China Import Penetration and U.S. Labor-Market Adjustments

Dr. William Spriggs, Nyanya Browne and Bethel Cole-Smith

Howard University

This draft: May 2021
PRELIMINARY, PLEASE DO NOT CITE

Abstract: Acemoglu et al. (2014) explore the contribution of the swift rise of import penetration from China to U.S. employment growth. Using industry-level analysis to compare changes in relative employment among industries with varying levels of trade exposure they find that the increase in U.S. imports from China caused significant reductions in U.S. manufacturing employment. This paper extends their analysis and contributes to the literature by closely examining the impact of the China trade shock on commuting zone Black employment. We find a significant negative impact of the China trade shock on commuting zone Black employment and earnings in industries most exposed to trade. We also find that there are lasting impacts of the China trade shock on Black employment and Black hire rate. More specifically, the change in the share of Black employment and the Black hire rate do not recover from the China trade shock in the exposed and non-exposed tradable industries.

1 Introduction

Acemoglu et al. (2014) investigate the contribution of the rapid increase of import competition from China on U.S. employment. They apply industry- and local labor market-level approaches to estimate:

i) the size of employment losses in directly exposed manufacturing industries;
ii) the size of employment effects in indirectly exposed upstream and downstream industries inside and outside manufacturing; and
iii) the net effects of conventional labor reallocation in non-exposed sectors.

The authors' industry-level analysis compares changes in relative employment among industries with varying levels of trade exposure in order to quantify the reallocation and aggregate demand effects. The baseline used to measure the exposure is the change in the import penetration ratio for U.S. manufacturing over the period 1991 to 2011. Acemoglu et al. (2014) find that the increase in U.S. imports from China caused significant reductions in U.S. manufacturing employment as well as significant suppression of overall U.S. job growth (Table 1 showing Table 7 of Acemoglu et al. (2014)). They estimate 2.0 to 2.4 million net job losses in general as a result of the rise in import competition from China from 1999 to 2011, and a decline in manufacturing jobs from 17.2 million in 1999 to 11.4 million in 2011.

While the authors provide thorough analyses on the industry- and local labor market-levels, average outcomes at these levels potentially mask important variations across racial groups. Hence, this paper extends their research and contributes to the literature by closely examining the impact of the China trade shock on commuting zone Black employment and earnings.

Table 1: Acemoglu et al. (2014): 2SLS Estimates of Import Effects on Commuting Zone Employment-to-Population Ratios. Dep.Var.: 100 x Annual Δ in Local Employment/Local Working-Age Population

	Overall Employment			Sectoral Employment			Overall	Sectoral
	1991-2011			1991-2011			1991-2007	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Commuting Zone Import Shock	-1.64***	-1.95***	-1.70**				-1.89***	
	(0.46)	(0.62)	(0.78)				(0.65)	
Commuting Zone Import Shock x 1[Exposed]				-1.95***	-2.14***	-1.68***		-1.66***
				(0.16)	(0.30)	(0.24)		(0.19)
Commuting Zone Import Shock x 1[Non-Exposed Tradable]				-0.01	0.04	-0.00		-0.05
				(0.06)	(0.11)	(0.11)		(0.10)
Commuting Zone Import Shock x 1[Non-Exposed Non-Tradable]				0.33	0.15	-0.01		-0.18
				(0.39)	(0.44)	(0.57)		(0.55)
Sector x Time Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector x Mfg Emp Share at Baseline	No	Yes	Yes	No	Yes	Yes	Yes	Yes
Sector x Census Division Dummies	No	No	Yes	No	No	Yes	Yes	Yes
N	1444	1444	1444	4332	4332	4332	1444	4332

Figures 1 and 2 show the share of workers in three of the main years of interest analyzed by Acemoglu et al. (2014), namely 1999, 2007, and 2011. The year 1999 captures an equilibrium of the labor market just prior to the entry of China into the WTO and thus, just prior to the China import penetration into the U.S. market. The year 2007 marks the end of a period of expansion in the US from 2001 to 2007. The year 2011 marks the final year of analysis for Acemoglu et al. (2014). As shown in Figure 1, the share of workers[1] in the exposed sectors, is in steady decline, from almost 25 percent in 1999, to just over Acemoglu et al. (2014) broadly conceptualize the shock as a decline in employment within an industry. The question therefore is "how does this shock affect the share of Black workers?". From

[1]Share of workers in the exposed sector is calculated as the number of workers in the sector divided by total number of employed individuals.

1999 to 2007, there is a slight decrease in the share of Black workers[2] in the exposed sector (see Figure 2) from 11.2% to 11.0%. However, Black workers appear to gain modestly in the non-exposed tradable sector -the second highest wage sector- and considerably in the lowest wage sector -non-exposed non-tradable sector. Nevertheless, in the long-run (1999 to 2011) Black workers are driven out of the two highest wage sectors and into the lowest wage sector. Notably, the share of Black workers not employed (that is, not employed in the private sector) increases significantly from 1999 to 2011. Thus, as the share of Black workers is reduced in all sectors from 2007 to 2011 Black workers are pushed into the public sector or become unemployed.

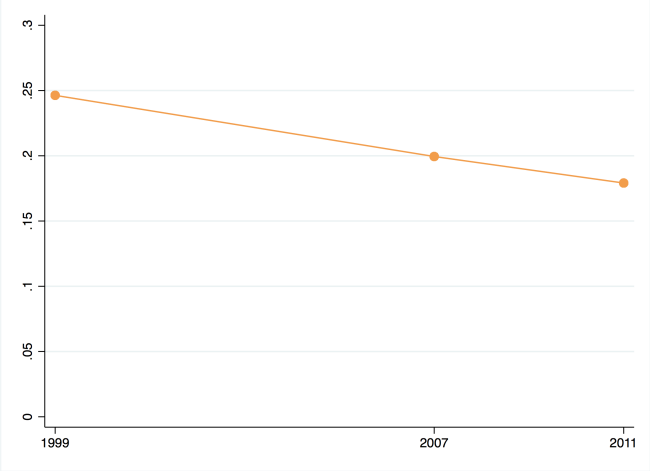


Figure 1: Share of workers in the exposed sector

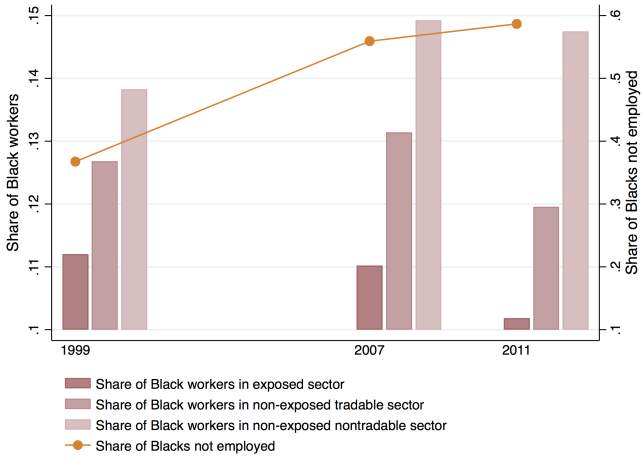
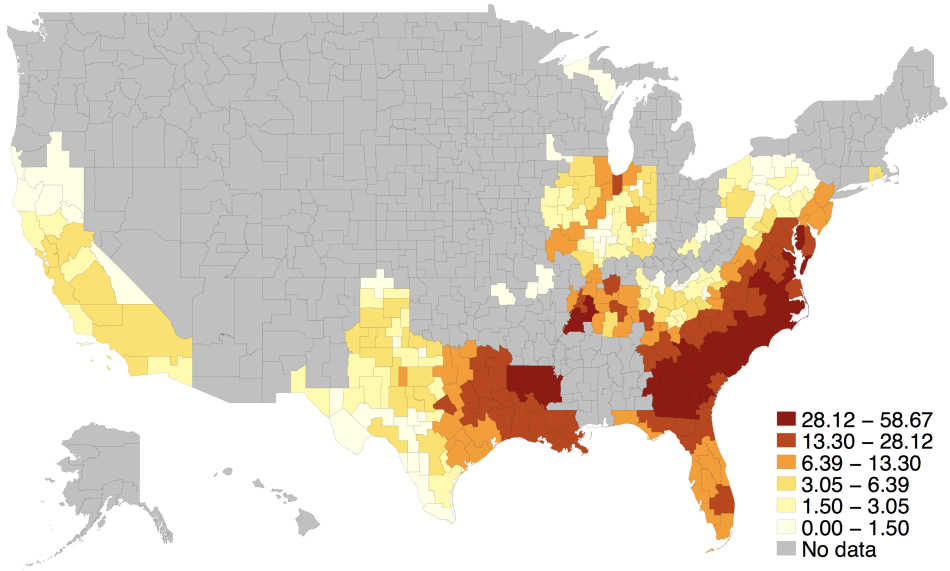


Figure 2: Share of Black workers vs not employed

Figure 3 maps the percentage share of Black workers in the exposed sector in 1999. There is a strong concentration in the South Atlantic Census Division, as well as some areas of concentration in West South Central.

[2]Share of Black workers in each sector is calculated as the number of Black workers in the respective sector divided by the total number of workers in the same sector.

Figure 3: Map of the Percentage Share of Black Workers in the Exposed Sector in 1999



2 Literature Review

There has been extensive research on the impact of the Great Recession on the U.S. labor market. U.S employment growth, however, was slow long before the recession of 2007-2009. After a remarkable improvement in the employment-to-population ratio from 1991 to 2000, the labor market lost a significant part of these gains over the next several years, with the national unemployment reaching its minimum at 4.0% in 2000 (Moffit, 2012 in Acemoglu et al. (2014)). Payroll employment peaked in February 2001 at 132.79 million then sagged in the 2001 recession, and did not surpass that peak until February 2005. Its peak in January 2008 of 138.40 million made for a lackluster start to the 21st Century. This "sag", however, coincided with China's export surge and the U.S. import increase from the Asian country.

Acemoglu et al. (2014) explore how much of the sluggish U.S. employment growth can be explained by the quick rise of import competition from China. Using employment data

from County Business Patterns, the authors use two empirical approaches which build on previous work by Autor et al. (2013a,b). The "direct industry level-employment approach" or "national industry level estimates" compares employment across four-digit manufacturing industries, from 1991 to 2011. The second approach focuses on local labor markets. Instead, it seeks to capture the reallocation and aggregated demand effects, assuming that the first approach failed to do so (Feenstra, 2003 in Acemoglu et al. (2014)). This approach measures the impact of trade shocks within U.S. commuting zones[3] (CZs). The authors assume, for instance, that if the reallocation mechanism is effective, contraction of one industry in a particular CZ should correspond to an expansion of other industries in the same labor market.

Earlier, from the mid-1970s and into the 1980s, the U.S. had experienced a similar import shock from Japan. Batistich and Bond (2019) investigate the extent to which the Japanese trade boom can explain the deterioration on racial disparities between Blacks and Whites. The Black-to-White median earnings ratio, which had risen from 52% to 70% from 1962 to 1976, had fallen to 61% by 1984. During this period, Blacks were hit particularly hard specifically in areas that experienced manufacturing declines (Gould, 2018 in Batistich and Bond (2019)). In the same period, 1975 to 1986, exports of Japanese manufacturing goods to the U.S. grew by an average of $8.5 billion dollars per year. Batistich and Bond (2019) use an empirical approach similar to that of Autor et al. (2013a). They estimate the impact on manufacturing employment by race in CZs. Two groups of independent variables include a vector of CZ characteristics measured in 1960 and a dummy variable representing the disparate impact of import exposure on Blacks. The authors' main conclusion is that im-

[3]Clusters of counties with strong internal commuting links.

port competition from Japan in late 1970s and earlier 1980s decreased Black manufacturing employment, labor force participation, and median earnings, and increased public assistance recipiency. In contrast, they find that manufacturing employment for Whites increased.

Batistich and Bond (2019) also find that the shift in the composition of the manufacturing sector might have been caused by a skill upgrading where the losses were concentrated mostly among Black high school dropouts whereas gains were concentrated among college educated Whites. Additionally, their results indicate a shifting of manufacturing employment toward professionals, engineers, and college educated production workers. Overall, the results can explain 66-86% of the relative decrease in Black manufacturing and 34-44% of the relative decline in Black median male earnings. Contrary to Acemoglu et al. (2014), Batistich and Bond (2019) find no evidence of aggregate losses for the U.S. manufacturing sector.

Roys (2016) investigates the reallocation of labor across firms in response to idiosyncratic shocks of different persistence. According to Roys, the persistence and variance of shocks are important parameters which determine the benefit of reallocating resources across firms. Firms usually face either permanent (long-term) or transitory (short-term) shocks and depending on the persistence or lasting impacts they may adopt different strategies. In his paper, Roys shows that while transitory shocks have a strong impact on wages and little impact on employment, permanent shocks tend to have strong and lasting effects on employment and little effect on wages.

Hsieh and Klenow (2009) find larger microeconomic gaps in productivity across firms in poor countries. The authors posit that impediments to the reallocation of resources from low to high productivity firms can have important aggregate consequences. Labor

adjustment costs such as technological (reduced efficiency during the period of adjustment) or institutional (employment protection framework which prevent wages from adjusting) are among the impediments to reallocation after a shock. The responsiveness of these labor-cost shocks can alter a firm's incentives to adjust its workforce. For instance, following a negative shock, if the cost of labor decreases sufficiently, a firm may decide not to reduce its workforce and the contrary is true. Second, if the shock raises the marginal productivity of labor, and the shock is expected to last, the firm will likely prefer to pay the cost of hiring additional workers. The decreasing marginal product of labor will offset the shock so that the marginal worker is not much more valuable than before. In this condition there will be a substantial rise in employment, but wages will not increase much.

3 Data and Methodology

3.1 Data

Acemoglu et al. (2014) main U.S. employment data were retrieved from the Country Business Patterns for the years 1991, 1999, 2007 and 2011. However, these data are not disaggregated by race; therefore, this paper utilizes the Quarterly Workforce Indicators (QWI) dataset, which provides employment data by various demographics.

The QWI comprises 32 economic indicators detailing a variety of firm characteristics and worker demographics at several levels of geographic aggregation. This study uses data on all private firms, at the county level, aggregated at the 2-digit North American Industry Classification System (NAICS) sector level, and disaggregated by race. QWI county-level

stable employment and monthly earnings data are pulled for states with sample sizes large enough to create accurate estimates on Black unemployment and monthly earnings according to the Economic Policy Institute (Williams, 2020). Since the geographic analysis is done at the CZ level, adjacent states which include counties forming part of the CZs[4] within the states of interest are also included. A list of the 34 states and the District of Columbia is provided in the appendix.

Census U.S. Intercensal County Population Data by Age, Sex, Race, and Hispanic Origin are collected from the National Bureau of Economic Research for the above-mentioned years. We utilize Acemoglu et al. (2014) international trade data, which they sourced from the UN Comtrade Database. Lastly, we adjust their upstream/downstream demand linkages data, originally sourced from the U.S. Bureau of Economic Analysis, in order to link the data to our NAICS industry data. The application of these data is explained in the following subsection.

3.2 Methodology

In our primary analysis, we follow Acemoglu et al. (2014) to estimate stacked first-difference models to determine the changes in CZ employment-to-population ratio using the following functional form:

$$\Delta E_{i\tau} = \alpha_\tau + \beta \Delta IP_{i\tau}^{CZ} + \gamma X_{i0} + \epsilon_{i\tau} \tag{1}$$

[4]Our analysis covers 378 CZs while Acemoglu et al. (2014) analysis is based on 722 CZs that cover the U.S. mainland.

where the dependent variable, $\Delta E_{i\tau}$, is equal to 100 times the annual change in the ratio of employment to working-age population in CZ i over time period τ; the main independent variable, $\Delta IP_{i\tau}^{CZ}$, measures a CZ's annual change in exposure to Chinese imports over time τ; a set of CZ-by-sector start-of-period controls is represented by X_{i0}; α_τ is a time effect; and $\epsilon_{i\tau}$ is the error term. Start-of-period industry employment is used to weight regression estimates. Standard errors are clustered at the CZ level to allow for error correlations within those geographic areas. Additionally, we adopt Acemoglu et al. (2014) instrument for growth in imports from China to the U.S. using the synchronous growth of Chinese imports in eight other developed countries (Acemoglu et al., 2014).

In order to assess the differential impact of import exposure on the various types of industries within local labor markets, we categorize changes in employment into three sectoral groupings (exposed industries, non-exposed tradable industries, and non-exposed non-tradable industries) following Acemoglu et al. (2014) and interact the CZ's change in import exposure with indicator variables for said groupings:

$$\begin{aligned}\Delta E_{ik\tau} = \alpha_{k\tau} + \beta_1 \Delta IP_{i\tau}^{CZ} \times 1\left[\text{Exposed}_k\right] + \beta_2 \Delta IP_{i\tau}^{CZ} \times 1\left[\text{Non-Exposed Tradable}_k\right] + \\ \beta_3 \Delta IP_{i\tau}^{CZ} \times \left(1 - 1\left[\text{Exposed}_k\right] - 1\left[\text{Non-Exposed Tradable}_k\right]\right) + \gamma X_{ik0} + \epsilon_{ik\tau}\end{aligned} \tag{2}$$

where $\Delta E_{ik\tau}$ is the employment change of sector k in CZ i, expressed in working-age-population percentage points.

For this paper, we first estimate equations (1) and (2) using the QWI data. Then, we replace the employment and population variables with Black employment and Black population to evaluate the impacts of the trade shocks on this group. The respective equations

take the following functional forms:

$$\Delta BlackE_{i\tau} = \alpha_\tau + \beta \Delta IP_{i\tau}^{CZ} + \gamma X_{i0} + \epsilon_{i\tau} \tag{3}$$

$$\Delta BlackE_{ik\tau} = \alpha_{k\tau} + \beta_1 \Delta IP_{i\tau}^{CZ} \times 1\left[\text{Exposed}_k\right] + \beta_2 \Delta IP_{i\tau}^{CZ} \times 1\left[\text{Non-Exposed Tradable}_k\right] + \beta_3 \Delta IP_{i\tau}^{CZ} \times \left(1 - 1\left[\text{Exposed}_k\right] - 1\left[\text{Non-Exposed Tradable}_k\right]\right) + \gamma X_{ik0} + \epsilon_{ik\tau} \tag{4}$$

We match the QWI stable employment data to Acemoglu et al. (2014) county-to-CZ crosswalk and then merge with the aforementioned population, and trade datasets. To compute $\Delta E_{ik\tau}$, Acemoglu et al. (2014) assign each industry to one of three mutually exclusive sectors: exposed industries, non-exposed tradable industries, and other non-exposed industries. They define the exposed sector[5] to comprise all manufacturing industries for which predicted import exposure rose by at least 2 percentage points between 1991 and 2011, as well as all industries (both within and outside of manufacturing) for which predicted full downstream import exposure increased by at least 4 percentage points from 1991 to 2011. The remaining industries (the non-exposed industries), are categorized as tradable and non-tradable. Non-exposed tradable industries[6] refer to those industries that produce tradable goods or commodities but which do not fall within the exposed category. All other sectors not previously categorized, including services, are designated as non-exposed non-tradable[7].

Our extension on earnings uses the same functional form as equation 1, with earnings

[5]Exposed industries include Manufacturing, Forestry, and Wholesale Trade. Additionally, Acemoglu et al. (2014) classify Mining as an exposed sector; however this is categorized as non-exposed tradable in our analysis.

[6]Examples include Information, Mining, Quarrying, and Oil and Gas Extraction.

[7]Examples include Construction, Retail Trade, and Transportation and Warehousing

as the dependent variable:

$$\Delta Earn_{i\tau} = \alpha_\tau + \beta \Delta IP_{i\tau}^{CZ} + \gamma X_{i0} + \epsilon_{i\tau} \tag{5}$$

where the dependent variable, $\Delta Earn_{i\tau}$, represents the annualized changed in nominal monthly earnings in CZ i over time period τ. Similar to equation 2, we also assess the differential impact of import exposure on earnings within the three sectoral groupings (exposed industries, non-exposed tradable industries, and non-exposed non-tradable industries). We do the same replacing earnings with Black earnings.

The sector classifications were defined using SIC codes[8]. However, since the QWI data is given by NAICS codes, it is necessary to generate a similar classification by NAICS. Using the aforementioned sector classification by SIC, along with Acemoglu et al. (2014) NAICS-to-SIC crosswalk, and QWI employment numbers, we apply the SIC employment ratio of each NAICS code, to the stable employment number for that NAICS code. As such, values for the sector dummy variables are calculated for each NAICS industry based on a threshold of 20 percent of employees from the constituent SIC industries falling within the category[9].

4 Results

4.1 Employment-to-population ratio

The results of the China trade shock impact on total employment are presented in Table 2. Similar to Acemoglu et al. (2014) the specifications in columns 1 through 3, which

[8]Acemoglu et al. (2014) use a slightly aggregated version of the 4-digit SIC industries.
[9]See Appendix Table A.2 for complete listing of industries within sectors

pool employment across all sectors, show a negative impact on local labor-market levels. While Acemoglu et al. (2014) find statistically significant estimates for sectors in CZs across the U.S., when we limit to states with high Black unemployment rates the results are not statistically significant.

Columns 4 through 6 show the sectoral constituents of the overall employment in columns 1 through 3. Consistent with Acemoglu et al. (2014), column 4 shows a strongly negative and statistically significant effect of import exposure on local labor-market employment in the exposed industries. The point estimate indicates that a 1 percentage point increase in local import exposure reduces the share of CZ's employed working-age population by 1.28 percentage points. While Acemoglu et al. (2014) find an overall positive net effect of import exposure on non-exposed industries that is never statistically significant, we also find a positive effect for non-exposed industries. But the effect on non-exposed tradable industries is statistically significant; though this appears to be caused by differences between Census Divisions, and not significant within Census Divisions (going from column 4 to 6). A 1 percentage point increase in local import exposure increases the share of CZ's employed working-age population by 0.14 percentage points. This loosely aligns with Acemoglu et al. (2014) conceptual discussions on the net impact of local reallocation that should raise employment in non-exposed sectors.

In the next pair of columns, the estimates are revised by controlling for initial local labor market manufacturing intensity and Census Divisions in columns 5 and 6, respectively, and again varied by sector. Similar to Acemoglu et al. (2014), the inclusion of these covariates only moderately changes the estimated negative impact of import exposure on employment in exposed industries, while the estimates for the non-exposed sectors are not statistically

significant.

Columns 7 and 8 reproduce the specifications from columns 3 and 6 over the stacked periods 1991-1999 and 1999-2007. The results are similar for the full sample period and suggest negative effects of trade competition on employment in exposed sectors, along with negative and statistically insignificant effects in non-exposed industries. The estimates for sectoral employment align with Acemoglu et al. (2014) while the result for overall employment contradicts that of the authors and is not statistically significant.

Table 2: 2SLS Estimates of Import Effects on Commuting Zone Employment-to-Population Ratios.
Dep.Var.: 100 x Annual Δ in Local Employment/Local Working-Age Population

	Overall Employment			Sectoral Employment			Overall	Sectoral
	1991-2011			1991-2011			1991-2007	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Commuting Zone Import Shock	-0.68	-1.83	-2.98				-3.44	
	(1.01)	(1.96)	(2.20)				(2.24)	
Commuting Zone Import Shock x 1[Exposed]				-1.28***	-1.24**	-1.37**		-1.76***
				(0.30)	(0.57)	(0.64)		(0.67)
Commuting Zone Import Shock x 1[Non-Exposed Tradable]				0.14***	0.05	0.04		-0.00
				(0.06)	(0.15)	(0.17)		(0.13)
Commuting Zone Import Shock x 1[Non-Exposed Non-Tradable]				0.46	-0.64	-1.65		-1.68
				(0.84)	(1.40)	(1.48)		(1.54)
Sector x Time Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector x Mfg Emp Share at Baseline	No	Yes	Yes	No	Yes	Yes	Yes	Yes
Sector x Census Division Dummies	No	No	Yes	No	No	Yes	Yes	Yes
N	317	317	317	951	951	951	317	950

The estimates of import effects on CZ Black employment-to-population ratios are presented in Table 4. Similar to Table 2, columns 1 through 3 show overall Black employment across all sectors. The specifications show a negative impact on local labor-market levels. As

seen in column 1, controlling for time effects results in a weak statistically significant (10%) negative relationship between the import shock and overall Black employment. Column 2, which shows added controls for the initial manufacturing employment share in a local labor market, reveals statistically significant results at the 10% level. According to Acemoglu et al. (2014), controlling for local manufacturing intensity, allows for differential employment trends in the manufacturing and non-manufacturing sectors. The estimate shows that a 1 percentage point increase in import exposure reduces overall Black employment by 3.24 percentage points.

Similar to columns 1 and 2, column 3 shows overall Black employment across all sectors, additionally controlling for Census Divisions. Controlling for Census Divisions results in the coefficient becoming statistically insignificant; meaning the difference is between the divisions and not within the divisions. Appendix Table A.3 shows that between the Census Divisions, the largest losses were in the upper Midwest, especially the West North Central states, and also in the Pacific states (California).

Columns 4 through 6 show the sectoral components of the overall Black employment which was shown in columns 1 through 3. Column 4 shows a strongly negative and statistically significant effect of import exposure on local labor-market Black employment in the exposed industries. The coefficient indicates that a 1 percentage point increase in local import exposure reduces the share of CZ's Black employed working-age population by 2.70 percentage points. Given the magnitude of the difference in coefficients for the exposed sector (column 4 of Tables 2 and 4) for Black employment (-2.70) versus all-race employment (-1.28) we perform a Wald test to determine whether there is a statistically significant difference between these coefficients. Table 3 below reports the results of this test. With a

p-value of 0.000 we reject the null hypothesis, and find a statistically significant difference at the 1 percent level.

Table 3: Test of Coefficients

	χ^s	p-value
Commuting Zone Import Shock x 1[Exposed]	22.95	0.0000

The average size of the shock is approximately 0.12, thus with a coefficient of -2.70, there is a predicted 32.4 percentage points drop in Black share of employment in the exposed sector. The biggest shock is 0.59 in CZ 5201, made up of Benton, Tippah, and Union Counties in Mississippi, with a predicted annualized employment drop of 1383 for Black employees in the exposed sector, and 2525 Black employees across all sectors.

We find an overall negative net effect of import exposure on both non-exposed sectors. However, only the effect on non-exposed tradable industries is statistically significant. A 1 percentage point increase in local import exposure increases the share of CZ's Black employed working-age population by 0.15 percentage points.

Again, for columns 5 and 6 the estimates are revised by controlling for initial local labor market manufacturing intensity and Census Divisions, respectively. The manufacturing intensity covariate reduces the statistical significance of the point estimate. The average size of the shock is approximately 0.12, thus with a coefficient of -1.25, there is a predicted 15 percentage points drop in Black share of employment in the exposed sector. The biggest shock is again in CZ 5201, made up of Benton, Tippah, and Union Counties in Mississippi. This shock of 0.59 has a predicted annualized employment drop of 618 for Black employees in the exposed sector, and 1 701 Black employees across all sectors.

As with the overall Black employment in column 3, controlling for Census Divisions within the sectoral breakdown (column 6) results in the coefficient becoming statistically insignificant; meaning the difference is between the divisions and not within the divisions.

Appendix Table A.4 shows that for the exposed sector, between the Census Divisions, the largest losses were in the upper Midwest and also in the Pacific states. For the non-exposed tradable sector, the losses were an order of magnitude smaller, primarily in the East North Central and south Atlantic, along with the Middle Atlantic and Pacific. For the non-exposed nontradable, the losses were statistically significant in all Census Divisions except the base group of New England.

Lastly, columns 7 and 8 show the estimates for the stacked periods 1991-1999 and 1999-2007. The results show negative and statistically significant effects of trade competition on overall Black employment as well as Black employment in exposed sectors. The average size of the shock for this time period is approximately 0.17, thus with a coefficient of -1.43, there is a predicted 24.3 percentage points drop in Black share of employment in the exposed sector. The biggest shock is 1.02 in CZ 5201, made up of Benton, Tippah, and Union Counties in Mississippi, with a predicted annualized employment drop of 447 for Black employees in the exposed sector, and 817 Black employees across all sectors.

Appendix Table A.3 shows that overall Black employment loss was significant within Census Divisions, but also between Census Divisions with the larger losses experienced in the upper Midwest and in the West South Central Census Division (Louisiana and Texas). Appendix Table A.5 shows that for the exposed sector, Black employment loss was significant within Census Divisions, but also between Census Divisions with the larger losses experienced in the Middle and South Atlantic, West North Central, and the Pacific. There are negative

and statistically insignificant effects on non-exposed industries. For non-exposed tradable, only West North Central shows a negative and statistically significant effect. For non-exposed non-tradable, East and West North Central, West South Central, and Pacific, show negative and significant effects. Overall, these estimates are in alignment with Acemoglu et al. (2014) sectoral employment results.

Table 4: 2SLS Estimates of Import Effects on Commuting Zone Black Employment-to-Population Ratios. Dep.Var.: 100 x Annual Δ in Local Black Employment/Local Black Working-Age Population

	Overall Employment			Sectoral Employment			Overall	Sectoral
	1991-2011			1991-2011			1991-2007	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Commuting Zone Import Shock	-2.91*	-3.24*	-2.76				-2.61*	
	(1.77)	(1.81)	(1.69)				(1.57)	
Commuting Zone Import Shock x 1[Exposed]				-2.70***	-1.25*	-0.93		-1.43***
				(0.45)	(0.66)	(0.63)		(0.53)
Commuting Zone Import Shock x 1[Non-Exposed Tradable]				0.15**	-0.07	-0.01		-0.07
				(0.07)	(0.12)	(0.15)		(0.12)
Commuting Zone Import Shock x 1[Non-Exposed Non-Tradable]				-0.35	-1.91	-1.83		-1.11
				(1.51)	(1.24)	(1.21)		(1.12)
Sector x Time Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector x Mfg Emp Share at Baseline	No	Yes	Yes	No	Yes	Yes	Yes	Yes
Sector x Census Division Dummies	No	No	Yes	No	No	Yes	Yes	Yes
N	316	314	314	948	942	942	314	941

4.2 Earnings

This subsection presents our estimates of the import effects on CZ Black average monthly earnings (nominal and annualized) are presented in Table 5. Not presented in this paper is the impact of the China trade shock on overall earnings. We find that the China import

competition had no significant impact on annualized average monthly nominal earnings over the period 1991 to 2011 but a positive and significant impact (4.27%) between 1999 and 2007 in the exposed industries. Columns 1 through 3 show overall Black earnings across all sectors. The specifications show a negative impact on Black earnings; however, within Census Divisions (column 3) the impact is insignificant. In column 1, controlling for time effects results in a negative and statistically significant (5% level) relationship between the import shock and overall Black earnings. Column 2, which shows added controls for manufacturing earnings at the base, reveals statistically significant results at the 5% level, where a 1 percentage point increase in import exposure reduces overall Black earnings by 2.07 percentage points.

Columns 4 through 6 show the sectoral components of the overall Black earnings which were shown in columns 1 through 3. Column 4 shows a strong negative and statistically significant effect (1% level) of import exposure on local labor-market Black wages in the exposed industries. The coefficient indicates that a 1 percentage point increase in local import exposure reduces Black earnings by 3.84 percentage points. We find an overall negative net effect of import exposure on both non-exposed sectors. However, only the effect on non-exposed tradable industries is statistically significant. A 1 percentage point increase in local import exposure reduces Black earnings in the non-exposed tradable industries by 4.75 percentage points (significant at the 10% level).

In columns 5 and 6 the estimates are revised by controlling for initial local labor market manufacturing earnings and Census Divisions, respectively. Manufacturing earnings at the base (column 5) improves the statistical significance of the point estimate. A 1 percentage point increase in the import shock reduces Black earnings in the exposed and non-exposed

tradable industries by 3.80 and 5.21 percentage points, respectively. While also negative, the effect on the non-exposed non-tradable sector is not statistically significant. Controlling for Census Divisions within the sectoral breakdown (column 6) results in a weak statistically significant (10% level) negative impact on Black earnings in the exposed industries, where earnings are reduced by 2.21 percentage points for every 1 percentage point increase in import competition.

Lastly, columns 7 and 8 show the estimates for the stacked periods 1991-1999 and 1999-2007. The results show that China trade competition had no significant impact on overall Black earnings but had a statistically significant and negative impact on Black wages in the exposed sectors. Column 8 shows that within Census Divisions, a 1 percentage point increase in the import shock reduces Black earnings by 2.31 percentage points and this is statistically significant at the 5% level. Our estimates show that while import competition from China did not shift overall wages it had a significant and adverse impact on Black earnings, not only in the exposed industries but in the non-exposed tradable industries.

Table 5: 2SLS Estimates of Import Effects on Commuting Zone Black Earnings.
Dep.Var.: 100 x Δ in Log Local Black Average Monthly Nominal Earnings Annualized

	Overall Earnings 1991-2011			Sectoral Earnings 1991-2011			Overall 1991-2007	Sectoral 1991-2007
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Commuting Zone Import Shock	-2.42**	-2.07**	-0.73				0.08	
	(0.97)	(0.91)	(0.91)				(1.47)	
Commuting Zone Import Shock x 1[Exposed]				-3.84***	-3.80***	-2.21*		-2.31**
				(1.19)	(1.16)	(1.17)		(1.13)
Commuting Zone Import Shock x 1[Non-Exposed Tradable]				-4.75*	-5.21**	-1.49		1.38
				(2.46)	(2.49)	(2.66)		(2.25)
Commuting Zone Import Shock x 1[Non-Exposed Non-Tradable]				-1.41	-1.06	0.16		0.73
				(1.11)	(1.07)	(1.04)		(1.72)
Sector x Time Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector x Mfg Earnings at Baseline	No	Yes	Yes	No	Yes	Yes	Yes	Yes
Sector x Census Division Dummies	No	No	Yes	No	No	Yes	Yes	Yes
N	317	311	311	927	918	918	311	918

5 Methodology

The previous estimation finds that the China import penetration had a negative impact on Black employment and earnings within commuting zones. To further extend the analysis we determine whether there have been lasting impacts from the China trade shock. Specifically, we explore whether the China import trade shock induced change in the three separate sectors. First, we examine whether the trade shock affected recovery within the most impacted sector - the exposed sector. Second, we estimate if the shock changed employment

in the second-highest wage sector, which after a simple cross-check we determined to be the non-exposed tradable sector. Third, we assess if China trade impacted the Black hire rate. Mason (1995) theory of labor market discrimination is based on a competition model in which Black workers can be excluded from the highest wage sectors. Since the China trade shock lowered employment in the highest wage sector, this would result in a cascading effect for competition in the next highest wage sector. So, following Mason (1995), the hypothesis would be that Black workers would now face increased competition to remain in the non-exposed tradable sector. Focusing on a new period of interest (2013 to 2019), we estimate the following linear models:

$$\Delta E_{ik2013-2019} = \alpha_{exposed\tau} + \beta_1 \Delta \hat{E}^{CZ}_{iexposed1999-2007} + \beta_2 \Delta E_{iexposed2001-2007} + \gamma X_{ik0} + \epsilon_{ik\tau} \quad (6)$$

$$\Delta Hire_{ik2013-2019} = \alpha_{exposed\tau} + \beta_1 \Delta \hat{E}^{CZ}_{iexposed1999-2007} + \beta_2 \Delta E_{iexposed2001-2007} + \gamma X_{ik0} + \epsilon_{ik\tau} \quad (7)$$

In equation (6), the dependent variable, $\Delta E_{ik2013-2019}$, is the annualized change in Black employment in sector k in CZ i, from 2013 to 2019. The China trade shock is represented by $\Delta \hat{E}^{CZ}_{iexposed1999-2007}$, which is the predicted values from the sectoral Black employment model (equation (4)); and $\Delta E_{iexposed2001-2007}$ is the annualized change in Black employment from 2001 to 2007, which was a period of expansion for the U.S. economy. We estimate the impact of these two independent variables on $\Delta E_{ik2013-2019}$ controlling for X_{ik0}, the manufacturing share of baseline commuting zone Black employment.

Equation (6) is used to estimate both the impact on the most impacted sector, as well as the impact on the second-highest wage sector. For the former, all variables correspond

to the exposed sector. As such, we see the impact of import penetration on the exposed sector. For the latter, we replace the dependent variable with change in Black employment from the second-highest paying sector -the non-exposed tradable sector. This allows us to determine the impact of the China trade shock to the exposed sector on the non-exposed tradable sector. In other words, we are able to test whether there is a shift away from the exposed sector to the non-exposed tradable sector, as workers are forced to find the next best paying jobs.

Equation (7) duplicates the independent and control variables from (6). However, we replace the dependent variable with $\Delta Hire_{ik2013-2019}$, which is the change in Black hire rate in sector k in CZ i for the period 2013 to 2019. We also estimate this equation twice. First we measure the impact of the trade shock and the change in Black employment from 2001 to 2007 in the exposed sector, on the exposed sector Black hire rate between 2013 and 2019, the recovery period from the Great Recession. The second estimation regresses the impact of the trade shock and the change in Black employment from 2001 to 2007 in the exposed sector on the Black hire rate in the non-exposed tradable sector between 2013 and 2019.

6 Results

The results of the estimates are presented in Table 6. Columns 1 and 2 show the impact on change in Black employment in the exposed and non-exposed tradable sectors, respectively. The impact on change in Black hire rate for the exposed and non-exposed tradable sectors are presented in columns 3 and 4, respectively. Each of the four estimates include sector level controls for manufacturing employment share at baseline.

Column 1 shows a negative and significant relationship between predicted job losses for the period 1999 to 2007, and change in Black employment between 2013 and 2019. A one unit increase in predicted job loss in the exposed sector from 1999 to 2007 is associated with a 0.000044 decrease in the Black employment-to-population ratio in the exposed sector during the recovery from the Great Recession in 2013 and 2019. Thus, the China trade shock reduces Black employment in the exposed sector, which implies that Black employment never recovered in this sector, even during the next subsequent economic expansion. Additionally, the relationship between change in employment from 2001 to 2007 and the dependent variable (change in employment between 2013 and 2019) is positive indicating that the U.S. expansion period from 2001 to 2007 continued into the period 2013 to 2019. However, the result is not statistically significantly different from zero.

Column 2 also shows a negative and significant relationship between predicted job losses (in the exposed sector) for the period 1999 to 2007, and the change in Black employment between 2013 and 2019 in the non-exposed tradable sector. A one unit increase in predicted job loss in the exposed sector between 1999 and 2007 is associated with a 0.000014 decrease in the Black employment-to-population ratio in the non-exposed tradable sector between 2013 and 2019. Thus, the China trade shock not only reduces Black employment in the exposed sector, but it also lowers Black employment in the second-highest paying sector, that is the non-exposed tradable sector, consistent with Mason (1995). Furthermore, the relationship between the change in employment between 2001 and 2007 and the change in employment between 2013 and 2019 is positive and statistically significant. This indicates that the U.S. expansion period from 2001 to 2007 continued into the period 2013 to 2019.

Similar to columns 1 and 2, column 3 shows a significant and negative relationship

between 1999 to 1997 predicted job losses and the change in the Black hire rate from 2013 to 2019 in the exposed sector. Contrary to the positive relationship between the 2001 to 2007 change in employment and the dependent variable in column 1, here we see a negative relationship with the change in hire rate. Column 4 shows similar results to column 3; however, the negative relationship between the 2001 to 2007 change in Black employment and the 2013 to 2019 change in Black hire rate is statistically insignificant. These results suggest that the Black hire rate in these sectors never recovered from the China trade shock nor did the expansionary period help it to recover.

Table 6: Estimates of Import Effects on Commuting Zone Black Employment-to-Population Ratios and Black Hire Rates 2013-2019. Dep.Var. 1: 100 x Annual Δ in Local Employment/Local Working-Age- Population. Dep.Var. 2: 100 x Annual Δ in Black Hire Rate/Total Hire Rate

	Change in Employment		Change in Hire Rate	
	Exposed (1)	Non-Exposed (2)	Exposed (3)	Non-Exposed (4)
1999-2007 Predicted Job Losses	-0.000044**	-0.000014*	-0.000179***	-0.0000835**
	(0.000017)	(8.50e-06)	(0.000047)	(0.0000353)
2001-2007 Change in Employment	0.094196	0.167605**	-0.129***	-0.0264594
	(0.111052)	(0.076000)	(0.0474)	(0.0298)
Sector x Mfg Emp Share at Baseline	Yes	Yes	Yes	Yes
N	378	378	378	378

7 Conclusion

This paper extends the paper by Acemoglu, Autor, Dorn, Hanson, and Price (2014) by looking at the impact of the China trade shock on Black employment and earnings within commuting zones, as well as the lasting impacts of that shock. We concur in finding a significant negative impact of the China trade shock on employment in the exposed sector (which

includes manufacturing). Moreover, we find a significant and negative impact of the China trade shock on Black employment and earnings within the exposed sector. We run models controlling first for time effects, and then we add controls for local manufacturing intensity and then Census Division dummies in subsequent regressions. The evidence suggests that Blacks are losing higher paying jobs within the exposed sector at least as much as the population in general, and possibly much more so than previously thought. Their earnings within this sector are also being eroded. At the same time, within the second-highest paying sector, jobs are either not being significantly impacted by the trade shock, or are being added at a lower rate than they are being lost. The data shows job loss for Black people in the exposed industries from 1991-2011 was 1,252,097. Our estimates imply that the average shock to the exposed industries resulted in a 32.4% reduction in jobs. Therefore, had it not been for import penetration from China, there would have been approximately 405,679 fewer jobs lost.

Additionally, we find that there are lasting impacts of the China trade shock on Black employment and Black hire rate. More specifically, the change in the share of Black employment and the Black hire rate do not recover from the China trade shock in the exposed and non-exposed tradable industries. The effect of the shock, limiting job opportunities in the highest wage sector, intensifies competition and forces of exclusion from the sector for Black workers, consistent with Mason (1995). An economy that was growing quickly from 2001 to 2007 does boost the share of Black employment in the second-highest paying sector. However, despite the economic expansionary period there is a negative impact on the share of Blacks hired in the exposed sector.

References

Acemoglu, D., Autor, D., Dorn, D., Hanson, G. H., and Price, B. (2014). Import Competition and the Great U.S. Employment Sag of the 2000s.

Autor, D. H., Dorn, D., and Hanson, G. H. (2013a). The China syndrome: Local labor market effects of import competition in the United States. *American Economic Review*, 103(6):2121–2168.

Autor, D. H., Dorn, D., and Hanson, G. H. (2013b). Untangling Trade and Technology: Evidence from Local Labour Markets.

Batistich, M. K. and Bond, T. N. (2019). Symptoms Before the Syndrome? Stalled Racial Progress and Japanese Trade in the 1970s and 1980s.

Hsieh, C. T. and Klenow, P. J. (2009). Misallocation and manufacturing TFP in China and India. *Quarterly Journal of Economics*, 124(4):1403–1448.

Mason, P. L. (1995). Race, competition and differential wages. *Cambridge Journal of Economics*, 19(4):545–567.

Roys, N. (2016). Persistence of shocks and the reallocation of labor. *Review of Economic Dynamics*, 22:109–130.

Williams, J. (2020). Black–white and Hispanic–white gaps persist as states record historic unemployment rates in the second quarter. Technical report, Economic Policy Institute, Washington.

A Appendix

A.1 States with Sufficient Black Populations within Commuting Zones Included in the Study

1. Alabama
2. Arkansas
3. California
4. Delaware
5. District of Columbia
6. Florida
7. Georgia
8. Illinois
9. Indiana
10. Iowa
11. Kansas
12. Kentucky
13. Louisiana
14. Maryland
15. Massachusetts
16. Michigan
17. Mississippi
18. Missouri
19. Nevada
20. New Jersey
21. New Mexico
22. New York
23. North Carolina
24. Ohio
25. Oklahoma
26. Oregon
27. Pennsylvania
28. Rhode Island
29. South Carolina
30. Tennessee
31. Texas
32. Vermont
33. Virginia
34. West Virginia
35. Wisconsin

A.2 List of Industries within Sectors

Exposed

Agriculture, Forestry, Fishing and Hunting
Manufacturing
Wholesale Trade

Non-exposed tradable

Mining
Information

Non-exposed non-tradable

Utilities
Construction
Retail Trade
Transportation and Warehousing
Finance and Insurance
Real Estate Rental and Leasing
Professional, Scientific, and Technical Services
Administrative and Support and Waste Management and Remediation Services
Educational Services
Health Care and Social Assistance
Arts, Entertainment, and Recreation
Accommodation and Food Services
Other Services (except Public Administration)

A.3 Impact on Overall Black Employment by Census Division

	1991-2011	1991-2007
Commuting Zone Import Shock	-2.76	-2.61*
	(1.69)	(1.57)
Middle Atlantic	-1.342***	-0.391
	(0.196)	(0.256)
East North Central	-1.350***	-0.394**
	(0.149)	(0.20)
West North Central	-1.744***	-0.941***
	(0.196)	(0.235)
South Atlantic	-1.366***	-0.283
	(0.173)	(0.228)
East South	-0.466	1.118*
	(0.475)	(0.679)
West South Central	-1.398***	-0.567**
	(0.195)	(0.224)
Pacific	-1.589***	-0.422
	(0.226)	(0.261)

Census Divisions with insignificant coefficients are excluded.
New England is the base group.

A.4 Impact on Sectoral Black Employment by Census Division, 1991-2011

	Exposed	Non-Exposed Tradable	Non-Exposed Non-Tradable
Commuting Zone Import Shock	-0.93 (0.63)	-0.01 (0.15)	-1.83 (1.21)
Middle Atlantic	-0.28*** (0.062)	-0.03* (0.014)	-1.03*** (0.174)
East North Central	-0.223*** (0.043)	-0.0341*** (0.009)	-1.093*** (0.116)
West North Central	-0.351*** (0.062)	-0.0139 (0.014)	-1.378*** (0.156)
South Atlantic	-0.310*** (0.061)	-0.028** (0.014)	-1.028*** (0.130)
West South Central	-0.225*** (0.065)	-0.0137 (0.027)	-1.159*** (0.151)
Mountain	0.259 (0.222)	0.186 (0.144)	-0.829*** (0.278)
Pacific	-0.280*** (0.041)	-0.0366* (0.022)	-1.272*** (0.184)

Census Divisions with insignificant coefficients are excluded.
New England is the base group.

A.5 Impact on Sectoral Black Employment by Census Division, 1991-2007

	Exposed	Non-Exposed Tradable	Non-Exposed Non-Tradable
Commuting Zone Import Shock	-1.43*** (0.53)	-0.07 (0.12)	-1.11 (1.12)
Middle Atlantic	-0.124** (0.062)	-0.00774 (0.013)	-0.259 (0.237)
East North Central	-0.0474 (0.054)	-0.0150 (0.010)	-0.332** (0.155)
West North Central	-0.198*** (0.063)	-0.0300** (0.0150)	-0.712*** (0.191)
South Atlantic	-0.170** (0.0702)	-0.0105 (0.0175)	-0.102 (0.169)
East South Central	0.361* (0.201)	0.017 (0.021)	0.741 0.474
West South Central	-0.0505 (0.067)	-0.00555 (0.029)	-0.511*** (0.177)
Pacific	-0.086* 0.052	-0.004 0.026	-0.331* 0.202

Census Divisions with insignificant coefficients are excluded.
New England is the base group.