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Gigs and Grub: How the Gig Economy Impacts Restaurant Industry Performance

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GIGS AND GRUB:

HOW THE GIG ECONOMY IMPACTS RESTAURANT INDUSTRY PERFORMANCE

by

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Abstract

In the last ten years, the gig economy has become a significant part of the labor market. Consumers depend on the services provided by people performing gig work, particularly as on-demand services are increasingly desired. Another trend that has developed is the rise of fast casual restaurants due to their relatively inexpensive and quick service while simultaneously providing unique and interesting cuisine options. I examined if there was a relationship between the rise of these emerging sectors of the economy through looking at the performance of limited service eating place establishments using a panel data regression model at the Metropolitan Statistical Area level from 2006 to 2015. I concluded that there is a negative relationship between the number gig firms and the number limited service eating places and no relationship between the number gig firms and the annual payroll of limited service eating places. With opposite results from those hypothesized, I recommend ways to improve the research and propose alternative research questions to answer looking at the gig economy and the restaurant industry.

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Table of Contents

I. Introduction

The gig economy is quickly becoming an influential part of people's lives. Companies such as Uber, Airbnb, Etsy, GrubHub, and others with growing name recognition are providing services to people across the United States. Gig workers, defined by the Bureau of Labor Statistics as "workers in contingent or alternative forms of employment, or both," are currently estimated to be about 34% of the workforce (Gillespie, 2017). With this growth, gig workers are affecting more than just those who utilize their services in other areas of consumption and leisure.

With growing trends in the food and restaurant industry, from celebrity chefs to creative fast casual restaurants, new cuisines and concepts are developing to appeal to consumers' tastes and preferences. These two rising movements in the economy lead to the question of how the gig economy and restaurants are related. More specifically, gig workers with different sources of income than those employed with a more rigid work schedule and steady source of income may have different consumption patterns. An analysis by Jonathan Hall and Alan Kruger found that 51% of Uber drivers work 1-15 hours per week, 30% work 16-34 hours per week, and only 12% work 35-49 hours per week (Rosenblat, 2016). The results of this study show that gig workers who solely rely on gigs for their income have more flexibility in their daily. This would shift their consumption to include possibly quick meals on the go or meals out at abnormal times of the day depending on their schedules. Diane Mulcahy, author of "The Gig Economy: The Complete Guide to Getting Better Work, Taking More Time Off, and Financing the Life You Want," suggests gig workers should "aim to create a financially flexible life of lower fixed costs, higher savings, and much less debt (Dahlberg, 2017). With this in mind, I would like to look at the relationship between trends in the gig economy and patterns of limited service restaurants. Examples of restaurants in this category include pizza

delivery shops, takeout eating places, and fast-food restaurants such as Chick-fil-A, Chipotle Mexican Grill, and Starbucks (NAICS). If gig workers have both flexible schedules and an income constraint that forces them consume less, they might opt for limited service restaurants because of the quick service and affordable options. The research will attempt to observe a relationship between the number of gig companies in the economy and the total number of establishments and annual payroll of limited service eating places.

I hypothesize that an increased number of gig firms causes an increase in the number and annual payroll of limited service eating place establishments. I propose that with less consistent income streams and schedules that require services almost instantaneously (i.e. meal deliveries and pickup/drop off driving), workers in the gig economy will spend more of their income on quick service food for relatively inexpensive prices. With less structured leisure time, as many gig economy jobs require service on weekends or at abnormal hours of the day, gig workers may choose not to eat at full service restaurants due to lack of time and income. Assuming gig workers are not employees of limited serving eating places, if there is a positive relationship between annual payroll and gig workers, there would be a higher demand for employees of limited service eating places. Hiring more workers would lead to an increase in payroll, suggesting a positive relationship between gig workers in the economy and the payroll of limited service eating places.

I will first review existing labor literature covering returns to skill, unemployment insurance, and labor market productivity. Understanding the relationship between returns to skill and human capital on labor market productivity is key for background on the behavior of gig workers, as gig employment attracts a variety of workers. I will also look briefly at the canonical model critiqued by Acemoglu and Autor

(2011) that describes the relationship between skill and technology to give insight into how changes in technology impact the labor market. For information on gig workers' consumption behavior, I will review literature on risk, leisure, and consumption patterns. This will provide insight into how consumers deal with risk that comes with various forms of employment, how consumers spend their leisure based on their various occupations, and how consumption patterns vary with risk and leisure.

Because gigs are atypical of traditional forms of employment, there is a unique component of risk for workers. Gig workers do not receive a constant wage and lack the benefits that many traditional jobs provide, which could possibly increase the risk associated with working gigs. Much of the gig economy falls into the category of the informal economy, thus it is necessary to look at the effect of such jobs on skill acquisition and job training.

I propose that gig workers will choose to purchase food outside of the home at limited service eating places rather than full service restaurants because the former offer quicker and often cheaper meal options. Because gig workers, due to their lack of a steady income stream, are uncertain about their consumption, they opt for less expensive, and often faster, meals when eating outside of the home. Full service restaurants are often more expensive for the consumer. Affording sit-down meals does not fit the budget of people who depend on gig work for their income. Thus, I would like to see if there is a relationship between the consumption of gig workers and limited service eating place establishments.

I am using data from the Annual Retail Trade Report for sales and annual payroll of limited service eating places, NAICS Code 7222, Geographic Area Series: Nonemployer Statistics by Legal Form of Organization for the United States for the number of nonemployer firms, and the American Community Survey for additional

variables of the model. Nonemployer firms will act as a proxy variable for gig workers due to the difficulty of accurately measuring the number of gig workers in the economy. Data will be collected for 26 Metropolitan Statistical Areas across the country to account for the variety and size of cities. The data will answer if there is a relationship between the gig economy and patterns of limited service eating places.

To test my hypothesis, I performed two regressions: one with the number of limited service restaurants as the dependent variable and one with the annual payroll as the dependent variable, both with the number of nonemployer firms as the independent variable. The first regression showed the number of nonemployer firms is negatively and significantly correlated with the number of limited service eating places when not controlling for MSA or yearly fixed effects. The second regression did not show a statistically significant relationship between nonemployer firms and the annual payroll of limited service eating places.

II. Literature Review

The entrance of gig workers into the labor market is relatively new. The gig economy is composed of employees in contingent or alternative employment arrangements working part-time, self-employed, or both (Torpey and Hogan, 2016). Smith (2016) defines the Uber-All Economy as a business model where "all consumer goods will be available as a service and all consumer services will be available on demand." In this economy that includes most business categories, personal services and technology merge to create on-demand mobile services. Examples of these services include laundry, meal delivery, and transportation that are all available via mobile apps on cell phones and other devices. The transition away from the traditional business model

and towards the on-demand business model will have waterfall effects on industries (Smith, 2016). For example, meal-delivery services like DoorDash and GrubHub will change where food is consumed, how it is prepared, and what households are keeping in their kitchens. A general trend noted from the shift to the Uber-All Economy is the expectation for immediacy (Smith, 2016). Many of these services occur quickly, such as Uber picking up customers within minutes and Airbnb locating overnight accommodations with the click of a button. With society becoming increasingly dependent on instantaneous results due to the services offered through the gig economy, consumer behavior will be affected.

Little research has been done on the relationship between the gig economy and consumption despite many gigs offering services that impact the consumption of a variety of goods and services. Many aspects of the gig economy increase the opportunity for consumption. Companies such as Uber and Lyft provide the transportation necessary for activities, such as shopping and dining, that would otherwise not occur for people dependent on the transportation service. Etsy provides an online platform for its products, making consumption quick and simple for its shoppers. On the side of the gig workers, being employed in this type of industry provides more flexibility than a structured 9-5 job, possibly leading to more leisure activities and increasing consumption. Flexible work hours could also lead to an increased demand for alternative food consumption. This paper will consider whether the changes to the labor market are affecting specifically the area of food consumption. The paper will focus on limited service eating places, defined by NAICS as: “establishments primarily engaged in providing food services (except snack and nonalcoholic beverage bars) where patrons generally order or select items and pay before eating. Food and drink may be consumed on premises, taken out, or delivered to the customer's location. Some establishments in this industry may provide these food

services in combination with selling alcoholic beverages" (NAICS). The paper will aim to find if the gig economy, a growing portion of the labor market, is impacting limited service restaurants, a growing sector of the food and beverage industry.

In the range of papers on the gig economy, the definition varies depending on the area of study. Looking at "the implications of nonstandard or 'informal' work for the measurement of employment status and labor market slack" in the U.S., Bracha and Burke (2016) list nonstandard work arrangements in the United States as the following: informal work, independent work, contract work, on-demand work, and/or gig work. Studying labor protection in the gig economy, De Stefano (2015), describes it as including two forms of work: "crowdwork" and "work on-demand via apps." Examining the entry of gig economy platforms on local entrepreneurial activity, Burtch, Carnahan, and Greenwood (2016) define the gig economy as "digital on-demand platforms which enable a flexible work arrangement." Friedman (2014) describes gig workers as those "are hired under 'flexible' arrangements, as 'independent contractors,' or 'consultants' working as only to complete a particular task or for a defined time." The Bureau of Labor Statistics defines a "gig" as "a single project or task for which a worker is hired, often through a digital marketplace, to work on demand" (Torpey & Hogan, 2016). Members of the gig economy can be in the contingent or alternative employment sectors, or both. According to the Census Bureau, gig workers fall under the nonemployer category because they are self-employed, operating a small unincorporated business without any paid employees (Torpey & Hogan, 2016). The definition of businesses in the gig economy are similar to those categorized as nonemployer businesses, which are defined as business that have "no paid employees, [have] annual business receipts of $1,000 or more ($1 or more in the construction industries), and [are] subject to federal income taxes" (Census). People who work for companies like Uber and Airbnb are technically

not employees of those companies; therefore, they fall into the category of nonemployer workers. In the context of this study, categorizing gig workers as contributing to the nonemployer sector is the most precise and categorical definition and will therefore be used throughout the study.

Technology has created an interesting dynamic between returns to skill and the effect of human capital on labor market productivity. Acemoglu and Autor (2011) create a framework that allows for firms and workers to choose the optimal allocation of skills to tasks given the prices and services of different tasks and the wages for different types of skills in the market. With technical change, both the productivity of different types of workers in all tasks and specific tasks can change, allowing for new technologies that could replace workers in certain tasks (Acemoglu and Autor, 2011). Many jobs within the gig economy are examples of how workers' skills are applied to tasks, such as artists selling their work on the online platform Etsy, that in turn produce output, which in this case is the selling of goods. Gigs also let "unemployed and underemployed professionals to keep their careers moving forward, and it has also provided many full-time workers an opportunity to practice facets of entrepreneurship before taking the full plunge" (Friedman, 2014). Gig workers can find employment in a variety of areas, including arts and design, computer and information technology, construction and extraction, media and communications, and transportation and moving materials, thus the informal economy will have an impact on skill acquisition for workers (Torpey & Hogan, 2016). The enhanced version of the canonical model designed by Acemoglu and Autor accounts for the ability of gig workers to transition between gigs given their set of skills. Accommodating changes in technology provides an additional component to the gig economy, suggesting that improvements in technology could hinder rather than help gig workers if such changes replace workers instead of improving gig work efficiency.

Acemoglu and Autor critique two aspects of the original model. First, the model does not account for the difference between tasks, the units of work activity that produces outputs, and skills, workers' endowments to tasks in exchange for wages. The model does not account for the ability of workers to perform a variety of tasks given their skill level, nor does it consider how changes in labor market conditions and technology can change the set of tasks workers perform given their skill set. Secondly, the model assumes technical change is skill biased and treats technology as exogenous, while they argue allocation of skills and tasks can be endogenous (Acemoglu and Autor, 2011). In their revised canonical model, Acemoglu and Autor (2011) assume that workers have three types of skills – low, medium, and high. Tasks are defined as a unit of work activity that produces output and skills are a worker's endowment of capabilities for performing various tasks. The endowment is a stock, either exogenously given or acquired through schooling and other investments, and workers apply their skill endowments to tasks in exchange for wages. This task-based approach shows that skills are applied to tasks to produce output rather than skills directly producing output (Acemoglu and Autor, 2011). Similarly to Ricardian trade models, workers in this model have different comparative advantages. The idea that returns to skill is determined by a race between the increase in the supply of skills in the labor market and technical change, assumed to be skill biased, is conceptualized in the model. There are two skills groups, high and low, and workers are considered to be imperfect substitutes in production (Acemoglu and Autor, 2011). Furthermore, the model assumes improvements in technology naturally increase the demand for more "skilled" workers. In the model, technology is assumed to take a factor-augmenting form, complementing either high or low skill workers. Changes in the technology therefore capture skill biased technical change, which is accounted for in the model.

Workers in the gig economy are likely to experience uncertainty and risk aversion due to the variable nature of gig work. The flexible nature of gig employment does not give workers a steady flow of income. Without a reliable stream of payments, workers whose only source of employment is gig work are more likely to experience risk aversion. Additionally, gig workers experience uncertainty without having reliable income. Friedman (2014) notes that "employers' gain [from the gig economy] thus risks amplifying economic distress, reducing employment and wages, as well as consumer spending." Consumption can be affected in a variety of categories, but due to the relatively recent development of the gig economy, little research has been done regarding the relationship between the gig economy and food. However, looking at the relationship between risk and consumption can give insight into possible preferences of gig workers. Attanasio, Hurst, and Pistaferri (2012) find that consumption inequality within the U.S. between 1980 – 2010 has increased nearly the same amount as income inequality. They also note that studying consumption inequality allows for the observation of the allocation of disposable income to different commodities, which would give greater insight into consumer behavior. The conclusion supports the notion that consumption will decline when income declines and vice versa. Workers with less income are more risk averse and thus consume less. Gig workers may follow this same pattern, however due to their fluctuating income and uncertainty about future income, their consumption pattern may not trend with the general population when compared to workers who receive steady income. Alderman and Paxton (1992) show the effects of negative shocks to income on consumption will depend on the initial asset position of households. Households with substantial savings and few fixed costs may be more likely to increase their consumption outside of the home in the form of more extravagant spending. When gig workers in this financial situation reach a stagnant point in their gig, they may decrease their consumption despite their increased leisure time when they are not working. On the

contrary, households with high fixed costs and significant debt may opt to either consume food inside of the home or purchase affordable options available from limited service eating places. Particularly when a negative shock occurs, the households will reduce spending outside of the home, decreasing food consumption at limited serving eating places.

As consumption and income inequality have increased over the past thirty years, it is worth discussing the changes in leisure inequality during the same time frame. Attanasio, Hurst, and Pistaferri (2012) find that "low educated households were spending much more time in leisure relative to their higher educated counterparts." They also note that while higher income individuals experienced a rise in consumption relative to lower income individuals, lower income individuals experienced greater change in leisure relative to higher income individuals and have taken more leisure relative to their counterparts (Attanasio, Hurst, and Pistaferri, 2012). Food can be classified as both a necessity or a luxury. For the purpose of this paper, food purchased for consumption outside of the home is assumed to be a luxury. If gig workers fall into the area of a low income individuals, increase in restaurant sales could be explained by the fact that lower income individuals are increasing their consumption and leisure more than higher income individuals.

For gig workers who do not have a primary job or do not hold multiple jobs, it is possible they are dependent on unemployment insurance. While they may not experience the effects of long-term unemployment, they might still rely on insurance to smooth their consumption. Gruber (1994) hypothesizes that unemployment insurance plays a role in consumption smoothing such that individuals are switching from restaurant meals to home meals when they are unemployed, lowering their expenditure on food in order to maintain the same total level of consumption. If this remains the case for gig workers,

individuals whose only source income comes from gigs are more likely to spend on food at home, thus decreasing the demand for restaurants. However, limited service eating places supply quick and inexpensive meal options, which offers an alternative hypothesis of the effect of unemployment insurance on consumption smoothing for food.

The aim of this paper is to find a relationship between the increased percentage of gig workers in the overall labor market in the United States and trends in limited service eating places, specifically within total number of establishments and annual payroll. This study is important in for economic research as the dynamics of the workforce are constantly changing with the gig economy representing an increasingly larger section of the workforce. The effects of a larger informal labor market will impact multiple sectors of the economy and this study will specifically focus on how this change impacts consumers and employees in the restaurant industry.

III. Model

I will perform two separate regressions using the following equation to test for the relationship between limited service eating place establishments and the number of nonemployer establishments. The first equation will use the number of limited service eating places as the dependent variable. The second model will use annual payroll of limited service eating places as the dependent variable. Observations will be collected for 26 Metropolitan Statistics Areas from 2006 – 2015.

$$ln\ Y = \beta_0 + \beta_1\, ln\, X_1 + \beta_2\, X_2 + \varepsilon$$

where Y_1 = number of establishments of limited-service eating places, NAICS Code 7222

Y_2 = annual payroll ($1,000) of establishments of limited-service eating places, NAICS Code 7222

X_1 = Total number of nonemployer firms

X_2 is a vector of independent variables that control for factors that impact Y. X_2 consists of Total Population, Percent of population 65 years of age and older, Percent of population Hispanic or Latino Origin, Percent of in-married couple family households, Percent of population 25 years and older with a Bachelor's Degree, and Median Household Income.

Based on this model, the following hypotheses are presented:

H_0: $\beta_1 = 0$

The number of nonemployer firms is not significantly correlated with number of Limited Service Eating Place establishments.

The number of nonemployer firms is not significantly correlated with annual payroll of Limited Service Eating Place establishments.

H_1: $\beta_1 \neq 0$

The number of nonemployer firms is significantly correlated with number of Limited Service Eating Place establishments.

The number of nonemploymer firms is significantly correlated with annual payroll of Limited Service Eating Place establishments.

The control variables included in the X_2 vector are justified for the following reasons.[1] Total Population accounts for increases in population that would increase the

[1]Assume any control variable that leads to an increased number of limited service eating places would also lead to an increased annual payroll because an increase in total number would cause a greater number of working employees and increased payroll.

demand for total eating establishments, in turn leading to an increased demand in Limited Service Eating Places. The Percent of population 65 years of age and older accounts for the effects of an aging population. An increase in this percentage would decrease the demand for limited service eating places because older consumers are less likely to purchase food from these establishments due to the general appeal of the establishments to younger people and families. The Percent of population Hispanic of Latino Origin controls for the effects of a more diverse population. Assuming that people move into cities for improved work opportunities, they would not have time to eat a full-service restaurant or to cook at home. This would increase the demand for limited service restaurants. The Percent of in-married couple family households assumes that an increase in households with married couples would decrease the demand for limited service restaurants if at least one spouse is home and available to cook meals. This also accounts for the possible pattern that families or couples may complement full service restaurants to their meals at home rather than stretch their income thinly across more frequent visits to limited service eating places. The Percent of population 25 years and older with a Bachelor's Degree accounts for effect of a more educated population. Making the assumption that a more educated population correlates to an increased income of residents, an increase in the percentage would decrease the number of limited service eating places. As consumers are cooking for themselves due to their established work routine and/or have the means to afford more expensive food, the demand for limited service eating places would decrease. Median Household Income controls for an increase in income that would decrease the demand for limited service eating place establishments, and vice versa. Individuals with more income would spend more money on full service restaurants, while individuals with less income would purchase groceries to cost-effectively cook at home rather than feel constrained by their limited income to purchase quick service food.

Because data is panel data, the regressions will need to account for fixed effects at the MSA and yearly levels. Thus, three separate regressions will be run for each of the two models. Fixed effects will control for individual behavior and/or unexpected events that could affect the dependent variable that are not accounted for in the model. Regression (2) of both tests controlled for MSA fixed effects. Regression (3) of both tests controlled for MSA and yearly fixed effects.

IV. Data

Panel data will be collected at a yearly frequency from 2006 to 2015 at the Metropolitan Statistical Area level to test the relationship between nonemployer firms and limited services eating places. Because data collection for "contingent" workers, the most common measurement for the gig economy, was discontinued in 2005 and will resume in 2017, I will use nonemployer firms as a proxy for gig economy activity to capture the relationship. Sales of limited service eating places will be obtained from the Annual Retail Trade Report. "Limited service eating places," NAICS Code 7222, are defined as "establishments primarily engaged in providing food services (except snack and nonalcoholic beverage bars) where patrons generally order or select items and pay before eating" (NAICS).

Data for this analysis will be collected from 26 Metropolitan Statistical Areas (MSAs).[2] Data for X_1, the number of nonemployer firms, comes from Geographic Area Series: Nonemployer Statistics by Legal Form of Organization for the United States. Data for the remaining variables of vector variable X_2 comes from the American Community Survey. Each Metropolitan Statistical Area has a *central city* that is the largest city in the

[2] See Appendix for complete list of MSAs

MSA. If other cities meet population requirements and follow specific commuting patterns, they can also be classified as central cities. Titles include up to three central cities in each region, including the primary central city. Central cities must contain at least one-third the population of the area's largest city or local opinion supports it inclusion (Chapter 13).

From 2006 to 2015, several Metropolitan Statistical Areas underwent geographical and title changes.[3] Because the changes remained in the same general area, the new MSA titles replaced the old MSA titles in the data collection. These changes would have implications the regression is unable to measure, such as differences in tastes, preferences, and characteristics of the population of the newly titled MSA. However, changes in titles could also be caused by shifting population from one central city to a different city, which would in effect only alter the MSA title name and not the total population.

All data was available for each MSA and year with exception of data for the percentage of population 65 years of age and older, which is unavailable from 2010-2012. This should not have a significant effect on the results because the variable of importance is X_1, number of nonemployer firms in each MSA.

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[1]2006-2012: Atlanta-Sandy Springs-**Marietta**, GA Metro Area, Boston-Cambridge-**Quincy**, MA-NH Metro Area, Chicago-Naperville-**Joliet**, IL-IN-WI Metro Area, Cincinnati-**Middletown**, OH-KY-IN Metro Area, Houston-Sugar Land-**Baytown**, TX Metro Area, Los Angeles-Long Beach-**Santa Ana**, CA Metro Area, New York-**Northern New Jersey-Long Island**, NY-NJ-PA Metro Area, Sacramento--Arden-Arcade--Roseville, CA Metro Area, San Diego-Carlsbad-**San Marcos**, CA Metro Area, San Francisco-Oakland-**Fremont**, CA Metro Area.

2013-2015: Atlanta-Sandy Springs-**Roswell**, GA Metro Area, Boston-Cambridge-**Newton**, MA-NH Metro Area, Chicago-Naperville-**Elgin**, IL-IN-WI Metro Area, **Cincinnati**, OH-KY-IN Metro Area, Houston-**The Woodlands**-Sugar Land, TX Metro Area, Los Angeles-Long Beach-**Anaheim,** CA Metro Area, New York-**Newark-Jersey City**, NY-NJ-PA Metro Area, Sacramento-**Roseville**-Arden-Arcade, CA Metro Area, San Diego-Carlsbad, CA Metro Area, San Francisco-Oakland-**Hayward**, CA Metro Area.

2006-2009: Phoenix-Mesa-Scottsdale, AZ Metro Area, Portland-Vancouver-Beaverton, OR-WA Metro Area

2010-2015: Phoenix-Mesa-**Glendale**, AZ Metro Area, Portland-Vancouver-**Hillsboro**, OR-WA Metro Area

It is worth mentioning some patterns of descriptive statistics for the number of limited service eating place establishments and number of nonemployer firms. As Table 1 shows, the mean number of establishments increased from 3,969 in 2006 to 4,240 in 2009, only to decrease to 3,721 in 2015. This increase in 2009 is an interesting pattern to observe the year after the 2008 recession. It might be expected that eating places would decline in numbers if consumers were limiting their spending outside of the home. However, the increase could be explained by a demand by consumers for restaurants that offered less expensive options when their income had declined within the last year. The decrease in annual payroll from 2006 to 2009 could be explained by the impact of the recession on overall wages and firms' inabilities to pay their employees. Another interesting observation is the overall decline in number of limited service eating place establishments. As consumers seem to gravitate towards a culture of on-the-go meals with increasingly busy schedules, the number of establishments might have expected to increase; however, if the individual income of consumers increases, there may be a lower demand for these types of services. Demand could be shifting from limited service eating places to full service restaurants if consumers have higher income and focus their leisure on eating at the physical locations of meal service.

Interestingly, the average percent of population 25 years and older with a Bachelor's degree, the control variable for education, also increased from 20.47% in 2006 to 22.60% in 2015. However, this slight increase could simply be an accompaniment to the increase in population. As expected, the average number of nonemployer firms increased from 2006 to 2015. Unlike the dependent variable that fluctuated over the nine-year span, the proxy variable for the gig economy showed continuous growth, specifically from 321,191 to 396,354. The standard deviations of the number of nonemployer firms and median household income measured annually were

larger than the means. This could be explained by the large range of population sizes among the 26 tested Metropolitan Statistical Areas. Because population is controlled for in the model, the standard deviation values are not concerning.

Tests for heteroskedasticity of the model and collinearity between median household income (*income*) and percent of population 25 years and older with a Bachelor's degree (*educ*) were performed. The White Test for Heteroskedasticity resulted in a χ^2 of 106.83 and a P-value of 0.00, indicating the presence of heteroskedasticity. The robust standard error of nonemployer firms for the model using number of limited service eating place establishments was 0.01 (compared to a non-robust standard error of 0.04) and the robust standard error for the model using the annual payroll of limited service eating place establishments was 0.05 (compared to a non-robust standard error of 0.14). Due to the small sample size and the possibility that errors may move at a national trend, corrections for heteroskedasticity by grouping errors were not performed. Testing for collinearity between the variables *income* and *educ* resulted in a VIF of 1.04. There is no collinearity between these two variables, thus the model did not have to be corrected.

V. Results

The regressions testing the relationship between the number of nonemployer firms and the number of limited service eating place establishments produced the same result. In regression (1), the coefficient for X_1, total number of nonemployer firms, is -0.08 with a P-value of 0.03. Because the P-value is less than 0.05, the coefficient is significant at the 5% level. With this value, I reject the null hypothesis and accept the alternative hypothesis that the number of nonemployer firms is significantly correlated with the number of limited service eating place establishments. A one percent increase in

the total number of nonemployer firms causes a 0.080 percent decrease in percentage of limited service eating place establishments. The R-squared value of 0.96 also shows that 96% of the number of limited service eating place establishments is explained by the model.

Because I used panel data, regressions needed to account for fixed effects. This was done in two separate regressions. Fixed effects controls for individual behavior and/or unexpected events that could affect the dependent variable that are not accounted for in the model. Regression (2) controlled for MSA fixed effects. This resulted in a coefficient value of -0.03 for X_1. Because the P-value is 0.33, the coefficient is not significant, and I fail to reject the null hypothesis that the number of nonemployer firms is not positively and significantly correlated to the number of limited service eating place establishments. Regression (3) controlled for both MSA and yearly fixed effects. The coefficient for X_1 is -0.01 with a P-value of 0.56, allowing for failure to reject the null hypothesis.

The first three regressions show that without controlling for fixed effects, the number of nonemployer firms causes a small decrease in the number of limited service eating place establishments. When controlling for MSA and yearly fixed effects, the relationship between nonemployer firms and limited service eating place establishments is not strong. One possible cause for this result is that as the gig economy has grown, workers have chosen to retain smooth consumption and purchase less food outside of the home. With a fluctuating income, they choose to eat less meals at limited service eating places and instead purchase food for meals at home. Another possibility is that gig workers are instead increasing their luxury and spending their income on full service restaurants, which in turn causes a decrease in limited service eating places. While the initial hypothesis that gig workers choose to spend their income and leisure on more

affordable and quicker meals outside of the home is not supported by these tests, there are other factors that were not considered that could explain the produced results.

The regressions testing the relationship between number of nonemployer firms and annual payroll of limited eating place establishments produced the same result, insignificant coefficient of X_1, total number of nonemployer firms, with slight variation in the value. In regression (1), the coefficient for X_1, the coefficient is -0.06 with a P-value of 0.65. Because the P-value is greater than 0.05, the coefficient is not significant. With this value, I fail to reject the null hypothesis that the number of nonemployer firms is not significantly correlated with the annual payroll of limited eating place establishments. The R-squared value of 0.45 also shows that 45% of the number of limited service eating place establishments is explained by the model. Regression (2) controlled for MSA fixed effects. This resulted in a coefficient value of -0.11 for X_1. Because the P-value is 0.44, the coefficient is not significant, and I fail to reject the null hypothesis that the number of nonemployer firms is not positively and significantly correlated to the annual payroll limited service eating place establishments. Regression (3) controlled for both MSA and yearly fixed effects. The coefficient for X_1 is 0.10 with a P-value of 0.48, allowing for failure to reject the null hypothesis.

Because the coefficients of the independent variable of interest are not significant for three regressions, the model does not show a relationship between the number of nonemployer firms and the annual payroll of limited service eating place establishments.

VI. Conclusion

In this paper, I have looked at the relationship between the gig economy and limited service eating places. First, I found that the number of limited service eating place

establishments is negatively correlated with the number of nonemployer firms from 2006 to 2015. I also found that there is no relationship between the annual payroll of limited service eating place establishments and the number of nonemployer firms.

These results have a variety of implications. Because the negative relationship between sales of limited service eating places and number of nonemployer firms is only significant without fixed effects, the results may not be warranted as useful information for implementing changes within the restaurant industry. Controlling for fixed effects, while strengthening the model, produced insignificant coefficients, giving results that are not useful for implementing changes in either sector. If there had been a positive relationship, it may have been worthwhile for limited service restaurants to market towards gig workers and gig companies to improve their sales and opening of new establishments. None of the regressions testing the relationship between annual payroll of limited service eating places and number of nonemployer firms produced significant coefficients. I hypothesized that an increase in the number of nonemployer firms would cause an increase in demand for workers, leading to increase in the total annual payroll for the industry. Despite insignificant variables, the negative relationship could be explained by the entrance of lower level workers at limited service restaurants, such as dishwashers or cashiers. Entry level jobs often pay less, particularly for new employees. This would justify the observation of a negative relationship between the number of nonemployer firms and annual payroll of limited service eating places.

This paper does not account for certain factors that could have strengthened the approach to answering the initial research question. First, data for gig workers is currently immeasurable, which posed a challenge when attempting to capture information for the gig economy. Because there is no strict definition for the gig economy, there are multiple ways to track gig workers' performance in the labor market. Using nonemployer

firms as a proxy does not allow for a complete understanding of the research question and application of the results. Collecting data for contingent workers, the most common measurement for gig economy activity, will resume in 2017. Future research could utilize this data for other questions on this topic. However, due to the nature of gig work, it will remain difficult to capture the total impact of the gig workers on the economy regardless of the classification and unit of measurement.

Secondly, I used the total number of nonemployer firms rather than the percentage of nonemployer firms in the overall labor market. While the model did control for population, it did not account for general economic growth. A variable representing nonemployer firms as a percentage of the population could have been produced to serve as a proxy for the percentage of gig workers in the overall population. Producing that percentage could have enhanced the model and produced different results. Data could have also been improved by using more Metropolitan Statistical Areas and collecting data over a greater period of time. The limited number of observations does not capture trends across the country as well as if more MSAs had been used in the data.

Despite limitations of this research, there are many ways to continue research on the topic. First, in order to observe relationships between the gig economy and the food and restaurant industry, models can be made using data from all subcategories of NAICS Code 722: Accommodation and Food Services to capture the impact of the gig economy on multiple components of the industry. In addition to total number of establishments and annual payroll, a variable measuring the annual total sales of limited service eating places would provide further insight into the research question. Using nonemployer firms as a proxy for future models, it is possible to look at sectors within nonemployer firms to track the areas where the "gig economy" is growing. More detailed data collection for both subjects of observation, gig economy and restaurants, could enhance future research.

Data could also be collected on the county and city level, capturing trends specific to certain areas of the country.

Future studies could also be performed at the micro level, looking at performance of specific gig companies and individual restaurants and eating places. This type of study would be beneficial for the respective companies, but could also provide interesting results with the possible application to other businesses within the food and restaurant industry. The basic model used in this paper can be applied to a variety of areas relating the gig economy and food businesses.

VII. Appendix

List of Metropolitan Statistical Areas as of 2015

1. Atlanta-Sandy Springs-Roswell, GA
2. Boston-Cambridge-Newton, MA-NH
3. Charlotte-Concord-Gastonia, NC-SC
4. Chicago-Naperville-Elgin, IL-IN-WI
5. Cincinnati, OH-KY-IN
6. Columbus, OH
7. Dallas-Fort Worth-Arlington, TX
8. Houston-The Woodlands-Sugar Land, TX
9. Jacksonville, FL
10. Los Angeles-Long Beach, Anaheim, CA
11. Minneapolis-St. Paul-Bloomington, MN-WI
12. Nashville, Davidson, Murfreesboro-Franklin, TN
13. New York-Newark-Jersey City, NY-NJ-PA
14. Philadelphia-Camden-Wilmington, PA-NJ-DE-MD
15. Phoenix-Mesa-Scottsdale, AZ
16. Pittsburgh, PA
17. Portland-Vancouver-Hillsboro, OR-WA
18. Richmond, VA
19. Sacramento-Roseville-Arden-Arcade, CA
20. St. Louis, MO-IL
21. Salt Lake City, UT
22. San Diego-Carlsbad, CA
23. San Francisco-Oakland-Hayward, CA
24. San Jose-Sunnyvale-Santa Clara, CA
25. Seattle-Tacoma-Bellevue, WA
26. Washington-Arlington-Alexandria, DC-VA-MD-WV

Table 1
Summary Statistics

Variable	2006	2009	2012	2015
***Y*: Limited Service Eating Places Establishments**	3,969	4,240	3,542	3,721
	3,591	3,905	3,366	3,535
***Y*: Annual Payroll ($1,000)**	1,932,668	1,711,032	1,991,958	2,515,778
	2,283,415	2,004,547	2,475,661	3,155,755
X1: Nonemployer Firms	321,191	337,607	361,640	396,354
	322,099	338,180	362,346	401,332
Population	4,346,154	4,469,231	4,538,462	4,734,615
	3,964,577	3,971,705	3,953,682	4,091,449
Percent of Population of Hispanic of Latino Origin	14.13	15.06	15.88	16.25
	11.45	11.63	11.54	11.56
Percent of In-married Couple Family Households	60.67	60.23	59.17	59.38
	2.04	2.45	2.60	2.59
Percent of Population 25 years and older with Bachelor's Degree	20.47	21.13	21.77	22.60
	2.55	2.54	2.39	2.32
Median Household Income	56,587	59,075	60,345	66,134
	8,748	9,570	10,510	12,101
Percent of Population 65 years and older	10.82	11.27	12.14	13.27
	1.92	1.84	2.01	1.82
Sample Size	26	26	26	26

Mean followed by Standard Deviation below

Table 2
Number of Limited Service Eating Places Establishments

Variable Name	**(1)**	**(2)**	**(3)**
Lognon	-0.08**	-0.03	-0.01
	(0.03)	(0.33)	(0.56)
Logpop	1.13***	1.22***	1.13***
	(0)	(0)	(0)
Age	0.07***	-0.11***	-0.11***
	(0)	(0)	(0)
Race	-0.01**	-0.01	-0.02*
	(0)	(0.36)	(0.06)
House	-0.01	-0.02*	-0.01**
	(0.39)	(0.06)	(0.05)
Educ	-0.01	0	0
	(0.19)	(0.77)	(0.75)
LogIncome	-0.01	-0.24	-1.07***
	(0.92)	(0.10)	(0)
N	229	229	229
R-Squared	0.95	0.93	0.83
MSA Fixed Effects		Y	Y
Yearly Fixed Effects			Y

* = P-Val ≤ 0.10 Significant at 10% level

** = P-Val ≤ 0.05 Significant at 5% level

*** = P-Val ≤ 0.01 Significant at 1% level

Table 3
Annual Payroll ($1,000) of Limited Service Eating Places Establishments

Variable Name	**(1)**	**(2)**	**(3)**
Lognon	-0.06	-0.11	-0.1
	(0.65)	(0.44)	(0.48)
Logpop	0.81***	1.21	1.25
	(0.00)	(0.13)	(0.13)
Age	0.53	0.02	-0.06
	(0.16)	(0.68)	(0.65)
Race	0.03***	0.03	-0.01
	(0.01)	(0.45)	(0.93)
House	0.04	0.04	0.05
	(0.20)	(0.25)	(0.18)
Educ	-0.01	0.01	0.01
	(0.82)	(0.79)	(0.90)
LogIncome	0.41	0.76	-0.26
	(0.51)	(0.26)	(0.85)
N	219	219	219
R-Squared	0.45	0.43	0.41
MSA Fixed Effects		Y	Y
Yearly Fixed Effects			Y

* = P-Val ≤ 0.10 Significant at 10% level

** = P-Val ≤ 0.05 Significant at 5% level

*** = P-Val ≤ 0.01 Significant at 1% level

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