Kings
Marin	Sacramento	Madera
Monterey	Solano	Merced
Napa	Sutter	San Joaquin
San Benito	Tehama	Stanislaus
San Francisco	Yolo	Tulare
San Luis Obispo	Yuba	
San Mateo		
Santa Clara		
Santa Cruz		
Sonoma		
Region 7: Sierra Nevada	**Region 8: South Coast**	**Region 9: South Desert**
Alpine	Los Angeles	Imperial
Amador	Orange	Riverside
Calaveras	San Diego	San Bernardino
El Dorado	Santa Barbara	
Inyo	Ventura	
Mariposa		
Mono		
Nevada		
Placer		
Sierra		
Tuolumne		