

Student Internships During Times of Pandemic: A Historical View of Pandemics, Recession and Their Effect on Education

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Student Internships during Times of Pandemic; A historical view of pandemics, recession, and their effect on education

Abstract

With the current pandemic, a potential recession is also occurring. Considering the “Great Recession” of 2007-2010, student enrollments went up while taxpayer support to public universities fell. Also associated with these changes was the increase in unemployment which correlates with the increase in enrollment. Non-traditional students (not typical recent high school graduates) return to college as jobs become more difficult to find. In a thorough review of the American Society of Engineering Education archives, there is little about any correlation between job placement and the Great Recession. Internships are a part of many construction, engineering, and architecture degree programs. These might be mandatory for course credit or strongly encouraged, yet voluntary, during college. Internships could also be mandatory for professional credentials after graduation. Little research is available to identify any correlation between internship placement and recessions. Anecdotal relationships between recessions and internships have been reported. With the current economic situation associated with the Covid pandemic, there is an opportunity to identify changes that occur in the construction industry. A thorough review of existing literature is performed. To determine the change in internship employment, a survey instrument was created. Respondents shared their perspective about gaining a summer internship this summer as compared to previous years. A comparison of recent salary data and career fair data was used to identify any economic changes which have occurred. This research seeks to define the relationship between the university, industry, and student and how it was affected by Covid.

Introduction

Construction programs encourage internships also called cooperative education (Kramer 2008) or Work-Integrated Learning (Luk and Chan 2020). Although cooperative education and internships are not the same, they are frequently used as interchangeable terms (Chapin et al. 1997). Internships are typically required as part of an accredited engineering degree programs (Bernstein 2003). Some programs require internships or construction work experience while other programs encourage students to seek these opportunities, but they do not tie them to graduation. Internships may be considered the ultimate in experimental learning (Senior 1997). Similarly, to other experimental learning activities, like laboratory exercises, it is difficult to conceive of virtual internships. A virtual internship may be beneficial for student learning but does not provide the same interaction with industry (Chesler et al. 2015). As noted below, internships become a tripartite relationship between the faculty, student, and employers, with each depending on each other to produce a successful internship experience for all parties.

Previous research has documented the relationship between the efficacy of internships in construction or engineering (Laxman et al. 2005 and Moore and Plugge 2008). However, little research has focused on the relationship between the availability of paid internships and the economy. There is plenty of research available on job rates and the economy in general (BLS 2020), however there is no research published that reflects the relationship between internships and the economy. In the past recession, job loss has caused some employed to return to university as non-traditional students (Barr and Turner 2013). It is not yet known if that same non-traditional population will return to university while courses have shifted to an online format. Perceptions of student participation, ease of communication, online delivery problems and the time requirements are all concerns for students and faculty alike (Kinney et al. 2012). During the Great Recession, enrollments increased whilst public (tax-based) funding was reduced (Barr and Turner 2013).

The Bureau of Labor Statistics collects data on the number of construction workers employed, overall and in different sectors. In the past fifty years, construction has increased in dollars and employment overall. But as many workers in the construction industry will note, there have been downturns which resulted in job loss. While the overall construction job market is used as a metric, there is not a similar dataset for summer internships. In fact, employment numbers are seasonally adjusted which may cause more difficulty in understanding and tracking this unique job situation.

Background

Internships are a relatively recent addition to the Construction, Engineering and Architecture curricula. In 1965, the National Council of Engineering Examiners (NCEE) started a pre-internship exam or the Fundamentals of Engineering (NCEES 2020). In 1996, only 10% of members of the Associated Schools of Construction had an identified internship program (Weber 1998). Since an initial intensive round of research in 1995-2000 (Rondinelli et al. 2000), another round of research focused on construction internships was performed in 2008-2010 (Moore and Plugge 2008). There has not been a similar in-depth review of construction internships in the last ten years.

Following the exam and a bachelor's degree, most states require an internship prior to taking the Principles and Practice of Engineering (PE) exam. Specifically, one state requires; "four (4) years of experience after the bachelor's degree is conferred" (Okla. Stat. 2019). However, many construction programs also require some sort of cooperative education (coop) or internship as part of their degree requirements (Siddiqi and Ozcan 2004). Internships indicate a mutual desire between the universities and industry for a pre-professional work experience (Siddiqi and Ozcan 2004, Marshall 2012 and Moore and Plugge 2008).

Educational goals for internships include the application of knowledge derived in the classroom (Marshall 2012). Some research has previously identified a correlation between grades in construction coursework and having had an internship (Kramer 2008). Additional benefits to the university include student recruitment (Tener et al. 2001), which can reflect the graduation placement rate. Because of the symbiotic relationship between industry and the university, industry is much more engaged in the program (Tener et al. 2001). From the perspective of industry, there is more to pre-graduation employment than the application of knowledge. Employers report internships are a recruitment method and to determine the student potential (Wanless 2013 and Moore and Plugge 2008).

Students also perceive that internships are a stepping-stone to their careers (Wanless 2013). However, students have also identified the application of knowledge during internships (Moore and Plugge 2008). To better align student experience with faculty expectations, additional requirements have been added to internships. Some programs require course credit and some sort of reporting (Siddiqi and Ozcan 2004). The reporting can be simple or can entail a more reflective journal (Minnes et al 2017).

Purpose

Internships in architecture, engineering and construction are typically paid, even before graduation. As previously described, internships require an industry investment. In times of recession, when labor reductions are occurring, it is important to determine how internships will fare as well. It is especially important to know that students will be able to gain employment when internships are a graduation requirement.

Construction interns provide a temporary workforce during the summer, which is also high season. With the understanding that interns form the basis for a supplemental workforce, it begs the question as to what happens when there is an economic downturn. Does the construction industry still hire interns when there is a shortage of work and during a recession? If not, how do universities respond when an economic slowdown reduces internship opportunities?

The Bureau of Labor Statistics (BLS) collects job data for a variety of industry sectors and even sub-divides the construction sector. When solely considering the construction sector, the cyclical nature is evident. Downturns in the economy, like the recessions in 2000 or 2008 are followed by a reduction in the construction labor force. Job losses associated with recession can impact the workforce long-term, causing additional stress for those who continue employment and those who suffer job losses (Modrek and Cullen 2013).

Discussion

Identified recessions are evident in Figure 1 and are known as the recessions of 1975, 1982, 2000 and most notably the Great Recession of 2008 (Kalleberg and Von Watcher 2017). More recently, in 2020, the job losses sustained since the beginning of the year are notable. The National Bureau of Economic Research (NBER) also collects data on the expansion and contraction of the economy. The NBER indicates the recession most closely associated with the 2000s started in 2001 and ended in 2003, while the recession of 2008 started in 2008 and ended in 2010 (2020). Why is this important? The shrinking economy for both recessions correlates with job losses in construction shown in Figure 1. An important unanswered question is whether the economy truly recovered since 2008-2010. Using the Construction Sector Workforce graph in Figure 1, it is evident that jobs in construction were at an all-time high in 2006. Although there was an increase in the workforce since the last recession and through 2019, it did not meet the high in 2006.

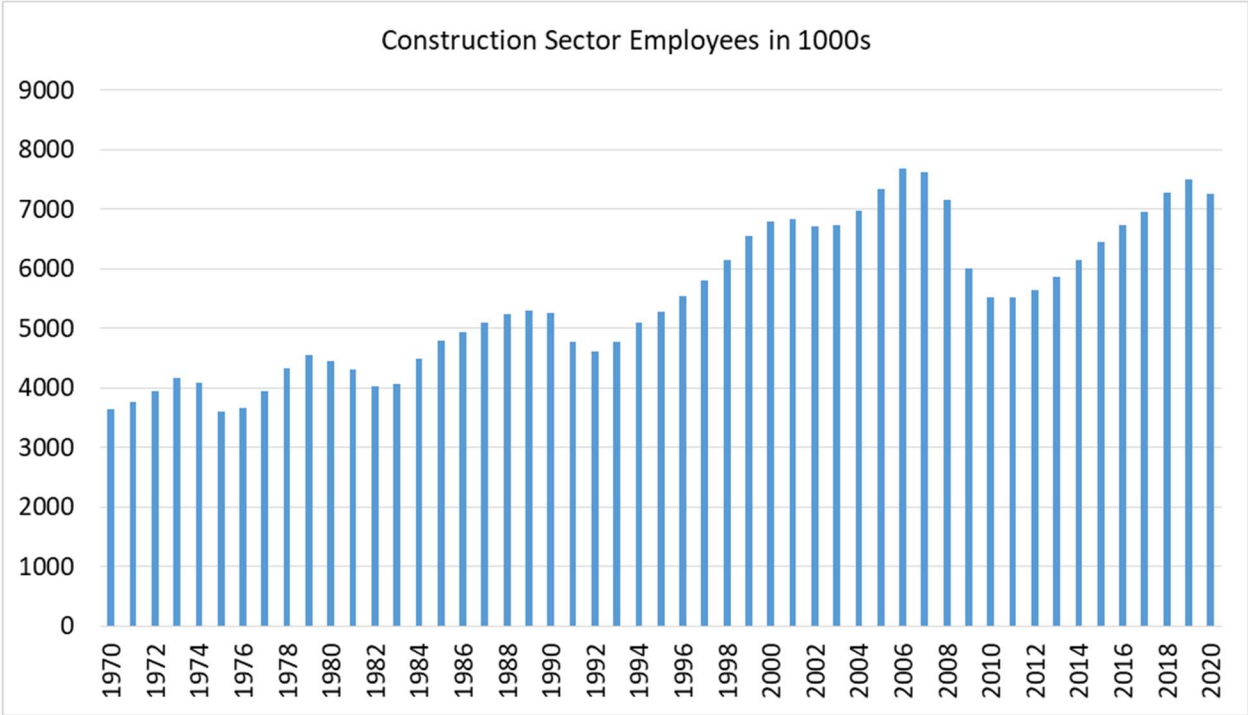


Figure 1 Construction Sector Workforce over Time (BLS 2020)

Another consideration for students is the financial portion of the internship. In fact, students may even prefer to work over the summer even if they need to be taking classes. Students seeking temporary work may also suffer stress as the job market changes in a recession (Modrek and Cullen 2013). Since the 2008 recession, intern pay fell below previous levels. Pay fell across multiple sectors as reported by the National Association of Colleges and Employers. The rate had not recovered nine years later, see Figure 2 (Miller 2017). In 2017, the Center for Disease Control issued recommendations about a potential future novel influenza virus, which included personal hygiene, hand washing and possibility of wearing face coverings. Recommendations at the community level limit mass gatherings and workplaces should provide routine cleaning masks (Qualls et al. 2017).

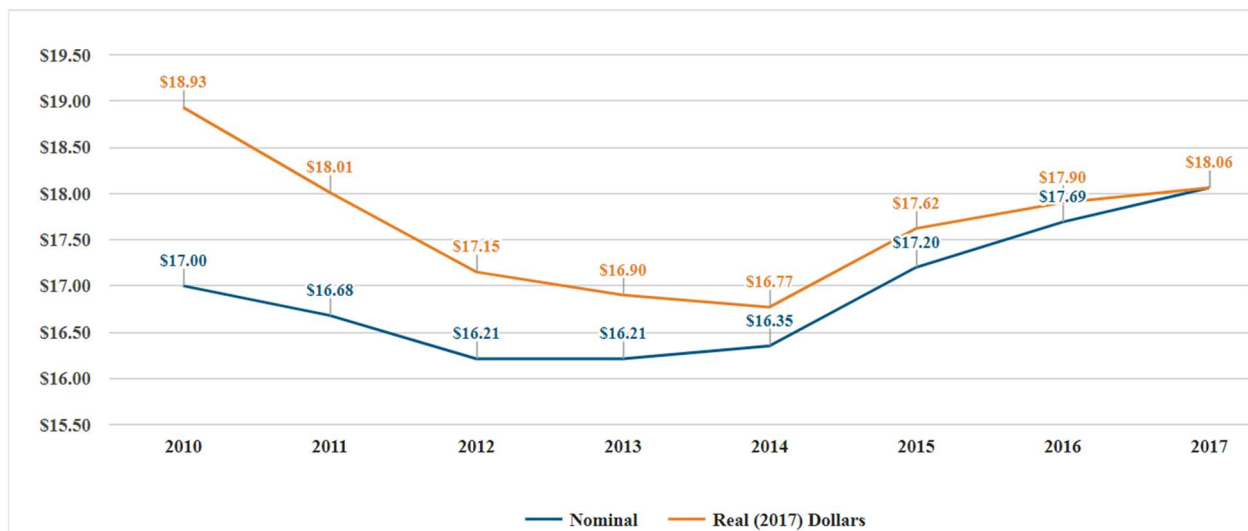


Figure 2 Mean Hourly Wage Rate for Bachelor Level Interns: 2010-2017 (Miller 2017)

Existing research identified that of the 26 respondent universities, 58% gave course credit of 1 hour or more (Siddiqi and Ozcan 2004). Oklahoma State University Construction Engineering Technology (CET) program requires two internships of 2 credit hours each, or four credit hours total (Yates 2010). The same CET program collects assessment data which includes the hourly rate offered to summer interns. Since 2015, the hourly pay rate appeared to be increasing for interns as shown in Figure 3. Linear and logarithmic regressions were performed. The logarithmic model matched the overall curve better, while both indicate growth into 2020. The linear equation is $y = 0.3792x + 15.285$, while the logarithmic equation is $y = 1.2186\ln(x) + 15.276$.

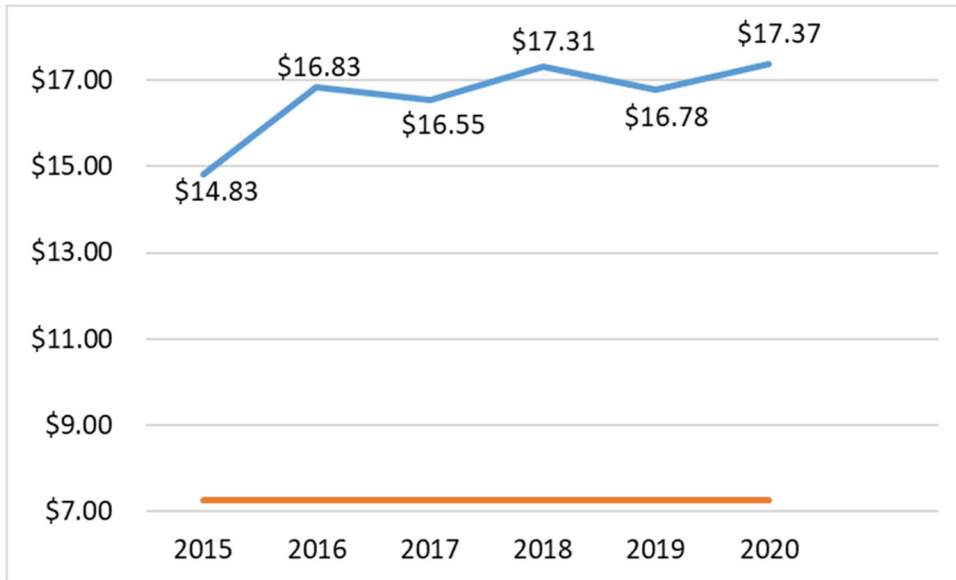


Figure 3 Program Assessment Reported Internship Hourly Rates with Federal Minimum Wage Shown

Similar regression techniques were performed on 2015-2020 Construction Workforce Data using employment in the millions, the linear equation is $y = 0.1901x + 6.3678$, while the logarithmic equation is $y = 0.5574\ln(x) + 6.422$. When comparing the linear growth in internship pay versus employment growth, the internship pay has been growing faster over the last six years. The same is true for logarithmic growth, indicating that internship pay in construction has fared well over the last six years. A comparison is shown in Figure 4.

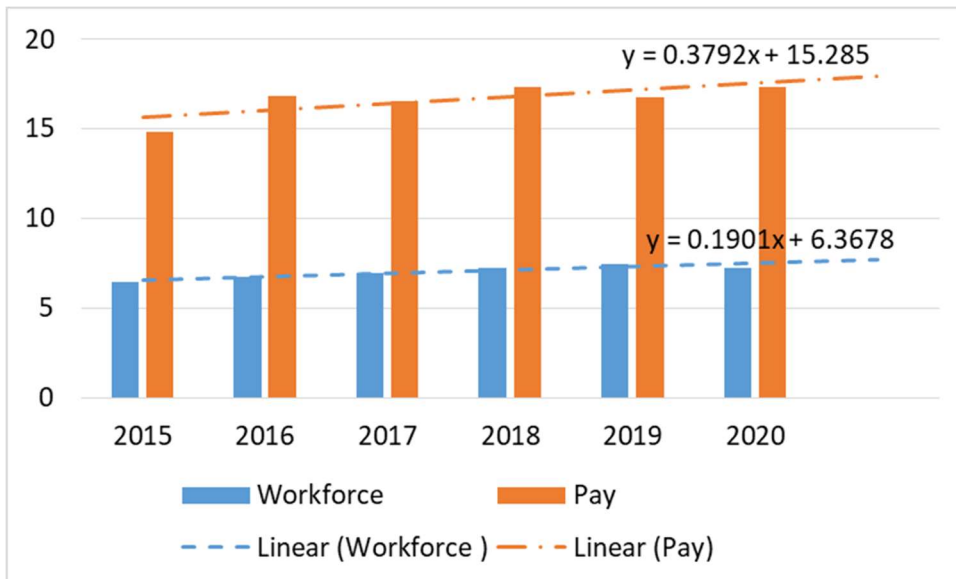


Figure 4 Comparison of Workforce Growth versus Intern Pay Growth Using Logarithmic Regression

Recent graduate salaries are collected annually for the purposes of program assessment. These salaries represent approximately 30-40 graduates. Overall, the salaries are increasing over time as expected. The low number of graduate salaries also adds variability to the salary base as a single student accepting a very low offer creates a large change. For 2020, one student accepted an offer of \$35,000 which is well

below average. That outlier caused a change to the average of \$725, which is illustrated as the orange bar in the graduate salary graph in Figure 5. The graph clearly shows that 2019 was an exceptional year for salary growth but may also reflect some individuals who went to states with much higher salary bases. Although salaries in 2020 were well above 2017, there was a definitive change.

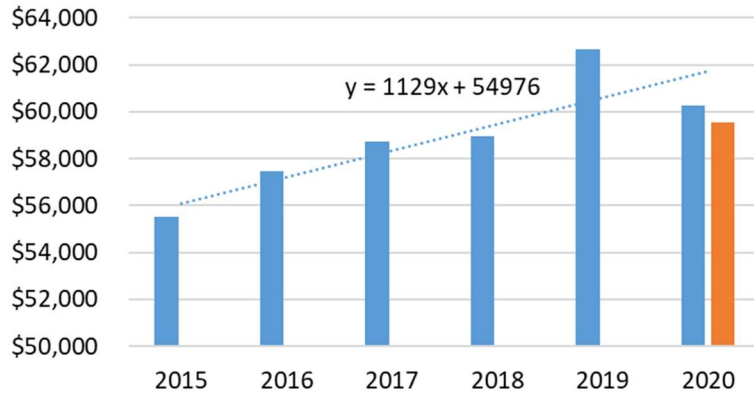


Figure 5 Graduation Salary Offers

A survey instrument was created in relation to internships by this research team. Those results are published elsewhere in detail, while a portion of the data has been included here (Adhikari et al. In Review). In addition to the changes seen in hourly rates, students report additional difficulties finding internships. From Adhikari et al. (In Review) students were asked, “Was this summer the same or more difficult to find an internship as compared to previous summers/years?” Of the 83 respondents 32.53% found 2020 more difficult to find a job. Approximately 70% of the respondents had previously sought a summer internship, shown in Figure 6.

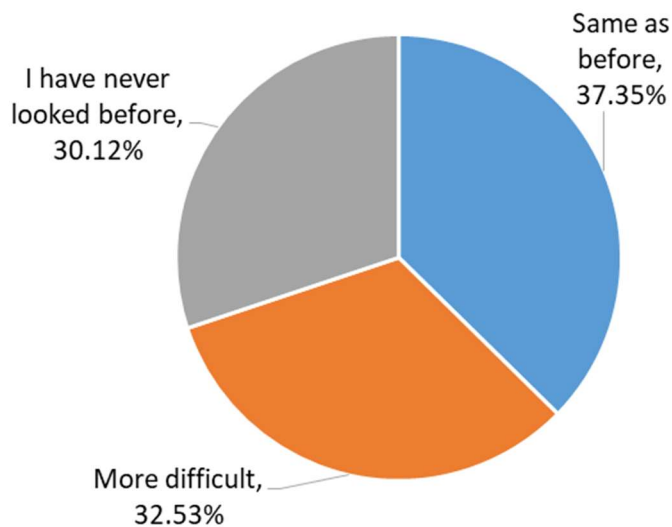


Figure 6 Was this summer the same or more difficult to find an internship as compared to previous summers/years? (Adapted from Adhikari et al. 2021)

As of April 2020, 64% of student internships nationally were canceled or rescinded due to the pandemic. (Akala 2020). Although the loss of student internships in 2020 was specifically tied to the pandemic and not solely due to an economic downturn, they are intrinsically connected. Adhikari et al. (2021)

identifies a group of students from two states who report job offers that were then retracted. When asked, “Were you given an offer that was then retracted?” 31.33% of the 83 respondents answered “yes” as shown in Figure 7.

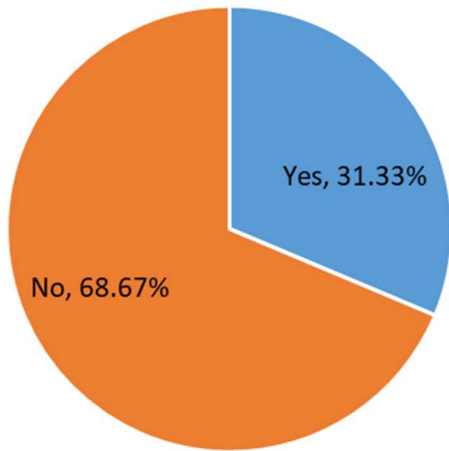


Figure 7 Were you given an offer that was then retracted? (Adapted from Adhikari et al. 2021)

Another way to gauge employer interest, would be to look at the employer participation in career fairs. Career fairs which may have previously had 40 companies present (Yates 2010), are now virtual. Many industries have moved to virtual meetings and some have established virtual interviews. Feedback from both students and employers is that virtual “come and go” meetings are not successful. Employers felt they were not a good use of time. Additional considerations are the number of students already in the pipeline needing these jobs. For many construction programs, enrollment has been increasing to match industry needs.

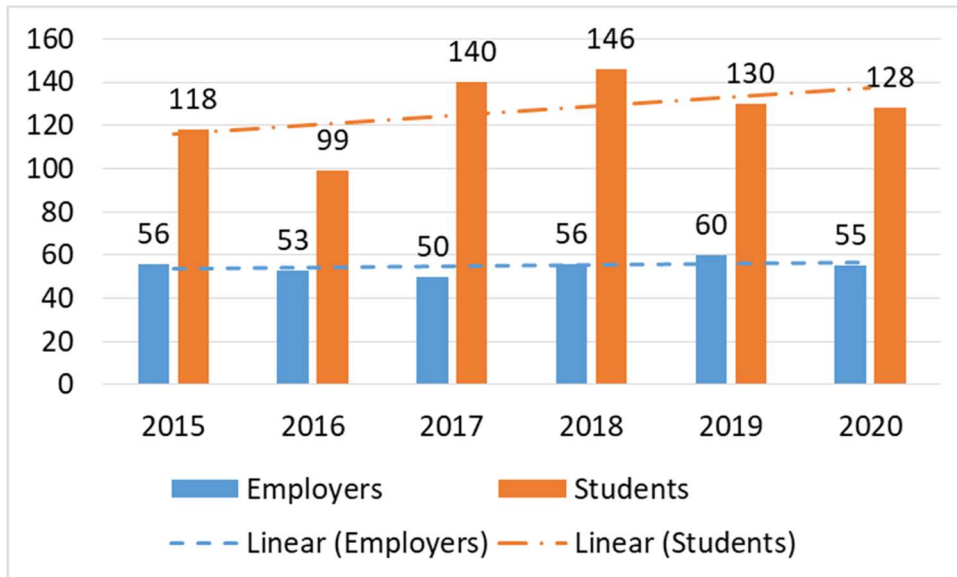


Figure 8 Career Fair Employer versus Student Participation

The career services department at Oklahoma State University reports their interest in the construction specific career fairs provided in January of each year. The CET program typically has had approximately

40 graduates (Yates 2010), so the number of students does not vary widely. However, the interest by employers does seem to change over time, see Figure 8.

Again, a comparison of the overall Construction Workforce versus employer interest as expressed by career fair participation might give insight into how construction employers are responding to the current economic situation. It is evident that employer interest was outpacing the job growth, see Figure 9.

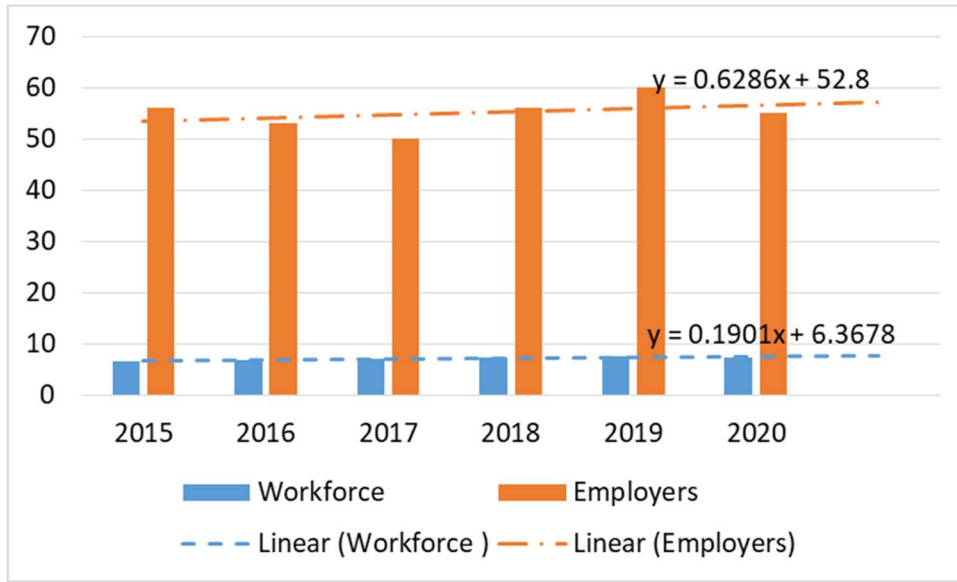


Figure 9 Comparison of Career Fair Employer Participation versus Construction Workforce Growth

Figures 8 and 9 reflect the view of the construction industry and employers as of January 2020, prior to moving classes which affected Oklahoma State University students. Figures 5 and 6 reflect the summer experience of students once the university closure had occurred. Oklahoma State University students were sent home over spring break not to return. Immediately after the university closure, many businesses were concerned about hiring in late March to early April. However, a broad definition of “essential business” was issued shortly thereafter (Forman 2020). There would certainly be a difference in the student experience in this state versus those on the east or west coasts.

Conclusion

Prior to the Covid-19 pandemic, previous research by the National Academies of Science, indicates that there is a serious impact to the global economy due to epidemic level diseases. Costs associated with influenza pandemics range from the billions to trillions of dollars (Pike et al. 2014). Additional concerns associated with pandemics are the workforce consequences due to infection rates, with the construction section being highly affected by absenteeism (Santos et al. 2013). Although not as recent, the 1918 Flu caused export slowdowns indicating productivity losses separate from those seen in World War 2. Additionally, there was an initial weak wave which subsided, leading some to believe the virus was not a concern (Karlsson et al. 2014). Recessions are typically classified by a reduction in Gross Domestic Product and unemployment insurance use rates (Kalleberg and Von Watcher 2017). Interns do not qualify for unemployment insurance as they are a temporary and/or part time workforce. With recessions forcing former full-time employees to compete for part-time positions (Kalleberg and Von Watcher 2017), additional opportunities for internships may be lost.

Internship programs affect all three participants, universities, industry, and the student interns. Some university programs include coordinators who oversee the internships (Senior 1998 and Marshall 2012). Similarly, employers may have an identified internship program and coordinator for more established programs, like the BRIDGE program offered by Turner Construction. Students and industry alike expect that interns may travel to work in new locations. Stipends for housing and dorm style housing may be provided as part of an internship program. With the pandemic, travel has been limited and some internships are solely virtual (Akala 2020). Other aspects of internship programs can include group activities for the interns and full-time employees to build rapport, like bowling, lunches, or happy hours.

Although there has been in-depth research about internships in the past, none has been performed recently creating a gap in knowledge. Further research has been performed on employment and seeking initial employment after receiving a bachelor's degree. No research has focused on internship employment as a requirement for course credit while also considering the economic perspective. Upon review of the existing literature, new research into economic drivers for internships during recession is needed.

References:

Adhikari, S., Mosier, R., and Yates, H. (2021). "Covid-19 effects on student internships in the construction industry: Experiences from Georgia and Oklahoma." Submitted to 2021 ASEE Annual Conference & Exposition. In Review.

Akala, A. (2020). "Students among workers getting stiffed as many internships canceled. Here's how they can stay competitive." CNBC.com. <<https://www.cnbc.com/2020/04/22/64percent-of-canceled-job-internships-offer-no-compensation.html>>

Barr, A., Turner, S.E. and Danziger, S. (2013). "Expanding Enrollments and Contracting State Budgets: The Effect of the Great Recession on Higher Education." The ANNALS of the American Academy of Political and Social Science. V.650 I.1 pp. 168-93.

Bernstein, S. (2003). "*The Effect of Construction Related Internships On Academic Studies: Is It Positive Or Negative*". Paper presented at 2003 Annual Conference, Nashville, TN. <https://peer.asee.org/12672>

Bureau of Labor Statistics (BLS). (2020). "Construction Sector - Workforce Statistics." <<https://www.bls.gov/iag/tgs/iag23.htm>> Retrieved June 15, 2020.

Chapin, L.T., Roudebush, W.H. and Krone, S.J. (1997). "Cooperative Education in the Associated Schools of Construction." ASC Proceedings of the 33rd Annual Conference Washington. Pp. 107 – 118.

Chesler, N.C., Ruis, A.R., Collier, W., Swiecki, Z., Arastoopour, G., and Williamson Shaffer D. (2015). "A Novel Paradigm for Engineering Education: Virtual Internships with Individualized Mentoring and Assessment of Engineering Thinking. Journal of Biomechanical Engineering. V.137 I. 2. doi: 10.1115/1.4029235.

Forman, C. (2020). "Coronavirus in Oklahoma: What is essential? Opinions differ on Stitt's business closure mandate." The Oklahoman. <<https://oklahoman.com/article/5659158/coronavirus-in-oklahoma-what-is-essential-opinions-differ-on-stitts-business-closure-mandate>>

Kalleberg, A., and Von Watcher, T. (2017). "The U.S. Labor Market During and After the Great Recession: Continuities and Transformations." Russell Sage Foundation Journal. V.3. N.3. doi:10.7758/rsf.2017.3.3.01

Karlsson, M., Nilsson, T., and Pichler, S. (2014). "The impact of the 1918 Spanish flu epidemic on economic performance in Sweden: An investigation into the consequences of an extraordinary mortality shock." Journal of Health Economics. V. 36. <http://dx.doi.org/10.1016/j.jhealeco.2014.03.005>

Kinney, L., & Liu, M., & Thornton, M. A. (2012). *Faculty and Student Perceptions of Online Learning in Engineering Education* Paper presented at 2012 ASEE Annual Conference & Exposition, San Antonio, Texas. <https://peer.asee.org/21387>

Kramer, S. W. (2008). "Does Prior Project Management Work Experience Have an Effect on the Academic Achievement of University Students in the Classroom?". International Journal of Construction Education and Research. V.4 N.1 pp. 18-33, DOI:10.1080/15578770801943877

Laxman, D., Bright, M. and Renshaw, S. (2005). "Internships: Lessons learned beyond the classroom." Paper presented at 2005 ASEE Annual Conference & Exposition Portland, Oregon. 10.18260/1-2—14145.

Luk, L.Y.Y. and Chan, C.K.Y. (2020). "Adaptation and Validation of the Work Experience Questionnaire for Investigating Engineering Students' Internship Experience." *Journal of Engineering Education*. V. 109. P. 801–820. <https://doi.org/10.1002/jee.20351>

Marshall, J. (2012). "A Professional Internship: Don't Graduate Without One." Paper presented at 2012 ASEE Annual Conference & Exposition, San Antonio, Texas. DOI: 10.18260/1-2--20853

Miller, S. (2017). "Despite Gains, Average Intern Wage Still Below Pre-Recession Level: Additionally, Unpaid Intern Programs Face Compliance Hurdles." *HRNews*.
<<https://www.shrm.org/resourcesandtools/hr-topics/compensation/pages/intern-wages.aspx>>

Minnes, M., Mayberry, J., Soto, M., and Hargis, J. (2017). "Practice Makes Deeper? Regular Reflective Writing during Engineering Internships." *Journal of Transformative Learning*, V.4. N.2 p. 7-20.

Modrek, S. and Cullen, M. (2013). "Job Insecurity during Recessions: Effects on Survivors' Work Stress." *BMC Public Health*. V.13. I.929. <http://www.biomedcentral.com/1471-2458/13/929>

Moore, J. D., and Plugge, P. W. (2008). "Perceptions and Expectations: Implications for Construction Management Internships." *International Journal of Construction Education and Research*. V. 4 N.2 pp. 82-96.

National Bureau of Economic Research (NBER). (2020). "Business Cycle Dating Committee Announcements." <<https://www.nber.org/research/business-cycle-dating/business-cycle-dating-committee-announcements>> Retrieved 11/4/2020.

National Council of Engineering Examiners (NCEE). (2020). "History." <<https://ncees.org/about/history/>> Retrieved 11/2/2020.

Oklahoma Statute Title 59 § 475. (2019). "Oklahoma Statutes Regulating Professional Engineering and Land Surveying."

Pike, J., Bogich, T., Elwood, S., Finnoff, D.C. and Daszak, P. (2014). "Economic Optimization of a Global Strategy to Address the Pandemic Threat." *Proceedings of the National Academy of Sciences of the United States of America*. V. 111. N. 52. pp. 18519-18523. <https://www.jstor.org/stable/43278877>

Qualls, N., Levitt, A., Kanade, N., Wright-Jegede, N., Dopson, S., Biggerstaff, M., Reed, C., and Uzicanin, A. (2017). "Community Mitigation Guidelines to Prevent Pandemic Influenza — United States, 2017." *MMWR Recommendations and Reports*. V.66. N.1.

Rondinelli, D., Allen, S. and Hauck, A. (2000). "Impact of Structured Internship Programs on Student Performance in Construction Management Curricula." *Conference Proceedings, Associated Schools of Construction* April 2000.

Santos, J., May, L., and Haimar, A. (2013). "Risk-Based Input-Output Analysis of Influenza Epidemic Consequences on Interdependent Workforce Sectors." *Risk Analysis*. V.33. N. 9. DOI:10.1111/risa.12002

Senior, B. A. (1998). "Infusing Practical Components into Construction Education." *Journal of Construction Education* V. 3 N.2 pp. 92-101.

Siddiqi, K. and Ozcan, S. (2004). "Construction Management Internship and Co-op Programs: Stakeholder Needs Assessment." *Conference Proceedings, Associated Schools of Construction* April 2004.

Tener, R., Winstead, M., and Smaglik, E. (2001). "Experiential Learning from Internships in Construction Engineering." Paper presented at 2001 ASEE Annual Conference & Exposition, Albuquerque, NM.

Wanless, D. (2013). "Perspectives from Internships and Co-ops with Industry." Paper presented at 2013 ASEE Annual Conference & Exposition, Atlanta, GA.

Weber, S. (1998). "Field Internships for Construction Students: A Survey." *Conference Proceedings, Associated Schools of Construction* April 1998.

Yates, H. (2010). "Case Study: Economic Downturn Affecting New Graduate Employment." *Conference Proceedings, Associated Schools of Construction* April 2010.