Research Brief,

Short Paper

Vol. 4, No. 17

(2022, September 3)

The Illinois Institute for Rural Affairs (IIRA) works to improve the quality of life for rural residents by partnering with public and private agencies on local development and enhancement efforts.

Western Illinois University

The Threat of Automation: Differences in Perceptions Between Metro and Nonmetro Labor Force Participants

ISSN 2687-8844

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Abstract

The present study was constructed to determine the social and economic characteristics of those workers who perceive automation as a threat. Data were from a survey of adults sponsored by the Center for Workforce Development at Rutgers University. Results of data analysis suggest that some individuals appear to live as if they are in the process of "becoming"; they are training to develop new skills in order to keep up with changes in the workplace; they are predominantly college-educated men with a household income of $50,000-$75,000.

Introduction

In an earlier *Research Brief* I estimated the occupational impacts of automation for Illinois using aggregate data[2]. This paper explores the topic using microdata; it focuses on labor force[3] perceptions about automation.

Previous studies of automation and job security have indicated that young workers, those in their twenties and thirties, are most concerned about technology putting them out of work[4]. For

[1] Professor, Illinois Institute for Rural Affairs, Western Illinois University.
[2] Athiyaman, A. (2022). Impacts of automation on employment: Metro and nonmetro Illinois, *Research Brief*, 4(16), August 25, 1-18. Available: http://www.iira.org/wp-content/uploads/2022/08/RB4_16-Impacts-of-Automation.pdf.
[3] Labor force includes both employed and unemployed persons looking for work; see BLS' Concepts and Definitions; https://www.bls.gov/cps/definitions.htm#lfconcepts.
[4] See, for example, Strack, R. et al (2021). *Decoding Global Reskilling and Career Paths*. Boston Consulting Group.

automation to be a 'stressor' or a threatening concept, one has to perceive and cognitively interpret it as dangerous, for example, to one's job security; this appraisal could result from a threat that is actual, anticipated, or imagined[5]. The empirical implication of this conception is that the cognitive appraisal of the threat is independent of the objective environmental stressor; automation doesn't need to be happening now, right at this moment.

The present study was constructed to determine the social and economic characteristics of those workers who perceive automation as a threat. Data were from a survey of adults sponsored by the John J. Heldrich Center for Workforce Development at Rutgers University[6].

Methodology

Labor force participants were asked to indicate whether technology, such as automation of jobs, is a major threat, a minor threat, or not a threat to American workers. This 'dependent' variable was cross-tabulated with respondents' demographics and socio-economic characteristics. In addition, metro and nonmetro respondents' perceptions about technologies and future expectancies were analyzed (Table 1). Chi-square was used to test the statistical significance of the relationships. Since many of the results are considered to be indicative as opposed to definitive, the .05 level of significance is not rigidly adhered to as delineating meaningful relationships[7].

[5] Lazarus, R. S., & Folkman, S. (1984). *Stress, appraisal, and coping*. Springer publishing company.

[6] See, https://ropercenter.cornell.edu/ipoll/study/31116367. Although the poll was conducted in 2018, the responses were for stimuli projected 5-years into the future.

[7] The $\alpha \leq .05$ criterion implies that the obtained χ^2 statistic, or greater ones, could occur by chance with a probability less than 5%.

Table 1: Key Variables and their Definitions

Variable	Operational Definition
THREAT: Threat of Automation	1 = Major threat; 2 = Minor threat; 3 = Not a threat to American workers.
EMPST: Employment status	1 = Employed; 2 = Unemployed and looking for work.
JOBIND: Employment industry	1 = Private; 2 = Govt / Military; 3 = Non-profit/academic; 4 = Self-employed; 5 = Other.
JOBSEC: Concerns about job security	1 = Very concerned; 2 = Somewhat concerned; 3 = Not too concerned; 4 = Not at all concerned.
CONF: Confidence in finding a job if present job is lost	1 = Extremely confident; 2 = Very confident; 3 = Somewhat confident; 4 = Not very confident; 5 = Not at all confident.
NEWSKILL: Importance of retraining throughout work life to keep up with workplace changes.	1 = Essential; 2 = Important, but not essential; 3 = Not important
NEWSKLPROB: Likelihood of retraining.	1 = Very likely; 2 = Somewhat likely; 3 = Not very likely; 4 = Not at all likely.
TECHCHNG: Agreement with the statement, "new tech have changed by job for the better".	1 = Agree a lot; 2 = Agree a little; 3 = Disagree a little; 4 = Disagree a lot.
TECHGD: Agreement with the statement, "new tech jobs are good for the economy".	
TECHJOBS: Agreement with the statement, "new tech jobs are good jobs".	

Findings

Overall Perceptions

When analyzed at the aggregate level, data for both segments of the labor force – employed and unemployed and looking for work - showed little or no differences in perceptions about severity of the threat of automation. However, inter group differences exist between the nonmetro labor force segments; a larger proportion of employed persons in the nonmetro perceived automation as a major threat than the "unemployed, but looking for work" segment (Table 2).

Table 2: Metro versus Nonmetro Differences in Perceptions: Technology, or Automation of Jobs, as a Threat to American Workers

(i) Total Labor Force

Level of Threat	Labor Force Segment Metro (N=211mil)	Nonmetro (N=33.96mil)
Major threat	41%	37%
Minor threat	49%	49%
Not a threat	10%	14%

Note: ^{2} = 0.356, $p < 0.50$

(ii) Nonmetro Labor Force

Level of Threat	Labor Force Segment Employed (N=29.75mil)	Unemployed, Looking for Work (N=4.37mil)
Major threat	41%	11%
Minor threat	47%	58%
Not a threat	12%	31%

Note: χ^{2} = 26.63, $p < 0.01$

Age

Age distributions of the labor force segments were similar for both the metro and the nonmetro (Figure 1). However, perceptions among the nonmetro respondents varied by age; the young and the middle-aged perceived technology as a major threat whereas the older respondents believed that automation posed little or no threat for American workers, Table 3.

These findings support the argument that because young people have a longer working life, they are more concerned about the impact of automation on job security. Also, the middle-aged population worry about losing their job because they don't wish to adopt new technology as they get older[8].

[8] Gentili, A. et al (2020). Are machines stealing our jobs? *Cambridge Journal of Regions, Economy, and Society*, 13(1), 153-173.

Figure 1: Age Distribution of the Metro and the Nonmetro Labor Force

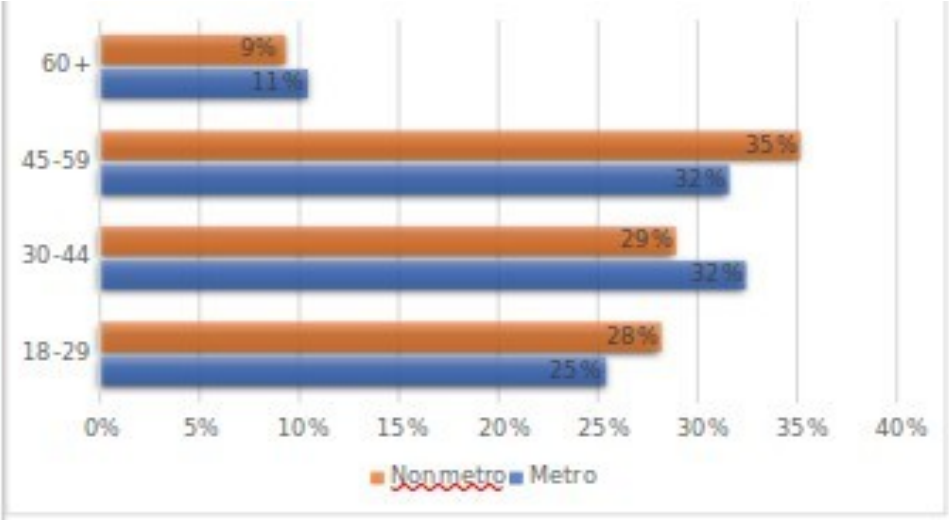

Table 3: Impact of Age on Perceptions about Threat of Automation: Nonmetro Labor Force

	Age Distribution			
Level of Threat	**18-29 (N=9.59mil)**	**30-44 (9.84mil)**	**45-59 (N=11.96mil)**	**60+ (N=3.19mil)**
Major threat	39%	31%	38%	41%
Minor threat	53%	44%	50%	41%
Not a threat	7%	25%	11%	18%

Note: $\chi^2 = 14.73$, $p < 0.02$

Education

A very significant relationship was found between education and threat perceptions of the nonmetro labor force; six times as many with "less than high school" than "college education" believe that automation is not a threat (Table 4).

It is highly likely that these non-high-school graduates work in labor intensive sectors such as food preparation and serving, cleaning and janitorial work, grounds cleaning and maintenance, and numerous jobs in security and protective services[9]. Often, the outputs of these

[9] David, A. et al (2013). The growth of low-skill service jobs and the polarization of the US labor market. *American Economic Review*, 103(5), 1553-97.

jobs must be produced and performed onsite or in-person, so they cannot be easily automated.

Table 4: Relationship of Formal Schooling to Beliefs About Threat of Automation: Nonmetro Labor Force

	Level of Education			
Level of Threat	**LT High School**	**High School**	**Some College**	**College Degree**
Major threat	33%	47%	32%	31%
Minor threat	39%	41%	50%	64%
Not a threat	29%	12%	18%	5%
N	5mil	11mil	11mil	7mil

Note: $\chi^2 = 31.5$, $p < 0.01$

Occupation

Little relationship could be found between occupation and threat perceptions for the metro respondents; for the nonmetro respondents, the relationship between occupation and threat perceptions was significant in terms of chi-square analysis (Table 5).

Labor force in the private sector believes that automation of jobs is a major threat; government employees and professionals in the non-profit sectors, including academics, see it as a minor threat (Table 5).

Table 5: Relationship of Respondents' Work Industry to Beliefs About Threat of Automation

	Industry Affiliation			
Level of Threat	**Private Sector**	**Government**	**Non-Profit**	**Self-Employed**
Major threat	36%	30%	24%	60%
Minor threat	57%	35%	76%	40%
Not a threat	7%	34%	0%	0%
N	12.9mil	3.05mil	1.02mil	2.72mil

Note: $\chi^2 = 138.62$, $p < 0.01$

Income

Household income is inversely related to beliefs about automation threat for respondents in the metro; the lower the household income, the stronger is the belief that automation is a threat for workers; the relationship is reversed for the nonmetro; more the income, higher is the threat perception (Table 6).

Table 6: Relationship of Household Income to Beliefs About Threat of Automation

(i) Metro

	Household Income					
Level of Threat	**Under $25,000**	**$25,000 - $49,999**	**$50,000 - $74,999**	**$75,000 - $99,999**	**$100,000 - $149,000**	**$150,000 and over**
Major threat	49%	46%	47%	28%	39%	42%
Minor threat	33%	47%	43%	60%	54%	51%
Not a threat	18%	7%	9%	12%	7%	7%
N	23,571,890	27,109,767	38,474,282	29,732,438	45,511,360	46,600,262

Note: $\chi^2 = 26.39$, $p < 0.03$

(i) Nonmetro

	Household Income					
Level of Threat	**Under $25,000**	**$25,000 - $49,999**	**$50,000 - $74,999**	**$75,000 - $99,999**	**$100,000 - $149,000**	**$150,000 and over**
Major threat	25%	45%	31%	22%	37%	46%
Minor threat	44%	39%	62%	59%	63%	54%
Not a threat	31%	15%	7%	18%		
N	8,377,881	5,381,988	6,877,532	4,113,884	3,113,927	8,377,881

Note: $\chi^2 = 84.62$, $p < 0.01$

Perceptions about Technology

Responses to a set of three questions indicate respondents' overall evaluation of technology. As shown in Table 7, nonmetro residents evaluate the concept at a lower level than their metro counterparts.

Table 7: Overall Evaluation of Technology: Metro versus Nonmetro Residents

(i) New technologies have changed my job for the better

Level of Agreement	Labor Force Segment	
	Metro (N=211mil)	Nonmetro (N=33.96mil)
Agree a lot	35%	23%
Agree a little	49%	44%
Disagree a little	12%	25%
Disagree a lot	5%	8%

Note: $\chi^2 = 8.56$, $p < 0.04$

(ii) New technologies are good for the economy

Level of Agreement	Labor Force Segment	
	Metro (N=211mil)	Nonmetro (N=33.96mil)
Agree a lot	46%	25%
Agree a little	47%	65%
Disagree a little	5%	9%
Disagree a lot	2%	2%

Note: $\chi^2 = 10.31$, $p < 0.02$

(iii) The jobs created by these new technologies are good jobs

Level of Agreement	Labor Force Segment	
	Metro (N=211mil)	Nonmetro (N=33.96mil)
Agree a lot	33%	20%
Agree a little	54%	60%
Disagree a little	11%	18%
Disagree a lot	1%	2%

Note: $\chi^2 = 4.78$, $p < 0.19$

Future Expectations

Certain individuals appear to live as if they are in the process of “becoming”; they are training to develop new skills in order to keep up with changes in the workplace. Others appear to live as if they feel they have “arrived”; they no longer strain to acquire new skills, less worried that their job will be replaced by technology (Table 8).

Table 8: Skills to Deal with Changes, Importance and Likelihood of Skill Acquisition: Metro versus Nonmetro Residents

(i) How worried are you that you won't be able to keep up with how fast technology changes in your job?

	Labor Force Segment	
Level of Agreement	**Metro (N=211mil)**	**Nonmetro (N=33.96mil)**
Not at all worried	30%	37%
Not too worried	47%	48%
Somewhat worried	18%	14%
Very worried	4%	2%

Note: $\chi^2 = 2.47$, $p < 0.48$

(ii) Importance of acquiring new skills to keep up with changes in the workplace

	Labor Force Segment	
Level of Importance	**Metro (N=211mil)**	**Nonmetro (N=33.96mil)**
Essential	53%	44%
Important, but not essential	41%	48%
Not important	7%	8%

Note: $\chi^2 = 1.49$, $p < 0.48$

(iii) Likelihood of acquiring new skills

	Labor Force Segment	
Likelihood	**Metro (N=211mil)**	**Nonmetro (N=33.96mil)**
Not at all likely	6%	8%
Not very likely	20%	23%
Somewhat likely	44%	47%
Very likely	30%	22%

Note: $\chi^2 = 1.82$, $p < 0.61$

A typical, “non-worrier” about technology changes impacting one’s job is a 45 to 49-year-old, female, high school graduate, with a household income of less than $50,000. In contrast, worriers tend to be older, Hispanic male, and with a household income of $50,000-$75,000 (Table 9).

Table 9: Profile of Typical Worriers about Technology Changes

Demographic Attribute	Typical Value	Frequency of all Values
Gender	Male	Female: 63% Male: 75% Black: 65%
Race	Hispanic	Hispanic: 72% White: 67% 1
Age	60+	8-29: 69% 30-44: 69% 45-59: 66% 60+: 77%
Education	Bachelor’s degree or higher	LT High School: 68% High school graduate: 68% Some college: 68% Bachelor’s degree or higher: 71% LT $25,000: 83%
Income	$50,000 - $74,999	$25K-$49,999: 56% $50k-$74,999: 80% $75K-$99,999: 65% $100k-$149K: 70% $150k and above: 61%

Summary and Conclusion

This paper explores labor force perceptions about technology or automation as a threat to their jobs; data are from a survey of a national sample of 827 adults. Data analysis shows:

1. The young and the middle-age worker perceive technology as a major threat in the nonmetro;
2. Less educated workforce, non-high-school graduates, are less concerned about the threat of automation;
3. Employees in the private sector are most concerned that changes in technology or automation will affect how they perform their job;

4. Household income exhibits an inverted “U” relationship with threat perceptions; middle-income households worry the most about automation whereas low income and high-income households worry less; and
5. Racial minorities worry the most about automation impacts.

Public concerns about the potential impacts of technology on employment have resulted in debates such as limiting robotic process automation to dangerous and unhealthy jobs[10]. It is our contention that risk of automation is present for all types of jobs[11]; collective sectoral loss of employment, conceptually ‘technological dis-employment”, will soon be widespread. Targeted policies such as retraining initiatives are needed.

[10] Pew Research Center (2017). Automation in Everyday Life. Available: www.pewresearch.org/internet/2017/10/04/automation-in-everyday-life/.

[11] See Footnote 2, my earlier paper on the topic.