ANALYSIS INTO THE MONOPSONIST POWER OF THE C.S.U
SYSTEM IN THE MARKET FOR UNIVERSITY PROFESSORS

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ABSTRACT

The focus of this paper will be to analyze the degree to which the California State University system possesses monopsonistic power in the market for university professors. Using data on compensation, tuition, enrollment and employment numbers between the years of 2009 and 2014 as well as geographic data collected from ArchGIS, I compare professor wages to an estimate of their marginal revenue product. I then determine whether or not the distance between a given CSU and the nearest university competing for professors effects the difference between professors’ marginal revenue product and their wages. Should the CSU system possess monopsonist power in the market for professors, campuses closer to competing employers should have less market power than campuses in more isolated areas and therefore should have a lower difference between average professor wages and my estimated marginal revenue product of labor.
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Chapter 1

Introduction

1.1 Background

Over the past few years, professor salaries in the California State University (CSU) system have increasingly become an issue of much contention. Up until recently, negotiations between the California Faculty Association (CFA) and CSU administration have become stalled since May 2014 as the two sides have failed to agree on the level of wage increases for CSU faculty. The union is demanding a 5% increase in wages, claiming that the real wages for faculty members have not changed for the past 8 years. The administration is offering a 2% increase in funding for all faculty and staff wages, citing attempts to keep tuition from rising (Song, 2015). As of early April 2016 both sides reached an agreement; averting a faculty strike scheduled to occur within the week (Xia, 2016).

In order to determine who is correct in this argument, we must determine why it is that wages for faculty of the CSU system remained unchanged over most of the past decade. If the market for CSU faculty is competitive, faculty are making their marginal revenue product and other external market forces are depressing wages. Should this be the case,
then the demands of the CFA are simply the union seeking additional rent for its members from the CSU system. While this is in line with objectives of the union, it does not necessitate a raise in wages. However, if the market for CSU faculty is not competitive and the CSU system is abusing market power in the labor market, the demands of the CFA are no longer the union seeking additional rent on the part of its members rather reducing the rent that the CSU system is extracting from its professors. In this paper I will attempt to find evidence for whether or not the market for CSU faculty is not competitive. Specifically, I will attempt to find evidence that the CSU system possesses monopsony power in the market for professors.

If it is found that the CSU system is acting as a monopsonist it brings up a number of implications. First and foremost it would mean that the CSU system, a publicly owned and operated higher education system, is operating in a way consistent with a for-profit entity. Since nowhere in the mission statement of the CSU system does it call for the system to produce a profit (CSU, 2016), it is curious for the system to operate in such a way and calls into question the motivation of such behavior. It could be the case that the operators of the CSU system is acting in their own best interest as opposed to acting in the interest for the CSU system as a whole. This could possibly explain why over the past decade faculty wages has remained relatively flat while the wages of managers, supervisors, and other administrator positions have grown substantially over the same time period (CFA, 2015). Another issue is the possible effects of below market wages for CSU faculty on the educational outcomes of CSU students and supply of qualified faculty labor for the CSU system in the long-term.
1.2 Market Structure of Monopsony

In a competitive market prices only change as a result of overall changes in market supply and demand. No single firm possesses the market power to influence the prices as a result of their own actions. Individual firms determine the level of consumption of an input good and maximizes their profits by consuming an input good to the point at which the revenue generated from the final input good purchased, the marginal revenue product, is equal to the marginal cost paid for that good, which is simply the price (Equation 1.1-1.4). Since the marginal cost for the input good is the price and the price, from the view of the individual firm, is fixed the firm is said to face a horizontal supply curve for the good.

At levels of consumption below this point the marginal revenue product of an additional input good is greater than the price and additional profit can be generated. At levels of consumption above the point at which marginal revenue product is equal to the price, the price paid for the final unit is greater than the revenue the final input good will generate. Below is an example of profit maximization behavior in a competitive market for labor as an input good with $\pi$ being profit, $TR$ being total revenue, $TC$ being total cost, $MRPL$ being marginal revenue product labor, and $MCL$ being marginal cost of labor in a competitive market, $w$ is equal to the wage rate of labor, and $L$ being the quantity of labor hired.

$$\pi = TR(L) - TC(L)$$  \hspace{1cm} (1.1)

$$\frac{d\pi}{dL} = \frac{dTR}{dL} - \frac{dTC}{dL}$$  \hspace{1cm} (1.2)
\[
\frac{d\pi}{dL} = \text{MRPL} - \text{MCL} 
\]

\[
\text{MRPL} = w 
\]

In contrast, monopsonists, as the sole buyer of a good, are the only source of demand in the market for a good and are able to influence prices by changing their level of consumption of the good; much like how a monopolist can influence prices by changing the quantity of a good they produce. If a monopsonist increases its consumption of a good it is increasing demand, which drives up the price for each unit the monopsonist consumes. Monopsonists would maximize their total profits generated in much the same way that a firm in a competitive market would, by setting marginal revenue product equal to marginal cost (Equation 1.5-1.8). However, since the monopsonist posses market power, the marginal cost is no longer a fixed value equal to the price, rather it is the price of that final input good plus the increase in price on all previous input goods consumed caused by consuming that final unit (Equation 1.7-1.8). Therefore, the monopsonist faces a trade off in which each input good consumed contributes to total revenue generated, but also increases the price the monopsonist must pay for each input good. As a result, a firm with monopsonist power faces an upward sloping supply curve. Below is the profit maximizing behavior of a monopsonist with \( \pi \) being profit, \( \text{TR} \) being total revenue, \( \text{TC} \) being total cost, \( \text{MRPL} \) being marginal revenue product labor, and \( \text{MCL} \) being marginal cost of labor in a monopsonist market, \( w \) is equal to the wage rate of labor, and \( L \) being the quantity of labor hired.

\[
\pi = \text{TR}(L) - \text{TC}(L) 
\]
\[
\frac{d\pi}{dL} = \frac{dTR}{dL} - \frac{dTC}{dL}
\]  
(1.6)

\[
\frac{d\pi}{dL} = \text{MRPL} - \text{MCL} 
\]  
(1.7)

\[
\text{MRPL} = w + \frac{dw}{dL} 
\]  
(1.8)

Since a monopsonist will consume a good to the point at which the marginal revenue product is equal to marginal cost, and marginal cost in this case is higher than the price, the result is a decrease in the equilibrium quantity consumed and price of the good consumed when compared to a competitive market. We can see this in the labor market example below in the Figure 2.1. In the graph below DD is equal to the MRPL, SS\textsubscript{1} is the competitive market labor supply curve and MCL of a competitive market, SS\textsubscript{2} is the monopsonist’s labor supply curve, and MC\textsubscript{2} is the MCL of a monopsonist market.
Figure 1.1: Monopsony
Labor supply is positively sloped instead of flat as a competitive market would be and MRP is equivalent to the firms demand for labor. Since increasing the quantity of labor hired drives up the price on all the labor hired instead of just the last unit of labor hired the marginal labor cost has a greater slope than the labor supply curve. The firm can extract rent from its employees and maximize its revenue by consuming where the MRP is equal to the MCL. This results in a wage equal to and a quantity hired equal to monopsonist equilibrium wages and quantity ($W_m$ and $L_m$). Notice that these values are both below the competitive market equilibrium wages and quantity ($W_c$ and $L_c$).

In the competitive labor market, from the standpoint of a single firm, the labor supply curve is flat (SS$_1$). The single firm cannot influence prices so the labor supply curve is their marginal cost curve. Thus a single firm in a competitive market will consume labor to where the MRPL curve intersects the MCL curve, resulting in a quantity of labor employed equal to $Q_1$ and a wage rate equal to $W_1$.

The monopsonist, however, faces an upward sloping labor supply curve (SS$_2$). The firm in this case will still operate where their MRPL curve intersects the MCL curve, however in this case the MCL curve is higher than the labor supply curve since the MCL is the wage of the next employee hired plus the increase in the wage rate for all employees already hired. The result is a quantity of labor hired equal to $Q_2$ and a wage rate equal to $W_2$.

Notice that the monopsonist equilibrium results in an equilibrium wage rate and employment level that is below the competitive market equilibrium. At this level, the monopsonist pays wages equal to $W_2$, but each employee contributes to total revenue (their MRPL) equal to $V$. The difference between $V$ and $W_2$ multiplied by the $Q_2$ is excess profit extracted by the monopsonist.
Chapter 2

Review of the Literature

2.1 Models of Monopsony

The term monopsony was initially introduced by Joan Robinson in 1933 (Robinson, 1933). In this classical model, monopsonists experience an upward sloping labor supply curve by being the sole buyer of a good in a market. Since the introduction of monopsony, the view by many economists has been that it is implausible for a market of any notable size to have only a sole buyer or a few buyers able to exert market power. However, empirical studies in labor markets has shown behavior that is unexpected in a competitive labor market including minimum wage increases resulting in increased employment numbers and an increase in average wages with firm sizes. Additionally, alternative models explaining how firms can face an upward sloping supply curve without being the sole buyer have been developed. As a result, there has been renewed interest in research focused on finding evidence of monopsonist behavior in labor markets.

Much of the current research into theoretical models in which monopsony power might arise aside from the classical sole buyer model is summarized by Boal and Ran-
som (1997). As an alternative to the sole buyer model, the authors introduce several other possible models in which firms might face and upward sloping supply curve. Of the models outlined in this paper three are relevant to the focus of this research paper; the oligopsonist model, employer differentiation model, and moving costs model of monopsony.

The oligopsonist model assumes that firms seeking the same type of labor either collude to hire the quantity of labor that maximizes total profits or each firm chooses their level of quantity that maximizes profits holding the quantity hired by other firms as constant. The model would require a degree of coordination between firms in order to maintain collusion, such as the firms all being the part of the same university system.

Employer differentiation arises when firms are not homogenous and possess characteristics that differentiate them from other firms. If workers have heterogeneous preferences in these characteristics firms can offer wages below competitive market wages with the difference being made up of the value of the employer specific characteristics to the worker. According to the authors, “if each worker prefers a particular firm over all others by a least some finite amount, the the only possible Nash equilibrium sets the wage exactly equal to the collusive level ...[however] if workers’ preferences are distributed continuously so that at least some workers are on the margin, then the rate of exploitation is smaller, but not zero” (Boal and Ransom, 1997). For example, if Ph.D holding workers prefer academic work at a university over alternative occupations, universities could exploit this and offer below competitive market wages for university professors. The universities would receive a discount on professor wages much like an employer in more amenable area could offer lower wages than an identical employer in a less desirable area.

Workers who must change firms will face moving costs, either explicit and/or im-
plicit. As a result, once a worker has moved to a location they will no longer be indifferent between two firms that differ in the distance from their location. If one firm necessitates the worker to move again they would have to offer a higher wage than the firm that would not require a move; conversely the closer firm could hire the worker at a lower wage than the firm further away. For long term employment, such as tenure, this should not alter the competitive market. However if workers are only offered short term employment, the firm will possess monopsony power once the worker is up for another short term employment period since the worker would face moving costs if they wanted to find work elsewhere. The model would most likely apply “to professionals with general skills whose alternative employers are geographically dispersed and whose wages cannot be specified far in advance-such as college professors” (Boal and Ransom, 1997).

In Manning (2003), the author argues that monopsonist behavior is not the result of insufficient competition for labor in the market that the classical perspective suggests, rather that labor markets are "thin" in ways that may be overlooked by economists. Features unique to the labor market such as employer differentiation and search costs on the part of employees create frictions in the labor market that allow firms without significant market power to perceive an upward-sloping supply curve of a monopsonist. In order to test this the authors used a dataset including the wages and commute times of workers in the U.K. The results of their research indicated that high commute times were correlated with higher wages, with an hour long commute being “associated with wages that are 7-9% higher” than similar jobs with lower commute times. This is consistent with commutes being a way in which employers are heterogeneous and a negative feature for workers that they need to be compensated for. This result indicates that higher wages attract workers from a larger geographic region around the employer than lower wages would; indicates that such firms do indeed face an upward sloping labor supply
2.2 Empirical Research

Nursing is a classic example of a labor market in which monopsonist behavior might arise due to a few factors. Nursing requires a high degree of specialization through education and/or licensing, which limits their choice of alternative employment and nurses are mostly hired by hospitals. Hirsch and Schumacher (1995) attempts to measure the monopsonist or oligopsonist power of hospitals on the wages for nurses by looking at nurses’ wages and comparing them with the concentration of hospitals in various metro areas. If hospitals do possess monopsonist power in the market for nurses, then the concentration of hospitals in a metro area should be positively correlated with wages for nurses.

The authors tested the theory by first estimating wages based on a variety of characteristics such as age, location, year, education, martial status, etc. through ordinary least squares for individuals in nursing as well as others in non-nursing occupations. With the estimated wages the authors found the difference in wages between nursing and non-nursing occupations for a variety of metro areas. Next they ran a weighted least squares regression on the wage differential between nursing and non-nursing occupations on the log of the hospitals per square mile in the metro area, the size of the metro area, the level of training or education, and the region. If the theory that hospitals exhibit monopsonist behavior holds, then the differential between nurses and non-nursing wages should be larger for metro areas with a relatively low hospital concentration than for metro areas with a relatively high level of hospital concentration and for larger metro areas compared to smaller metro areas.
The results of the paper indicated that although previous studies have suggested that hospitals do face an upward sloping supply curve for nurses (Sullivan, 1989), there is no evidence that it influences wages and employment levels for nurses. Hirsch and Schumacher (1995) shows that the differential between nursing wages and other occupations are largely unaffected by hospital density and actually increase with the size of the market size of the metro area (Sullivan, 1989), which is not consistent with employers observing and abusing monopsony power. Registered nurses as a subgroup should have been the most susceptible to monopsonist wages since they require the most occupation-specific training and therefore face higher opportunity costs in switching to non-nursing occupations. However, the results show that the coefficient for the measure of competition between employers (hospitals per square mile) is close to zero with a low significance level. This result is also found in the market for licensed nurse practitioners and nursing aids.

Another empirical test was done by Card and Krueger (1993), which tests the effect of a minimum wage increase in New Jersey on employment at fast food restaurants and compares the results to neighboring Pennsylvania that did not raise its minimum wage. Their initial results suggested that the increase in the minimum wage in New Jersey increased employment relative to Pennsylvania, which would be expected if there was monopsony in the market for unskilled labor. The findings of this paper were criticized as bias by other researchers and has been re-evaluated with more accurate data (Neumark and Wascher, 1995; Card and Krueger, 1998). After re-evaluation of their analysis with new, more accurate data it was found that their initial results were incorrect and that the increase in the minimum wage had either no effect or a slight decrease on employment in New Jersey relative to Pennsylvania over the given time period (Card and Krueger, 1998). Still, the paper greatly increased the interest in research into the monopsonistic
characteristics of the U.S. labor market. Other papers testing monophonic behavior in nurses in individual hospitals, the effects of Walmart on wages in metro vs non-metro areas, wages in academic labor markets, and in the market for public school teachers all result in differing conclusions (Bonanno and Lopez, 2012; John H. Landon, 1971).
Chapter 3

Methodology

3.1 Estimates

Regardless of the source of monopsony power, the model predicts that a monopsonist will pay wages below the marginal revenue product of its employees, taking the difference as rent and resulting in a deadweight loss in the labor market. To test whether the California State University system possesses monopsonist power in the market for college professors, this analysis will attempt to measure the difference between the marginal revenue product and marginal cost of professors on each CSU campus (i) campuses for each year (t) and compare them with the distance to the nearest alternative employment option for university professors.

\[ \theta_{i,t} = MRPL_{i,t} - MCL_{i,t} \]

Should the CSU system possess monopsonist power the degree of that power should vary based on how far away competing employers are to the campus. Thus \( \theta \) should be a function of the distance between each CSU campus and the proximity to other
universities competing for professors.

In order to analyze the degree of monopsony power of the CSU system I first need to create a measure of the marginal revenue product of labor (MRPL) for professors. The CSU system’s revenue is generated through two sources; direct funding from the state of California and tuition paid by students. Since students attend the campus for classes with professors, the MRPL of professors should only be reflected in the CSU revenue generated by tuition paid by students. In order to calculate the MRPL I first multiply the yearly cost of tuition by the number of full-time equivalent (FTE) students on campus. Tuition paid depends on whether a student is enrolled as an undergraduate, graduate, or credential program. To correct for this I generate a weighed average of tuition (ω) for each campus (i) and each year (t) with the level of tuition for undergraduate (u), graduate (g), and credential (c) programs multiplied by the proportion of the total FTE student enrollment enrolled in each degree program. Below is the equation for weighted average tuition with ρ being the proportion of total FTE students enrolled in each degree program (u, g, c), and τ is the cost of tuition for each degree program (u, g, c).

\[ \omega_{i,t} = \rho_{u,i,t} \tau_{u,t} + \rho_{g,i,t} \tau_{g,t} + \rho_{c,i,t} \tau_{c,t} \]  

(3.2)

I then multiply the weighted average tuition paid (ω) by the total FTE student enrollment (σ) for each campus year. This value should reflect all revenue generated through the educational activities for each CSU campus. With this I then divided by the total number of instructional faculty (γ). The value generated will be my estimate of MRPL.

\[ MRPL_{i,t} = \sigma_{i,t} \omega_{i,t} / \gamma_{i,t} \]  

(3.3)
3.2 Assumptions

My estimate of MRPL (eMRPL) only works with a few assumptions about the data. First, that the number of classes taught by instructional faculty each year is normally distributed about an average classes taught per instructor. Given that standard faculty contracts typically state the number of classes taught per year I feel this is a reasonable assumption. Second, that the number of students is normally distributed about an average number of students per class. Given that some courses and programs tend to have larger class sizes and others smaller class sizes I feel that this also a reasonable assumption to make.

One issue to bring up with my estimated MRPL is how it would be expected to deviate from the true measure of MRPL. My estimate assumes that all revenue generated through tuition is generated by the labor of a campus’s faculty activities, which is almost certainly not the case. There are a large number of lecturers and other instructional staff rivaling the number of faculty on many campuses also engaged in teaching classes and contributing to revenue generated. Additionally, many other ancillary activities such as facilities maintenance, administration, and student services that also contribute to the generating of CSU revenue. As a result my measurement very likely over states the MRPL of faculty on CSU campuses. Another issue is that my estimate of MRPL does not capture any of the non-class activities that professors perform on a daily basis. Tasks such as office hours made available for students, research activities performed by professors that enhance the campus status, any possible grants professors receive from outside sources to fund research, etc. Since these activities also affect revenue generated and are not being captured in my estimate of MRPL it would mean my estimate is underestimating the MRPL of faculty. Of these two errors in my estimate of MRPL, I assume that the fact that I am not accounting for the effect of ancillary activities in the generation of CSU
revenue to be a larger effect than the fact that I am not capturing the non-teaching activities of professors, so net I would expect that my measurement of MRPL to overestimate the true MRPL of faculty.

However, although my estimate may overstate the value of the true MRPL there is no reason to expect my estimate to not track the true measure of MRPL. As a result, if I see my estimated MRPL increasing I should expect that the true value of faculty MRPL is also increasing, if at a lower value.

3.3 Method of Analysis

With the measure of MRP calculated for each university I then compare the changes in MRP over time with the changes in average professor yearly wages. If the CSU campuses possess market power I expect that over the time frame of 2009-2014 there will be an increase in the measure of MRP and average faculty wages will remain flat. In other words the mean professor wages will not be equal to their MRP, which is indicative monopsony power. However if changes in wages over time do match the changes in MRP it will indicate that the labor market for faculty in the CSU system is competitive.

The next step will be to determine if the degree of monopsonist power faced by each CSU campus is dependent on the concentration of alternative university employers in the geographic area. In order to test this I will use find the difference between the estimated MRPL and average faculty wages (MCL) in order to estimate the surplus that the CSU campuses are extracting from their faculty. I will then find the distance from each CSU campus to the nearest alternative university, for which I will test community colleges, private non-profit (PNP) universities, alternative CSU campuses, and UC campuses. Finally I will regress a measure of distance between each CSU campus and the nearest
alternative universities on the difference between MRPL and MCL. Recall $\theta_{i,t}$ is the difference between MRPL and MCL for each CSU campus and year and $\delta_{i,u}$ is the average distance between each CSU and the nearest three CSU campuses, community colleges, private non-profit universities, and UC campuses.

$$\theta_{i,t} = \mu_0 + \mu_1 \delta_{i,u} + \epsilon$$ (3.4)

If the CSU campuses do face upward sloping labor supply curves the elasticity of labor supply should be related to the concentration of alternative employers of college professors in the area. If we find that the coefficient of $\delta$ to be positive and significant for any of the group of competing universities included in this analysis it suggests the surplus that CSU campuses can extract is dependent on the concentration of alternative universities nearby. This would be further evidence that the CSU system is exhibiting monopsonist behavior.
Chapter 4

Data

4.1 Enrollment, Tuition and C.S.U. Revenue

For this project I will need to data over a number of years in California on professor wages, tuition data by campus, enrollment data by campus, average student to faculty ratio by campus, as well as a list of colleges and universities in the state with their address as well as whether or not they are a public or private university.

The tuition data was collected from the California State University System website (California State University, 2015). The data covers the period between 2007-2016. Tuition is the same across the CSU campuses and is broken down by undergraduate, graduate, credential programs, nursing programs, physical therapy doctorates, and education doctorates. In this paper I will be using the tuition for undergraduates, graduate, and credential programs.

Enrollment data by campus was collected from the same source as the tuition data (California State University, 2015). The data is broken down by year and includes the total number full-time equivalent (FTE) undergraduate, graduate, and credential program
enrollees.

Figure 4.1: CSU Tuition over Time
Figure 4.2: CSU Enrollment over Time
Figure 4.3: CSU Budget from Funding and From Tuition
In Figures 4.1 we can see the cost of tuition over time for the CSU system. This time period includes the Great Recession in 2007-2009 as well as its aftermath in which California cut its funding for the CSU and UC systems. As a result, the CSU increased tuition multiple times to make up for the budget shortfall. Figure 2 shows the total enrollment in the CSU system over time. Figure 4.2 shows the total enrollment of the CSU system. From 2009 to 2010 we can see that total enrollment fell as the Great Recession ended and people who enrolled in college during the recession left once their employment prospects improved. Since 2010 there has been a steady increase in the total enrollment for the CSU system. Taken together, Figures 1 and 2 would suggest that total revenue generated by the CSU system through teaching activities is increasing over most of the 2009-2014 time period.

Figure 4.3 is taken from a report created by the California Faculty Association (CFA, 2015) and shows the breakdown of total CSU revenue broken down between funding provided by the state of California and from operations. In red is total expenditures paid by the CSU system on faculty salaries. In the figure we can see that funding from student paid tuition and fees is becoming a larger proportion of overall funding for the CSU system. In other words revenue derived from operations is becoming a larger share of overall revenue than it has in the past.

4.2 Faculty Employment Levels and Wages

Salary data was collected from the California Public Pay website (California State Controller’s Office, 2016). The datasets for each year between 2009-2014 and includes school name, position, regular pay, overtime pay, total wages, and defined benefits for all employees of the California State University. I have trimmed the datasets to include only
full-time faculty and have calculated the average regular wages, total compensation, and total full-time faculty count for each campus for each year. Below are graphed results over time, divided by urban and non-urban campuses.
Figure 4.4: Faculty Count over Time (Urban)

Figure 4.5: Faculty Count over Time (Non-Urban)
In Figures 4.4 and 4.5 we see the number of faculty employed for each university. Over the time frame it appears that the number of faculty employed at CSU campuses appears to be either constant or slightly decreasing over time for both urban and non-urban campuses. This is in spite of the fact that over the same time period total enrollment of full-time equivalent (FTE) students in the CSU system has increased by nearly 10%.

Recall that in Figures 4.1-4.3 we have shown that the revenue generated by the CSU system through operations has been increasing and in Figures 4.4-4.5 that the total count of faculty hired by the CSU system has either been constant or decreasing over the given time period. Since this is the case it would be fair to assume that the marginal revenue product of labor (MRPL), or the additional revenue generated by each professor, has increased between 2009-2014. If the CSU operates in a competitive labor market this should also be visible in an increase in average wages paid to professors over the same time period, since in a competitive labor market the wage is equal to the marginal revenue product of labor.

Below are graphs of the average regular wages of full-time faculty over time for each campus; again divided into urban and non-urban campuses.
Figure 4.6: Faculty Wages over Time (Urban)

Figure 4.7: Faculty Wages over Time (Non-Urban)
In Figures 4.6-4.7 we can see average salaries of full-time faculty for each campus over time. All campuses seem to have a low point in 2010 that appears to be the remaining effects of the Great Recession on the CSU budget. From 2010 to 2011 wages seem to recover a bit as the CSU budget recovered (see Figure 4.3). However, from 2011-2014 wages seems to have either remained unchanged or slightly decreased. There are a few campuses that have seen constant increases in wages over the whole time period such as San Francisco, but there are others that have seen drastic declines such as Maritime Academy.

Since above fails to include additional forms of compensation such as employer retirement contributions or health insurance. In order to include this in the total cost of labor from the view of the CSU I have generated a measure of total compensation for each full-time professor by adding total retirement and health insurance benefits to their regular wages. Below are graphs of the average total compensation of full-time faculty over time for each campus; again divided into urban and non-urban campuses.
Figure 4.8: Faculty Total Compensation over Time (Urban)

Figure 4.9: Faculty Total Compensation over Time (Non-Urban)
Where as in looking at mean wages the trend seemed to be they remained constant or slightly decreased, total compensation has a clear upward trend between 2009-2014. The average change appears to be about %10 over the time period.

4.3 Location and Distance

I have also collected a dataset for California listing all universities or colleges that offer associate, bachelors, or advanced degrees, are public or private not-for-profit, and have a minimum of 500 undergraduates enrolled from the National Center for Education Statistics website (National Center for Education Statistics, 2015). The datasets consist of the name, address, website, type, degrees offered, campus setting, campus housing, student population, undergraduate population, graduation rate, transfer rate, and net price for each university that meets the criteria previously listed. Using GIS software I am able to geocode and map all of the colleges and universities in California; both public and private. Below are the mapped the CSU system campuses (in red), UC system campuses (in blue), and all of the private, non-profit universities (in purple) on one map and all of the California Community College system campuses in California (in green) on another map.
Figure 4.10: Map of CSU (Red), UC (Blue) and Private Non-Profit (Purple) Campuses
Figure 4.11: Map of Community College Campuses (Green)
Looking at Figure 10 we can get a sense of how universities are dispersed across the state. There are clear clusters of both CSU and private, non-profit (PNP) campuses in the population centers of the Bay area, Los Angeles, and San Diego; with the rest of the campuses in the state being spread out along the coast and Central Valley. CSU campuses within the major population centers are in areas of higher employer concentrations for university professors; providing them with a number of professor employment options at non-CSU campuses. In contrast, the CSU’s that are spread out across the state are in areas of much lower employer concentrations for university professors; with some campuses being 100 plus miles from the nearest PNP university. As such, CSU campuses in these locations should face a steeper sloped labor supply curve than universities that are in the major population centers and therefore extract higher surplus.

In Figure 11 are all the Community Colleges (CC) in the state of California. Community colleges also look as if they cluster in the major population centers of the Bay area, Los Angeles, and San Diego. However, there are many more that are dispersed across the state than either CSU’s or PNP universities. In looking at the two maps together one thing to note is that unlike PNP and UC campuses, no CSU appears to be further than a few miles from at least one CC campus.

4.4 Population and Cost of Living

Another factor I would like to account for in my analysis is how large the labor market in which each C.S.U campus operates. Campuses surrounded by more urban environments with a larger labor market to draw upon would theoretically have less market power than campuses with smaller populations surrounding them. This factor should also influence the difference between MRPL and MCL for each campus. In order to test this I created 10
mile and 25 mile radii around each campus (shown in Figure 4.12 below) and estimated the population within each circle using 2010 Census Population and Housing Units Block (United States 2010 Census, 2016) data and ArchGIS software. While the population is only for 2010 and the difference between MRPL and MCL is for the years 2009-2014, since population is to explain the differences between CSU campuses and not between years, this should not be an issue.
Finally, since tuition is the same for each campus regardless of where the campus is located, and the average total compensation paid to faculty members is campus specific, the cost of living surrounding each campus should have an effect on the difference between MRPL and MCL. Campuses that are in high cost of living locations would have to pay employees a higher rate of total compensation in order to entice faculty to work there than ones in a lower cost of living location, holding all other variables constant. In order to account for this I have also included the 2013 median household income for the zip code in which each C.S.U campus is located (United States Census American Community Survey, 2016). Again, although median household income is a measure for only 2013 and he difference between MRPL and MCL is for the years 2009-2014, since it is only included to explain differences between campuses I do not believe this should cause any issues.
Chapter 5

Analysis

5.1 Gap between MRPL and Faculty Total Compensation

With the estimated MRPL I then found the difference between MRPL and the MCL by subtracted the mean average of total compensation for professors at each campus for each year, with total compensation being total wages plus total health and retirement benefits. If my estimate of MRPL reflected the true value of MRPL and the market for professors to be competitive I would expect the difference between MRPL and MCL to be zero. If the difference is not zero, which is likely since my estimate is expected to overestimate MRPL, I would expect that, in a competitive market, the difference to at least remain fairly constant over time, with the difference only being the difference between my estimated MRPL and the true value.

Below are the difference between MRPL and MCL for each campus over time, divided by urban and non-urban campuses.
Figure 5.1: Faculty eMRPL-MCL (Urban)

Figure 5.2: Faculty eMRPL-MCL (Non-Urban)
Looking at the results it is clear that the difference between MRPL and MCL are not zero as a competitive market would predict nor are they constant over time as expected if my estimated MRPL was off but moved the same as the true MRPL. For both urban and non urban campuses the difference between MRPL and MCL nearly doubles over the given time period. Additionally it seems that the difference between MRPL and MCL is larger for urban CSU campuses than it is for non-urban CSU campuses, which is unexpected since urban schools tend to be closer to alternative professor employment options such as PNP or CC campuses.

5.2 Regression Analysis

In order to test this further I have found the distance between each CSU campus and the nearest three private non-profit universities (p), community colleges (c), CSU campuses (csu), and UC campuses (uc), giving me four sets of three. I then calculated the average distance between each CSU and those three campuses for each group using equation 5.1 below; resulting in the average distance to the nearest three private non-profit universities, the nearest three community colleges, the nearest three CSU campuses, and the nearest three UC campuses.

\[
\text{Average Distance} = (\Delta_1 + \Delta_2 + \Delta_3)/3 \quad (5.1)
\]
I then ran a series of regressions in which I regressed the difference between the MRPL and MCL on the average distance to the nearest three private non-profit universities, average distance to the nearest three community college campuses, average distance to the nearest three University of California campuses, average distance to the nearest three CSU campuses, an estimate of population within 10 and 25 miles around each campus, median household incomes of the campus’ zip code as well as including dummy variables for each year (2009-2014), with 2009 being the base year, and each of the 23 campuses, with Cal Poly Pomona being the base campus, to account to natural variation between each campus and each year. Below are the results.
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<th>(5)</th>
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YearDummies: Y Y Y Y Y

CampusDummies: Y Y Y Y Y

Adj $R^2$ – Squared: .92 .92 .92 .92 .92

N: 138 138 138 138 138

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
In the table above we can see that in all of the combinations, distance to community colleges is statistically significant in determining the gap between MRPL and MCL for university professors at CSU campuses. However, contrary to what theory predicts, the coefficient of distance to community colleges is negative; implying that CSU’s further from community colleges have less monopsonist power than CSU’s that are closer to community colleges competing for labor.

In Models 1, 3, 4, and 5 the distance between a CSU campus and private non-profit universities are statistically significant and are consistent with what theory would predict. For every one mile increase in average distance between a CSU and a PNP there is roughly a $600 increase in the gap between MRPL and MCL for university professors.

The distances between a CSU and nearby CSU’s and UC’s were not statistically significant in any of the models.

One issue that is likely to arise in this analysis is that that the distance between CSU campuses and community colleges, private non-profit universities, and University of California campuses are likely to be highly correlated to each other. This is expected since all are more likely to be clustered where there is demand for higher education; cities.

Below is the covariance table for all of the variables in my analysis.

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Figure 5.3: Covariance (correlation) between variables
Looking at the table we can see that the distances between CSU campuses and community colleges, private non-profits, other CSU campuses, and UC campuses are indeed highly correlated with each other. Additionally, the estimates for total population within 10 and 25 miles are also highly correlated. Thus, including all three distances or both the total population within 10 and 25 miles in one regression model will result in bias estimation results. In order to correct for this I will regress each distance and total population measure individually along with the household income measure to account for cost of living and the year and campus dummies to account for fixed effects.

Below is a table containing the resultant coefficients of each of my distance measures (columns) when regressed on the difference between MRPL and MCL along with a series of combinations of population, household income measures (rows). Each regression includes year and campus dummies as well. The complete regression output is included in the appendix at the end of the paper (Table 7.1 and 7.2).

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</table>

Above is the resultant table. Once the distance measures are run in separate regressions we can see that the resultant coefficients are no longer positive. In all the models ran the coefficients between the market power of CSU campuses and the distance to competing universities. Implying that CSU’s have less monopsonist power the further away they are from competing universities. The most statistically significant results
came when the distance measure was regressed along with the measure of cost of living (median household income) and a measure of population around each campus (either the population within a 10 or 25 mile radius around each campus); although of the two only the population measure was statistically significant.

5.3 Results

According to theory, campuses further away from other campuses should have less competition for labor and therefore possess more monopsonist power in the labor market for university professors. As a result they should have a larger difference between the MRPL and MCL for professors. In other words the coefficient of average distance on the difference between MRPL and MCL should be positive; controlling for all other variables.

However, the results of my analysis indicate that the coefficient of the average distance measure between a CSU and the nearest competing university is textitnegative regardless of which variation of the model I run; implying that CSU’s further away from competing universities exhibit textitless monopsonist power than CSU’s located closer to competing universities. I am especially surprised from the results for distance to nearby CSU campuses and community college campuses since I would assume they are the closest substitutes for potential employers.

One possibility is that my model is not controlling for the full effect that being located in a more densely populated location has on MRPL and MCL. In figure Although my model does include a measure of population and median household income in order to attempt to control for these effects, it may be the case that these variables are not capturing the full effect of the degree to which a campus is located on an urban or rural location has on the difference between MRPL and MCL. Referring to Figure 5.3 we can
see that the population measure is correlated with the distance measures in my model. While the degree to which they are correlated is not enough to induce significant bias in my model it may be the case that some omitted variable is explaining both the distance and population values.

Another possibility is that my model is picking up the effects of a negative compensating wage differential on the part of professors at CSU campuses in urban settings. A compensating wage differential is the additional amount of income necessary for a worker to accept a job with undesirable attributes over a job that is identical in all regards except in lacking the undesirable attributes. This would be an example of a positive compensating wage differential. A negative compensating wage differential is the amount income a worker is willing to forgo to accept a job with desirable attributes over a job that is identical in all regards except in lacking the desirable attribute. If professors prefer to live and work closer to major urban centers with all the amenities they provide rather than in more isolated locations, they may be willing to accept lower wages for a position at an urban campus than they would for a position at a more isolated campus, ceteris paribus. The difference in wages between the two would be the minimum value that the professor places on having a job in a more urban environment. Should this be the case, campuses in more urban environments, and closer to competing universities, would be able to pay professors lower wages than campuses in more rural locations. The result would be that rural campuses would have a lower difference between MRPL and MCL than urban campuses. This is consistent with the results of my model.
Chapter 6

Conclusion

6.1 Results of my Analysis

The result of my analysis into whether or not the CSU system is acting as a monopsonist in the market for university professors is mixed. On the one hand, I have shown that, as seen in Figures 5.1 and 5.2, it is clear that the difference between the estimated MRPL and MCL of CSU professors has grown significantly between 2009-2014. Although my estimate of MRPL is likely to overestimate the true value of MRPL, so long as the error in my estimate is either a constant or a multiple of the true value the two should move together. Thus, seeing the difference between estimated MRPL and MCL nearly double between 2009-2014 would indicate that either the CSU is extracting rent from its university professors. Should the error not be either of this it is possible that the increase in the difference is attributed to my misestimation.

The regression results analyzing the degree to which this market power is the result of distance from competing universities produced clearly negative results indicating that the degree to which CSU campuses possess market power in the market for univer-
sity professors decreases with increased distance from other universities competing for professors. These results are contrary to what theory would predict as well as my own expectations. However they are consistent with the effects of a compensating wage differential as professors prefer to work at urban campuses and enjoy the non-wage benefits provided by them.

These results do not disprove the possibility that the CSU system possesses monopsonist power. The measurement of distance to nearby competing universities was one method by which employers could possibly have monopsonist power (Manning, 2003) and a similar approach was used in the analysis of monopsony power in the market for nurses (Sullivan, 1989). While the results of this analysis are negative, it could potentially still be the case that CSU campuses do exhibit market power in the market for university professors as a result of geographic distance from alternative employers but the effects are obscured by the effects of a compensating wage differential. Alternatively, CSU campuses could still possess monopsonist power through non-geographical causes such as the employer-differentiation or moving cost models described in Boal and Ransom (1997).

6.2 Improvements in Estimation

One way I could improve my estimate of the impact of the concentration of universities competing for university professors around each CSU campus on their monopsony power would be to obtain yearly data for population and cost of living around each campus and either regress the difference between MRPL and MCL on those yearly measurement or on the year-on-year changes in population and cost of living. This would likely reduce the influence that the correlation between the distance measure and population measure
Another possible improvement on this estimation would be to separate professors by major and experience. Since not all campuses are identical in the size of various departments it seems likely that the average total compensation for professors would depend on the size of various departments at each campus. For example, average total compensation in a school with a larger engineering or business department would be higher than at a school that instead had larger philosophy or communication departments since engineering and business professors tend to earn more than philosophy or communication departments. While the inclusion of campus dummies in my analysis should capture some of this effect it would make the analysis more accurate if I was able to regress the difference between MRPL and MCL for professors in a specific department by the distance to competing universities.
Chapter 7

Appendix
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Standard errors in parentheses.
<sup>∗</sup> p < 0.05, <sup>∗∗</sup> p < 0.01, <sup>∗∗∗</sup> p < 0.001
Table 7.2: Table 5.1 Rows 3 & 4 Complete Regression Output

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Standard errors in parentheses

* p < 0.05, ** p < 0.01, *** p < 0.001
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