

UCLA Anderson Forecast with GoDaddy Venture Forward

How Does AI Impact Microbusinesses and Local Economic Activity?

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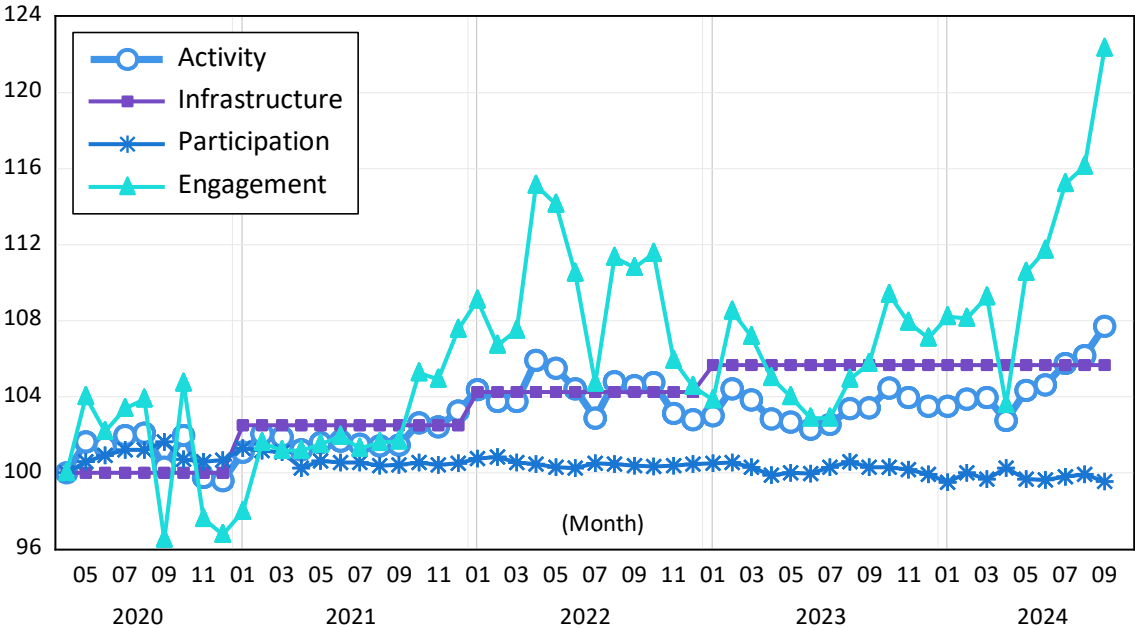
Since the launch of ChatGPT in November 2022, the world has begun to witness the transformative power and potential impact of Artificial Intelligence (AI), particularly generative AI (GAI). In November 2023, GoDaddy Inc., one of the largest domain and website providers, integrated GAI into its products and services to support its customers, primarily small businesses and entrepreneurs. This AI-driven service is called Airo. Airo's goal is to help entrepreneurs establish their online presence with less time and effort, leveraging AI technology.

For example, an entrepreneur can describe their idea, product, or service in a prompt, and Airo will recommend relevant and available domain names. Once a domain is selected, Airo will suggest specially designed logos and website content tailored to fit the business. Additionally, Airo incorporates cutting-edge AI capabilities directly into the user's website, offering features such as: (1) Rapid creation of emails and newsletters. (2) AI-powered search engine marketing to optimize site rankings and drive traffic. (3) A library of AI-generated responses to address frequently asked questions, resolve issues, and enhance customer engagement.

There was a significant surge in new website launches at various points following the Airo rollout. Additionally, Figure 1 presents the U.S. Microbusiness Activity Index¹ (MAI) through September 2024. The Engagement sub-index, which measures various online interaction metrics between microbusiness owners and their customers, increased notably from 108 in January 2024 to 122 in September 2024.

¹ <https://www.anderson.ucla.edu/about/centers/ucla-anderson-forecast/projects-and-partnerships/godaddy>

Figure 1. Microbusiness Activity and Sub-Indices in the U.S.



Source: Anderson Forecast

The Correlation Between AI and Local Economic Activity

Many argue that AI enhances efficiency and productivity for businesses that adopt it. However, its broader impact on local economic activity remains a pressing question. One significant concern is the potential for job losses resulting from labor substitution and automation. This leads to an important inquiry: has the increased website creation and engagement facilitated by GoDaddy’s Airo positively or negatively affected the local economy, particularly in terms of employment? In this analysis, we aim to explore this issue in a short, preliminary analysis.

Figure 2 shows the concentration of published websites by ZIP code as of September 2024, where the circle sizes correspond to the concentration of websites. Figures 3 provides a detailed view of these metrics specifically within the Los Angeles metro area. We found there is a strong correlation between the concentration of published websites and total sales by ZIP code. Unsurprisingly, regions with a higher concentration of websites and microbusinesses tend to generate greater sales, driven by their enhanced online presence and tools. However, it is important to note that a portion of the websites are non-business-related and therefore generate no revenue—examples include websites for non-profit organizations or personal hobbies.

Figure 2. Concentration of Published Websites by Zip Code

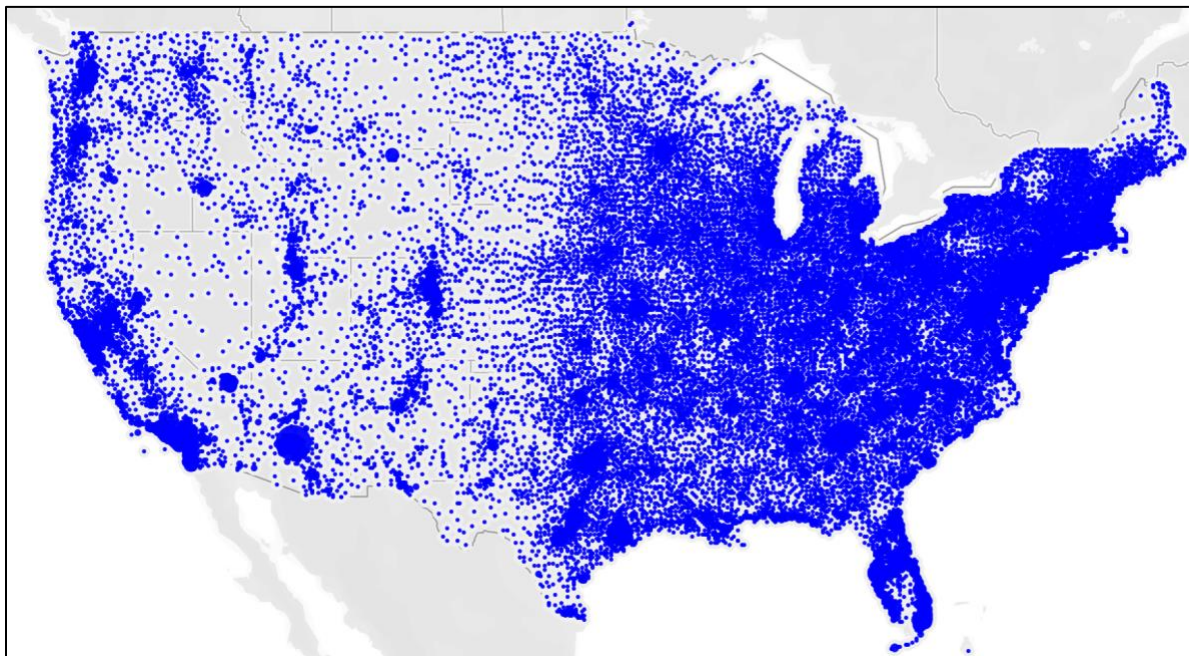
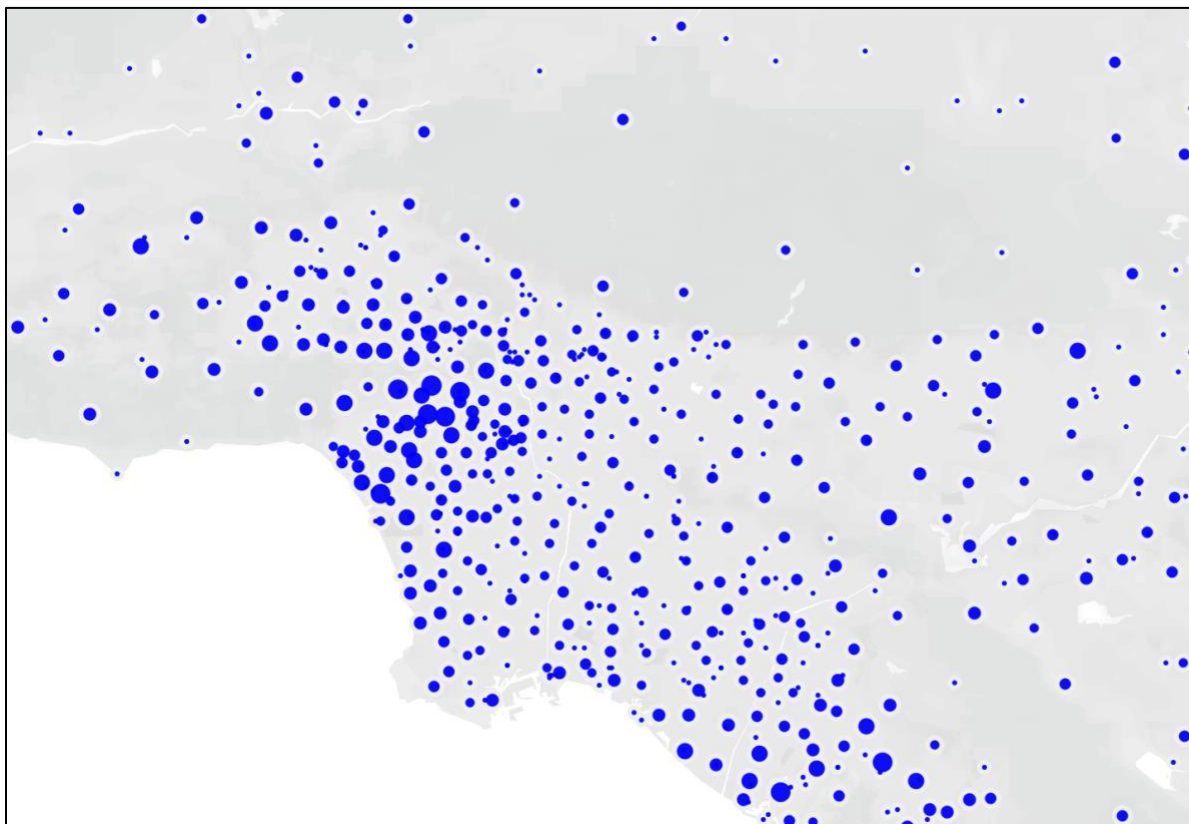


Figure 3. Concentration of Published Websites by Zip Code in Los Angeles Metro



To evaluate whether the adoption of Airo by microbusinesses influences employment and unemployment, we aggregated ZIP code-level data on the concentration of newly published websites in each county by month, spanning from April 2020 to September 2024. The key Airo introduction dates we examine are before/after November 2023 and before/after January 2024. In the former GoDaddy introduced the domain suggestion Airo tool for new customers; in the latter GoDaddy introduced its website creation Airo tool (see later section on daily events for more description of these dates).

We performed a series of panel data regressions, incorporating county and monthly fixed effects to account for unobservable characteristics and nationwide trends. The primary dependent variables analyzed were the county's monthly unemployment rate and employment levels. To capture dynamic and momentum effects at the county level, we included a one-month lag of the dependent variables. Detailed regression specifications and statistical analyses are presented in Tables 1 and 2 in the Appendix.

Most of our results should be interpreted as associations; however, we discuss under which conditions these may qualify as causal. These tools were not rolled out uniformly however, which presents some challenges for causal analysis. GoDaddy paired the rollout with a marketing campaign. Different tools were rolled out at different times (for example the domain suggestion tool was rolled out in advance of the website and logo creation tools). The tools were rolled out to different user groups (new versus existing) at different times. No randomized controlled trials were conducted to assess the independent effect of the AI tools. We discuss these challenges and explain caveats to our results in what follows.

Here are our main findings:

- (1) Over the entire sample period from April 2020 to September 2024, the addition of 10 new websites in a county is statistically associated with a 0.002 percentage-point decrease in the county's unemployment rate (Spec. 1). Notably, in August 2024, counties at the 50th percentile reported 3 new websites, while those at the 75th percentile reported 12 new websites.
- (2) Across the full sample period, each additional website is associated with an increase of 3.5 jobs in a county (Spec. 5).
- (3) After the introduction of Airo, an increase of 10 additional websites in a county is linked to a 0.017 percentage-point decrease in the county's unemployment rate (Spec. 4).
- (4) In the post-Airo period, each additional website is associated with an increase of 20 jobs in a county (Spec. 7).

How can we explain the positive association between AI-boosted websites and the local economy? One possibility is that, with the assistance of Airo, new microbusinesses were able to generate revenue more quickly. This accelerated growth could have led to increased job creation. Alternatively, faster website creation might have facilitated easier access for other microbusinesses to purchase inputs, enabling them to grow more rapidly and thereby boost employment levels.

However, another explanation is that employment growth may already have been occurring in areas with higher website activity, posing a key challenge to establishing causality in these estimates and distinguishing them from mere correlations. Additionally, the observed effects might not be driven by AI itself but rather by GoDaddy's promotional efforts related to Airo, which could have directly increased the concentration of published websites and, in turn, stimulated economic activity. Determining whether AI technology is the

primary driver behind these positive economic associations remains complex. If these effects are indeed causal, it would suggest that for small and microbusinesses, AI may serve as a complement to labor, contributing to favorable economic outcomes for society.

Income and Urban vs Rural Areas Analysis

In this section, we examine the differential impacts of website adoption and Airo adoption on local economic activity, focusing on variations across a county's income level and its classification as urban, suburban, or rural. Figure 4 reveals a positive correlation between a county's median household income and the concentration of new websites published, while Figure 5 highlights a similar positive correlation between the degree of urbanization and the concentration of websites published. It is worth noting that part of this correlation could be attributed to the larger population sizes in more urban counties.

Table 3 in the Appendix shows the summary statistics, categorized counties by income level and urbanization. Counties are classified into low-income (bottom 20% nationally based on median household income), middle-income (middle 20%), and high-income (top 20%) groups. Similarly, counties are divided into rural (bottom 20% nationally by the percentage of residents living in urban areas), suburban (middle 20%), and urban (top 20%) groups. These classifications are representative and informal because no official definitions exist at the county level. Figure A in the Appendix shows the distribution of counties by various features.

Here are our main findings based on the panel regressions with these six sub-groups shown in Tables 4 and 5:

- (1) The reduction in unemployment rates after the introduction of Airo is primarily driven by high-income counties (Spec. 13) and urban counties (Spec. 16). Note that these groups account for the largest populations, with 161 million in high-income counties and 237 million in urban counties.
- (2) During the full sample period, March 2020-September 2024: in rural counties, a positive correlation is observed between the concentration of new websites and county employment with each new website associated with an increase of 9.1 jobs (Spec. 20). In suburban counties, a larger positive correlation is found, with each new website linked to an increase of 17 jobs (Spec. 21). However, a negative correlation exists in urban counties, where each new website is associated with a reduction of 24 jobs (Spec. 22). This likely reflects the significant job losses during the COVID-19 pandemic as people moved online, particularly in urban areas, leading to simultaneous increases in unemployment and website publication.
- (3) In the post-Airo period, January 2024-September 2024: for rural counties, each new website is associated with a 4.2-job increase (Spec. 20). For suburban counties, no significant correlation is observed (Spec. 21). For urban counties, each new website is associated with a 22-job increase (Spec. 22).
- (4) Across counties with different income levels, the correlation between the concentration of websites and county employment is generally positive and consistent, as shown in Specs. 17 to 19.

Figure 4. Correlation Between Median Household Income and Log Concentration of Websites by County As of September 2024

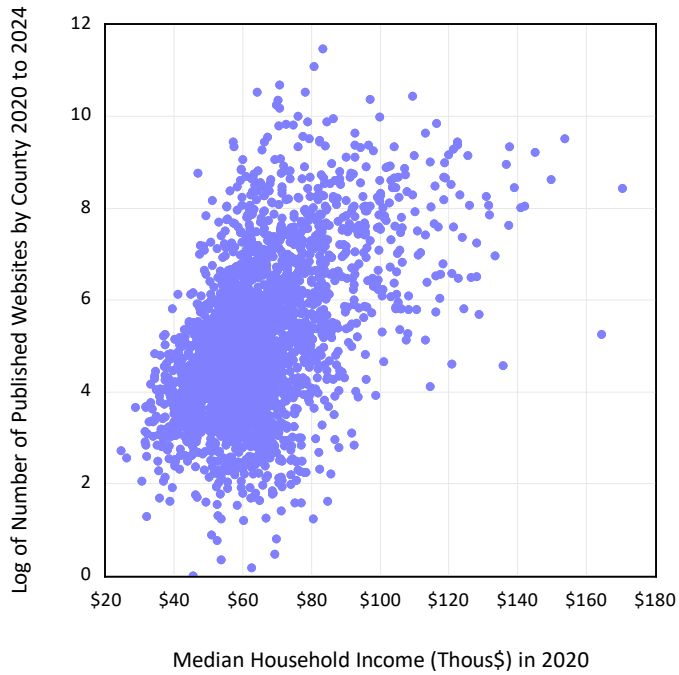
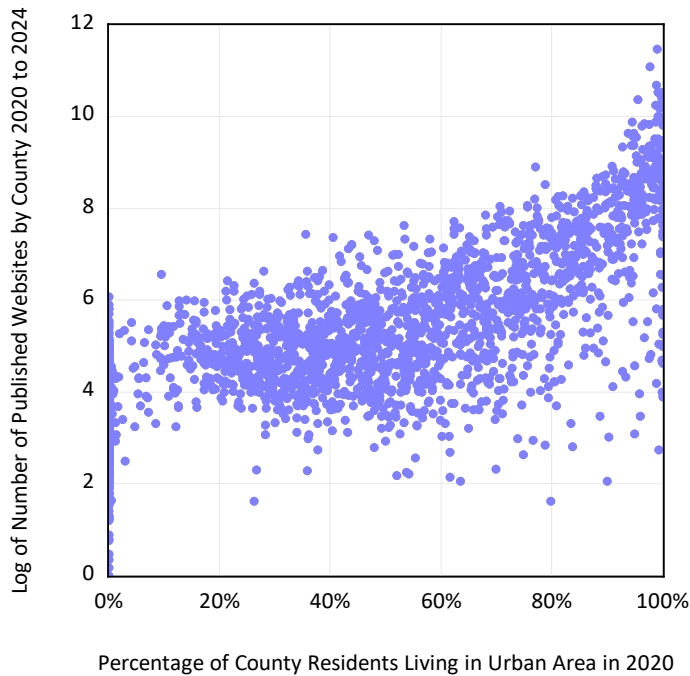


Figure 5. Correlation Between Percentage of Urban Residents and Log Concentration of Websites by County As of September 2024



Caveats and Future Work

As indicated, we have shown that there does appear to be an association between websites created and the employment rate after the introduction of Airo. This effect appears large in magnitude. However, a variety of questions remain which affect whether we can interpret this association as causal and could be useful to explore in future work:

1. The Airo rollout was uneven. This makes it challenging to disentangle the true effects of Airo changes. In separate daily analysis (which we cannot display here for confidentiality reasons), we have some evidence that elevated website creation was in evidence before the first Airo tool rollout, perhaps related to the Airo promotional campaign undertaken prior to the rollout.
2. Parallel trends: it could be that employment was separately increasing in areas that have higher website activity anyway. Then the effect of Airo would simply be picking up changes that were occurring for other reasons. Further testing would be needed to fully rule out this possibility.

Future work may be able to run additional tests to ascertain whether these caveats do not hold and the effect is in fact causal. Similarly, the best way to understand the true impact of Airo is to undertake control trials with randomized treatment groups. This may be a useful exercise in the future.

Appendix

Table 1. Panel Regression Result -- Dependent Variable: County Unemployment Rate (%)

Dependent variable	County Unemployment Rate (%)			
	Spec 1	Spec 2	Spec 3	Spec 4
Independent variables				
<i>Lag 1 of dependent variable</i>	0.68 *** [0.002]	0.68 *** [0.002]	0.68 *** [0.002]	0.6 *** [0.002]
<i># of new websites</i>	-0.0002 *** [0.00006]	0.0025 *** [0.0002]	0.0026 *** [0.0002]	0.0024 *** [0.0003]
<i>Airo adoption period (2024.1 to 2024.9)</i>		-8.2 *** [0.023]	-8.2 *** [0.023]	0.24 *** [0.01]
<i># of new websites x Airo adoption period</i>		-0.0029 *** [0.0002]	-0.0019 *** [0.0001]	-0.0017 *** [0.0002]
<i>Covid period (2020.3 to 2021.6)</i>				1.29 *** [0.011]
<i># of new websites x Covid period</i>				0.0028 *** [0.0002]
<i>% of residents in rural area</i>			-0.3 [0.28]	-0.16 [0.48]
<i># of new websites x % of residents in rural area</i>			-0.003 ** [0.001]	0.004 * [0.002]
County Fixed Effect	V	V	V	V
Month Fixed Effect	V	V	V	V
Sample	Full	Full	Full	Full
Observations	119,563	119,563	119,563	119,563

Note: Standard errors are in the bracket; *** denotes 1% significance level, ** 5%, * 10%

Table 2. Panel Regression Result-- Dependent Variable: County Employment

Dependent variable	County Employment					
	Spec 5	Spec 6	Spec 7	Spec 8	Spec 9	Spec 10
Independent variables						
<i>Lag 1 of dependent variable</i>	0.89 *** [0.001]	0.87 *** [0.001]	0.6 *** [0.002]	0.6 *** [0.002]	0.71 *** [0.005]	0.6 *** [0.004]
<i># of new websites</i>	3.5 *** [0.35]	-50 *** [1.1]	-21 *** [1]	-22 *** [1]	6.1 *** [1.9]	-24 *** [2]
<i>Airo adoption period (2024.1 to 2024.9)</i>		8768 *** [126]	-200 * [112]	-242 ** [112]	61 *** [12]	-1127 ** [452]
<i># of new websites x Airo adoption period</i>		40 *** [0.8]	20 *** [0.7]	21 *** [0.7]	-3.1 [2.5]	22 *** [1.4]
<i>Covid period (2020.3 to 2021.6)</i>			-7939 *** [114]	-7866 *** [114]	-0.06 *** [12.6]	-27740 *** [447]
<i># of new websites x Covid period</i>			-123 *** [0.7]	-124 *** [0.7]	-26 *** [2.9]	-119 *** [1.5]
<i>% of residents in rural area</i>				-14980 *** [1401]		
<i># of new websites x % of residents in rural area</i>				75 *** [6.8]		
County Fixed Effect	V	V	V	V	V	V
Month Fixed Effect	V	V	V	V	V	V
Sample	Full	Full	Full	Full	Bottom 20 percentile county for # of new websites	Top 20 percentile county for # of new websites
Observations	119,563	119,563	119,563	119,563	28,339	28,339

Note: Standard errors are in the bracket; *** denotes 1% significance level, ** 5%, * 10%

Table 3. Summary Statistics of Three Groups of Counties by Income and Urban Density

	Low-income	Middle-income	High-income	Rural	Suburban	Urban
# of Counties	526	525	526	705	523	524
Total population	17,199,148	47,056,275	161,761,306	8,586,195	23,277,161	237,154,540
Population	Min. : 350	Min. : 674	Min. : 631	Min. : 350	Min. : 6515	Min. : 3687
	1st Qu.: 11578	1st Qu.: 16526	1st Qu.: 36911	1st Qu.: 6774	1st Qu.: 22680	1st Qu.: 108520
	Median : 19394	Median : 33337	Median : 107770	Median :10611	Median : 36709	Median : 249422
	Mean : 32698	Mean : 89631	Mean : 307531	Mean :12179	Mean : 44507	Mean : 452585
	3rd Qu.: 32350	3rd Qu.: 74552	3rd Qu.: 331148	3rd Qu.:15651	3rd Qu.: 56696	3rd Qu.: 528176
	Max. :1472654	Max. :2701767	Max. :10014009	Max. :66021	Max. :215999	Max. :10014009
# of New Websites	Min. : 0.0	Min. : 0.0002	Min. : 0.00	Min. : 0.00009	Min. : 0.0015	Min. : 0.001
	1st Qu.: 0.92	1st Qu.: 1.0236	1st Qu.: 6.34	1st Qu.: 0.14209	1st Qu.: 1.64	1st Qu.: 17.924
	Median : 1.69	Median : 3.8140	Median : 25.70	Median : 0.99774	Median : 3.71	Median : 48.855
	Mean : 3.5	Mean : 17.0681	Mean : 84.29	Mean : 1.41389	Mean : 5.50	Mean : 116.987
	3rd Qu.: 3.08	3rd Qu.: 10.4396	3rd Qu.: 82.82	3rd Qu.: 1.93561	3rd Qu.: 6.78	3rd Qu.: 118.361
	Max. :168	Max. :1265.9722	Max. :3171.22	Max. :20.69143	Max. :62.33	Max. :3171.221
Median Household Income (\$)	Min. :24638	Min. :58440	Min. : 75227	Min. : 24638	Min. : 33658	Min. : 35061
	1st Qu.:42115	1st Qu.:60071	1st Qu.: 79422	1st Qu.: 48072	1st Qu.: 51896	1st Qu.: 62371
	Median :46186	Median :61911	Median : 84715	Median : 56823	Median : 60187	Median : 72604
	Mean :44889	Mean :61925	Mean : 90654	Mean : 57335	Mean : 61706	Mean : 77894
	3rd Qu.:48772	3rd Qu.:63594	3rd Qu.: 96974	3rd Qu.: 65468	3rd Qu.: 69180	3rd Qu.: 90355
	Max. :51262	Max. :65565	Max. :170463	Max. :124360	Max. :133534	Max. :170463
Percentage of Urban Residents	Min. :0.0000	Min. :0.0000	Min. :0.0000	Min. :0	Min. :0.2959	Min. :0.7481
	1st Qu.:0.0000	1st Qu.:0.0000	1st Qu.:0.3855	1st Qu.:0	1st Qu.:0.3539	1st Qu.:0.8154
	Median :0.1913	Median :0.4078	Median :0.7223	Median :0	Median :0.4034	Median :0.8853
	Mean :0.2437	Mean :0.3987	Mean :0.6231	Mean :0	Mean :0.4047	Mean :0.8857
	3rd Qu.:0.4382	3rd Qu.:0.6581	3rd Qu.:0.9027	3rd Qu.:0	3rd Qu.:0.4634	3rd Qu.:0.9596
	Max. :0.9999	Max. :1.0000	Max. :1.0000	Max. :0	Max. :0.5110	Max. :1.0000
Broadband Adoption (%)	Min. :47.30	Min. :59.00	Min. :65.60	Min. :47.30	Min. :52.40	Min. :65.50
	1st Qu.:71.40	1st Qu.:81.50	1st Qu.:88.30	1st Qu.:74.30	1st Qu.:79.92	1st Qu.:86.50
	Median :76.00	Median :84.00	Median :90.40	Median :79.30	Median :83.40	Median :89.60
	Mean :74.94	Mean :83.47	Mean :89.97	Mean :78.16	Mean :82.45	Mean :88.92
	3rd Qu.:79.70	3rd Qu.:86.10	3rd Qu.:92.60	3rd Qu.:83.30	3rd Qu.:86.40	3rd Qu.:91.80
	Max. :89.90	Max. :92.80	Max. :97.30	Max. :96.00	Max. :93.80	Max. :97.30
Unemployment Rate (%)	Min. : 1.900	Min. : 1.700	Min. :1.500	Min. : 1.500	Min. :1.800	Min. : 1.800
	1st Qu.: 4.000	1st Qu.: 3.300	1st Qu.:3.100	1st Qu.: 3.100	1st Qu.:3.400	1st Qu.: 3.500
	Median : 4.800	Median : 4.000	Median :3.700	Median : 3.900	Median :4.100	Median : 4.100
	Mean : 4.917	Mean : 4.067	Mean :3.703	Mean : 4.066	Mean :4.197	Mean : 4.276
	3rd Qu.: 5.600	3rd Qu.: 4.700	3rd Qu.:4.200	3rd Qu.: 4.800	3rd Qu.:4.800	3rd Qu.: 4.800
	Max. :12.000	Max. :11.000	Max. :6.900	Max. :12.000	Max. :9.700	Max. :20.600
Employment	Min. : 125	Min. : 342	Min. : 816	Min. : 125	Min. : 2035	Min. : 1504
	1st Qu.: 4352	1st Qu.: 7561	1st Qu.: 18960	1st Qu.: 2887	1st Qu.: 9473	1st Qu.: 54006
	Median : 7483	Median : 15178	Median : 55018	Median : 4566	Median : 15667	Median : 121621
	Mean : 12934	Mean : 41565	Mean : 157687	Mean : 5369	Mean : 20091	Mean : 225140
	3rd Qu.: 12590	3rd Qu.: 32352	3rd Qu.: 172356	3rd Qu.: 6858	3rd Qu.: 24985	3rd Qu.: 260796
	Max. :572117	Max. :1358343	Max. :4750287	Max. :31578	Max. :116979	Max. :4750287
# of Ventures	Min. : 2	Min. : 7.0	Min. : 9	Min. : 2.0	Min. : 70	Min. : 59
	1st Qu.: 173	1st Qu.: 430.8	1st Qu.: 2076	1st Qu.: 129.0	1st Qu.: 584	1st Qu.: 6622
	Median : 388	Median : 1158.5	Median : 8563	Median : 234.0	Median : 1170	Median : 18061
	Mean : 1032	Mean : 6741.3	Mean : 41463	Mean : 405.9	Mean : 2047	Mean : 57711
	3rd Qu.: 759	3rd Qu.: 3339.2	3rd Qu.: 27668	3rd Qu.: 488.2	3rd Qu.: 2342	3rd Qu.: 48177
	Max. :55628	Max. :671455.0	Max. :2161842	Max. :3822.0	Max. :34845	Max. :2161842
# of Entreperuers	Min. : 2.0	Min. : 6.0	Min. : 6	Min. : 2.0	Min. : 36.0	Min. : 29
	1st Qu.: 82.0	1st Qu.: 180.0	1st Qu.: 764	1st Qu.: 62.0	1st Qu.: 233.0	1st Qu.: 2001
	Median : 163.0	Median : 436.5	Median : 2651	Median : 100.0	Median : 444.5	Median : 5572
	Mean : 375.7	Mean : 1930.6	Mean : 10415	Mean : 148.9	Mean : 678.4	Mean : 14390
	3rd Qu.: 303.0	3rd Qu.: 1148.5	3rd Qu.: 8503	3rd Qu.: 186.0	3rd Qu.: 831.8	3rd Qu.: 13890
	Max. :20750.0	Max. :155497.0	Max. :473960	Max. :1257.0	Max. :6764.0	Max. :473960

Table 4. Panel Regression Result-- Dependent Variable: County Unemployment Rate (%)

Dependent variable	County Unemployment Rate (%)					
	Spec 11	Spec 12	Spec 13	Spec 14	Spec 15	Spec 16
	Low-income	Middle-income	High-income	Rural	Suburban	Urban
Independent variables						
<i>Lag 1 of dependent variable</i>	0.69 *** [0.005]	0.65 *** [0.005]	0.69 *** [0.004]	0.65 *** [0.005]	0.62 *** [0.005]	0.74 *** [0.004]
<i># of new websites</i>	0.0018 [0.003]	0.0008 [0.0008]	0.0008 *** [0.0002]	-0.003 [0.0007]	-0.001 [0.002]	0.001 *** [0.0002]
<i>Airo adoption period (2024.1 to 2024.9)</i>	0.007 [0.05]	-0.038 [0.05]	0.12 ** [0.05]	-0.05 [0.05]	0.03 [0.05]	0.15 *** [0.05]
<i># of new websites x Airo adoption period</i>	-0.0026 [0.002]	-0.0006 [0.0006]	-0.0005 *** [0.0001]	-0.01 [0.008]	-0.003 [0.003]	-0.0007 *** [0.0001]
<i>Covid period (2020.3 to 2021.6)</i>	6.76 *** [0.05]	8.76 *** [0.06]	8.64 *** [0.05]	6.65 *** [0.05]	8.3 *** [0.05]	8.88 *** [0.05]
<i># of new websites x Covid period</i>	0.02 *** [0.002]	0.005 *** [0.0004]	0.0015 *** [0.0001]	0.04 *** [0.01]	0.02 *** [0.003]	0.001 *** [0.0001]
County Fixed Effect	V	V	V	V	V	V
Month Fixed Effect	V	V	V	V	V	V
Sample	Bottom 20 percentile county based on median income	Middle 20 percentile county based on median income	Upper 20 percentile county based on median income	Bottom 20 percentile county based on urban density	Middle 20 percentile county based on urban density	Upper 20 percentile county based on urban density
Observations	28,875	28,820	28,875	38,720	28,710	28,765

Note: Standard errors are in the bracket; *** denotes 1% significance level, ** 5%, * 10%

Table 5. Panel Regression Result-- Dependent Variable: County Employment

Dependent variable	County Employment					
	Spec 17	Spec 18	Spec 19	Spec 20	Spec 21	Spec 22
	Low-income	Middle-income	High-income	Rural	Suburban	Urban
Independent variables						
<i>Lag 1 of dependent variable</i>	0.61 *** [0.004]	0.67 *** [0.005]	0.57 *** [0.004]	0.82 *** [0.003]	0.75 *** [0.004]	0.61 *** [0.004]
<i># of new websites</i>	3.2 [3.5]	-3.2 [2.1]	-28 *** [2.1]	9.1 *** [1.2]	17 *** [1.7]	-24 *** [2]
<i>Airo adoption period (2024.1 to 2024.9)</i>	43 [56]	137 [129]	-897 ** [426]	46 *** [8.9]	112 *** [28]	-1129 ** [483]
<i># of new websites x Airo adoption period</i>	20 *** [2.5]	8 *** [1.5]	24 *** [1.5]	4.2 *** [1.5]	0.9 [1.4]	22 *** [1.5]
<i>Covid period (2020.3 to 2021.6)</i>	-1202 *** [57]	-5263 *** [131]	-19190 *** [425]	-573 *** [9]	-2251 *** [29]	-27860 *** [480]
<i># of new websites x Covid period</i>	-167 *** [2.6]	-107 *** [1.7]	-129 *** [1.5]	-21 *** [1.9]	-70 *** [2]	-119 *** [1.5]
County Fixed Effect	V	V	V	V	V	V
Month Fixed Effect	V	V	V	V	V	V
Sample	Bottom 20 percentile county based on median income	Middle 20 percentile county based on median income	Upper20 percentile county based on median income	Bottom 20 percentile county based on urban density	Middle 20 percentile county based on urban density	Upper 20 percentile county based on urban density
Observations	28,875	28,820	28,875	38,720	28,710	28,765

Note: Standard errors are in the bracket; *** denotes 1% significance level, ** 5%, * 10%

