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Abstract

Exploiting variation in exposure to Chinese import growth across U.S. local markets, I investigate the effects of import competition on self-employment between 1990 and 2014. I find that increased Chinese import competition has negatively affected self-employment in the manufacturing and wholesale & retail sectors. The reduction in self-employment has also played a significant role in total employment adjustment in these sectors. I do not find any effects of import exposure on self-employment in other broadly defined sectors.

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1 Introduction

Entrepreneurs have long been considered the engine of economic progress by creating jobs, spurring innovation, and generating prosperity. A large body of work is devoted to understanding entrepreneurship and analyzing its determinants. One strand of the literature examines the effects of preferences and personal traits (e.g., attitudes towards risk, human capital) on entrepreneurship. Still, a larger strand investigates how external factors (e.g., credit constraints, discrimination, government policies, etc.) can affect it (Hurst and Pugsley, 2017). Some studies have investigated globalization's impact on entrepreneurship but have been mostly theoretical or model-based simulations.[1]

This paper empirically investigates the impact of international trade on entrepreneurship in the United States. More precisely, it examines the effects of increased Chinese import competition between 1990 and 2014 on U.S. self-employment. I study the impact on self-employment for several reasons. First, self-employment has been considered the simplest form of entrepreneurship, and self-employed individuals make up a large portion of small businesses in the U.S., which disproportionally contribute to jobs in the economy and economic progress (Fairlie et al., 2019). Second, they also play an important role in employment dynamics (Levine and Rubinstein, 2018). Finally, self-employed business owners hold a substantial portion of the U.S. wealth (De Nardi et al., 2007).

I study the effects of Chinese import growth on self-employment because China's spectacular rise in world trade since the early 1990s provides a natural experiment for researchers to *identify* the impact of trade on various outcomes. China launched reforms in the late 1970s, but until the early 1990s, the success of the reforms was questionable, and whether they would be continued was hotly disputed in China and elsewhere.[2] In a highly influential paper exploring cross-market variation in import exposure, Autor et al. (2013) show that Chinese import competition led to a sizable reduction in U.S. manufacturing employment and wages.

[1] See Dinopoulos and Unel (2015), Dinopoulos et al. (2020), Grossman (1984), Rauch and Watson (2004), among others. Dinopoulos et al. (2020), for example, developed a computable general equilibrium model of trade with occupational choice and revenue-generating tariffs to study the impact of the recent tariff wars between the U.S. and China on entrepreneurship and income distribution.

[2] In 1992, after seeing the success of reforms in China's southern provinces, President Deng Xiaoping committed to their continuation and expansion (Autor et al., 2016, Naughton, 2007).

Using U.S. Census decennial surveys and the American Community Surveys, I identify individuals who report self-employment as their primary worker class. My analysis further distinguishes between incorporated and unincorporated self-employed individuals because recent studies have shown that these two groups have different human capital traits and income profiles (Levine and Rubinstein, 2017). The geographic unit used in the analysis is the commuting zone which represents a cluster of counties with strong commuting ties between workers and businesses (Tolbert and Sizer, 1996). Exploiting variation in exposure to Chinese imports across commuting zones, I investigate the effects of Chinese import growth on the likelihood of becoming self-employed. Finally, to address the possible simultaneity associated with U.S. industry import demand shocks, I use changes in Chinese imports by other advanced countries as an instrument for growth in Chinese imports to the U.S., following Autor et al. (2013, 2019).

The main findings of this study can be summarized as follows. First, I find a negative and insignificant impact of Chinese import growth on self-employment. However, industry-level analysis reveals that it has a sizable, adverse effect on both incorporated and unincorporated self-employment in manufacturing. Specifically, increased Chinese import competition can explain about 25% (21%) of the total decline in the likelihood of becoming incorporated (unincorporated) self-employment in manufacturing. The decline in self-employment can also explain about 2% of the reduction in total manufacturing employment. Second, I find that it has had a negative effect on wholesale & retail self-employment, entirely stemming from unincorporated self-employed individuals. Estimates imply that the import exposure can explain about 22% of the decline in unincorporated self-employment in this sector. Finally, my analysis yields that the effects of Chinese import growth on self-employment in other industries are small, negative, and statistically insignificant. These findings are robust to a rich set of sensitivity checks.

This paper relates to a growing literature investigating the impact of China's rising trade on U.S. labor markets. There are two distinct approaches in this literature. The first approach, originally developed by Autor et al. (2013) and also used in this paper, explores variation in exposure to Chinese import growth across U.S. local markets since 1990. The second approach, advanced by Pierce and Schott (2016), explores variation in exposure to rising imports from China following its accession to the WTO across U.S. industries and local markets. However,

studies using either approach have reached similar conclusions: increased Chinese import competition has had substantial adverse effects on employment across industries and local labor markets (Acemoglu et al., 2016, Fort et al., 2018).

The subsequent studies have investigated the effects of the China shock on various other social and economic outcomes in the U.S., such as earnings and employment trajectories of U.S. workers (Autor et al., 2014), crime and government transfers (Che et al., 2018), marriage, fertility, and children's living circumstances (Autor et al., 2019b), price and consumer welfare (Amiti et al., 2020, Jaravel and Sager, 2018), U.S. politics and voting (Autor et al., 2019a, Che et al., 2016, Heins, 2016), and innovation and productivity (Autor et al., 2020, Bloom et al., 2016). However, to the best of my knowledge, only two papers explore the relationship between self-employment and Chinese import competition.

Liang and Goetz (2016) investigate the effects of self-employment on the impact of Chinese import growth on wage & salary employment between 2000 and 2007 and find that self-employment can mitigate the adverse impact of trade penetration. [3] Aslan and Kumar (2021), utilizing the Pierce and Schott (2016) approach and using longitudinal data from the Survey of Income and Program Participation (SIPP), study the impact of China's accession to the WTO on self-employment. They find that granting permanently lower tariffs on Chinese goods reduced entrepreneurship through lowering entry and rising exit in exposed sectors but increased entry by highly educated individuals in skill-intensive nontradable industries. My analysis uses a distinct approach and investigates the impact of Chinese import growth since 1990. Further, I use the Census Bureau's decennial surveys and the ACSs, the most comprehensive surveys including several million observations and covering the entire area of the United States.[4] My findings do not fully corroborate theirs, as I discuss in Section 5.

The rest of the paper is organized as follows. The next section introduces data sources and explains how the key variables are constructed. Section 3 presents and discusses the econometric

[3]Specifically, they include the self-employment share in 2000 interacted with Chinese import growth over 2000-2007 as an additional control variable into a model similar to that in Autor et al. (2013) and Kovak (2013), and estimate the combined effect using the OLS method.

[4]Each round of the SIPP includes about forty thousand households and covers only major metropolitan areas. Metropolitan areas with populations less than 250,000 and nonmetropolitan areas are not identified. However, an appealing feature of the SIPP database is that individuals are tracked over time, and thus one can calculate the entry to and exit from self-employment, as Aslan and Kumar (2021) do.

specification used in the analysis. Section 4 presents the results and explores heterogeneity across different sectors. Section 5 offers a rich set of sensitivity checks, and the last section concludes the paper.

2 Data and Descriptive Statistics

This section discusses the sources and construction of the sample I use in my analysis. I first introduce self-employment data, provide related statistics, and discuss their implications. I then present the data on trade and import penetration. Periods in this analysis cover the years 1990, 2000, and 2014, and the availability of trade data dictates the choice of these years.

2.1 Data on Self-employment

Data on self-employment and other workers are from the Census decennial surveys for the years 1990 and 2000 and the American Community Survey (ACS) files for 2013-2015. I use publicly available data from the Integrated Public Use Micro Samples (IPUMS) prepared by Ruggles et al. (2020). I pool the ACS 2013-2015 files and treat them as referring to 2014 to increase sample size and the precision of estimates, as in Autor et al. (2019).

The analysis is at the commuting zone (C.Z.) level because this is the smallest geographic unit that can be consistently constructed over a long-time period. Further, C.Z.s represent clusters of counties with strong commuting ties between employers and employees (Tolber and Sizer 1996). Using crosswalk files from Autor et al. (2013), I map Public Use Microdata Areas (PUMAs) to 741 commuting zones that cover the entire area of the U.S. over the sample period. Alaska and Hawaii are excluded; thus, the final sample includes 722 CZs.

Each census survey covers several million individuals, and provides information about demography (i.e., gender, age, race, education), work (e.g., employment status, worker class, industry worked, occupation, income, etc.), and so on. I consider all working-age individuals (ages 16-64) who are not residents of institutional group quarters. Using the information on worker class and employment status, I reclassify individuals into five mutually exclusive categories that sum up to the sample population: incorporated self-employment, unincorporated self-employment, wage employment, unemployment, and labor force nonparticipation.

Table 1: Summary Statistics on Worker Classes

	Self-employed Individuals			Wage
	All	Incorp.	Unincorp.	Workers
	1	2	3	4
Female (%)	36.0	28.5	39.9	48.0
White (%)	84.2	85.5	83.4	77.3
Hispanic (%)	11.6	8.5	13.3	13.4
Immigrant (%)	17.7	17.3	17.8	13.9
Age	44.7	45.8	44.0	38.8
	(11.0)	(10.4)	(11.3)	(12.5)
College Educated (%)	62.3	71.2	58.3	61.5
Hours Worked	41.5	45.4	39.4	39.7
	(15.9)	(14.6)	(16.2)	(11.4)
Routine Tasks (%)	22.6	18.7	24.5	29.5
Annual Income ($1,000)	58.4	88.9	41.9	45.4
	(78.1)	(104.9)	(51.6)	(49.2)

Notes: The data draw on the Census 1990 and 2000 decennial surveys and the 2013-2015 ACS files from IPUMS (Flood et al. 2020). The sample covers all working-age individuals. College educated represents all individuals who have at least some college education. Numbers in parentheses are standard errors.

Previous studies have identified all self-employed individuals as entrepreneurs (Borjas and Bronars, 1989, Fairlie, 2014, Hamilton, 2000). However, Levine and Rubinstein (2017) argue that the two self-employed groups differ in their human capital traits and income profiles. For example, incorporated self-employed individuals are more educated and earn more than unincorporated ones and salaried workers, and also exhibit greater self-esteem and engage in risky activities when young. My analysis also distinguishes between these two groups.

Table 1 reports descriptive statistics on different class workers over the sample years. Column 1 in Table 1 presents the statistics for all self-employed individuals, whereas columns 2 and 3 present the same statistics for incorporated or unincorporated business owners, respectively. The last column reports the corresponding statistics for wage and salary workers. The share of self-employment in the working-age population is about 6%, and that of unincorporated self-employment is 3.9%. College-educated represents individuals with at least some college

education, and routine tasks represent activities that can be readily codified and computerized.[5]

Columns 1-3 reveal that most self-employed are white, slightly older males. However, the statistics vary significantly across worker classes. Incorporated self-employed individuals are more likely to be male, more educated, work longer hours, and perform more non-routine tasks than unincorporated self-employed and wage workers. Further, their average annual income is substantially higher than the other two groups.[6] These findings corroborate Hamilton (2000) and Levine and Rubinstein (2017).[7] The self-employment rate is higher among immigrants than US-born individuals, given that the sample share of immigrants is about 14.6%. The self-employment rate is lower among Hispanics than non-Hispanics, given that the former constitutes about 14.3% of the sample population.

Table 2 reports the self-employment share of the working-age population working as self-employed in each industry over the years, and the choice of these industries are explained in Section 4. The sum of shares across sectors in each year gives the fraction of population that is self-employed in that year, as shown in the last row. The sum of incorporated and unincorporated shares in each industry and year gives the population share of all self-employment in that industry and year. Note that the population share of incorporated (unincorporated) self-employment shows an upward (downward) trend over the sample years. Both self-employment groups declined in manufacturing and wholesale & retail sectors over the sample period. However, the pattern is more subtle in other sectors. In other private services (which include transportation, information, professional businesses, etc.), incorporated self-employment increased considerably, whereas unincorporated ones increased during the 1990s and decreased after 2000. In the con-

[5]Using the U.S. Department of Labor's Dictionary of Occupations, Autor and Dorn (2013) measure routine task content by occupation listed in the Census's surveys. They then identify routine occupations such that they accounted for 1/3 of U.S. employment in 1980. I use their crosswalk files and definition to identify routine occupations in the sample surveys.

[6]These are earned incomes, which are expressed in thousands of 2012 dollars using the PCE index from the Bureau of Economic Analysis. Top-coded incomes are corrected using a procedure in Autor et al. (2008), and the bottom 1 percent is trimmed from the sample.

[7]Hamilton (2000), for example, reports that the median income of self-employed individuals is lower than that of wage workers. Since most self-employed people are unincorporated, the median income is mainly determined by that group. The above findings are also consistent with De Nardi et al. (2007), who, using the Survey of Consumer Finances over 1989-2004, find that self-employed business owners hold a substantial portion of the U.S. wealth and earn more income. The set of entrepreneurs they consider includes those owning a business and having an active management role and excludes all individuals working independently, i.e., mostly unincorporated self-employed workers.

Table 2: Self-employment Shares Across Industries Over Years (%)

	Incorporated			Unincorporated		
	1990	2000	2014	1990	2000	2014
Manufacturing	0.18	0.16	0.11	0.25	0.19	0.12
Wholesale & Retail	0.52	0.50	0.39	0.81	0.58	0.40
Other Services	0.83	1.07	1.31	2.54	2.58	2.49
Constr. & Mining	0.26	0.35	0.35	0.67	0.78	0.67
All Industries	1.79	2.08	2.17	4.28	4.13	3.68

Notes: The data draw on the Census 1990 and 2000 decennial surveys and the 2013-2015 ACS files from IPUMS (Flood et al. 2020). The sample covers all working-age individuals (i.e., ages 16-64).

struction & mining sectors, incorporated and unincorporated self-employment increased during the 1990s, and the latter declined after 2000.

2.2 Data on Trade

Data on trade come from Autor et al. (2019). They first calculated imports from China at the four-digit manufacturing industries for the years 1991, 2000, and 2014 using the U.N. Comtrade Database on imports at the six-digit Harmonized System product level. Here, 1991 is the earliest year for which the trade data are available, and there are 392 manufacturing industries. The change in Chinese import penetration in each industry j is defined as follows:

$$\triangle IP_{jt} = \frac{\triangle M_{jt}}{Y_{j91} + M_{j91} - X_{j91}}, \tag{1}$$

where $\triangle M_{jt}$ is the change in imports from China over the period t and $Y_{j91} + M_{j91} - X_{j91}$ represents the absorption capacity in the base year 1991. Y denotes domestic output, M imports, and X exports.

Above trade exposure shocks are then aggregated to obtain Chinese import penetration in a CZ using each industry's employment share in the CZ's total employment in 1990 as weights. More precisely,

$$\triangle IP_{zt} = \sum_{j} \frac{L_{zj90}}{L_{z90}} \triangle IP_{jt}, \tag{2}$$

where L_{zj90}/L_{z90} is the share of industry j in CZ z's total employment in 1990.[8] Employment shares are calculated using County Business Pattern (CBP) data from the US Census Bureau. Thus, $\triangle IP_{zt}$ is a local employment-weighted average of changes in import penetration in each industry. Decadal change in Chinese import penetration is about 0.95 percentage points during 1991-2000, and 1.15 percentage points during 2000-2014.

As will be discussed in the next section, $\triangle IP_{zt}$ may respond to local-demand shocks, and hence is not exogenous. To identify the supply-driven part of Chinese imports in estimating their impact on local-labor markets, Chinese import growth in other high-income countries is used as an instrument. More precisely,

$$\triangle IP^o_{jt} = \frac{\triangle M^o_{jt}}{Y_{j88} + M_{j88} - X_{j88}}, \tag{3}$$

where $\triangle M^o_{jt}$ is the change in imports from China in eight other advanced economies (Australia, Denmark, Finland, Germany, Japan, New Zealand, Spain, and Switzerland), and the denominator is the absorption capacity in 1988. These industrial-level import growths are then aggregated to obtain

$$\triangle IP^o_{zt} = \sum_j \frac{L_{zj80}}{L_{z80}} \triangle IP^o_{jt}. \tag{4}$$

Unlike equation (2), $\triangle IP^o_{jt}$ is weighted with the industry j's 1980 share of total employment to reduce the error covariance between the dependent and independent variables. Decadal change in Chinese import penetration in these high-income economies is 0.71 percentage points during 1990-2000, and 1.42 percentage points during 2000-2014.

3 Empirical Methodology

Let e_{zt} denote the self-employment share of the sample population (ages 25-64) in commuting zone z in year t. I use the following model to estimate the impact of Chinese import growth on self-employment:

$$\triangle e_{zt} = \beta \triangle IP_{zt} + \gamma X_{zt-1} + \eta_r + \eta_t + \varepsilon_{zt}, \tag{5}$$

[8] This is slightly different from Autor et al. (2013) and Acemoglu et al. (2016), who use the start-of-period employment shares (i.e., L_{zjt-1}/L_{zt-1}) as weights. The 1990 employment shares are more exogenous to Chinese import shocks in the 2000s than the 2000 employment shares.

$\triangle e_{zt} = e_{zt} - e_{zt-1}$ is the decadal change in the self-employment share in CZ z and $\triangle IP_{zt}$ is the decadal change in Chinese import defined by (2).[9] The parameter β, the coefficient of interest, measures the impact of Chinese import growth on self-employment change: a one-percentage point increase in $\triangle IP_{zt}$ changes the self-employment share by β percentage points.

Here, X_{zt-1} represents the start-of-period CZ covariates that can potentially affect self-employment. It includes demographic controls (such as shares of whites, blacks, Hispanics, immigrants, the college-educated, and those ages 16-24, 25-39, and 40-64 in the population), the share of employment among women, the percentage of employment in routine occupations, and the average offshorability of tasks that workers perform. The last two variables are included to control the possible effects of automation and globalization on labor markets. The set also consists of the share of manufacturing in a CZ's start-of-period employment to control for variation across manufacturing industries in their exposure to Chinese imports. Variables related to age profiles are from the Census surveys, and other controls are from Autor et al. (2019), who also derive them from the Census surveys.

Region-fixed effects (η_r) are included to control for region-specific trends in self-employment, and period-fixed effects (η_t) to control for common shocks. Regions refer to nine geographic divisions defined by the U.S. Census. Finally, ε_{zt} denotes the error term. In estimating (5), I weight regressions by the start-of-period CZ working-age population, and robust standard errors are clustered at the CZ level.[10]

Estimating equation (5) using the OLS approach most likely yields a biased estimate of β because unobserved contemporaneous demand shocks can affect self-employment and Chinese import penetration. For example, the economic expansion during the 1990s might create strong demand for imported products, including those from China; as a result, US import demand shocks might contaminate trade from China. To identify the supply-driven component in US imports from China, I use the instrumental variable (IV) approach proposed by Autor et al. (2013, 2019). More precisely, I instrument $\triangle IP_{zt}$ with $\triangle IP^{oc}_{zt}$, as defined by equations (2)

[9] $\triangle e_{zt}$ over the 2000-2014 period is divided by 1.4 to put both periods on a comparable decadal scale. When I consider a particular type of self-employment, $\triangle e_{zt}$ denotes the corresponding decadal change in that type of self-employment share.

[10] Weighting regressions with the start-of-period CZ *total* population does not have any significant impact on results. Further, clustering at the state level yields very similar standard errors.

and (4), respectively. The underlying assumptions in this approach are that the supply shocks in China also drive Chinese import growth in other advanced countries, and industry demand shocks are uncorrelated across advanced economies.

4 Results

Table 3 presents results from stacked regressions over 1990–2000 and 2000–2014 periods using equation (5). All regressions include region- and period-fixed effects and are weighted by the start-of-period CZ population. Regressions models in columns 1-3 do not include start-of-period CZ-level controls, whereas those in columns 4-6 include them. For brevity, I do not report estimates on CZ-level controls. In all tables, "All" covers incorporated and unincorporated self-employment.[11]

Panel A reports OLS estimates. The impact of Chinese import growth on each self-employment group is negative and statistically insignificant in the first three columns. Including initial CZ-level controls makes the impact on all self-employment higher and statistically significant at the 10% level. The point estimate implies that a one-percentage-point increase in Chinese import growth in a CZ decreases the self-employment share by 0.040 percentage points. Effects on both incorporated and unincorporated self-employment are negative but statistically insignificant. However, as discussed in the previous section, OLS estimates most likely suffer from the simultaneity problem associated with import demand shocks.

Panel B reports the estimates when $\triangle IP_{jt}$ is instrumented with $\triangle IP^{o}_{jt}$. The last row reports the first-stage (Kleibergen-Paap) F-statistic used to measure the instrument's strength in regressions, and note that they are well above 10, the conventional threshold used in the empirical literature. According to estimates in columns 1-3, Chinese import growth does not impact either type of self-employment. Although including start-of-period CZ controls considerably decreases the impact on unincorporated self-employment, all estimates are statistically insignificant. Large standard errors suggest substantial variation across observations in the sample.

There is a considerable variation in industry composition across CZs. Manufacturing indus-

[11] In this case, the sum of estimated coefficients reported in columns 2 and 3 (or 5 and 6) must be equal to that in column 1 (4).

Table 3: Effects of Chinese Import Growth on Self-employment in the U.S.

	I. Without CZ-Level Controls			II. With CZ-Level Controls		
	All	Incorp	Unincp	All	Incorp	Unincp
	1	2	3	4	5	6
A. OLS Estimates						
$\triangle IP_{zt}$	−0.015	−0.009	−0.005	−0.040*	−0.015	−0.024
	(0.025)	(0.012)	(0.019)	(0.024)	(0.015)	(0.016)
B. IV Estimates						
$\triangle IP_{zt}$	0.012	−0.005	0.017	−0.056	−0.008	−0.048
	(0.040)	(0.014)	(0.033)	(0.044)	(0.023)	(0.035)
F-Stats	220.1	220.1	220.1	92.1	92.1	92.1

Notes: Each regression uses 1,444 observations from 722 U.S. commuting zones. All regressions include region- and period-fixed effects, and are weighted by the start-of-period CZ working-age population. Robust standard errors in parentheses are clustered at the CZ level, and ***, **, and * represent statistical significance at the 1%, 5%, and 10% level, respectively.

tries, for example, are concentrated mainly in parts of Midwest and Southeast (Autor et al. 2016); as a result, CZs in these regions are more exposed to Chinese trade shocks. Therefore, I estimate the impact of Chinese import growth on self-employment at the industry level. In my analysis, I group industries into four broadly-defined and mutually exclusive sectors: manufacturing, wholesale & retail, other services, and construction & mining.[12] Manufacturing has been hit hard by Chinese import growth and, consequently, has experienced a stiff decline in employment (Autor et al. 2013, Pierce and Schott 2016). I consider wholesale & retail separately from other service sectors because they have stronger linkages with the manufacturing sector -all manufacturing products are sold through the wholesale & retail sectors. Other services include all remaining private service sectors such as transportation, information, utilities, finance & insurance, professional businesses, personal businesses, etc. Finally, analyzing the construction sector is crucial because it has experienced considerable fluctuations -expanded rapidly until 2006 and contracted dramatically during the Great Recession.

Table 4 reports the IV results when I separately estimate the impact of Chinese import

[12]I combined construction and mining because self-employment in the latter is very small. In addition, mining activities involve a substantial amount of construction process.

Table 4: Effects of Chinese Import Growth on Self-employment in the U.S.

	All	Incorp	Unincp	All	Incorp	Unincp
	1	2	3	4	5	6
	A. Manufacturing			B. Wholesale & Retail		
$\triangle IP_{zt}$	-0.018^{***}	-0.007^{*}	-0.011^{***}	-0.026^{**}	0.006	-0.033^{***}
	(0.006)	(0.004)	(0.004)	(0.012)	(0.008)	(0.011)
	C. Other Services			D. Construction & Mining		
$\triangle IP_{zt}$	−0.005	−0.002	−0.003	−0.006	−0.005	−0.001
	(0.029)	(0.016)	(0.021)	(0.019)	(0.009)	(0.017)

Notes: Each regression uses 1,444 observations from 722 U.S. commuting zones. All regressions include start-of-period CZ-level controls, region- and period-fixed effects, and are weighted by the start-of-period CZ working-age population. Robust standard errors in parentheses are clustered at the CZ level, and ***, **, and * represent statistical significance at the 1%, 5%, and 10% level, respectively.

competition on self-employment in each industry. All regressions include start-of-period CZ-level controls and region- and period-fixed effects. Since the control set has not changed, the (Kleibergen-Paap) F-statistic associated with the first-stage regression in each column is still 92.1. Note that the sum of estimated coefficients for each self-employment group across industries equals the corresponding point estimate in Panel B of Table 3.

Panel A reports results for manufacturing. Estimates in columns 1-3 indicate that Chinese import growth has a negative and highly significant impact on manufacturing self-employment: a one-percentage-point increase in import exposure lowers the likelihood of becoming self-employed in this sector by 0.018 percentage points. The effect on each type of self-employment is negative and significant, at least at the 10% level. Since the average decadal change in Chinese import growth is 1.05 percentage points between 1990-2014, the estimate in column 1 implies that import exposure explains about 22.8% of the total decline in the population share of manufacturing self-employment over the years. [13] Similarly, estimates in columns 2 and 3 imply that Chinese import growth explains about 25.2% (21.3%) of the observed decline in the likelihood of becoming incorporated (unincorporated) self-employed in manufacturing.

Panel B reports results for the wholesale & retail sectors. Again, Chinese import growth

[13] Accoridng to Table 2, the average *decadal* change in manufacturing self-employment is [0.11+0.12-(0.18+0.25)]/2.4=-0.083 percentage points between 1990 and 2014. Thus, $0.018 \times 1.05/0.083 = 22.8\%$.

negatively and significantly impacts self-employment, and the effect entirely comes from the unincorporated. The point estimate in column 3, combined with the average decadal changes in Table 2, implies that the import exposure explains about 21.5% of the decline in the likelihood of becoming unincorporated self-employed in this sector. Thus, as in manufacturing, Chinese import competition has had a sizable impact on self-employment in the wholesale & retail sectors.

Finally, Panels C and D report the impact of Chinese import growth on self-employment in other private service and construction & mining sectors. In both panels, points estimates are small and statistically insignificant, indicating that the import exposure has no impact on self-employment in these sectors. In sum, increased Chinese import competition has had a sizable, negative impact on self-employment in manufacturing and wholesale & retail sectors while having no effects on the other private service and construction & mining sectors.

To put these findings in a broader context, I now examine the role of self-employment in employment changes stemming from Chinese import growth. Table 5 reports the impact on total employment (including self-employment) in each industry, using equation (5). The last column reports the impact on the total number of unemployed workers and labor force non-participants. Note that the sum of estimates across columns 1-4 in each row gives the net impact on the total employment. Note also that the sum of estimates across all columns equals zero because the working-age population consists of employed workers, unemployed workers, and labor force non-participants.

Estimates in the first column indicate that import exposure has a substantial, negative impact on manufacturing employment. The aggregate effect on non-manufacturing employment (i.e., the sum of columns 2-4) is also negative but statistically insignificant. Thus, the decline in manufacturing employment has not been compensated by an increase in non-manufacturing employment; instead, the number of unemployed workers and labor force non-participants has risen sharply, as shown in the last column.[14] Point estimate in column 1 of Panel A in Table

[14]These findings are qualitatively the same as those in Autor et al. (2013). My point estimates are not one-to-one comparable with theirs because Chinese import growth is defined differently, and sample periods differ. The point estimate in column 1 is more comparable with Autor et al. (2019), who find that a one-percentage-point increase in Chinese import growth between 1990 and 2014 lowers the manufacturing employment share of the young adult population (ages 18-39) by 1.06 percentage points (cf. -0.951). The small difference mainly stems from my sample covering all working-age population.

Table 5: Effects of Chinese Import Growth on Employment in the U.S.

	Manufacturing	Wholesale & Retail	Other Services	Construction & Mining	Unemp & NILF
	1	2	3	4	5
$\triangle IP_{zt}$	-0.951^{***}	-0.035	0.131	-0.218^{**}	1.073^{***}
	(0.134)	(0.077)	(0.188)	(0.091)	(0.299)

Notes: Each regression uses 1,444 observations from 722 U.S. commuting zones. All regressions include start-of-period CZ-level controls, region- and period-fixed effects, and are weighted by the start-of-period CZ working-age population. Robust standard errors in parentheses are clustered at the CZ level, and ***, **, and * represent statistical significance at the 1%, 5%, and 10% level, respectively.

4, combined with that in column 1 in Tabel 5, implies that the decline in manufacturing self-employment can explain about 1.9% ($\approx 0.018/0.951$) of the total reduction in manufacturing employment. Since the self-employment share of total manufacturing employment is about 3.2%, this finding implies that Chinese import growth has had a relatively larger effect on wage & salary workers.

Column 2 in Table 5 shows the impact on total employment in the wholesale & retail sectors. It is negative and statistically insignificant, and the large standard error makes it difficult to draw a definite conclusion. However, this finding and estimates in Panel B of Table 4 suggest that self-employed individuals primarily drive the possible adverse effect of import exposure on employment.[15] According to columns 3 and 4, Chinese import competition has had a positive but statistically insignificant impact on employment in other private service sectors and a negative and significant impact on the construction & mining sectors. Since the effects of import exposure on self-employment in these sectors are small, self-employment does not play any significant role in employment adjustment in those sectors. Results in Tables 4 and 5 suggest that the China trade has not had any reallocation effects on self-employment. That is, the decline in self-employment in manufacturing and wholesale & retail sectors has not been compensated by any increase in either self-employment or wage & salary employment in other sectors.

[15]For example, if the actual value of β is -0.102 (i.e., one standard deviation below the point estimate in Table 5), then the decline in wholesale & retail self-employment can explain about 25% ($\approx 0.026/1.02$) of the total reduction in wholesale & retail employment.

5 Sensitivity Checks

This section discusses several sensitivity checks to examine the robustness of the results. Table 6 reports the additional IV estimates of the effects of Chinese import competition on self-employment in the manufacturing and wholesale & retail sectors. [16] As in the previous tables, all regressions in Table 6 include start-of-period CZ-level controls, region- and period-fixed effects and are weighted by the start-of-period CZ population.

Estimates become problematic when the outcome variable exhibits pre-trends correlated with the trade exposure (Borusyak et al., 2018, Goldsmith-Pinkham et al., 2020). To control for potential pre-trends, I include self-employment change in 1980-1990 interacted with the period-fixed effects in equation (5). [17] As estimates in Panel A show, pre-trends do not play any significant role in the effects of the import exposure. Although not shown in the table, the impact of pre-trend on both self-employment groups in manufacturing is negative and usually significant. They are negative and significant (positive and insignificant) on unincorporated (incorporated) self-employment in wholesale & retail.

One concern is the spillover effects from neighboring CZs because areas most exposed to the trade shock are also more likely to be close to CZs exposed. Ignoring the spillover effects may underestimate the impact. In a recent paper, Adão et al. (2019) extend Autor et al. (2013) by including spatial linkages in the formof the import competition exposure of nearby regions. They find that a CZ whose neighbors are more exposed to Chinese import competition experienced a relatively more substantial decline in its employment rate. To incorporate their approach, I include a spillover term, $\triangle IP^s_{zt}$, defined as follows

$$\triangle IP^s_{zt} = \sum_{k \neq z} \mu_k \triangle IP_{kt}, \qquad \mu_k = \frac{L_{k90} D^{-\delta}_{kz}}{\sum_j L_{j90} D^{-\delta}_{jz}},$$

where L_{k90} is CZ k's working-age population in 1990 and D_{kz} is the distance between CZs k and z. The parameter δ measures the trade-cost elasticity, and following Adão et al. (2019), I set equal to 5. Ignoring L_{k90} in the above computations yields qualitatively the same results.

[16] For brevity, I only present sensitivity analysis for these sectors because the impact on other sectors is small and statistically insignificant. Table A.2 in the appendix report sensitivity checks for other sectors.

[17] As an alternative way, I also considered including the lagged dependent variable into the model, and results were broadly similar to those in Panel A.

Table 6: Effects of Chinese Import Growth on Self-employment: Robustness

	Manufacturing			Wholesale & Retail		
	All	Incorp	Unincp	All	Incorp	Unincp
Variable	1	2	3	4	5	6
Panel A. Pre-trends						
$\triangle IP_{zt}$	-0.020^{***}	-0.008^{*}	-0.012^{***}	-0.026^{**}	0.008	-0.034^{***}
	(0.006)	(0.004)	(0.004)	(0.012)	(0.008)	(0.011)
Panel B. Spillovers						
$\triangle IP_{zt}$	-0.019^{***}	-0.008^{*}	-0.011^{***}	-0.026^{**}	0.004	-0.031^{***}
	(0.006)	(0.005)	(0.004)	(0.012)	(0.008)	(0.011)
$\triangle IP^{s}_{zt}$	0.009	0.014^{**}	-0.005	0.007	0.024^{**}	-0.023^{*}
	(0.009)	(0.007)	(0.006)	(0.014)	(0.011)	(0.012)
Panel C. Great Recession						
$\triangle IP_{z1}$	-0.025	-0.018	-0.007	-0.062^{**}	0.001	-0.063^{**}
	(0.018)	(0.011)	(0.012)	(0.032)	(0.021)	(0.026)
$\triangle IP_{z2}$	-0.019	-0.008^{*}	-0.011^{***}	-0.029^{**}	0.005	-0.035^{**}
	(0.007)	(0.004)	(0.004)	(0.012)	(0.008)	(0.012)
Panel D. State-fixed effects						
$\triangle IP_{zt}$	-0.023^{***}	-0.010^{**}	-0.012^{***}	-0.025^{*}	0.006	-0.031^{**}
	(0.006)	(0.004)	(0.004)	(0.014)	(0.007)	(0.013)

Notes: All regressions include start-of-period CZ-level controls, region- and period-fixed effects, and are weighted by the start-of-period CZ working-age population. Robust standard errors in parentheses are clustered at the CZ level, and ***, **, and * represent statistical significance at the 1%, 5%, and 10% level, respectively.

Panel B reports results when we include $\triangle IP^{s}_{zt}$ into equation (5), and note that it does not significantly impact the original estimates. However, it does have a sizable, adverse effect on unincorporated self-employment in the wholesale & retail sectors. Interestingly, Chinese import shocks to other CZs have a positive and statistically significant impact on incorporated self-employment in both sectors.

Another concern is the possible adverse effects of the 2007-2009 recession on results.[18] One

[18]The fact that the 2000-2014 period includes several post-recession years (during which labor markets have recovered) should alleviate this concern to a large extent. Further, previous studies (e.g., Fossen Fossen (2020)) have shown that individuals' likelihood of becoming self-employed increases during the recession. In this case, the

simple way to address this concern is to introduce an interaction term between $\triangle IP_{jt}$ and a time dummy for 2000s to capture the differential impact of trade shocks during 2000-2014. Panel A reports the results from this exercise, estimates on $\triangle IP_{zt}$ and $\triangle IP_{z2}$ measure the net impact of import exposure in the first and second periods, respectively.[19] Note that effects on manufacturing self-employment are negative in both periods though they are less precisely estimated for the first period. Ignoring statistical imprecision, point estimates in column 1 imply that import exposure can explain 29.7% and 25.4% of the total decline in the population share of manufacturing self-employment during the first and second periods, respectively.[20] Similarly, the import exposure negatively impacts self-employment in the wholesale & retail sectors in both periods, and effects come entirely from the unincorporated group. Estimates in column 6 imply that Chinese import growth explains about 26% (31.2%) of the observed reduction in the likelihood of becoming unincorporated self-employed in wholesale & retail between 1990 and 2000 (2000 and 2014). Thus, these findings suggest that the negative impact on self-employment in these sectors is not driven by the Great Recession.[21]

Aslan and Kumar (2021), using data from the Survey of Income and Program Participation (SIPP) and adopting a DID framework, examine the impact of granting permanently normal tariff rates to China following its accession to the WTO in late 2001 on self-employment entry and exit rates in US local markets. They find that this policy change lowered the entry rate and increased the exit rate in more exposed sectors but increased entry by highly educated individuals in skill-intensive nontradable industries. Results in Table 5 indicate that increased Chinese import competition has had a negative impact on more exposed sectors (i.e., manufacturing and wholesale & retail) in both periods, and the effects during the 1990s are as strong as those

benchmark estimates represent a lower bound for the negative effect of the import competition.

[19]More precisely, I include $\beta_2 D \times \triangle IP_{jt}$ into equation (5), where D is a dummy variable that equals one for the second period. Coefficients on $\triangle IP_{z1}$ and $\triangle IP_{z2}$ in Panel C represent $\hat{\beta}$ and $\hat{\beta} + \hat{\beta}_2$, respectively.

[20]The average decadal change in Chinese import growth is 0.95 (1.15) percentage points during the first (second) period. The average *decadal* change in manufacturing self-employment is 0.16+0.19-(0.18+0.25)=-0.08 percentage points between 1990 and 2000, and [0.11+0.12-(0.16+0.19)]/1.4=-0.086 percentage points between 2000 and 2014. Thus, $0.025 \times 0.95/0.08 = 29.7\%$ and $0.019 \times 1.15/0.086 = 25.4\%$.

[21]As additional robustness, using Census decennial surveys and ACSs, I calculate the fraction of households in each CZ that were encumbered by a mortgage loan for 1990 and 2007. Including the mortgage variable in the model does not significantly impact results, i.e., estimates remain almost the same as the benchmark results. However, this variable's impact on self-employment is negative and statistically significant.

observed after 2000. In addition, results in Appendix Table A2 show some reallocation effects of trade in other nontradable sectors. Still, these positive effects only happened during the first period (i.e., before China entered the WTO). Moreover, results remain qualitatively the same if I only consider self-employment among college-educated individuals.

Finally, the benchmark specification included nine geographic dummies to control for region-specific trends in self-employment. However, there may be substantial variation across sub-regions within the same region. To address this issue, I extend the model by including state-fixed effects, and Panel B presents regressions results. Again, estimated coefficients mostly remain the same. As an additional analysis, I also consider regressions without any regional-fixed effects, and the results are mainly similar to those reported in Table 4.

6 Conclusion

Recent studies have documented significant adverse effects of increased Chinese import competition since the early 1990s on social and economic outcomes in the United States. This paper contributes to this literature by studying its impact on self-employed business owners, who constitute a significant portion of U.S. employment and play a crucial role in job dynamism and wealth generation. Many studies have already examined various factors that affect an individual's decision to become self-employed. However, the impact of trade on self-employment has attracted limited attention because of data and identification challenges that researchers have faced. This paper aimed to close this gap as well.

I find that Chinese import growth has had a sizable, negative impact on self-employment in more exposed sectors: manufacturing and wholesale & retail. Chinese import growth can explain more than 20 percent of the total decline in these sectors' self-employment. Further, reducing self-employment has played an important role in total employment adjustment in these sectors. Finally, my analysis indicates that Chinese import growth has not significantly affected self-employment in other sectors. In other words, the decline in self-employment in exposed sectors has not been compensated by any increase in either self-employment or wage employment in other sectors. Instead, the population share of unemployed workers and labor force non-participants has increased.

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Appendix: Additional Tables

Table A1: Effects of Chinese Import Growth on Self-employment in the U.S.

	OLS Estimates			IV Estimates		
Variable	All 1	Incorp 2	Unincp 3	All 4	Incorp 5	Unincp 6
$\triangle IP_{zt}$	−0.040*	−0.015	−0.024	−0.056	−0.008	−0.048
	(0.024)	(0.015)	(0.016)	(0.044)	(0.023)	(0.035)
Employment share of	0.006**	0.001	0.005**	0.008	0.001	0.007**
Manufacturing$_{-1}$	(0.003)	(0.002)	(0.002)	(0.005)	(0.002)	(0.003)
Share of ages 16-24	−0.038***	−0.027***	−0.010	−0.038***	−0.027***	−0.010
in population$_{-1}$	(0.014)	(0.007)	(0.010)	(0.014)	(0.007)	(0.010)
Share of ages 25-39	0.014	−0.017***	0.031***	0.014	−0.017***	0.032***
in population$_{-1}$	(0.011)	(0.005)	(0.009)	(0.011)	(0.005)	(0.009)
Share of ages 40-64	−0.061**	−0.042***	−0.019	−0.061**	−0.042***	−0.019
in population$_{-1}$	(0.025)	(0.012)	(0.015)	(0.025)	(0.012)	(0.015)
Share of employment	−0.039***	−0.009***	−0.031***	−0.040***	−0.008***	−0.031***
among women$_{-1}$	(0.007)	(0.003)	(0.005)	(0.008)	(0.003)	(0.005)
Share of blacks	−0.003	−0.004***	0.001	−0.003	−0.004***	0.001
in population$_{-1}$	(0.003)	(0.001)	(0.002)	(0.003)	(0.001)	(0.002)
Share of other race	−0.006	−0.000	−0.005	−0.006	−0.000	−0.005
in population$_{-1}$	(0.005)	(0.002)	(0.004)	(0.005)	(0.002)	(0.004)
Share of Hispanic	−0.004	−0.005***	0.001	−0.004	−0.005***	0.001
in population$_{-1}$	(0.003)	(0.001)	(0.003)	(0.003)	(0.001)	(0.003)
Share of Immigrants	0.012***	0.002	0.009***	0.012***	0.002	0.009***
in population$_{-1}$	(0.003)	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)
Share of clg-educated	0.003	0.004**	−0.001	0.003	0.004*	−0.001
in population$_{-1}$	(0.005)	(0.002)	(0.003)	(0.005)	(0.002)	(0.003)
Share of employment	0.016	0.001	0.014*	0.015	0.001	0.014
in routine occp$_{-1}$	(0.013)	(0.006)	(0.009)	(0.013)	(0.006)	(0.009)
Avg. offshorability	0.002***	0.001***	0.001	0.002***	0.001***	0.001*
of occp$_{-1}$	(0.001)	(0.000)	(0.001)	(0.001)	(0.000)	(0.001)

Notes: All regressions include region- and period-fixed effects, and are weighted by the start-of-period CZ working-age population. Robust standard errors in parentheses are clustered at the CZ level, and ***, **, and * represent statistical significance at the 1%, 5%, and 10% level, respectively.

Table A2: Effects of Chinese Import Growth on Self-employment: Robustness

	Other Services			Construction & Mining		
	All	Incorp	Unincp	All	Incorp	Unincp
Variable	1	2	3	4	5	6
Panel A. Pre-trends						
$\triangle IP_{zt}$	−0.001	0.009	−0.010	0.004	−0.006	0.010
	(0.032)	(0.018)	(0.023)	(0.021)	(0.009)	(0.019)
Panel B. Spillovers						
$\triangle IP_{zt}$	−0.007	−0.002	−0.006	−0.006	−0.005	−0.000
	(0.028)	(0.016)	(0.021)	(0.020)	(0.009)	(0.018)
$\triangle IP^{s}_{zt}$	0.024	0.003	0.029	−0.010	0.000	−0.010
	(0.043)	(0.016)	(0.031)	(0.039)	(0.012)	(0.032)
Panel C. Great Recession						
$\triangle IP_{z1}$	0.099*	0.040	0.059	0.076*	0.003	0.073**
	(0.060)	(0.030)	(0.046)	(0.045)	(0.021)	(0.036)
$\triangle IP_{z2}$	0.002	0.001	0.001	−0.000	−0.005	0.004
	(0.028)	(0.016)	(0.021)	(0.019)	(0.009)	(0.017)
Panel D. State-fixed effects						
$\triangle IP_{zt}$	−0.024	−0.002	−0.021	−0.003	−0.005	0.002
	(0.034)	(0.016)	(0.024)	(0.021)	(0.009)	(0.017)

Notes: All regressions include start-of-period CZ-level controls, region- and period-fixed effects, and are weighted by the start-of-period CZ working-age population. Robust standard errors in parentheses are clustered at the CZ level, and ***, **, and * represent statistical significance at the 1%, 5%, and 10% level, respectively.