Beyond the Great Recession: Labor Market Polarization and Ongoing Fertility Decline in the United States

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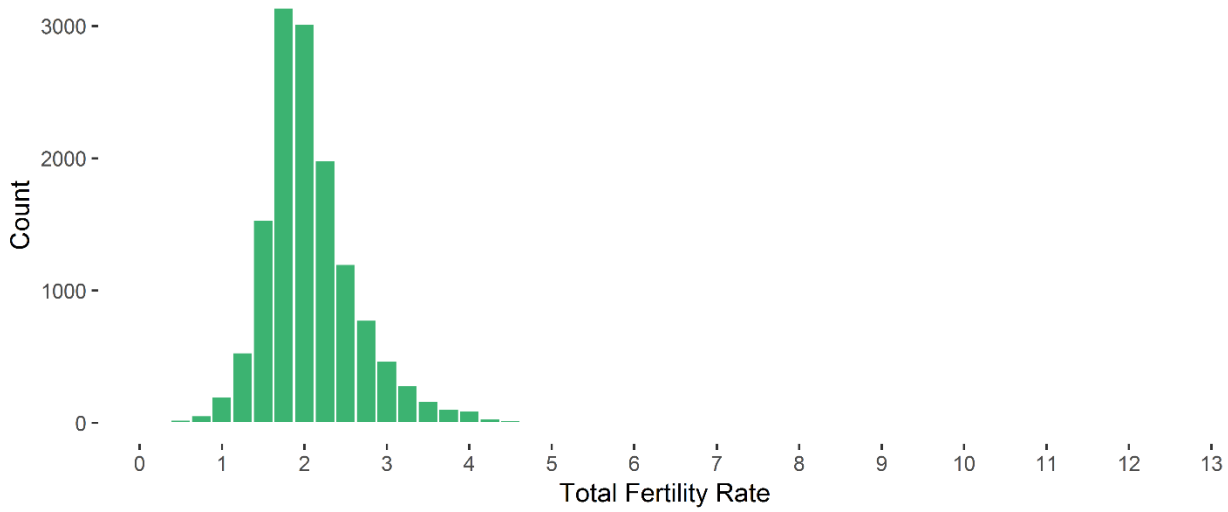
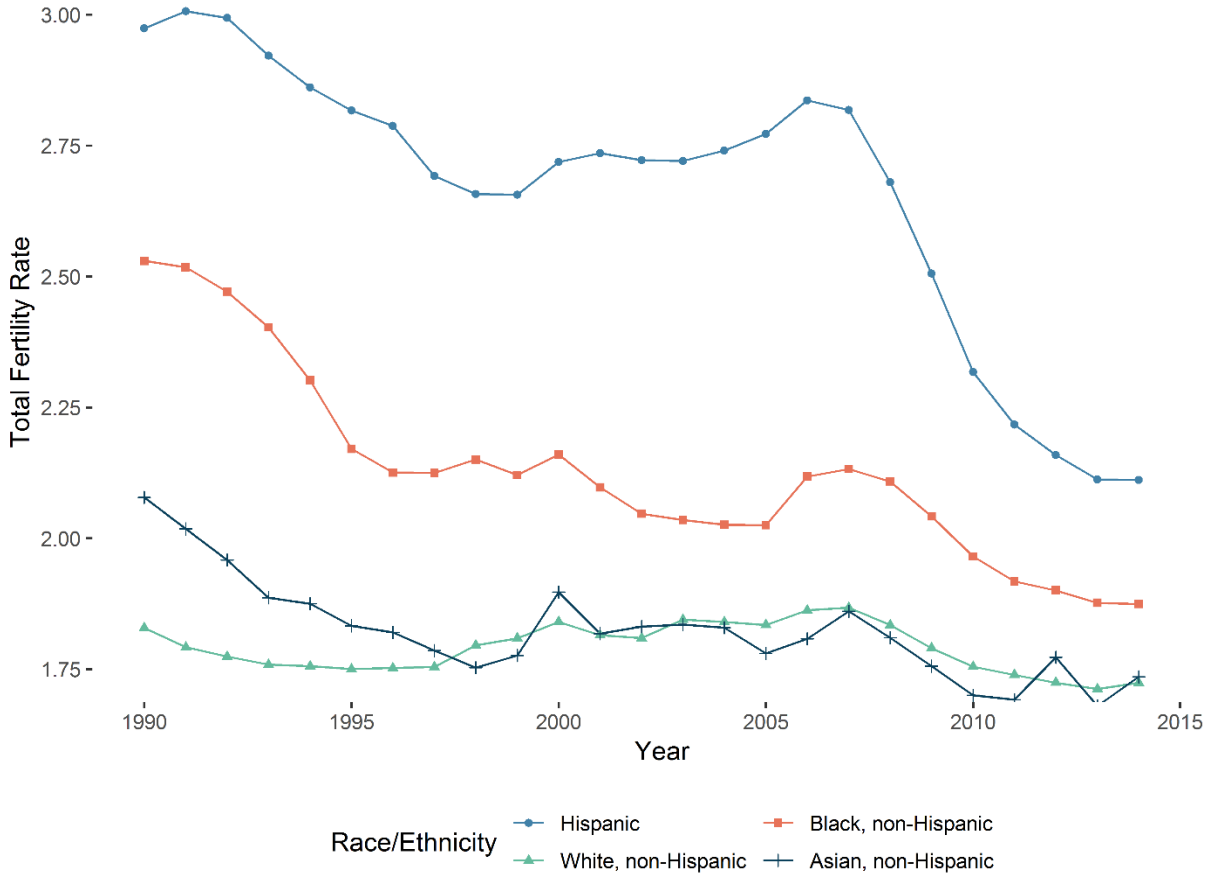
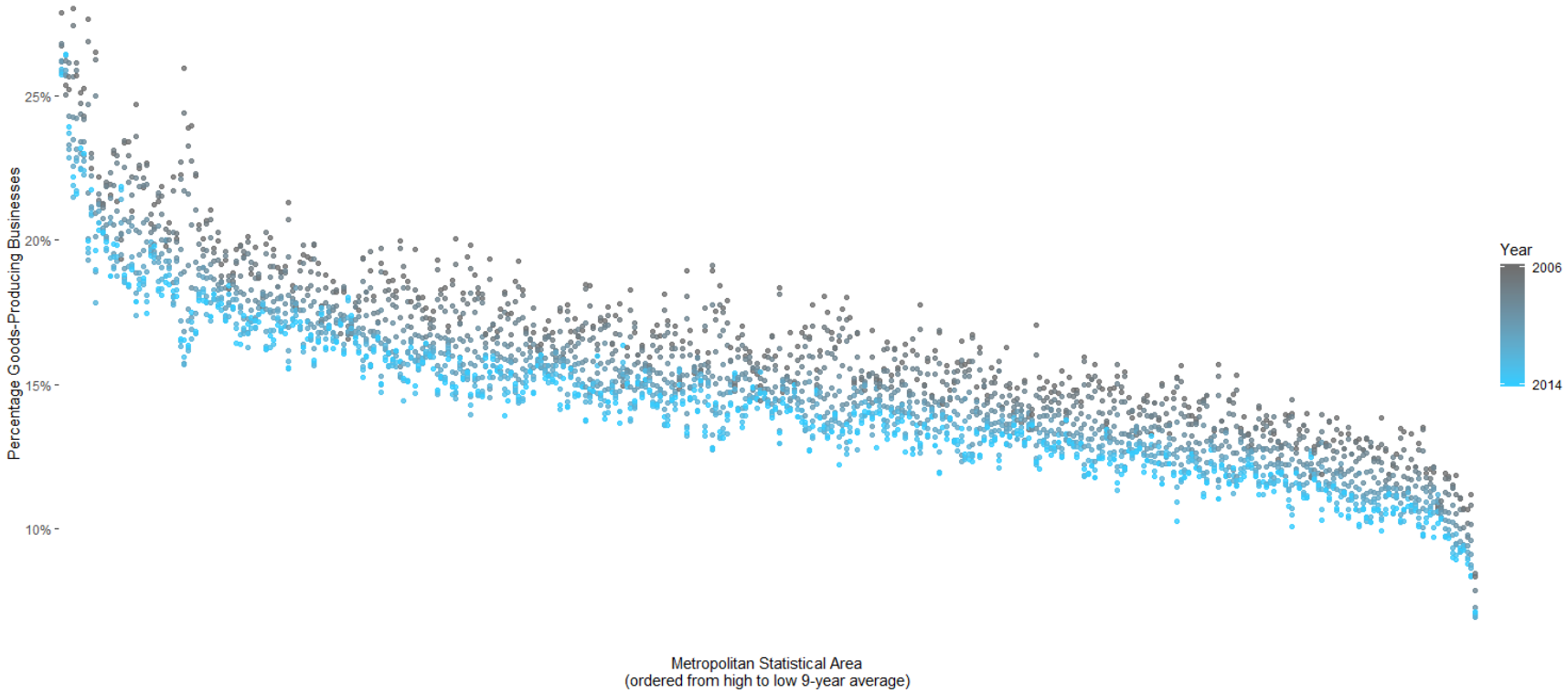


Note: 159 outliers above TFR of four, 38 outliers above TFR of five, and 2 outliers above TFR of eight.

Online Appendix Figure S2. Total Fertility Rate by Race/Ethnicity For all U.S. Metro Areas between 1990-2014



Online Appendix Figure S3. The Decline of Goods-Producing Businesses in the United States, 2006-2014, disaggregated by MSA



Notes: (a) Each vertical set of points represents one MSA over 9 years. (b) MSAs are ordered from high to low based on 9-year average of the share of goods-producing businesses. (c) Data are from the U.S. Census County Business Patterns Program, 2006-2014.

Online Appendix Table S1. Full Regression Output of Table 3, Full 381 MSA analysis

	Non-Hispanic White			Non-Hispanic Black			Non-Hispanic Asian			Hispanic		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
pct_goodsproducing_lag		0.021***	0.020***		0.022**	0.019*		0.027**	0.022*		0.058***	0.046***
		(0.002)	(0.002)		(0.008)	(0.008)		(0.010)	(0.011)		(0.008)	(0.008)
UnemploymentMSA_lag	-0.007***		-0.003*	-0.012*		-0.008	-0.016*		-0.012	-0.036***		-0.027***
	(0.001)		(0.001)	(0.005)		(0.006)	(0.007)		(0.007)	(0.005)		(0.006)
TOT_POP_log_lag	-0.082	0.056	0.050	-0.367	-0.228	-0.245	0.282	0.451	0.424	-2.248***	-1.915***	-1.988***
	(0.056)	(0.057)	(0.057)	(0.226)	(0.232)	(0.232)	(0.291)	(0.299)	(0.299)	(0.238)	(0.242)	(0.241)
gdp_pc_lag	0.051***	0.024*	0.019*	-0.007	-0.025	-0.037	0.375***	0.358***	0.340***	0.345***	0.313***	0.273***
	(0.009)	(0.010)	(0.010)	(0.037)	(0.039)	(0.039)	(0.048)	(0.050)	(0.051)	(0.037)	(0.038)	(0.039)
2006.year	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
2007.year	0.004	0.011*	0.010*	0.050*	0.058**	0.056**	-0.033	-0.024	-0.026	-0.047*	-0.029	-0.032
	(0.005)	(0.005)	(0.005)	(0.021)	(0.021)	(0.021)	(0.027)	(0.027)	(0.027)	(0.022)	(0.022)	(0.022)
2008.year	-0.041***	-0.028***	-0.028***	0.043	0.056*	0.055*	-0.152***	-0.138***	-0.138***	-0.202***	-0.172***	-0.172***
	(0.006)	(0.006)	(0.006)	(0.024)	(0.024)	(0.024)	(0.030)	(0.031)	(0.031)	(0.024)	(0.024)	(0.024)
2009.year	-0.090***	-0.074***	-0.070***	-0.031	-0.021	-0.012	-0.227***	-0.220***	-0.206***	-0.350***	-0.337***	-0.306***
	(0.007)	(0.007)	(0.007)	(0.028)	(0.029)	(0.030)	(0.037)	(0.037)	(0.038)	(0.028)	(0.029)	(0.029)
2010.year	-0.099***	-0.093***	-0.082***	-0.054	-0.071*	-0.038	-0.184***	-0.214***	-0.166***	-0.342***	-0.409***	-0.302***
	(0.009)	(0.007)	(0.009)	(0.036)	(0.029)	(0.037)	(0.046)	(0.037)	(0.047)	(0.036)	(0.029)	(0.037)
2011.year	-0.117***	-0.104***	-0.091***	-0.080*	-0.092**	-0.056	-0.207***	-0.232***	-0.179***	-0.417***	-0.475***	-0.357***
	(0.010)	(0.008)	(0.010)	(0.040)	(0.033)	(0.041)	(0.051)	(0.043)	(0.053)	(0.040)	(0.033)	(0.041)
2012.year	-0.135***	-0.106***	-0.095***	-0.073	-0.067	-0.035	-0.270***	-0.273***	-0.226***	-0.558***	-0.570***	-0.466***
	(0.011)	(0.010)	(0.011)	(0.042)	(0.040)	(0.046)	(0.055)	(0.051)	(0.059)	(0.042)	(0.040)	(0.045)
2013.year	-0.166***	-0.124***	-0.115***	-0.111*	-0.089	-0.063	-0.396***	-0.378***	-0.340***	-0.636***	-0.601***	-0.517***
	(0.011)	(0.011)	(0.012)	(0.044)	(0.046)	(0.049)	(0.056)	(0.059)	(0.063)	(0.044)	(0.045)	(0.049)
2014.year	-0.156***	-0.108***	-0.101***	-0.081	-0.050	-0.029	-0.412***	-0.383***	-0.352***	-0.648***	-0.588***	-0.521***
	(0.011)	(0.011)	(0.012)	(0.043)	(0.047)	(0.049)	(0.055)	(0.060)	(0.063)	(0.043)	(0.047)	(0.049)
_cons	2.840***	0.809	0.938	6.820*	4.691	5.054	-2.707	-5.320	-4.770	30.211***	24.966***	26.346***
	(0.711)	(0.725)	(0.727)	(2.849)	(2.946)	(2.956)	(3.667)	(3.791)	(3.804)	(2.996)	(3.061)	(3.063)
BIC	-8964.134	-9062.759	-9059.313	515.738	512.584	518.285	2193.286	2191.786	2196.777	366.063	357.993	339.903
Log-Likelihood	4530.907	4580.220	4582.567	-209.090	-207.513	-206.299	-1047.865	-1047.115	-1045.545	-134.362	-130.327	-117.226
# MSAs	3429	3429	3429	3394	3394	3394	3394	3394	3394	3333	3333	3333
# Observations	381	381	381	380	380	380	381	381	381	381	381	381

* p<.05, ** p<.01, *** p<.001 (two-tailed tests)

Online Appendix Table S2. Fixed-Effects Regression Models of Total Fertility Rate by Race/Ethnicity between 2006-2014 for ACS Subsample, Substituting Divorce Rate for Adults Ages 15-64 for Percent Single, Never-Married

	2006-2014
Dependent Variable: Total Fertility Rate	Model 1
White, Non-Hispanic (290 MSAs; N=2375)	
% Goods-Producing Businesses	0.021***
	(0.002)
Unemployment Rate (%)	-0.001
	(0.001)
Black, Non-Hispanic (289 MSAs; N=2354)	
% Goods-Producing Businesses	0.014
	(0.009)
Unemployment Rate (%)	-0.007
	(0.005)
Asian, Non-Hispanic (290 MSAs; N=2360)	
% Goods-Producing Businesses	0.007
	(0.012)
Unemployment Rate (%)	-0.014
	(0.007)
Hispanic (290 MSAs; N=2319)	
% Goods-Producing Businesses	0.063***
	(0.009)
Unemployment Rate (%)	-0.031***
	(0.006)
MSA Controls	Yes
Year Fixed Effects	Yes

* p<.05, ** p<.01, *** p<.001 (two-tailed tests)

Notes: (a) Year fixed effects and MSA-level covariates included in all models. Covariates include annual measures of logged population, per capita GDP, percentage of homeowners, percentage of one-year in-migration, percentage with more than a high school education, and percentage divorced. (b) All covariates are lagged one year. (c) Standard errors in parentheses

Online Appendix Table S3. Fixed-Effects Regression Models of Total Fertility Rate for Hispanics between 2006-2014 for ACS Subsample, adjusting for the Percentage of Reproductive Age Hispanic Women who are Mexican Immigrants

	2006-2014			2006-2010	2011-2014
Dependent Variable: Total Fertility Rate	Model 1	Model 2	Model 3	Model 4a	Model 4b
Hispanic (282 MSAs; N = 2023)					
% Goods-Producing Businesses		0.097***	0.082***	0.059***	0.052***
		(0.007)	(0.008)	(0.008)	(0.009)
Unemployment Rate (%)	-0.046***		-0.027***	-0.033***	-0.023***
	(0.005)		(0.005)	(0.006)	(0.005)
MSA Controls	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes

* p<.05, ** p<.01, *** p<.001 (two-tailed tests)

Notes: (a) Year fixed effects and MSA-level covariates included in all models. Covariates include annual measures of logged population, per capita GDP, percentage of homeowners, percentage with more than a high school education, and percentage never married, and percentage of reproductive-age Hispanic women who are Mexican immigrants. (b) All covariates are lagged one year. (c) Standard errors in parentheses

Online Appendix Table S4a. Robustness and Sensitivity Checks

Independent Variable	Log Number of Goods-Producing Business Establishments			% Goods-Producing Business Establishments	% Goods-Producing Employees (Mid-March)
Sample	Full	ACS Subset	ACS Subset	ACS Subset	Full
Covariate Set	MSA	MSA	Racial/Ethnic	Racial/Ethnic	MSA
Dependent Variable: TFR	Model 1	Model 2	Model 3	Model 4	Model 5
White, Non-Hispanic					
Goods-Producing Variable	0.138***	0.259***	0.252***	0.022***	0.004***
	(0.022)	(0.032)	(0.032)	(0.002)	(0.001)
Unemployment Rate (%)	-0.011***	-0.001	-0.001	-0.001	-0.005***
	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)
Black, Non-Hispanic					
Goods-Producing Variable	0.306***	0.083	0.112	0.013	0.007*
	(0.074)	(0.116)	(0.090)	(0.007)	(0.003)
Unemployment Rate (%)	-0.020***	-0.008	-0.005	-0.005	-0.009
	(0.004)	(0.005)	(0.004)	(0.004)	(0.006)
Asian, Non-Hispanic					
Goods-Producing Variable	0.088	0.168	0.159	0.016	0.012**
	(0.094)	(0.158)	(0.149)	(0.011)	(0.004)
Unemployment Rate (%)	-0.021***	-0.013	-0.016*	-0.015*	-0.012
	(0.006)	(0.007)	(0.007)	(0.007)	(0.007)
Hispanic					
Goods-Producing Variable	0.519***	0.915***	0.958***	0.066***	0.007*
	(0.080)	(0.122)	(0.113)	(0.008)	(0.003)
Unemployment Rate (%)	-0.028***	-0.028***	-0.020***	-0.024***	-0.033***
	(0.005)	(0.006)	(0.005)	(0.005)	(0.005)

* p<.05, ** p<.01, *** p<.001 (two-tailed tests)

Online Appendix Table S4b. Unemployment Rate and Labor Force Participation Rate Sensitivity Checks

Independent Variable	% Goods-Producing				
Sample	ACS Subset				
Covariate Set	MSA				
Dependent Variable: TFR	Model 6	Model 7	Model 8	Model 9	Model 10
White, Non-Hispanic (290 MSAs; N=2375)					
% Goods-Producing	0.021***	0.022***	0.022***	0.021***	0.021***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Female Unemployment Rate	-0.001				
	(0.001)				
Male Unemployment Rate	-0.001				
	(0.001)				
Labor Force Participation Rate		0.001			
		(0.001)			
Female Labor Force Participation Rate			0.001		
			(0.001)		
Male Labor Force Participation Rate			0.000		
			(0.001)		
Employment-to-Population Ratio				0.002**	
				(0.001)	
Female Employment-to-Population Ratio					0.001*
					(0.001)
Male Employment-to-Population Ratio					0.001
					(0.001)
Black, Non-Hispanic (289 MSAs; N=2354)					
% Goods-Producing	0.015	0.016	0.017*	0.015	0.016
	(0.009)	(0.008)	(0.008)	(0.008)	(0.008)
Female Unemployment Rate	-0.003				
	(0.003)				
Male Unemployment Rate	-0.001				
	(0.003)				
Labor Force Participation Rate		0.001			
		(0.003)			
Female Labor Force Participation Rate			-0.003		
			(0.002)		
Male Labor Force Participation Rate			0.003		
			(0.002)		
Employment-to-Population Ratio				0.002	
				(0.003)	
Female Employment-to-Population Ratio					-0.001
					(0.002)
Male Employment-to-Population Ratio					0.004

					(0.002)
Asian, Non-Hispanic (290 MSAs; N=2369)					
% Goods-Producing	0.011	0.013	0.014	0.013	0.013
	(0.012)	(0.011)	(0.011)	(0.012)	(0.012)
Female Unemployment Rate	0.006				
	(0.004)				
Male Unemployment Rate	-0.007				
	(0.004)				
Labor Force Participation Rate		-0.001			
		(0.004)			
Female Labor Force Participation Rate			-0.004		
			(0.003)		
Male Labor Force Participation Rate			0.003		
			(0.003)		
Employment-to-Population Ratio				0.000	
				(0.004)	
Female Employment-to-Population Ratio					0.000
					(0.003)
Male Employment-to-Population Ratio					0.000
					(0.003)
Hispanic (290 MSAs; N=2319)					
% Goods-Producing	0.071***	0.076***	0.076***	0.073***	0.072***
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
Female Unemployment Rate	-0.002				
	(0.003)				
Male Unemployment Rate	-0.006*				
	(0.003)				
Labor Force Participation Rate		0.002			
		(0.003)			
Female Labor Force Participation Rate			0.003		
			(0.002)		
Male Labor Force Participation Rate			-0.001		
			(0.002)		
Employment-to-Population Ratio				0.006*	
				(0.003)	
Female Employment-to-Population Ratio					0.005*
					(0.002)
Male Employment-to-Population Ratio					-0.000
					(0.002)

* p<.05, ** p<.01, *** p<.001 (two-tailed tests)

Notes: unemployment rates, labor force participation rates, and employment-to-population ratios are calculated at the MSA-level and for working age adults 15-64.

Online Appendix Table S5. Descriptive Statistics, Extended Analysis

	1991-2014		
Variables	Mean	S.D.	Number of MSAs
Total Fertility Rate			
White TFR	1.86	0.27	381
Black TFR	2.07	0.52	381
Asian TFR	1.93	0.55	381
Hispanic TFR	2.44	0.68	381
MSA-level Covariates			
Unemployment Rate (%)	6.19	2.85	381
Percentage Goods-Producing Businesses	16.71	3.16	381
Total Population (logged)	12.56	10.37	381

Notes: (1) All covariates lagged 1-year

Online Appendix Table S6. Fixed-Effects Regression Models of Age-Specific Fertility Rates by Race/Ethnicity between 2006-2014 for All MSAs

Dependent Variable: Age-Specific Fertility Rates	**15-19**	**20-24**	**25-29**	**30-34**	**35-39**	**40-44**	**45-49**
White, Non-Hispanic (381 MSAs)							
% Goods-Producing Businesses	0.00028**	0.00158***	0.00067**	0.00097***	0.00031**	0.00012**	0.00003*
	(0.00010)	(0.00020)	(0.00021)	(0.00017)	(0.00010)	(0.00004)	(0.00001)
Unemployment Rate (%)	-0.00022**	-0.00089***	0.00017	0.00021	0.00012	0.00006*	0.00000
	(0.00007)	(0.00013)	(0.00014)	(0.00011)	(0.00007)	(0.00003)	(0.00001)
Black, Non-Hispanic (380 MSAs)							
% Goods-Producing Businesses	0.00039	0.00006	0.00239**	0.00056	0.00049	0.00035	-0.00008
	(0.00040)	(0.00074)	(0.00081)	(0.00070)	(0.00060)	(0.00036)	(0.00017)
Unemployment Rate (%)	0.00040	-0.00135**	-0.00038	-0.00023	0.00032	0.00014	0.00012
	(0.00026)	(0.00049)	(0.00054)	(0.00046)	(0.00038)	(0.00022)	(0.00009)
Asian, Non-Hispanic (380 MSAs)							
% Goods-Producing Businesses	0.00043	0.00275**	0.00101	0.00072	-0.00043	0.00042	-0.00094
	(0.00062)	(0.00099)	(0.00107)	(0.00095)	(0.00069)	(0.00041)	(0.00063)
Unemployment Rate (%)	0.00029	-0.00065	-0.00147*	0.00041	0.00000	0.00008	-0.00074*
	(0.00041)	(0.00067)	(0.00072)	(0.00064)	(0.00047)	(0.00027)	(0.00036)
Hispanic (381 MSAs)							
% Goods-Producing Businesses	0.00227***	0.00470***	0.00221**	0.00051	0.00051	0.00019	-0.00040
	(0.00049)	(0.00071)	(0.00069)	(0.00062)	(0.00046)	(0.00049)	(0.00039)
Unemployment Rate (%)	0.00004	-0.00201***	-0.00180***	-0.00108**	-0.00026	0.00009	-0.00005
	(0.00032)	(0.00047)	(0.00046)	(0.00041)	(0.00030)	(0.00032)	(0.00022)
MSA Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes

* p<.05, ** p<.01, *** p<.001 (two-tailed tests)

Online Appendix Text S1. Limitations of Employee Data in the County Business Patterns Dataset

The statistical analyses presented in this study operationalize labor market polarization as the percentage of goods-producing *business establishments* in a MSA. Although the County Business Patterns dataset includes a variable for the number of mid-March employees which could be used to calculate the percentage of *employees* in goods-producing industries, the use of this measure is not without several data and conceptual limitations. Nevertheless, the employee measure and the business establishment measure are strongly correlated (r = .5015).

The main consideration for this decision is the availability and quality of the employee data for business establishments. A nontrivial amount of the employee data is withheld from the dataset since the Census Bureau is prohibited by law from releasing information that would identify the operations of individual employers (CBP Methodology Report). Missing values in the dataset are not missing based on county population size; instead, data is withheld based on the sparseness of the number of business establishments within each sub-classification level of the NAICS coding scheme.

In contrast, none of the data on the number of business establishments for each NAICS sub-classification level are withheld since this data is not considered confidential (CBP Methodology Report).

There are also conceptual reasons for using a business establishment measure over an employee measure. As noted in the Data and Methods section, I conceptualize labor market polarization as more than just the loss of middle-skill, middle-wage jobs in manufacturing and construction industries, but instead the decline of those industries themselves. Closure of business establishments in the goods-producing business sector (e.g. factory closures) are more permanent than layoffs of individual workers in the sense that it is more difficult for jobs to return once a business establishment has been permanently closed. As a result, I argue that structural change in U.S. labor markets is best measured through the loss of business establishments.

As a robustness check, I calculate and estimate models using the employee measure (Online Appendix Table S4a, Model 5), which should be interpreted with an understanding of the limitations noted above.

References:

U.S. Census Bureau. 2018. County Business Patterns Methodology Report. Retrieved from https://www.census.gov/programs-surveys/cbp/technical-documentation/methodology.html.

U.S. Census Bureau. 2018. County Business Patterns, Using Noise for Disclosure Limitation of Establishment Tabular Data. Retrieved from https://www.census.gov/prod/2/gen/96arc/iiaevans.pdf.