



## Online-Appendix zu

# „The Impact of the Gig-Economy on U.S. Labor Markets: Understanding the Role of Non- Employer Firms using Econometric Models and the Example of Uber“

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## Appendix

## Tables

Table 1: Selective Overview of Online Labor Platforms and Markets

Platform	Type/ Field	Registered 'contractors'	Origin/Coverage
Uber	P2P/ Ride Services	400,000	US/International
Lyft	P2P/ Ride Services	50,000	US/US
Sidecar	P2P/ Ride Services	6,000	US/ US major cities
Handy	P2P/Generic/Home Services	5,000	US/US
Care.com	P2P/Generic/Home Services	6,600,000	US/International
TaskRabbit	P2P/Generic/Generic	30,000	US/International
Gigwalk	P2P2B/Generic & Market Research	10,000	US/US
Postmates	P2P2B/Generic/Delivery	10,000	US/US
Instacart	P2P/Generic/Delivery	7,000	US/US
Favour	P2P/Generic/Delivery	3,200	US/US
Fieldagent	P2B/Market research	800,000	US/ International
Wegolook	P2B / Market Inspection	20,000	US / US, Canada UK, Australia
Amazon MTurk	P2B/Micro-tasking	500,000	US/International
Twago	P2B/Micro-tasking	225,000	Spain / Latin America
Crowdfunder	P2B /Micro-tasking	5,000,000	US/International
Crowdguru.de	P2B /Micro-tasking	30,000	Germany/Germany
Crowdsourc	P2B /Micro-tasking	8,000,000	US/International
Clickworker	P2B /Micro-tasking	700,000	Germany / International
Lingjob	P2B /Micro-tasking	3,000	Lithuania/Lithuania
Topdesigner.cz	P2B /Micro-tasking	3,900	Czech/Czech
Upwork	P2B /Macro-tasking / IT & business	10,000,000	US/International
Freelancers	P2B /Macro-tasking / IT & business	18,000,000	Australia/International
HourlyNerd	P2B /Macro-Tasking	17,000	US/International
eYeka	P2B/Design	101,774	ES/International
Frizbiz	P2P/Generic	65,000	FR/FR
Helpy	P2P/Generic	20,000	FR-ES/FR, ES
CoContest	P2P/Design	25,000	IT/International
ListMinut	P2P	34,922	BE/BE
Doido	P2P/Generic	1,857	DE/DE
Codeur.com	P2P/Generic	91,880	FR/International
Atizo.com	P2P/P2B/Innovation	30,000	CH/International
Jovoto	P2P/P2B/Innovation	82,776	DE/International
Userfarm	P2P/Video	120,000	GB/International
Hopwork	P2P/P2B/Generic	20,152	FR/International
Peopleperhour	P2P/Generic	250,000	GB/International
Testbirds	P2P/Software testing	100,000	DE/International
MyHammer	P2P/Micro-Tasking	300,000	DE/ DE, AT, CH, UK
Microworkers	P2B /Micro-tasking	763,000	US/International
99designs	P2P/Design	364,571	US/International
Zillion Designs	P2P/Design	100,000	US/International
<b>Total number of registered contractors</b>		<b>52,891,032</b>	

**Note:** P2P (Peer-to-Peer); P2P2B (Peer-to-Peer-to-Business); P2B (Peer-to-Business); Source: Codagnone, et al. (2016).

**Table 2: Overview of Data Sources and Descriptions**

<b>Data Name</b>	<b>Source /Issuer</b>	<b>Description</b>	<b>Period</b>	<b>Type/Sampling</b>
<b>Non-employer Statistics</b>	U.S. Census Bureau	Dataset tracking the activity of business with no employees and less than \$1,000 in earnings	1999 - 2014	Discrete numeric time-series data / Administrative data
<b>Current Population Survey (CPS) - Contingent Work Survey (CWS)</b>	U.S. Bureau of Labor Statistics (BLS)	Data analyzing “contingent work” and “alternative employment arrangements” in the year 2005	2005	Survey data
<b>RAND-Princeton Contingent Work Survey (RPCWS)</b>	Katz and Krueger	Data upholding the BLS’ research in 2015 including a new category of “workers using an online intermediary”.	2015	Survey data
<b>Current Business Pattern (CBP)</b>	U.S. Census Bureau	Data by industry including the number of establishments, employment, and payroll.	1999 - 2014	Administrative data
<b>Uber Expansion Data</b>	Uber Technologies Inc.	Data published by Uber on the geographical launch of their operations transferred at commuting zone level	2010 - 2014	Binary time-series data
<b>Business Dynamics Statistics (BDS)</b>	U.S. Census Bureau	Annual measures of business dynamics such as establishment openings and closings, firm startups, job creation and destruction.	1994 - 2014	Discrete numeric time-series data/ Administrative data
<b>Local Area Unemployment Statistics (LAUS)</b>	U.S. Bureau of Labor Statistics (BLS)	Annual employment, unemployment, and labor force data.	2000 - 2014	Administrative data & Survey data

**Table 3: Summary of Analysis Datasets**

Data Source	Variables	by				
		Year	State	FIPS	NAICS	
Data set 1	County Business Patterns (CPB)	Number of Employer Firms	X	X	X	X
Data set 2	CENSUS Non-employer firms	Number of Non-Employer Firms	X	X	X	X
Data set 3	Local Area Unemployment Statistics (LAUS)	Number of Employed Number of Unemployed Labor Force Employment Rate	X	X	X	
Data set 4	Uber Expansion Statistics	Year of Market Entry	(X)	X	X	
Data set 5	Current Population Survey (CPS) - Contingent Work Supplement (CWS)	Number of Alternative Workers Number of Self-Employed Contractors Number of On-call Workers Number of Temporary Workers Number of Contractors	2005	X		X
Data set 6	Rand-Princeton Contingent Work Survey (RPCWS)	Number of Alternative Workers Number of Self-Employed Contractors Number of On-call Workers Number of Temporary Workers Number of Contractors	2015	X		X

**Note:** FIPS refers to the county codes of the Federal Information Processing Standard, and NAICS refers to the North American Industry Classification System. Data indicated by year - except for RPCWS and CPS data which are only given for 2005 and 2015 respectively - are available for each year between 2000 and 2014. Based on these variables new variables and ratios were generated.

**Table 4: OLS Regressions - Non-Employer Share and Alternative Work at State\*Industry Level with Analytical Weights**

<i>All variables are standardized</i>	Non-employment share		$\Delta$ Non-employment share 2005-14
Alt. work arrangements share (KK)	0.613*** (0.065)	0.130*** (0.037)	
$\Delta$ Alt. work arrangements share (KK), 2005-15			0.325*** (0.081)
Year FE	Yes	Yes	Yes
State FE	No	Yes	Yes
Sector FE	No	Yes	Yes
Observations	343	343	139
R <sup>2</sup>	0.407	0.914	0.478
<i>All variables are standardized</i>	Non-employment share		$\Delta$ Non-employment share 2005-14
Self employed share (KK)	0.605*** (0.079)	0.153*** (0.042)	
$\Delta$ Self employed share (KK), 2005-15			0.381*** (0.069)
Year FE	Yes	Yes	Yes
State FE	No	Yes	Yes
Sector FE	No	Yes	Yes
Observations	343	343	139
R <sup>2</sup>	0.396	0.918	0.510

**Note:** This table presents the result of panel regressions assessing both the effect of alternative work arrangements on non-employer firms and the effect of the change in alternative work arrangements on the change in non-employer firms at state\*industry level. Non-employer share refers to the share of non-employer firms to all employees. Robust standard errors are in parentheses; all coefficients are standardized to facilitate comparability, therefore, standardized coefficients estimate how many standard deviations the dependent variable will change, per standard deviation increase in the independent variable (one standard deviation higher in the independent variable is associated with an increase of the dependent variable by the amount of the respective coefficient). Regressions are weighted by the industry share in total U.S. employees to be in line with the results from Katz & Krueger (2016) and balance disproportions in the data. \*, \*\* and \*\*\* means statistically different from zero at 10%, 5% and 1% level of significance.

**Table 5: OLS Regressions - Non-Employer Share and Alternative Work without Analytical Weights**

<i>All variables are standardized</i>	<b>Non-employment share</b>		<b>Δ Non-employment share 2005-14</b>
Alt. work arrangements share (KK)	0.496*** (0.057)	0.003 (0.002)	
Δ Alt. work arrangements share (KK), 2005-15			0.023 (0.069)
Year FE	Yes	Yes	No
State FE	No	Yes	Yes
Sector FE	No	Yes	No
Analytical weights	No	No	No
Observations	343	343	139
R <sup>2</sup>	0.253	0.999	0.451
<i>All variables are standardized</i>	<b>Non-employment share</b>		<b>Δ Non-employment share 2005-14</b>
Self employed share (KK)	0.472*** (0.067)	0.000 (0.002)	
Δ Self employed share (KK), 2005-15			-0.011 (0.063)
Year FE	Yes	Yes	No
State FE	No	Yes	Yes
Sector FE	No	Yes	No
Analytical weights	No	No	No
Observations	343	343	139
R <sup>2</sup>	0.229	0.999	0.450

**Note:** This table presents the result of panel regressions assessing both the effect of alternative work arrangements on non-employer firms and the effect of the change in alternative work arrangements on the change in non-employer firms at state\*industry level. Non-employer share refers to the share of non-employer firms to all employees. Robust standard errors are in parentheses; all coefficients are standardized to facilitate comparability, therefore, standardized coefficients estimate how many standard deviations the dependent variable will change, per standard deviation increase in the independent variable (one standard deviation higher in the independent variable is associated with an increase of the dependent variable by the amount of the respective coefficient). \*, \*\* and \*\*\* means statistically different from zero at 10%, 5% and 1% level of significance.

**Table 6: DID Regressions – Non-Employer Share of Transportation Sector and Uber Entry at the County Level**

Years around Uber launch	Non-employer share of transportation sector (Taxi non-employer firms as a share of all taxi employees)			
post	0.072*** (0.018)		0.129*** (0.046)	
t-3		-0.024 (0.021)		-0.024 (0.021)
t-2		-0.000 (0.017)		-0.000 (0.017)
t-1		-0.015 (0.022)		-0.015 (0.022)
t		-0.002 (0.024)		-0.002 (0.024)
t+1		0.022 (0.022)		0.066 (0.044)
t+2		0.097*** (0.024)		0.147*** (0.042)
t+3		0.151*** (0.044)		0.203*** (0.053)
t+4		0.210*** (0.055)		0.246*** (0.069)
post x 2010 share of non-employer firms			-0.456* (0.256)	-0.430* (0.230)
post x employment growth [2006-10]			-0.330 (0.271)	-0.425 (0.288)
post x non-employer firm growth [2006-10]			0.103 (0.234)	0.121 (0.217)
Year FE	Yes	Yes	Yes	Yes
County FE	Yes	Yes	Yes	Yes
Observations	13641	13641	13641	13641
R <sup>2</sup>	0.711	0.712	0.712	0.712
Standard errors in parentheses				
Significance levels				
	* p<0.10	** p<0.05	*** p<0.01	

**Note:** This table presents the result of DID regressions assessing the effect of Uber's staggered market entry on the change in non-employer firms in that transportation sector at county level. Non-employer share of transportation sector refers to the share of non-employer firms in the taxi industry to all taxi employees. The variables composed of the dummy post times a ratio or a growth component are control variables which modify the effect of post by the magnitude of the regression coefficient. It can be interpreted as an increase of 1 unit (on the respective scale it is measured) is associated with a change by the magnitude of the regression coefficient. Regressions are weighted by the industry share in total U.S. employment. Robust standard errors are reported in parentheses. \*, \*\* and \*\*\* means statistically different from zero at 10%, 5% and 1% level of significance.

**Table 7: DID Regressions – Non-Employer Share and Uber Entry at the County Level**

Years around Uber entry	Taxi non-employer firms as a share of all employees		Non-employer firms as a share of all firms	
post	0.00121*** (6.00)		0.00682*** (4.75)	
t-3		0.000101 (1.57)		0.0954*** (7.12)
t-2		0.000133 (1.57)		0.0972*** (7.40)
t-1		0.000226* (2.51)		0.0989*** (7.53)
t		0.000406*** (3.82)		0.100*** (7.64)
t+1		0.000825*** (4.67)		0.108*** (7.95)
t+2		0.00136*** (6.41)		0.118*** (7.19)
t+3		0.00332*** (5.45)		0.136*** (5.53)
t+4		0.00617*** (24.68)		0.116 (1.74)
Year FE	Yes	Yes	Yes	Yes
County FE	Yes	Yes	Yes	Yes
R <sup>2</sup>	0.860	0.876	0.863	0.449
t statistics in parentheses				
Significance levels	*p<0.05	** p<0.01	*** p<0.001"	

**Note:** This table presents the result of DID regressions assessing the effect of Uber's staggered market entry on the change in non-employer firms in that taxi industry and across all industries at county level. Regressions are weighted by the industry share in total U.S. employment. Taxi non-employer firms as a share of all employees refer to the share of non-employer firms in the taxi industry to all employees. T statistics are reported in parentheses. \*, \*\* and \*\*\* means statistically different from zero at 10%, 5% and 1% level of significance.



**Table 8: Growth Decomposition of Non-Employer Firms (NAICS 2-digit)**

<b>Decomposition</b>	<b>Period</b>	<b>Total Change</b>	<b>Between</b>	<b>Within</b>	<b>Covariance</b>
NAICS2	2000-2014	0.044	0.003	0.044	-0.003
NAICS2	2000 - 2007	0.029	0.004	0.026	-0.001
NAICS2	2007 - 2014	0.015	-0.002	0.017	-0.001
State	2000-2014	0.044	0.001	0.042	0.000
State	2000 - 2007	0.029	0.001	0.028	0.000
State	2007 - 2014	0.015	0.000	0.015	0.000

**Table 9: Growth Decomposition of Non-Employer Firms within and between State and Industry**

<b>Level</b>	<b>Period</b>	<b>Total growth</b>	<b>Check</b>	<b>Between</b>	<b>Within</b>	<b>Covariance</b>
State	2000 - 2014	0.0439	0.0439	0.0014	0.0423	0.0002
State	2000 - 2007	0.0287	0.0287	0.0009	0.0277	0.0000
State	2007 - 2014	0.0152	0.0152	0.0005	0.0148	-0.0001
NAICS 2-digit	2000 - 2014	0.0439	0.0439	0.0028	0.0438	-0.0027
NAICS 2-digit	2000 - 2007	0.0287	0.0287	0.0040	0.0256	-0.0009
NAICS 2-digit	2007 - 2014	0.0152	0.0152	-0.0017	0.0175	-0.0006
NAICS 3-digit	2000 - 2014	0.0371	0.0360	0.0113	0.0244	0.0003
NAICS 3-digit	2000 - 2007	0.0242	0.0232	0.0084	0.0148	0.0000
NAICS 3-digit	2007 - 2014	0.0129	0.0129	0.0038	0.0097	-0.0006
NAICS 4-digit	2000 - 2014	0.0281	0.0255	-0.0024	0.0330	-0.0051
NAICS 4-digit	2000 - 2007	0.0080	0.0053	-0.0133	0.0229	-0.0044
NAICS 4-digit	2007 - 2014	0.0201	0.0201	0.0124	0.0080	-0.0003

**Table 10: OLS Regressions – Unemployment Rate and Non-Employer Share**

	Unemployment Rate					
Non-employer share	0.084***			0.084***		
	(0.009)			(0.009)		
post		-0.000			-0.002	
		(0.001)			(0.002)	
t-3			0.000			0.000
			(0.002)			(0.002)
t-2			-0.000			-0.000
			(0.002)			(0.002)
t-1			-0.000			-0.000
			(0.002)			(0.002)
t			-0.000			-0.000
			(0.002)			(0.002)
t+1			-0.001			-0.002
			(0.002)			(0.003)
t+2			-0.000			-0.002
			(0.002)			(0.003)
t+3			0.001			-0.001
			(0.002)			(0.003)
t+4			-0.010***			-0.008**
			(0.002)			(0.003)
post x employment growth [2006-10]				0.044***	0.033**	0.031*
				(0.012)	(0.016)	(0.016)
post x nonemp firm growth [2006-10]				0.039***	0.054***	0.053***
				(0.014)	(0.021)	(0.020)
post x labor force growth [2006-10]				-0.047***	-0.043**	-0.040**
				(0.016)	(0.020)	(0.020)
Observations	31230	31230	31230	31230	31230	31230
R <sup>2</sup>	0.879	0.876	0.876	0.879	0.876	0.876
Standard errors in parentheses						
Significance levels                    * p<0.10      ** p<0.05      *** p<0.01						

**Note:** This table presents the result of panel regressions assessing the effect of non-employer firms on unemployment rate at county level. Non-employer share refers to the share of non-employer firms to all employees. The variables composed of the dummy post times a ratio or a growth component are control variables which modify the effect of post by the magnitude of the regression coefficient. Robust standard errors are in parentheses. \*, \*\* and \*\*\* means statistically different from zero at 10%, 5% and 1% level of significance.

**Table 11: OLS Regression – Unemployment Rate and Non-Employer Share with Uber Entry**

Years around Uber entry	Unemployment Rate	
post	-0.0126 (-1.51)	
t-3		-0.000263 (-0.17)
t-2		-0.000441 (-0.25)
t-1		-0.000546 (-0.30)
t		-0.000798 (-0.49)
t+1		-0.0127 (-1.50)
t+2		-0.0124 (-1.46)
t+3		-0.0115 (-1.28)
t+4		-0.0220* (-2.57)
R <sup>2</sup>	0.885	0.885
t statistics in parentheses		
Significance levels * p<0.05, ** p<0.01, *** p<0.001		

**Note:** This table presents the result of panel regressions assessing the effect of non-employer firms on unemployment rate around Uber's market entry at county level. Non-employer share refers to the share of non-employer firms to all employees. T statistics are in parentheses. \*, \*\* and \*\*\* means statistically different from zero at 10%, 5% and 1% level of significance.

Figures

Figure 1: Non-employer Firms Vs. Employer Firms

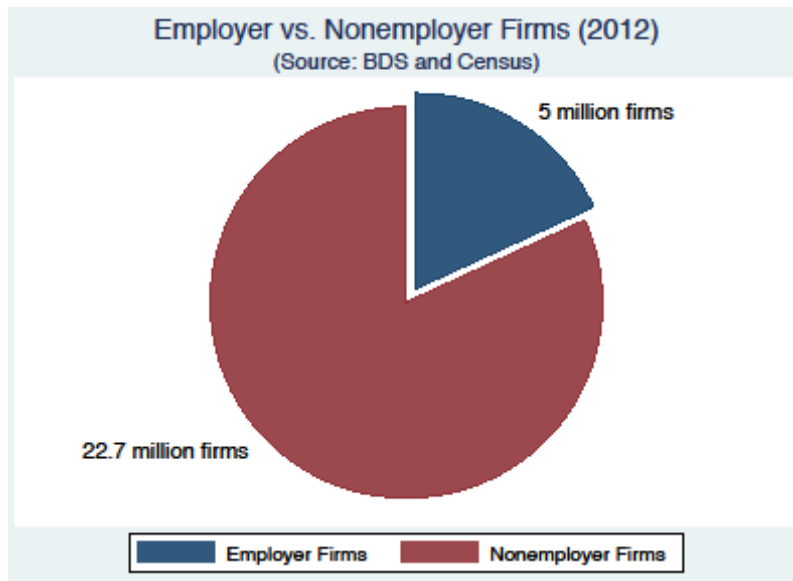
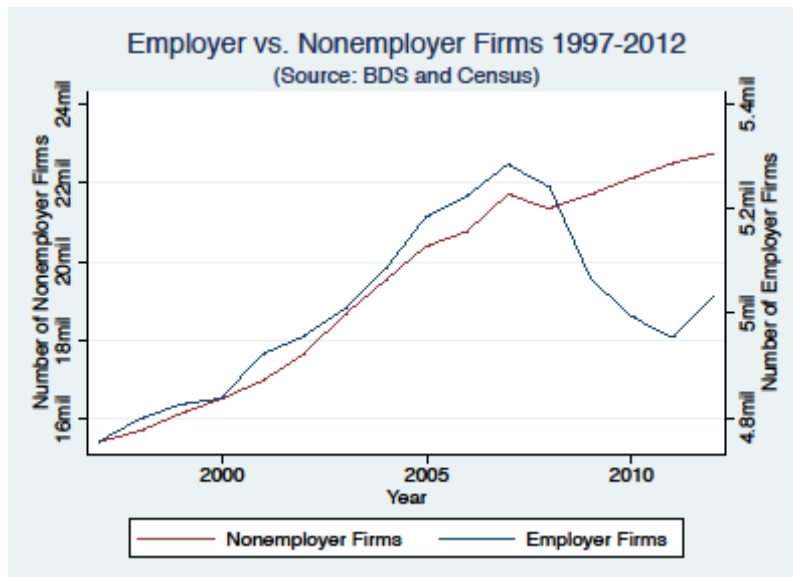
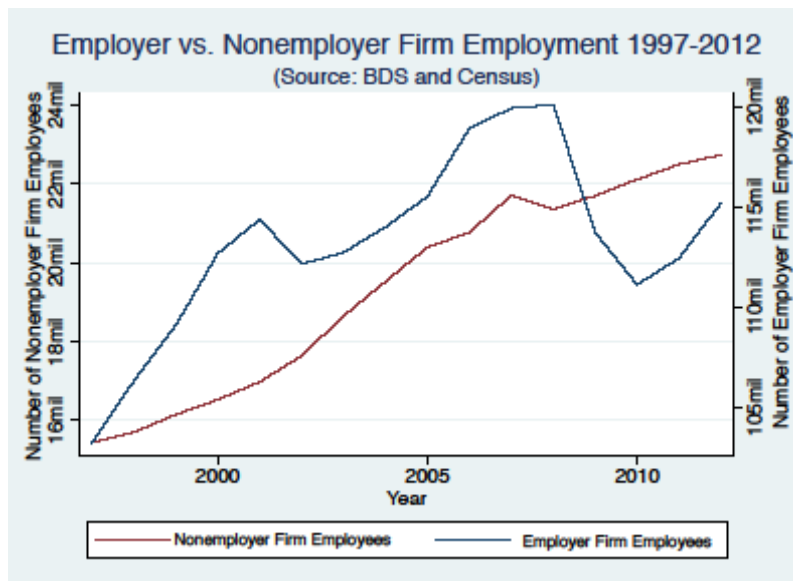


Figure 2: Trend in Employer and Non-Employer Firms

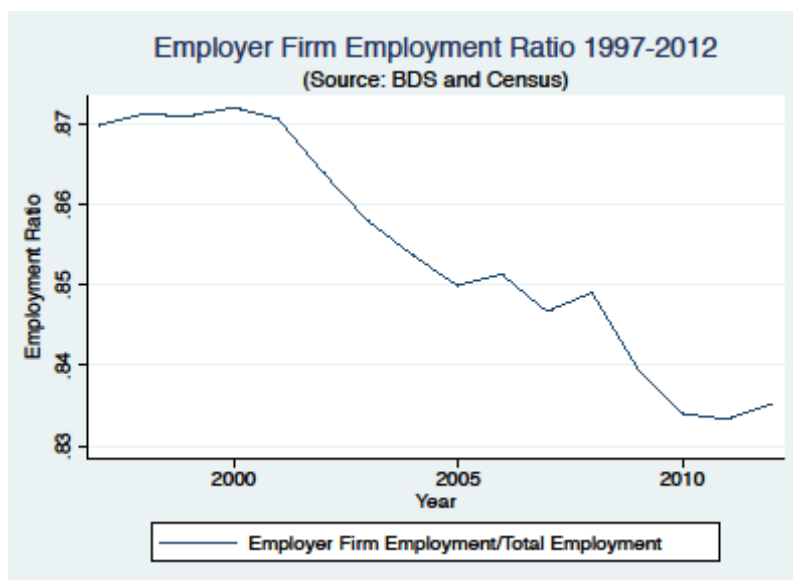


**Note:** To make the trends comparable both scales were leveled and adapted. Non-employer firms are counted on the right scale which is different in level and interval from the left scale which draws for the number of employer firms.

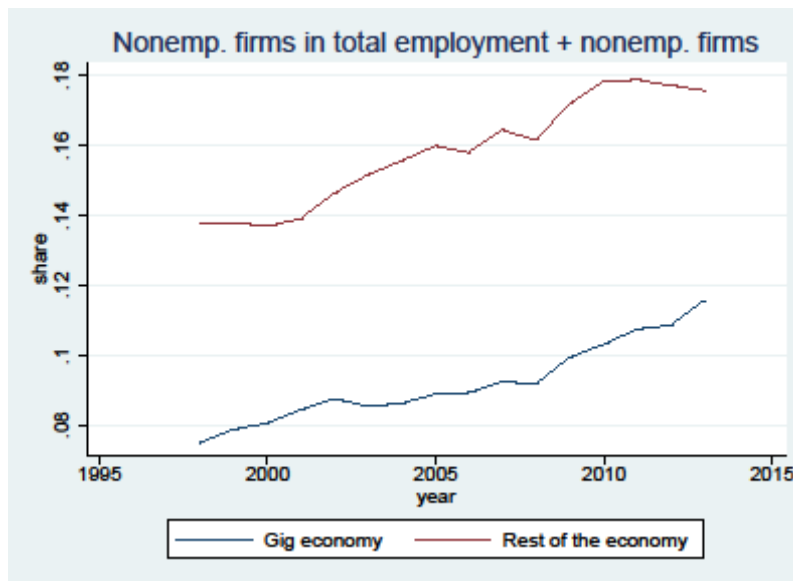
**Figure 3: Employment Trend Comparison**



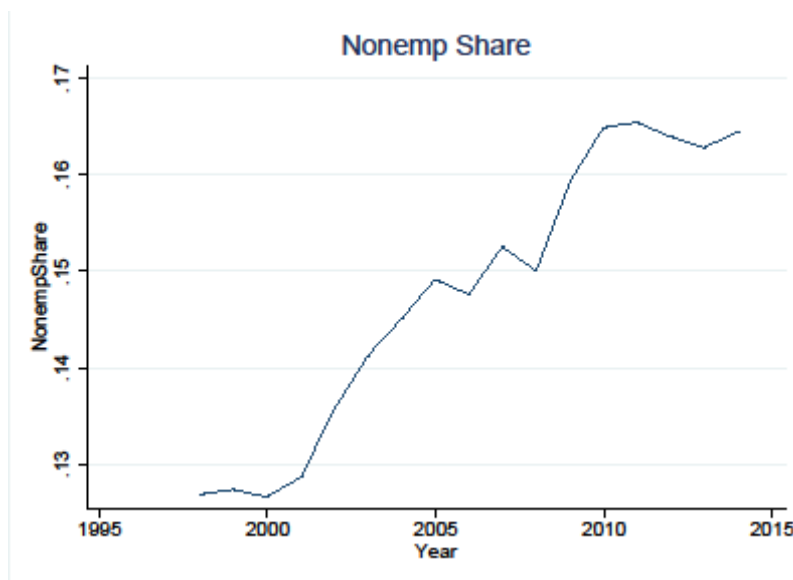
**Figure 4: Trend in Employment Ratio**



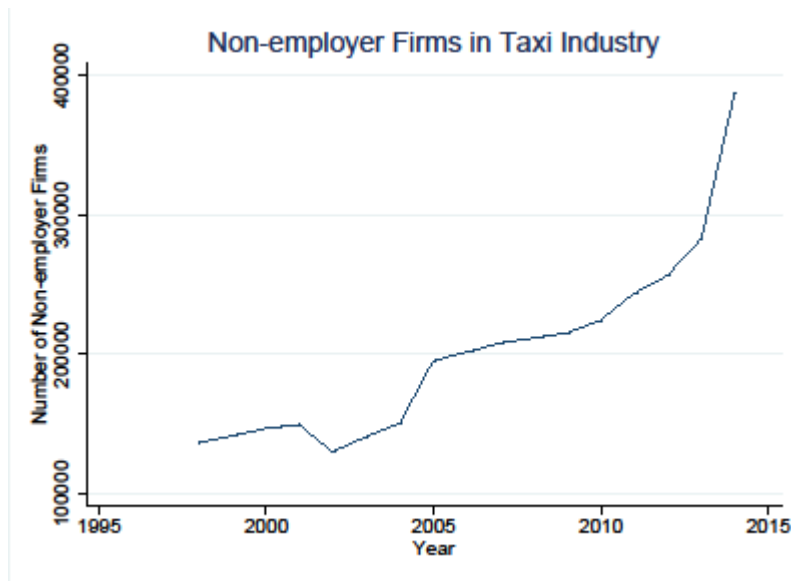
**Figure 5: Trend of Non-Employer Firms in the Gig-Economy**



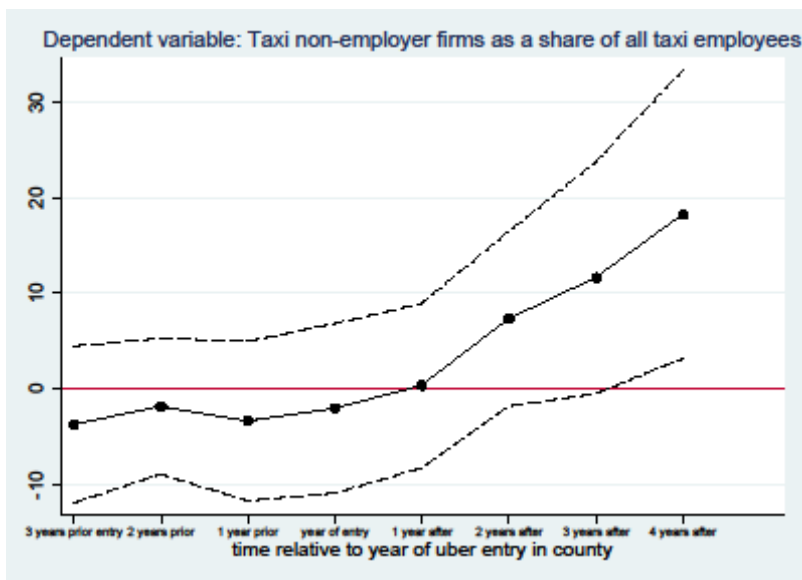
**Figure 6: Non-Employer Share Trend**



**Figure 7: Evolution of Number of Non-Employer Firms in the Taxi Industry**

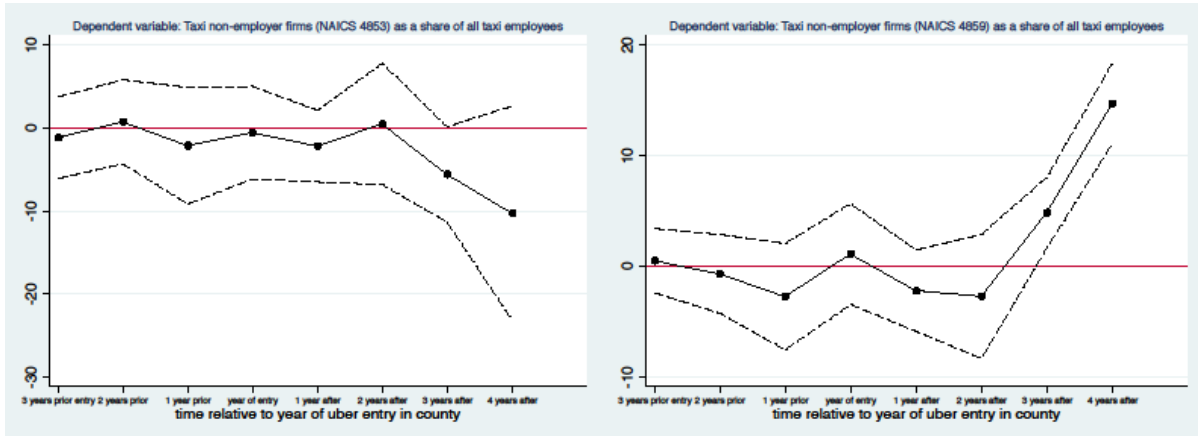


**Figure 8: Pre and Post Uber Entry Coefficients - Non-Employer Share of Taxi Sector**



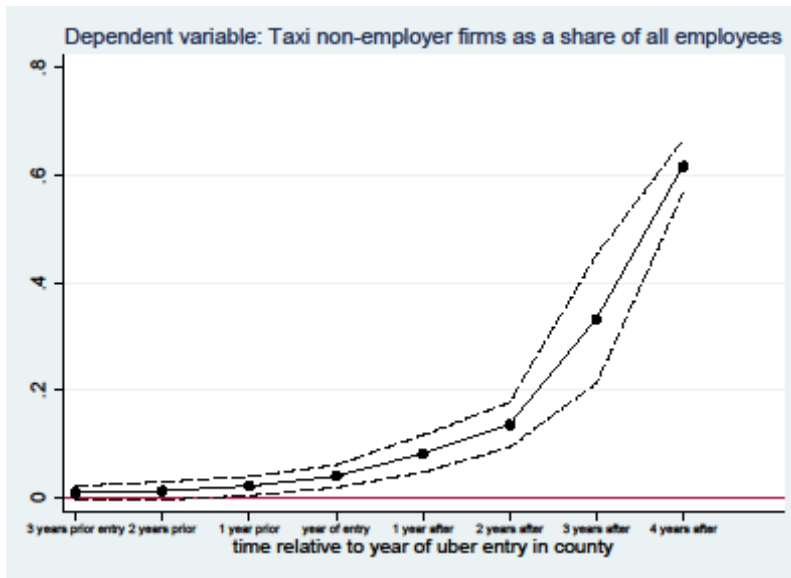
**Note:** The dependent variable “non-employer share of taxi sector” refers to the share of non-employer firms in the taxi industry to all taxi employees. The y-axis represents the regression coefficients in percentage change from the previous year with the year 2010 fixed as the base (coefficient equals “0”). The dotted lines correspond to the confidence interval (CI) of 95%.

**Figure 9: Pre and Post Uber Entry Coefficients - Non-Employer Share of Taxi Sector (NAICS 4853 and NAICS 4859)**



**Note:** The y-axis represents the regression coefficients in percentage change from the previous year with the year 2010 fixed as the base (coefficient equals “0”). The dotted lines correspond to the confidence interval (CI) of 95%.

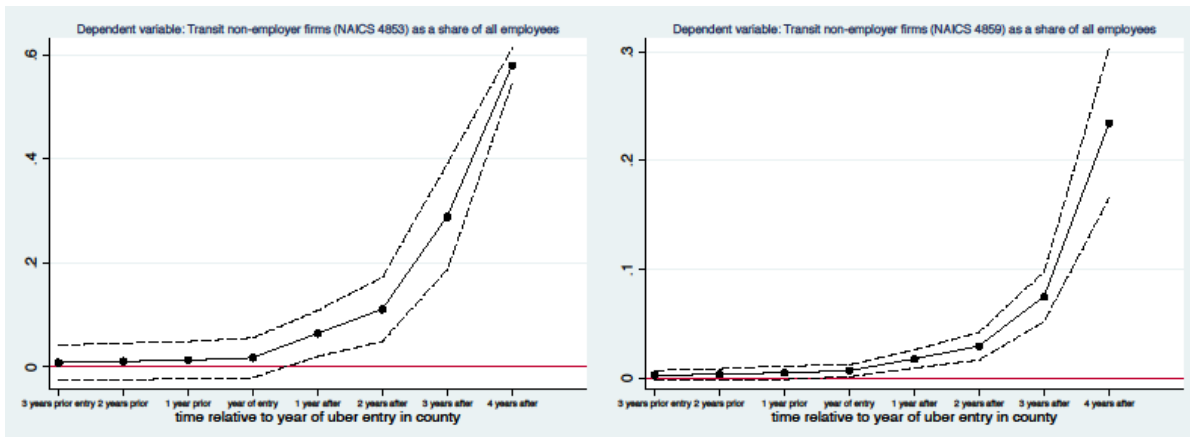
**Figure 10: Pre and Post Uber Entry Coefficients - Taxi Non-Employer Share over all employees**



**Note:** Taxi non-employer share over all employees refers to the share of non-employer firms in the taxi industry to all employees. The y-axis represents the regression coefficients in percentage change from the previous year with the year 2010 fixed as the (coefficient equals “0”). The dotted lines correspond to the confidence interval (CI) of 95%.



**Figure 11: Pre and Post Uber Entry Coefficients - Non-Employer Firms of Taxi Sector (NAICS 4853 and NAICS 4859) over all Employees**



**Note:** The y-axis represents the regression coefficients in percentage change from the previous year with the year 2010 fixed as the (coefficient equals “0”). The dotted lines correspond to the confidence interval (CI) of 95%.

**Figure 12: Plot of Average Non-Employer Firms Ratios by Year relative to Uber’s Entry**

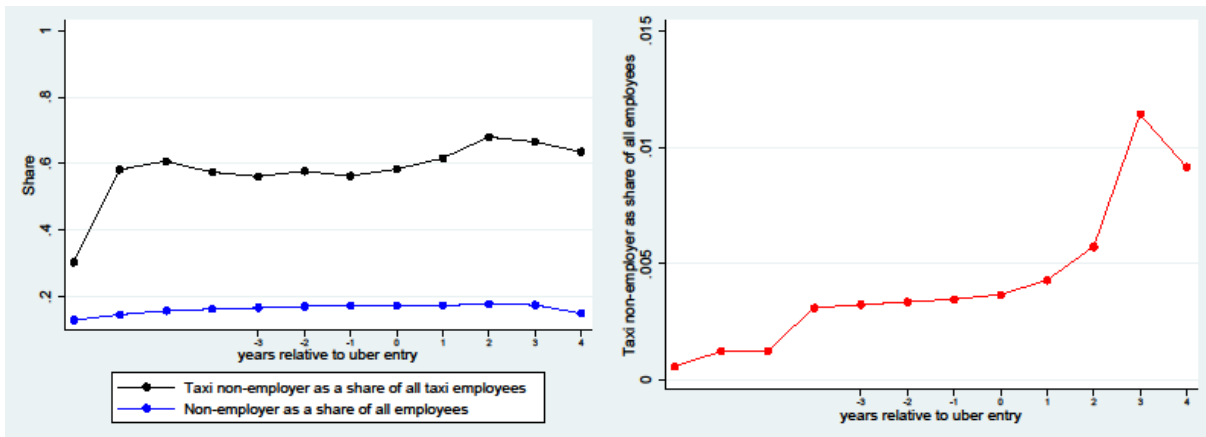


Figure 13: Plot of Average Ratios by Year relative to Uber's Entry and Sector

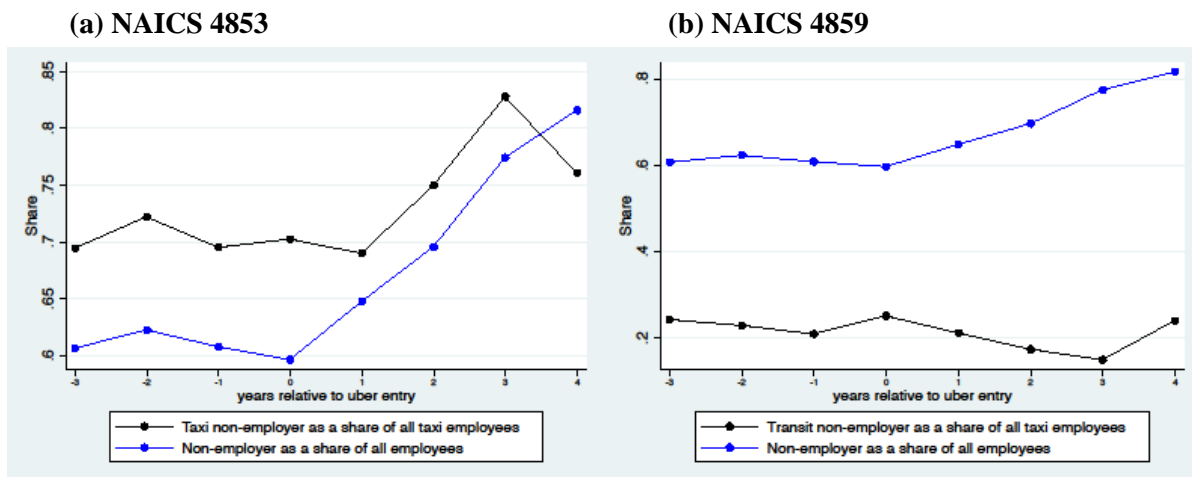
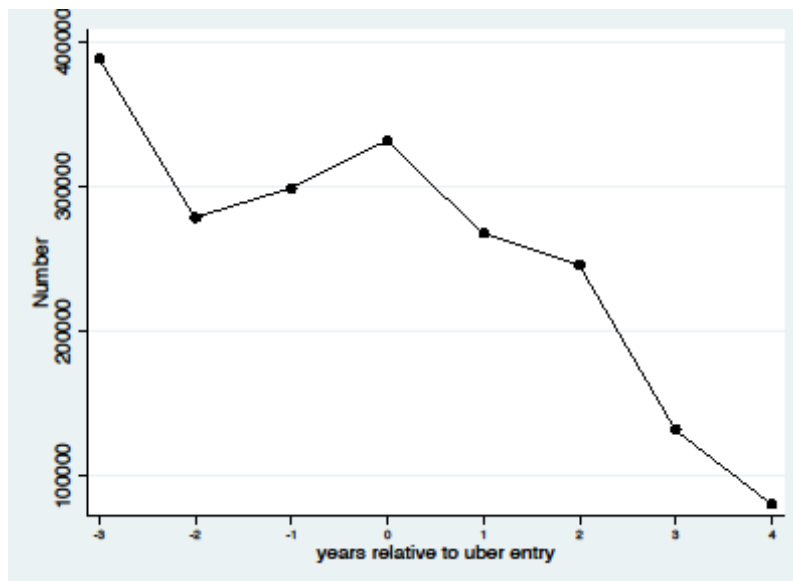
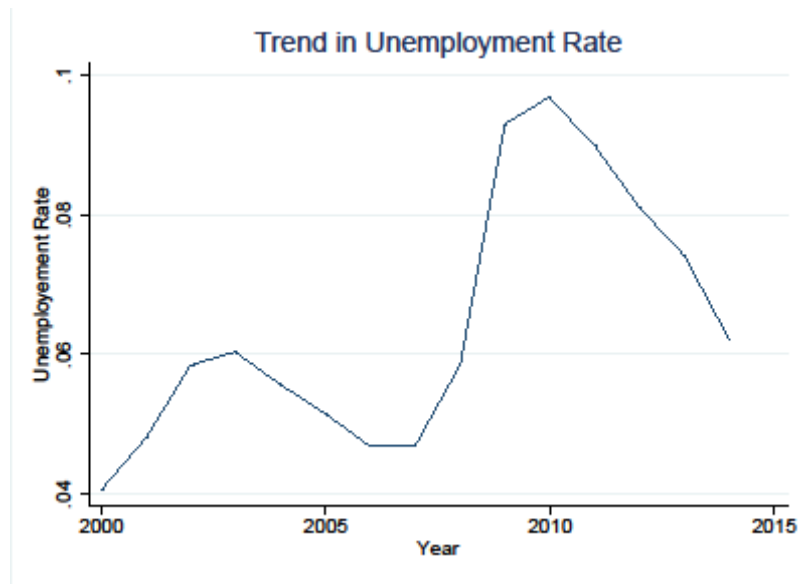


Figure 14: Employment Trend by Year relative to Uber Entry



**Figure 15: Trend in Unemployment Rate**



**Figure 16: Trend in Unemployment Rate and Non-Employer Share**

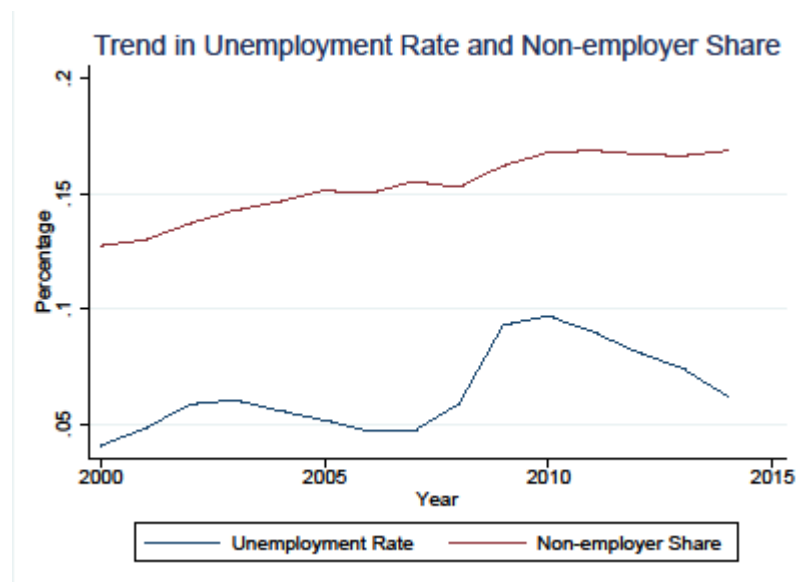


Figure 17: Trend in Unemployment Rate in Areas with Uber

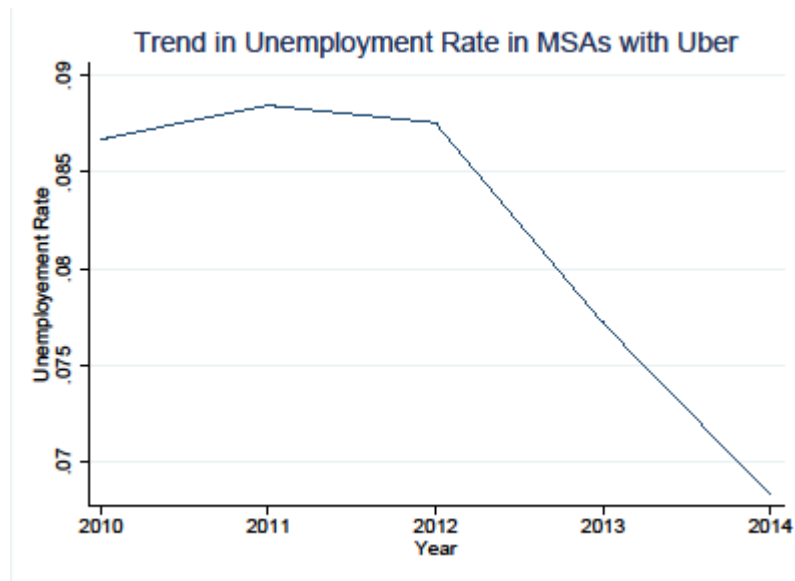
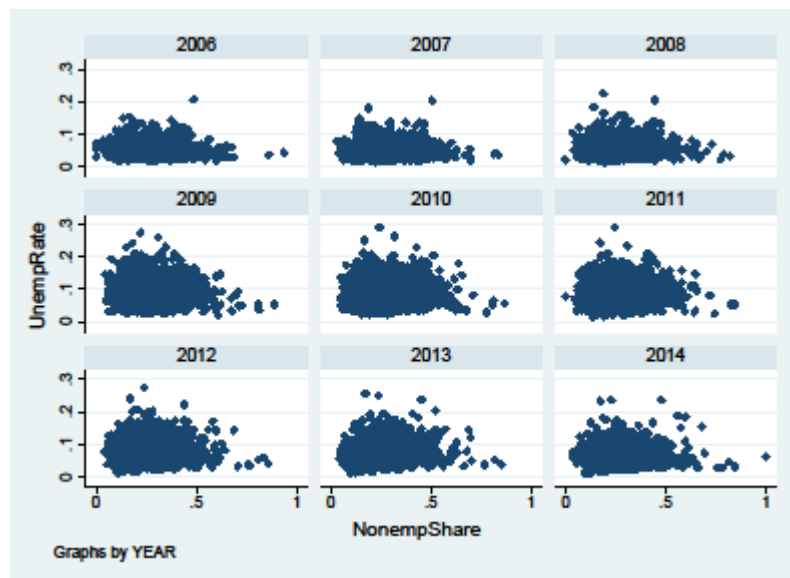
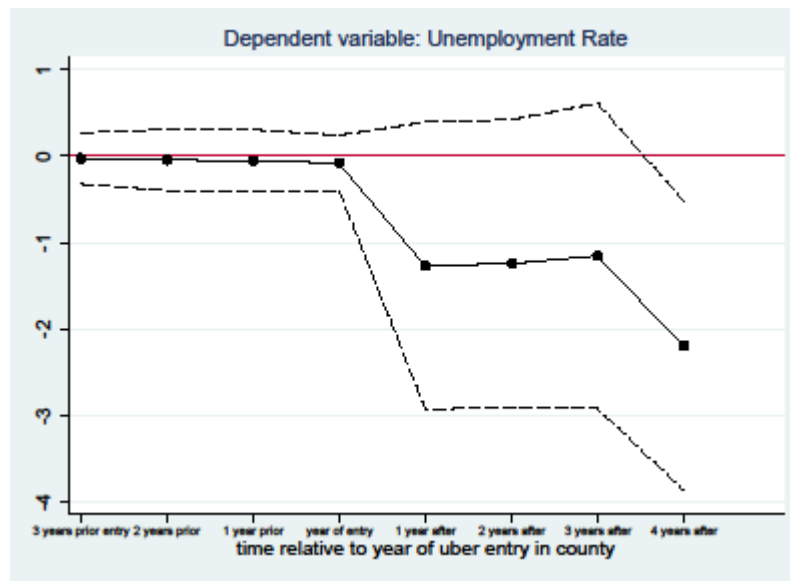


Figure 18: Regression Plots of Unemployment Rate and Non-Employment Share by Year



**Figure 19: Non-Employer Firms' Impact on Unemployment Rate pre and post Uber Entry**



**Note:** The y-axis represents the regression coefficients in percentage change from the previous year with the year 2010 fixed as the (coefficient equals "0"). The dotted lines correspond to the confidence interval (CI) of 95%.