U.S. Job Flows and the China Shock

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Abstract

International trade exposure affects job creation and destruction along the intensive margin (job flows due to expansions and contractions of firms' employment) as well as along the extensive margin (job flows due to births and deaths of firms). This paper uses 1992-2010 yearly employment data from the *universe* of U.S. establishments to construct job flows at both the industry and commuting-zone levels, and then estimates the impact of import exposure from China on each job-flow type. We find that the 'China shock' affects U.S. employment mainly through deaths of establishments. At the commuting-zone level, we find evidence of job reallocations from the Chinese-competition exposed sector to the nonexposed sector. This happens in spite of a reduction in the nonexposed sector's gross rate of job creation because of an even greater reduction in the gross rate of job destruction.

JEL Classification: F14, F16

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> But for too many of our citizens, a different reality exists:... rusted-out factories scattered like tombstones across the landscape of our nation...
>
> President Donald Trump, Inaugural Address, January 20, 2017

1 Introduction

Net employment changes conceal large changes in gross job flows. Using the universe of establishments of the U.S. from the National Establishment Time-Series (NETS) database, Figure 1 shows the ratio of three-year net employment changes (gross job creation − gross job destruction) to total gross job reallocations (gross job creation + gross job destruction) for manufacturing, non-manufacturing, and all industries from 1992-1995 to 2009-2012. In absolute value, the averages of these ratios are only 0.17 for manufacturing, 0.15 for non-manufacturing, and 0.14 for all industries, showing a stark contrast between net employment changes and actual job turnover in the U.S. economy. Hence, to properly assess the costs and benefits of any shock that affects U.S. labor markets, it is crucial to understand not only its net employment effects but also its impact on gross job flows.[1]

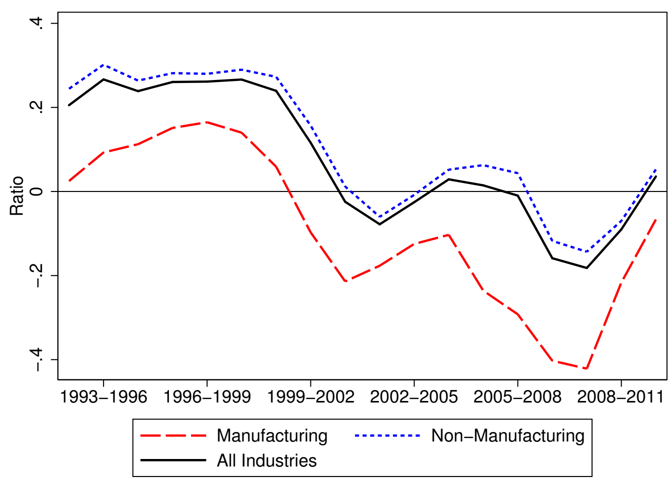


Figure 1: Ratio of U.S. net employment changes to total gross job reallocations (three-year changes)

The objective of this paper is to estimate the impact of the so-called 'China shock'—the dramatic increase in Chinese import penetration in the U.S. since the 1990s—on each of the components of U.S. job flows at both the industry and commuting-zone levels. We decompose gross job creation into its births and expansions components, and gross job destruction into its deaths and contractions

[1] For example, a shock may have near zero net employment effects but large increases in the rates of job creation and destruction. More job creation and destruction could potentially increase costs of adjustment for both firms and workers, but this would be missed by an analysis based on net employment changes.

components. To guide our empirical exercise we build on the comprehensive work of Acemoglu, Autor, Dorn, Hanson, and Price (2016)—AADHP hereafter—who in addition to a local-labor-markets analysis of the China shock on net employment changes as in Autor, Dorn, and Hanson (2013), perform an industry-level analysis that considers manufacturing and non-manufacturing industries, as well as upstream and downstream linkages across industries.

In addition to providing a more complete picture of U.S. employment dynamics after the China trade shock, our focus on job flows is within the scope of modern models of trade with heterogeneous firms. Indeed, the seminal models of Bernard, Eaton, Jensen, and Kortum (2003) and Melitz (2003) have clear-cut implications for the effects of trade liberalization on gross job creation and destruction. For example, in their Ricardian model simulation of a 5 percent decline in trade barriers, Bernard, Eaton, Jensen, and Kortum (2003) obtain an increase of 1.5 percent in the rate of gross job creation (from plants that expand) and an increase of 2.8 percent in the rate of job destruction (from plants that contract or die), for a net employment decline of 1.3 percent. Bernard, Redding, and Schott (2007) tackle the job turnover implications of a Heckscher-Ohlin augmented version of the Melitz model. After trade liberalization, the standard Melitz model predicts gross job creation from expanding exporting firms and new entrants, and gross job destruction from the death and contraction of less productive firms. In their version, Bernard, Redding, and Schott (2007) obtain that the net employment effect is positive in the industries in which a country has comparative advantage, and is negative otherwise.

Our empirical analysis shows that U.S. net job destruction due to the China shock is mainly driven by an increase in the rate of job destruction due to deaths of establishments. This result appears not only for the direct effect of Chinese import penetration, but also for its upstream and downstream effects (the effects that flow from buying industries to a selling industry, and vice versa). The analysis of local labor markets shows that the decline in the employment-to-population ratio in the (Chinese-imports) exposed sector—after an increase in Chinese import penetration—is the result of increases in the gross rates of job destruction by both deaths and contractions, but the effect of deaths is more important.

This paper also finds novel evidence of job reallocation effects from exposed sectors to nonexposed sectors at the commuting-zone level. A nonexposed sector is indirectly affected by the China shock through job reallocation effects and aggregate demand effects. Given that these indirect channels have opposite effects on the nonexposed sector's employment, it is not surprising that previous studies have not found evidence of them when looking at net employment changes (they cancel each other out). This paper is not only able to find statistically significant evidence of *net* job reallocation effects, but by focusing on all the job flows components, it is also able to capture evidence of these counteracting indirect effects.

Highlighting the benefits of looking at job flows, we find that the positive net job reallocation from the exposed sector to the nonexposed tradable sector happens in spite of a reduction in the sector's gross rates of job creation (for both births and expansions). This is only possible because of an even greater reduction in the sector's gross rates of job destruction (for both deaths and contractions). With firms hiring and being born at a lower pace (due to aggregate demand shocks), but firms dying and contracting at an even lower rate, the net result is an increase in the employment-to-population ratio in the nonexposed tradable sector. We also find strong and significant evidence of an increase in the rate of job creation by births in the nonexposed nontradable sector, which suggest job reallocations from the exposed sector. However, the net effect in that sector is insignificant due to large but imprecise job destruction effects.

This paper highlights the important role that deaths of establishments play in U.S. net job destruction as a consequence of the China shock. This result is useful to better gauge the associated benefits and costs of increased trade with China. On the one hand, if dying firms are unproductive or obsolete, the China shock may simply be accelerating the process of creative destruction, which may lead to productivity increases and is a source of benefits (see, for example, Davis, Haltiwanger, and Schuh, 1996).[2] On the other hand, a net employment decline due to an increase in job destruction by deaths of establishments is likely to be more costly than a decline due to a reduction in the rate of expansions or births. Along these lines, Klein, Schuh, and Triest (2003) refer to the destruction of human capital and search and relocation costs associated with higher rates of job destruction, as opposed to less pervasive effects of a reduction in the rate of job creation.

This paper is organized as follows. Section 2 describes the NETS data, and section 3 provides a brief overview of the evolution of job flows. Section 4 presents our empirical analysis for the impact of Chinese import penetration on U.S. job flows, starting with the industry-level analysis and then moving to the local-labor-markets approach. In section 5 we present a falsification exercise that explains the discrepancies in predicted employment changes between our three-year difference estimation and the long-difference estimation of AADHP. Lastly, section 6 concludes.

2 Job Flows Data

This paper constructs job flows from the National Establishment Time Series (NETS) database, which reports yearly data on employment, sales, industry, location, year of entry, and year of exit,

[2] These benefits would be reduced if the China shock also negatively affects the rate of births. A couple of our specifications find a significant negative relationship between births and Chinese exposure.

for the universe of establishments in the U.S. from 1992 to 2012.

As described by Neumark, Zhang, and Wall (2007) and Neumark, Wall, and Zhang (2011), who provide an exhaustive assessment of the NETS database, the NETS database reports higher employment levels than the BLS's Quarterly Census of Employment and Wages (QCEW). They attribute the difference to the NETS better coverage of small establishments, as well as to the fact that the BLS data excludes self-employed workers and proprietors. Comparing the NETS data against the Current Employment Statistics (CES) database of the BLS, Neumark, Wall, and Zhang (2011) find that their correlation at the county-by-industry level is 0.99. Also, focusing on biotech companies, they show that NETS is able to detect 88 percent of new companies within a year. Their assessment also reports some employment stickiness in the NETS data from year to year, and argue that three-period differences are sufficient to avoid most of this problem. Following their suggestion, this paper calculate job flows using three year changes.

Haltiwanger, Jarmin, and Miranda (2013) compare the Longitudinal Business Database (LBD) of the Census Bureau against the NETS database and report that while the LBD contains about 7 million establishments in a typical year, NETS contains about 14.7 million establishments in a typical year. They attribute the difference to the inclusion of nonemployer businesses in NETS, while the LBD includes establishments if they have at least one employee. To avoid nonemployer businesses, we restrict our NETS data to establishments that had 5 or more employees in at least one year in our sample.

AADHP use employment data from the County Business Patterns (CBP) of the Census Bureau. After carefully following AADHP's industry codes, we create a version of the NETS database that matches their industry classification. There are 392 industries at the four-digit SIC level, and 87 non-manufacturing industries. At the industry level, the correlation between employment levels of the CBP database and our NETS database is 0.93, while at the commuting-zone level the correlation is 0.99. On average, our NETS data reports about 10 percent more employment for all industries, and 19 percent more employment for manufacturing industries.

3 A Brief Description of U.S. Job Flows

We calculate three-year job flows from our NETS dataset as follows. Let L_{ijt} denote total employment in commuting zone i, in industry j, at year t. Hence, it always holds that

$$L_{ijt} - L_{ijt-3} \equiv \underbrace{(B_{ijt} - D_{ijt})}_{\text{Extensive margin}} + \underbrace{(E_{ijt} - C_{ijt})}_{\text{Intensive margin}}, \tag{1}$$

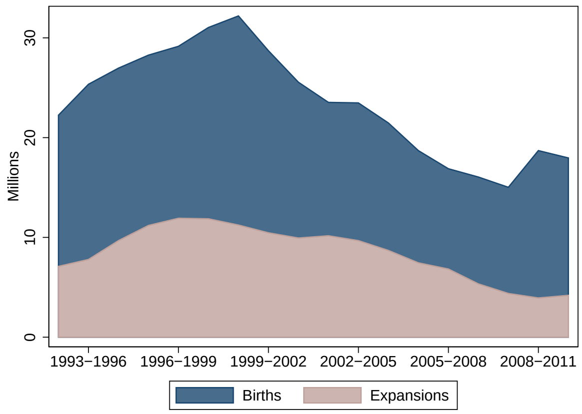
where $L_{ijt} - L_{ijt-3}$ is the net employment change between $t-3$ and t, B_{ijt} is the employment change due to births of establishments, D_{ijt} is the employment change due to deaths of establishments, E_{ijt} is the employment change due to expansions of establishments, and C_{ijt} is the employment change due to contractions of establishments. After obtaining the industry-commuting zone level data, we can aggregate at the industry level, or at the commuting zone level. Identity (1) ignores the *relocation margin* of employment, *i.e.* move-ins and move-outs of establishments across commuting zones. However, as shown by Neumark, Zhang, and Wall (2007) using the NETS data, the relocation margin is largely insignificant, so we exclude it from the computations to sharpen the focus on the four job-flow drivers described above.[3]

Figure 2 shows four metrics for the three-year changes in job flows across all industries from 1992 to 2012. The first metric shows job creation due to births and expansions (Figure 2a), the second shows the average share of job creation due each to births and expansions (Figure 2b), the third shows job destruction due to deaths and contractions (Figure 2c), and the fourth and last shows the average share of job destruction due each to deaths and contractions (Figure 2d). Unsurprisingly, Figure 2a shows a peak for births toward the end of the 1990s, and Figure 2c shows two peaks for deaths around 2001-2004 and 2008-2011. Figures 2b and 2d show that births and deaths dominate the job creation and destruction process, respectively.

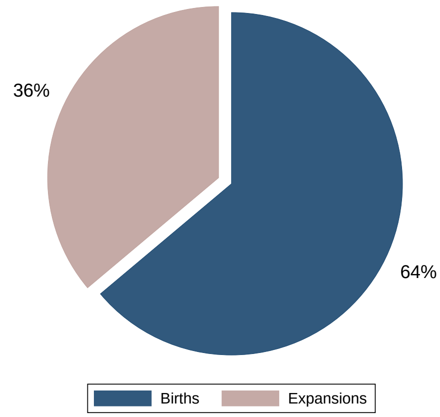
Table A.1 in the Appendix gives more detail on these job flows. Total jobs grew consistently over the 1990s, but job growth since 2000 was more anemic, with net job destruction occurring over 2000-2003, 2001-2004, 2002-2005, and then again in 2005-2008, 2006-2009, 2007-2010, and 2008-2011, coinciding with the bursting of the Dotcom Bubble and the Great Recession. Prior to 2000, births were far and away the largest single factor in job flows, but since then, deaths took over as the most important source of job reallocation. Figure 3 illustrates the patterns in Table A.1 by showing the evolutions of the net extensive margin of employment (Births − Deaths), the intensive margin of employment (Expansions − Contractions), and overall net job creation. Note that the intensive margin is a source of job creation for the U.S. economy during the entire period, but the extensive margin is the main driver of overall net effects.

Breaking out the job flows by industry groupings, Figure A.1 in the Appendix shows the composition and evolution of job creation and destruction in the manufacturing sector. Figure A.1a shows a steady decline in job creation since the early 2000s leading to an all-time low in 2007-2010, followed by a sharp increase in births of new establishments post-2010. Unlike in the overall

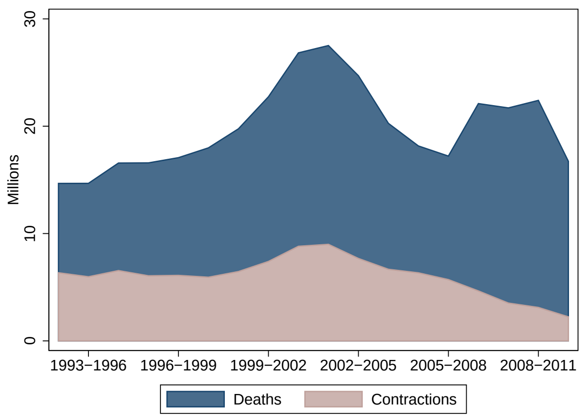
[3]The NETS dataset reports the first and last year an establishment was in business, irrespective of whether it relocated. We use these variables to report when a firm was born and died, so that a business relocation cannot be confused with a birth or death.



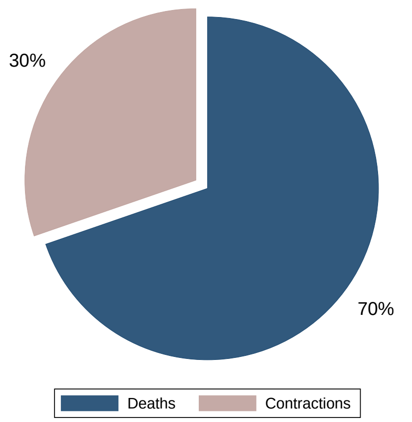
(a) Job creation decomposition



(b) Job creation shares (average)



(c) Job destruction decomposition



(d) Job destruction shares (average)

Figure 2: Employment creation and destruction in all industries (three-year windows)

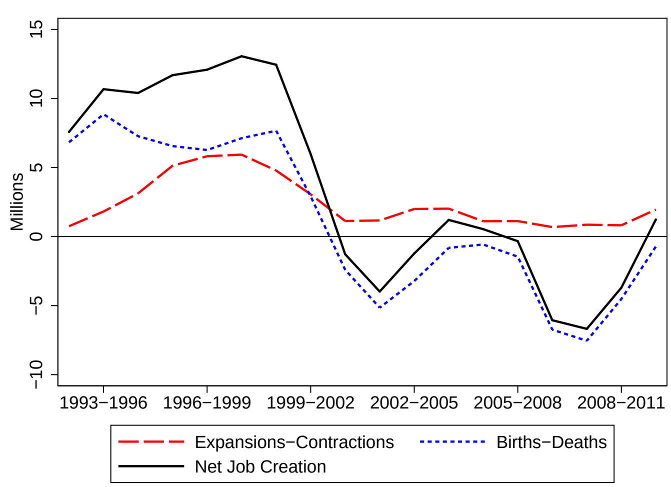
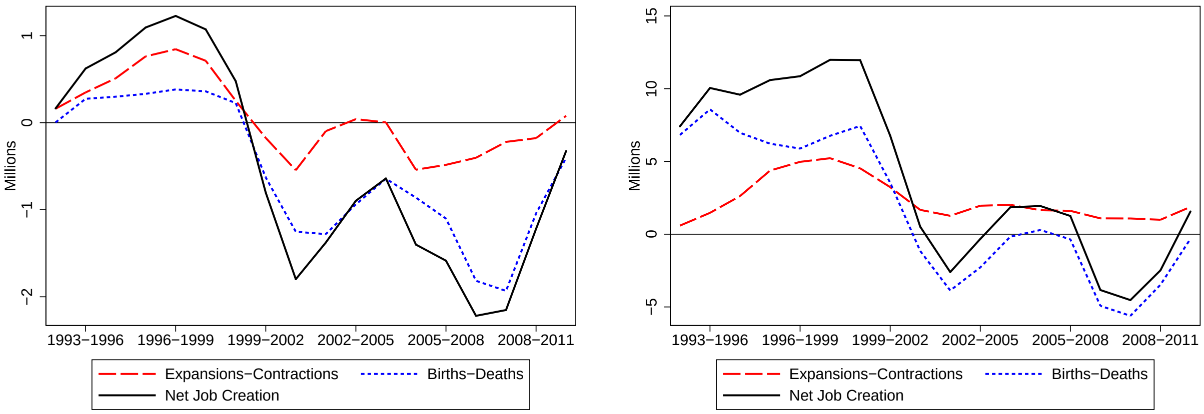


Figure 3: Net employment changes in all industries



(a) Manufacturing industry

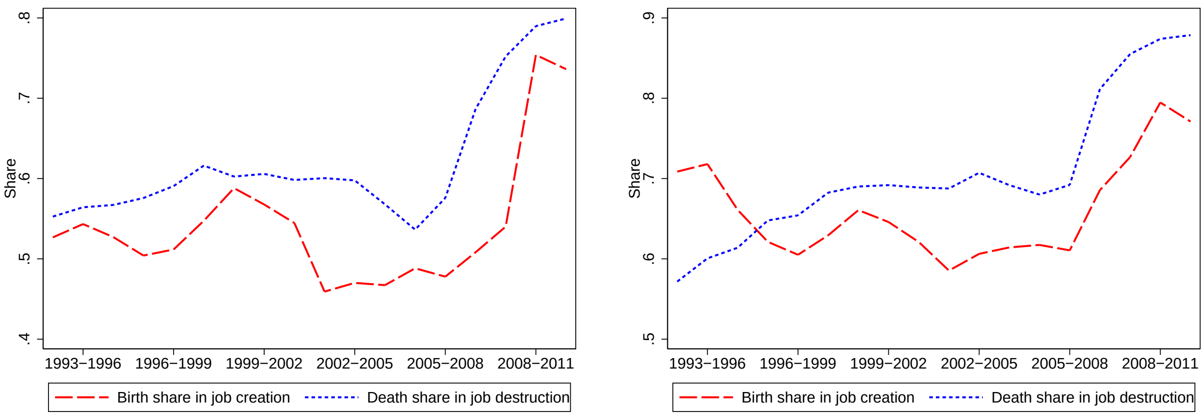
(b) Non-manufacturing industry

Figure 4: Net employment changes by industry

economy, Figure A.1b shows that births and expansions had on average an almost equal share in job creation. In Figure A.1c, we can see that after a sharp increase starting from 1996-1999, job destruction reached its peak in 2000-2003. This was followed by a sharp decline, driven mostly by decreasing contractions of establishments. Figure A.1d shows that 62 percent of job destruction is accounted for by deaths of establishments; hence, the extensive margin dominates in job destruction in the manufacturing sector.

Figure 4a shows net employment changes at the intensive margin, the extensive margin, and overall for manufacturing industries. The net effect at the intensive margin of employment was positive until 1998-2001, after which it briefly became positive again (although close to zero) in 2002-2005 and 2003-2006, and again in 2009-2012. The extensive margin of employment remained negative since 1999-2002, reaching an all-time low in 2007-2010. In contrast to the overall economy, and driven strongly by establishments' deaths, net job creation in manufacturing never returned to being positive after the 2001 recession—manufacturing net job losses progressed steadily in the post-2000 period, reaching their nadir during the Great Recession.

Figures A.2 in the Appendix and Figure 4b show why the overall-economy job picture and the manufacturing job picture exhibit largely different trends: the non-manufacturing sector's trends dominate the job flow behavior of the economy as a whole. As in the overall economy, Figure A.2a shows that job creation in the non-manufacturing sector reached its peak in 1998-2001, declined thereafter, and rebounded since 2008-2011. Figure A.2c shows an increase in job destruction from the early 1990s until a peak in 2001-2004 (mostly due to deaths), followed by a sharp decline until 2005-2008, and then followed by another sharp increase during the Great Recession. Contractions



(a) Manufacturing industry

(b) Non-manufacturing industry

Figure 5: Share of births and deaths in job creation and detruction

in existing establishments, however, saw a steady decline since 2001-2004, so that job destruction during the Great Recession was largely driven by increases in deaths.

Figures A.2b and A.2d also show that the overall economy is largely driven by what happens in the non-manufacturing sector, as births overall have an average share of 64 percent in job creation, while births in the non-manufacturing sector make up an average share of 66 percent. Likewise, deaths make up 70 percent of job destruction overall, and 71 percent of job destruction in non-manufacturing. Thus, the extensive margin clearly dominates for both job creation and destruction in non-manufacturing industries. As in the overall economy, Figure 4b shows that for non-manufacturing industries, the net intensive margin was positive throughout our period of study. The net extensive margin declines from 7.4 million in 1998-2001 to negative 1.2 million in 2000-2003, and remains negative thereafter with the exception of the 2004-2007 period. Again, net job creation moves closely with the extensive margin.

The last stylized fact we present is that the relative importance of the extensive margin processes grew sharply after the Great Recession. For both the manufacturing and non-manufacturing sectors, Figures 5a and 5b show a strong increase in the death share in job destruction starting from 2005-2008. As well, the birth share in job creation also experienced a steady increase starting from 2005-2008. Hence, in the post-Great Recession period, the extensive margin of employment accounted for a much larger share in total job reallocation than it did previously, speaking again to the importance of using the NETS dataset to tease out changes in the intensive and extensive margins.

4 Empirical Analysis

Our exercise builds on AADHP, who provide the most comprehensive analysis for the impact of the China shock on U.S. net employment changes. AADHP focus on three periods, 1991-1999, 1999-2011, and 1999-2007, using stacked differences of the first two periods as a benchmark, and excluding the Great Recession years (2008-2011) as a robustness check in some specifications. In our case, working with such long differences is not an option because longer time periods artificially increase the importance of the extensive margin of employment, and would miss substantial job creation and destruction on both the intensive and extensive margins.[4]

Therefore, we work instead with a panel of non-overlapping three-year differences. To remain as close as possible to the periods analyzed by AADHP, we start in 1992 (our first year with NETS data) and end in 2010. Hence, our benchmark specifications contain six periods, 1992-1995, 1995-1998, 1998-2001, 2001-2004, 2004-2007, 2007-2010. Some specifications split the panel in 1998, and some others exclude the last period. For comparison purposes, online Appendix B presents a full replication of AADHP's main results using their CBP data as well as our NETS data, but starting in 1992 instead of 1991.

We start by looking at the responses of manufacturing industry-level employment to Chinese import exposure. Then we expand the industry-level analysis to include non-manufacturing industries and upstream and downstream linkages across industries. Finally, we follow a local-labor-markets analysis by calculating job flows for exposed and non-exposed industries at the commuting-zone level.

4.1 Manufacturing Employment and the China Shock

This section looks exclusively at manufacturing employment responses to Chinese import exposure. Hence, we aggregate job flows across all commuting zones for each of the 392 manufacturing industries. To measure Chinese import exposure, we use the exact measure of AADHP, who define Chinese import penetration in industry j at year t as

$$IP_{jt} = \frac{\mathbb{M}^C_{jt}}{\mathbb{Y}_{j91} + \mathbb{M}_{j91} - \mathbb{X}_{j91}}, \tag{2}$$

where $\mathbb{M}^C_{jt}$ are real U.S. imports from China in industry j at year t, and $\mathbb{Y}_{j91} + \mathbb{M}_{j91} - \mathbb{X}_{j91}$ is real domestic absorption of U.S. industry j (the industry's real output, plus real imports, less real

[4] For example, for the twelve-year difference from 1999 to 2011, expansions and contractions of employment would be calculated only for those firms that are active in both periods, job flows from deaths would be calculated as the sum of 1999 employment of all the firms that were active in that year but no longer alive in 2011, and job flows due to births would be the sum of 2011 employment of all the firms that are active in that year but that did not exist in 1999. Hence, we would be missing all the employment action of the survivors in the middle of the period, but more importantly, we would be missing all those firms that were born born after 1999 but that never made it to 2011.

exports) in 1991.[5]

Similar to AADHP, we use the operator "Δ" to denote the annualized change of a variable times 100. Hence, in our exercise with three-year differences, for any variable X we define ΔX_t as

$$\Delta X_t = \frac{100}{3}\left(X_t - X_{t-3}\right),$$

which is simply referred to as the "annual change in X". Thus, the specification to study the impact of Chinese import exposure on U.S. manufacturing net employment is

$$\Delta \ln L_{jt} = \alpha_t + \beta \Delta IP_{jt} + \gamma Z_j + \varepsilon_{jt}, \tag{3}$$

where for industry j from $t-3$ to t, $\Delta \ln L_{jt}$ is the annual change in log employment, and ΔIP_{jt} is the annual change in Chinese import penetration. The term α_t denotes a time fixed effect, Z_j is a vector of time-invariant industry-level controls, and ε_{jt} is the error term.

The annual change in industry j's log employment can be split into its job-flow components. In particular, given that the employment change in industry j from year $t-3$ to year t is due to establishments' expansions, contractions, births and deaths, we can write $\Delta \ln L_{jt}$ as

$$\Delta \ln L_{jt} \equiv b_{jt} - d_{jt} + e_{jt} - c_{jt},$$

where b_{jt} denotes the contribution of births to the industry's employment log change, and the same for deaths (d_{jt}), expansions (e_{jt}), and contractions (c_{jt}). We calculate b_{jt} as

$$b_{jt} \equiv \frac{100}{3}\left(\frac{B_{jt}}{\Delta L_{jt}}\right)\Delta \ln L_{jt},$$

with analogous expressions for d_{jt}, e_{jt}, and c_{jt}.

Thus, for each job flow we estimate

$$F_{jt} = \alpha_t^F + \beta^F \Delta IP_{jt} + \gamma^F Z_j + \varepsilon_{jt}^F, \tag{4}$$

where $F_{jt} \in \{b_{jt}, d_{jt}, e_{jt}, c_{jt}, b_{jt} - d_{jt}, e_{jt} - c_{jt}, b_{jt} + e_{jt}, d_{jt} + c_{jt}\}$. Note that we also estimate the impact of Chinese import exposure on the net extensive margin of employment, $b_{jt} - d_{jt}$, the net intensive margin of employment, $e_{jt} - c_{jt}$, gross job creation, $b_{jt} + e_{jt}$, and on gross job destruction, $d_{jt} + c_{jt}$. By construction, linear combinations of the import-exposure coefficients from (4) must be equivalent to the import-exposure coefficient from the regression of the log-employment annual change in (3). That is, it must always be the case that

$$\beta \equiv \beta^b - \beta^d + \beta^e - \beta^c \equiv \beta^{b-d} + \beta^{e-c} \equiv \beta^{b+e} - \beta^{d+c}.$$

[5] Nominal imports and exports data is gathered from the United Nations COMTRADE database, and nominal output is given by the value of shipments from the NBER productivity database. To calculate real values, AADHP use as deflator the BEA's personal consumption expenditure price index (PCE).

Table 1 presents our industry-level results for the manufacturing sector. All regressions include 392 manufacturing industries, time fixed effects, and are weighted by 1992 employment, but differ in their period coverage and estimation method. Each estimated coefficient represents the Chinese import-exposure outcome of a regression, with standard errors clustered at the three-digit SIC level. The first row shows $\hat{\beta}$ from the estimation of (3), while the following rows show $\hat{\beta}^F$ from the estimation of (4), for $F \in \{b, d, e, c, b-d, e-c, b+e, d+c\}$. For comparison against NETS's net-employment results, we also estimate equation (3) using AADHP's CBP data. The instrumental variables (IV) regressions use AADHP's instrument, which is defined as ΔIP^*_{jt}, where

$$IP^*_{jt} = \frac{\mathbb{M}^{C*}_{jt}}{\mathbb{Y}_{j88} + \mathbb{M}_{j88} - \mathbb{X}_{j88}}$$

is the sum of eight high-income countries' imports from China, $\mathbb{M}^{C*}_{jt}$, relative to 1988 U.S. real domestic absorption.[6]

Columns 1 and 2 use all the periods but differ in their estimation method. Although OLS and IV results are similar in sign and statistical significance, the IV coefficients are about twice as large as the OLS coefficients. For the rest of the paper we focus exclusively on IV estimation results. As in AADHP, an increase in Chinese import penetration is associated with net job destruction. The most important result in column 2, however, comes from the analysis of the job-flow coefficients. Note that only the increase in job destruction by deaths significantly matters to explain the result on net employment growth. The coefficients on births and expansions are very close to zero, and the coefficient on contractions is not statistically significant. The estimated share of deaths in total Chinese-induced job reallocation, represented with $\hat{\delta}$ and calculated as

$$\hat{\delta} \equiv \frac{|\hat{\beta}^d|}{|\hat{\beta}^b| + |\hat{\beta}^d| + |\hat{\beta}^e| + |\hat{\beta}^c|}, \tag{5}$$

is 0.71. Columns 3, 5, and 6 show that the results barely change if we reduce the sample to exclude the Great Recession, or if we exclude data before 1998.

Column 4 uses only data from 1992 to 1998 and shows that, in spite of non-significant net job destruction from an increase in Chinese import exposure during that period, there are statistically significant increases in the rates of job creation by births and expansions, and in the rates of job destruction by deaths and contractions. This is a typical example on how net employment changes conceal large changes in job flows: there is substantial job creation but also large job destruction, with total Chinese-induced job reallocation ($|\hat{\beta}^b| + |\hat{\beta}^d| + |\hat{\beta}^e| + |\hat{\beta}^c| = 1.64$) being more than 9

[6] By using Chinese exports to other countries as instrument, AADHP argue that their IV estimation takes care of U.S. domestic shocks that increase U.S. demand for Chinese imports and which may then cause a misidentification of the Chinese supply shock.

Table 1: Effects of Chinese Import Exposure on Manufacturing Employment

	OLS	IV Estimation				
	1992-2010	**1992-2010**	**1992-2007**	**1992-1998**	**1998-2010**	**1998-2007**
	(1)	(2)	(3)	(4)	(5)	(6)
Net employment growth	-0.15***	-0.30**	-0.28**	-0.18	-0.31**	-0.29**
	(0.06)	(0.13)	(0.12)	(0.41)	(0.13)	(0.12)
Job Flows						
Births	0.01	0.01	0.01	0.39*	0.00	-0.00
	(0.02)	(0.03)	(0.02)	(0.20)	(0.03)	(0.02)
Deaths	0.14***	0.25**	0.21**	0.55**	0.24**	0.20**
	(0.05)	(0.10)	(0.09)	(0.28)	(0.10)	(0.09)
Expansions	0.02	0.01	-0.01	0.34**	0.00	-0.02
	(0.02)	(0.03)	(0.02)	(0.17)	(0.03)	(0.02)
Contractions	0.04	0.08	0.07	0.37*	0.07	0.06
	(0.02)	(0.06)	(0.05)	(0.20)	(0.06)	(0.05)
Net extensive margin	-0.13***	-0.24**	-0.20**	-0.16	-0.24**	-0.21**
	(0.05)	(0.10)	(0.09)	(0.27)	(0.10)	(0.09)
Net intensive margin	-0.02	-0.06	-0.08	-0.02	-0.07	-0.08
	(0.02)	(0.06)	(0.05)	(0.31)	(0.06)	(0.05)
Job creation	0.03	0.03	0.00	0.73**	0.00	-0.02
	(0.03)	(0.05)	(0.03)	(0.28)	(0.05)	(0.03)
Job destruction	0.18***	0.33**	0.29**	0.91***	0.31**	0.26**
	(0.06)	(0.13)	(0.12)	(0.33)	(0.13)	(0.12)
CBP data:						
Net employment growth	-0.39***	-0.66**	-0.74**	-0.47	-0.67**	-0.75**
	(0.12)	(0.29)	(0.30)	(1.02)	(0.29)	(0.30)
Observations	2,352	2,352	1,960	784	1,568	1,176

Notes: This table reports $\hat{\beta}$ and $\hat{\beta}^F$ from the estimation of specifications (3) and (4). All regressions include time fixed effects (not reported) and are weighted by 1992 employment. The net growth regression with CBP data is weighted by 1992 CBP employment and is reported for the purpose of comparison with the net growth regression with NETS data. Standard errors (in parentheses) are clustered at the three-digit industry level. The coefficients are statistically significant at the *10%, **5%, or ***1% level.

times larger than the net effect. During this period, the share of deaths in total Chinese-induced job reallocation is only 0.33.

Comparing the net growth results from the NETS data in the first row against the net growth results from the CBP data of AADHP in the last row, we see that they are similar in sign and statistical significance but they differ in their magnitudes. In all columns, the $\hat{\beta}$'s from CBP are between 2.2 and 2.6 times larger in magnitude than the $\hat{\beta}$'s from NETS. This does not necessarily imply that predicted employment losses are larger when using the CBP data, as NETS reports in general more employment than CBP. For an appropriate comparison, we follow Autor, Dorn, and Hanson (2013) and AADHP and calculate 1992-2010 predicted employment changes as

$$\textit{Predicted employment change} = \sum_j \left[1 - e^{-\hat{\beta}\rho(IP_{j10} - IP_{j92})}\right] L_{j10}, \tag{6}$$

where $\hat{\beta}$ is either the NETS or CBP coefficient from the net growth regression in column 2, L_{j10} is either the NETS or CBP employment in industry j in 2010, and $\rho = 0.46$ is the partial $R-$squared from the first-stage regression of ΔIP_{it} on ΔIP^*_{it}.

Using (6), the predicted net employments losses associated to Chinese import exposure from 1992 to 2010 are 190,000 jobs when using the NETS data, and 249,000 jobs when using the CBP data. Thus, net employment losses are 24 percent less with the NETS data. If we exclude the Great Recession years, the net growth coefficients from column 3 imply net losses of 193,000 jobs with the NETS data and 360,000 jobs with the CBP data—net job losses from NETS are 46 percent smaller. This discrepancy may be due to remnant effects of the NETS data stickiness described above, or simply due to idiosyncratic characteristics of each dataset.

Another contrasting result regarding the estimates for β from the CBP data, is their lower magnitude when compared to the original results in AADHP. The Chinese import exposure coefficients for the 1991-2011 and 1991-2007 IV regressions in AADHP (the closest to our net growth regressions in columns 2 and 3) are -1.30 and -1.24, with predicted losses of 837,000 and 853,000 manufacturing jobs. If we adjust their regressions to start in 1992 (along with 1992 employment weights), the coefficients barely change to -1.33 and -1.26, with predicted job losses of 826,000 and 842,000. Hence, from their long-difference specifications, AADHP predict between 2.3 and 3.3 times more Chinese-induced job losses than with a similar specification with three-year differences.[7] As an explanation for this disparity, section 5 shows that the long-difference specifications likely confound past employment changes with future changes in import exposure.

[7] Note that the 826,000 job losses from the long-difference AADHP regression are from 1992 to 2011, while the 249,000 job losses from the three-year difference CBP regression are from 1992 to 2010. The extra year in the first case, however, is unlikely to make a big difference in predicted losses.

As robustness checks, Table 2 builds on columns 2 and 3 from Table 1 by adding industry-level time invariant controls. These AADHP controls are: *(i)* ten one-digit manufacturing sector dummies (*manufacturing sector controls*), *(ii)* 1991 levels of the share of production workers in total industry employment, the log average wage, and the ratio of capital to value-added, as well as 1990 levels of the share of computer investment in total investment, and the share of high-tech equipment in total investment (*production controls*), *(iii)* 1976-91 changes in the log average wage and in the share of the industry's employment in total U.S. employment (*pretrend controls*), and *(iv)* industry fixed effects.

Columns 1 to 5 indicate that across different combinations of industry-level controls, the coefficient for the net growth regression remains statistically significant and between -0.31 and -0.22. The results on job flows give the same story: job destruction by death is the main (and only statistically significant) driver of the net employment decline associated with Chinese import exposure during the 1992-2010 and 1992-2007 periods. Job destruction by death of establishments explains between 57 percent (in column 5) and 73 percent (in column 3) of total Chinese-induced job reallocation in the U.S. manufacturing industry.

In comparison, the import exposure coefficients in the net growth regressions using 1992-2010 CBP data become closer to the NETS net coefficients when one-digit manufacturing sector controls are added, but they become statistically insignificant. However, column 5 shows that if we exclude the Great Recession period, the CBP coefficient is smaller in magnitude but regains its statistical significance. An important caveat is the outcome in column 6, which shows everything losing statistical significance when industry-level fixed effects are added, suggesting important industry-level trends.[8]

4.2 Upstream and Downstream Sectoral Linkages

This section considers input-output linkages across industries. As in Pierce and Schott (2016), AAHDP argue that upstream and downstream linkages across industries can increase or decrease the impact of the China shock on U.S. employment. Upstream linkages refer to effects flowing upward from a purchasing industry to a selling industry: if an industry is negatively affected by the China shock, it will decrease its purchases and hence negatively affect providing industries. Hence, it is expected that an increase in upstream Chinese exposure drives down an industry's employment. Downstream linkages, on the other hand, refer to effects flowing downward from a selling industry to a purchasing industry: if an industry contracts due to higher Chinese exposure,

[8]In their long-difference fixed-effects regression, AADHP report a net coefficient that is smaller by more than half than their benchmark, but is still statistically significant.

Table 2: IV Estimation of the Effects of Chinese Import Exposure on Manufacturing Employment with Industry-Level Controls

	(1)	(2)	(3)	(4)	(5)	(6)
Net employment growth	-0.25**	-0.29**	-0.31**	-0.24*	-0.22**	-0.09
	(0.12)	(0.13)	(0.13)	(0.12)	(0.11)	(0.08)
Job flows						
Births	-0.01	0.00	-0.01	-0.02	-0.02	-0.03
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)
Deaths	0.18*	0.21**	0.24**	0.16*	0.12*	0.06
	(0.09)	(0.10)	(0.10)	(0.09)	(0.07)	(0.08)
Expansions	-0.00	0.00	0.01	-0.01	-0.02	0.00
	(0.03)	(0.03)	(0.03)	(0.03)	(0.02)	(0.03)
Contractions	0.06	0.09	0.07	0.05	0.05	0.00
	(0.06)	(0.07)	(0.06)	(0.06)	(0.05)	(0.05)
Net extensive margin	-0.19**	-0.20**	-0.25**	-0.18*	-0.15*	-0.09
	(0.09)	(0.10)	(0.10)	(0.09)	(0.08)	(0.09)
Net intensive margin	-0.06	-0.08	-0.06	-0.06	-0.08	-0.00
	(0.06)	(0.07)	(0.06)	(0.07)	(0.06)	(0.06)
Job creation	-0.01	0.00	0.00	-0.03	-0.05**	-0.03
	(0.04)	(0.04)	(0.04)	(0.04)	(0.02)	(0.03)
Job destruction	0.24**	0.29**	0.31**	0.21*	0.18*	0.07
	(0.11)	(0.13)	(0.13)	(0.11)	(0.10)	(0.07)
CBP data:						
Net employment growth	-0.31	-0.52**	-0.69**	-0.28	-0.45**	-0.09
	(0.19)	(0.25)	(0.30)	(0.20)	(0.19)	(0.23)
Manf. sector controls	Yes	No	No	Yes	Yes	No
Production controls	No	Yes	No	Yes	Yes	No
Pretrend controls	No	No	Yes	Yes	Yes	No
Industry fixed effects	No	No	No	No	No	Yes
Exclude 2007-2010	No	No	No	No	Yes	No
Observations	2,352	2,352	2,352	2,352	1,960	2,352

Notes: This table reports $\hat{\beta}$ and $\hat{\beta}^F$ from the estimation of specifications (3) and (4) with industry-level time invariant controls. All regressions include time fixed effects and are weighted by 1992 employment. The net growth regression with CBP data is weighted by 1992 CBP employment. Standard errors (in parentheses) are clustered at the three-digit industry level. The coefficients are statistically significant at the *10%, **5%, or ***1% level.

purchasing industries have less access to domestic inputs, which may cause them to contract too; however, these displaced domestic inputs may be replaced by cheaper Chinese inputs, which has a countervailing impact on purchasing industries. Thus, an increase in downstream Chinese exposure may decrease or increase an industry's employment.

Most of non-manufacturing firms are non-importing industries and therefore, they do not have an associated direct import penetration measure as defined in (2). However, these non-importing non-manufacturing industries purchase inputs from and sell goods to importing industries. Hence, a benefit of the input-output approach is that we are able to obtain measures of indirect import exposure for non-importing non-manufacturing firms.

To calculate upstream and downstream import penetration measures, which are weighted averages of the industries' direct import penetration measures, AADHP use the 1992 input-output table from the Bureau of Economic Analysis (BEA) as follows. If μ_{gj} denotes industry g's purchases from industry j, the share of industry g in total sales of industry j is given by $\omega^U_{gj} = \mu_{gj} / \sum_{g'} \mu_{g'j}$. Thus, the upstream Chinese import penetration measure for industry j is calculated as

$$UIP_{jt} = \sum_{g} \omega^U_{gj} IP_{gt}, \tag{7}$$

where IP_{gt} is the direct Chinese import penetration in industry g as defined in (2). Similarly, the share of industry g in total purchases of industry j is $\omega^D_{jg} = \mu_{jg} / \sum_{g'} \mu_{jg'}$, so that the downstream Chinese import penetration measure for industry j is

$$DIP_{jt} = \sum_{g} \omega^D_{jg} IP_{gt}. \tag{8}$$

The main analysis on input-output linkages of AADHP separately includes ΔIP_{jt}, ΔUIP_{jt}, and ΔDIP_{jt} as regressors in their net-employment-growth IV regressions, using ΔIP^*_{jt}, ΔUIP^*_{jt}, and ΔDIP^*_{jt} as instruments.[9] Given that their estimated coefficient on ΔDIP_{jt} is not statistically significant in any of their specifications, they focus their discussion on predicted employment losses from specifications that only include ΔIP_{jt} and ΔUIP_{jt}. As well, they estimate a specification that combines IP_{jt} and UIP_{jt} in a single measure, $\Delta(IP_{jt} + UIP_{jt})$, which yields similar results to the specification that includes them separately.

To simplify our job flows analysis, here we follow the latter approach and focus on combined measures of Chinese import exposure. The first combined measure adds the direct and upstream measures, $\Delta(IP_{jt}+UIP_{jt})$, while the second combined measure adds all three, $\Delta(IP_{jt}+UIP_{jt}+DIP_{jt})$. As in AADHP, instruments are included separately, using ΔIP^*_{jt} and ΔUIP^*_{jt} as instruments for the first measure, and adding ΔDIP^*_{jt} for the second measure. We also tried using as instruments $\Delta(IP^*_{jt} + UIP^*_{jt})$ for the first measure, and $\Delta(IP^*_{jt} + UIP^*_{jt} + DIP^*_{jt})$ for the second measure, with the results barely changing in magnitude and significance.

Pooling all manufacturing and non-manufacturing industries, Table 3 presents our IV estimation results for the impact of combined measures of Chinese import exposure on net employment growth (measured as the log-employment annual change), and on each of its job-flow components.

[9] To construct UIP^*_{jt} and DIP^*_{jt}, we simply have to replace IP_{gt} with IP^*_{gt} in (7) and (8).

Table 3: IV Estimation of the Effects of Chinese Import Exposure on U.S. Employment — with Upstream and Downstream Linkages Across Industries

	Combined measure I *(direct+upstream)*			**Combined measure II** *(direct+upstream+downstream)*		
	(1)	(2)	(3)	(4)	(5)	(6)
Net employment growth	-0.26**	-0.32***	-0.29***	-0.26**	-0.30***	-0.27***
	(0.11)	(0.12)	(0.11)	(0.10)	(0.10)	(0.10)
Job flows						
Births	0.00	0.02	0.02	0.05	0.07	0.05*
	(0.03)	(0.03)	(0.02)	(0.05)	(0.04)	(0.03)
Deaths	0.22**	0.29***	0.24***	0.28**	0.33***	0.26***
	(0.10)	(0.11)	(0.09)	(0.11)	(0.11)	(0.09)
Expansions	0.02	0.03	0.01	0.05	0.06	0.03
	(0.03)	(0.03)	(0.02)	(0.04)	(0.04)	(0.02)
Contractions	0.06	0.08	0.07	0.08	0.10**	0.09*
	(0.05)	(0.06)	(0.05)	(0.05)	(0.05)	(0.05)
Net extensive margin	-0.22**	-0.27***	-0.22***	-0.23***	-0.26***	-0.21***
	(0.09)	(0.10)	(0.08)	(0.09)	(0.09)	(0.08)
Net intensive margin	-0.04	-0.05	-0.07	-0.03	-0.04	-0.06
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.04)
Job creation	0.02	0.05	0.02	0.10	0.13*	0.08
	(0.04)	(0.05)	(0.03)	(0.08)	(0.08)	(0.05)
Job destruction	0.28**	0.37***	0.31**	0.36***	0.43***	0.35***
	(0.12)	(0.13)	(0.12)	(0.14)	(0.14)	(0.13)
CBP data:						
Net employment growth	-0.45**	-0.81***	-0.83***	-0.50**	-0.78***	-0.80***
	(0.22)	(0.29)	(0.30)	(0.20)	(0.24)	(0.27)
Sector × period controls	Yes	Yes	Yes	Yes	Yes	Yes
Manf. sector controls	Yes	No	No	Yes	No	No
Exclude 2007-2010	No	No	Yes	No	No	Yes
Observations	2,874	2,874	2,395	2,874	2,874	2,395

Notes: This table reports results for the effects of $direct + upstream$, and $direct + upstream + downstream$ Chinese import exposure on annualized three-year log-employment changes and job flows. Regressions are weighted by 1992 employment. The net growth regression with CBP data is weighted by 1992 CBP employment. Standard errors (in parentheses) are clustered at the three-digit industry level. The coefficients are statistically significant at the *10%, **5%, or ***1% level.

Columns 1-3 use the first measure (*direct+upstream*) and columns 4-6 use the second measure (*direct+upstream+downstream*). All regressions are weighted by 1992 employment, and include different time fixed effects for manufacturing industries and non-manufacturing industries. As before, standard errors are clustered at the three-digit SIC level.

Across all specifications, the first row in Table 3 shows that an increase in any of the combined measures of Chinese import exposure is associated with net job destruction. As before, the job-flow regressions show that job destruction by deaths of establishments is the main driver of this result:

the import-exposure coefficient on deaths is the largest in magnitude in all specifications, and is the only one that significantly matters in columns 1-4. Based on the $\hat{\delta}$ measure in (5), deaths explain between 69 and 73 percent of direct and upstream Chinese-induced job reallocation (from columns 1-3), and explain between 59 and 61 percent if we also consider downstream exposure (from columns 4-6).

Columns 5 and 6 show richer job-flow dynamics. In contrast to columns 2-3, column 5 shows that when we add downstream import exposure, there is also statistically significant job destruction due to establishments' contractions. As well, columns 5 and 6 also show important countervailing channels of job creation, as shown by statistically significant import-exposure coefficients in the "job creation" regression in column 5, and in the regression for births in column 6. Hence, although downstream import exposure increases the rates job destruction by both deaths and contractions, that effect is watered down by an increase in the rate of job creation (mainly due to births). These results show the counteracting forces of downstream import penetration described above, which cannot be observed if we look only at net employment changes.

Comparing the magnitude of the net coefficients in the first row, note that their size is equal or slightly smaller when using the second combined measure of import exposure. This, however, does not mean that predicted employment losses are smaller when we consider downstream exposure, as changes in the second measure of import exposure are likely to be larger than changes in the first measure. To know whether there are larger or smaller predicted losses with the second measure, we need to use a formula similar to (6). Following AADHP, to calculate losses we focus on the specifications in columns 2, 3, 5, and 6, which do not include the one-digit manufacturing sector dummies. All the predicted employment changes discussed in this paper, as well as the contributions of each type of job flow, are summarized in Table 5 in the end of section 4.3.

For the 1992-2010 period, Chinese-induced net destruction is 332,000 U.S. jobs when considering direct and upstream exposures, and 418,000 jobs if we also consider downstream exposure. If we do not account for the Great Recession period, losses are slightly smaller at 314,000 jobs under the first measure, and 392,000 under the second measure. Hence, Chinese downstream exposure is also a source of net job destruction for U.S. establishments. Of the net predicted losses, about 20 percent occur in non-manufacturing industries when we consider upstream exposure, and this share rises to about 32 percent if we also consider downstream exposure.

Equations (7) and (8) show *first-order* upstream and downstream import penetration measures. Following Acemoglu, Carvalho, Ozdaglar, and Tahbaz-Salehi (2012), AADHP also consider *higher-order* (HO) upstream and downstream linkages—*e.g.*, an industry is also affected by shocks to one of its buyers' buyers or sellers, or by shocks to one of its sellers' buyers or sellers, and so on. Along these lines, Table A.2 in the Appendix presents our estimation of the effects of the HO-combined measures of Chinese import exposure on U.S. net employment and job flows. When compared to Table 3, the results barely changes in terms of signs, magnitudes, and statistical significance.

In comparison with the predicted employment changes of the corresponding first-order specifications, Table 5 shows that net job losses are between 34 and 39 percent higher when considering higher-order upstream linkages (461,000 in 1992-2010, and 421,000 in 1992-2007), and are between 45 and 49 percent higher when also taking into account downstream linkages (623,000 in 1992-2010, and 570,000 in 1992-2007). The later case yields the largest net destruction in our industry-level analysis. As well, the share of net losses occurring in non-manufacturing industries rises to 32 percent when accounting for HO upstream linkages, and to 45 percent when also accounting for HO downstream linkages.

The higher-order results in Table 5 also show that the net outcome obscures a large amount of Chinese-induced job reallocation. Note, for example, that job destruction by deaths in 1992-2010 and 1992-2007 is larger than the net outcome (703,000 in the first period, and 591,000 in the second period), with further significant destruction from contractions; in addition, there are significant sources of job creation by expansions in 1992-2010, and by births in 1992-2007. In the end, total job reallocation in the industry-level analysis is almost twice as much the net effect in 1992-2010, and 1.8 times the net effect for the 1992-2007 period.

For the net-growth regressions using the CBP data in Tables 3 and A.2, the import exposure coefficients are again similar in sign and statistical significance to those obtained with NETS in the first row, but they are between 1.7 and 3 times larger in magnitude. In terms of net employment changes, Table 5 shows that the CBP data predicts between 1.8 and 2 times more losses than the NETS data in the 1992-2010 period, and between 2.3 and 2.5 times more losses in the 1992-2007 period.[10] In spite of these differences, which we attribute to idiosyncratic characteristics of each dataset and remnants of NETS stickiness, CBP and NETS data never yield conflicting estimates for net employment responses. Hence, we are confident in the strength of our qualitative results.

Similar to the previous section, the CBP's predicted net losses from our three-year difference specifications are smaller (by about half in most cases) than those obtained using the long-difference specifications of AADHP. For example, while our CBP specification that considers higher-order upstream exposure predicts net losses of about 1 million jobs during the 1992-2010 period, the

[10] If we calculate predicted employment changes using instead the coefficients from columns 1 and 4 in Tables 3 and A.2, whose specifications include manufacturing sector controls, the difference in predicted net losses is much smaller, with CBP reporting between 21 and 48 percent more net destruction than NETS.

equivalent specification of AADHP predicts losses of 2.15 million jobs. Section 5 looks carefully into the cause of this discrepancy.

4.3 Local-Labor-Markets Approach

The influential work of Autor, Dorn, and Hanson (2013) showed that, due to aggregate demand effects, import competition from China has employment effects in local labor markets that go far deeper than the impact in directly exposed sectors. For example, displaced workers from an exposed industry in Pittsburgh will have less income, which then drives these fired workers to spend less in other goods and services such as haircuts, which then depresses the incomes of barbershops and hair salons, and so forth. AADHP extend this framework to try to capture job reallocations from exposed sectors to non-exposed sectors.

This analysis is based on the 722 U.S. commuting zones of Autor, Dorn, and Hanson (2013) and AADHP. The first step is to obtain a measure of Chinese import exposure at the commuting zone level. Starting from the annualized three-year changes in industry-level import penetration, we calculate the change in import penetration in a commuting zone using as weights the initial employment share of each industry in total commuting-zone employment. That is,

$$\Delta IP_{it}^{CZ} = \sum_j \left(\frac{L_{ijt-3}}{L_{it-3}} \right) \Delta IP_{jt}, \tag{9}$$

where ΔIP_{it}^{CZ} is the annual change in import penetration in commuting zone i from $t-3$ to t, L_{ijt-3} is the level of employment in commuting zone i in industry j at $t-3$, $L_{it-3} = \sum_{j'} L_{ij't-3}$ is total employment in commuting zone i at $t-3$, and ΔIP_{jt} is the annual change in import penetration in industry j from $t-3$ to t as defined in section 4.1.

Following AADHP's approach, each of the 479 industries is classified into one of three sectors: exposed, nonexposed tradable, and nonexposed nontradable.[11] We use $k \in \{1, 2, 3\}$ to indicate sector type, so that 1 identifies the exposed sector, 2 identifies the nonexposed tradable sector, and 3 identifies the nonexposed nontradable sector. After classifying each industry in each commuting zone, we then aggregate the NETS job flows data across the three sectors and the 722 commuting zones. This creates a panel with 12,996 observations: 722 commuting zones, three sectors, and six three-year periods.

The dependent variable in the local-labor-market analysis is based on the employment-to-population ratio. Here we define the annual change in the employment-to-population ratio in

[11] AADHP classify an industry as exposed if import exposure increase by more than 2 percentage points between 1991 and 2011, or if the higher-order upstream exposure measures increased by more than 4 percentage points during the same period.

sector k in commuting zone i from $t-3$ to t as

$$\ell_{ikt} = \frac{\Delta L_{ikt}}{\bar{P}_{it}}, \tag{10}$$

where for each commuting zone i and between $t-3$ and t, ΔL_{ikt} is the annual employment change in sector k, and $\bar{P}_{it}$ is the mid-point working-age population (*i.e.*, $\bar{P}_{it} = (P_{it} + P_{it-3})/2$). The working-age population for each commuting zone i and each year t, P_{it}, is obtained from AADHP, who construct it from the Census Population Estimates. The measure in (10) is slightly different from the measure used by AADHP, $\Delta\left(L_{ikt}/P_{it}\right)$. We use the alternative measure to cleanly separate each of the job-flow components, but importantly, the regressions for the net effect are barely altered if we use instead the original AADHP measure.

With a slight notational abuse, we split the annual change in the employment-to-population ratio into its job-flow components as

$$\ell_{ikt} \equiv b_{ikt} - d_{ikt} + e_{ikt} - c_{ikt},$$

where b_{ikt} denotes the contribution of births to the change in the employment-to-population ratio in sector k in commuting zone i, and the same for deaths (d_{ikt}), expansions (e_{ikt}), and contractions (c_{ikt}). Knowing that $L_{ikt} - L_{ikt-3} \equiv (B_{ikt} - D_{ikt}) + (E_{ikt} - C_{ikt})$, we calculate b_{ikt} as

$$b_{ikt} = \frac{100}{3}\left(\frac{B_{ikt}}{\bar{P}_{it}}\right),$$

with analogous expressions for d_{ikt}, e_{ikt}, and c_{ikt}.

The specifications to estimate the net and gross employment effects of local Chinese import exposure are

$$\ell_{ikt} = \alpha_{kt} + \sum_k \beta_k \left[\Delta IP^{CZ}_{it} \times D_k\right] + \gamma_k Z_{ikt} + \varepsilon_{ikt}, \tag{11}$$

$$F_{ikt} = \alpha^F_{kt} + \sum_k \beta^F_k \left[\Delta IP^{CZ}_{it} \times D_k\right] + \gamma^F_k Z_{ikt} + \varepsilon^F_{ikt}, \tag{12}$$

where $F_{ikt} \in \{b_{ikt}, d_{ikt}, e_{ikt}, c_{ikt}, b_{ikt} - d_{ikt}, e_{ikt} - c_{ikt}, b_{ikt} + e_{ikt}, d_{ikt} + c_{ikt}\}$ for commuting zone i and sector $k \in \{1, 2, 3\}$, D_k is a sectoral dummy, Z_{ikt} is a vector of commuting zone i–sector k controls, α_{kt} and α^F_{kt} are sector-time fixed effects, and ε_{ikt} and ε^F_{ikt} are error terms. Our coefficients of interest are the β_k's and the β^F_k's because they show the net and gross local responses to Chinese exposure of the employment-to-population ratio for each sector. As before, it is always true that

$$\beta_k \equiv \beta^b_k - \beta^d_k + \beta^e_k - \beta^c_k \equiv \beta^{b-d}_k + \beta^{e-c}_k \equiv \beta^{b+e}_k - \beta^{d+c}_k$$

for $k \in \{1, 2, 3\}$.

Table 4 shows the estimation of (11) and (12) for the 1992-2010 and 1992-2007 periods. In addition to sector-time fixed effects, we follow AADHP and include as controls *(i)* the commuting zone's manufacturing share (at the beginning of each period) interacted with sector dummies, and *(ii)* regional Census division dummies interacted with sector dummies. All regressions are weighted by total population in 1992, and standard errors are clustered at the commuting-zone level. In contrast to Tables 1-3, where each coefficient was the estimate of β or β^F from a single regression, in Table 4 each group of three columns in a row gives the estimates of β_1, β_2, and β_3 (or β_1^F, β_2^F, and β_3^F) from a single regression. For example, the first three coefficients in the first row yield $\hat{\beta}_1$, $\hat{\beta}_2$, and $\hat{\beta}_3$ from the estimation of (11) with NETS data from 1992 to 2010.

For both periods, the first row in Table 4 shows a strong and highly significant negative response of the employment-to-population ratio in the exposed sector to an increase in the commuting zone's Chinese exposure. In contrast to previous net results, the coefficient for the exposed sector for the 1992-2010 period (-1.77) is larger in magnitude than the benchmark coefficient of AADHP from our 1992-2011 replication—see online Appendix B—of their long-difference regression (-1.60). For the 1992-2007 net regression, the coefficient for the exposed sector in our three-year difference regression is only 16 percent smaller in magnitude than their 1992-2007 coefficient from our long-difference replication (-1.35 vs -1.61).[12]

As in the industry-level analysis, the main driving factor of the decline in the exposed sector's employment-to-population ratio is an increase in job destruction due to establishments' deaths—according to our $\hat{\delta}$ measure, deaths account for 66 percent of total Chinese-induced job reallocation in the exposed sector during the 1992-2010 period, and for 55 percent during the 1992-2007 period (see Table 5). Moreover, in both periods, the job-flow coefficients for the exposed sector show that an increase in job destruction by contractions also plays a prominent role in the decline of the employment-to-population ratio. Although the contractions' coefficients for the exposed sector are between 37 and 60 percent of the size of the deaths' coefficients, they are still very large a highly significant. Hence, the decline in this sector's employment-to-population ratio is a consequence of a large increase in gross job destruction through its two components.

The most interesting results from Table 4 arise from the nonexposed sectors. AADHP carefully discuss the China shock implications for job reallocations and aggregate demand effects for the nonexposed sectors, but they are not able to find statistically significant evidence of any of them. This is not surprising, given that aggregate demand effects and job reallocations from the exposed sector have opposite impacts on the employment-to-population ratios in the nonexposed sectors.

[12] AADHP's original benchmark estimated coefficients for the exposed sector for the 1991-2011 and 1991-2007 periods are, respectively, -1.68 and -1.66.

Table 4: IV Estimation of the the Effects of Chinese Import Exposure on U.S. Commuting Zones by Sectoral Employment

	1992-2010 ($N = 12,996$)			**1992-2007** ($N = 10,830$)		
	Exposed	*Nonexposed tradable*	*Nonexposed nontradable*	*Exposed*	*Nonexposed tradable*	*Nonexposed nontradable*
Δ(Employment/Population)	-1.77***	0.30***	0.22	-1.35***	0.20*	0.44
	(0.50)	(0.11)	(0.48)	(0.30)	(0.10)	(0.38)
Job flows						
Births	0.11	-0.12**	1.14***	0.09	-0.15***	0.93**
	(0.14)	(0.06)	(0.43)	(0.12)	(0.05)	(0.38)
Deaths	1.44***	-0.20***	1.02	0.96***	-0.15**	0.68
	(0.40)	(0.08)	(0.64)	(0.22)	(0.06)	(0.49)
Expansions	0.10	-0.14***	0.41	0.10	-0.13***	0.28
	(0.12)	(0.05)	(0.32)	(0.12)	(0.05)	(0.25)
Contractions	0.53***	-0.35***	0.30	0.58***	-0.34***	0.09
	(0.14)	(0.12)	(0.32)	(0.13)	(0.10)	(0.26)
Net extensive margin	-1.33***	0.08	0.12	-0.87***	-0.01	0.25
	(0.46)	(0.06)	(0.43)	(0.22)	(0.05)	(0.32)
Net intensive margin	-0.43***	0.21**	0.11	-0.48***	0.21**	0.19
	(0.16)	(0.10)	(0.28)	(0.16)	(0.09)	(0.15)
Job creation	0.21	-0.26***	1.55**	0.20	-0.29***	1.21**
	(0.24)	(0.09)	(0.67)	(0.22)	(0.09)	(0.58)
Job destruction	1.97***	-0.56***	1.32	1.54***	-0.49***	0.76
	(0.41)	(0.16)	(0.89)	(0.29)	(0.13)	(0.71)
CBP data:						
Δ(Employment/Population)	-0.69	0.05	-0.53	-1.33***	-0.09	-0.19
	(0.55)	(0.15)	(0.86)	(0.45)	(0.13)	(0.81)

Notes: This table reports $\hat{\beta}_k$ and $\hat{\beta}_k^F$ from the estimation of specifications (11) and (12), for $F = \{b, d, e, c, b-d, e-c, b+e, d+c\}$, and $k \in \{1(\text{exposed}), 2(\text{nonexposed tradable}), 3(\text{nonexposed nontradable})\}$. All regressions include as controls sector-time fixed effects, the commuting zone's manufacturing share (at the beginning of each period) interacted with sector dummies, and regional Census division dummies interacted with sector dummies. All regressions are weighted by 1992 commuting-zone population. The net regression with CBP data is reported for the purpose of comparison with the net regression with NETS data. Standard errors (in parentheses) are clustered at the commuting-zone level. The coefficients are statistically significant at the *10%, **5%, or ***1% level.

Both of them may be important, but if they cancel out we will not be able to see any track of them by looking only at the net change. Fortunately, by being able to decompose net employment changes into their job-flow components we are in a better position to capture these effects. This is the case here.

For the nonexposed tradable sector, note that in contrast to AADHP, we are able to observe a statistically significant increase in the employment-to-population ratio after an increase in local Chinese exposure. This is evidence of an active and important job reallocation mechanism from the exposed sector. Even more interesting, this is not the result of higher rates of job creation in the nonexposed sector. To the contrary, there are statistically significant declines in the rates of creation by births and expansions, which point out toward negative aggregate demand effects. However, there are even larger significant declines in the rates of job destruction by deaths and contractions. With nonexposed tradable firms hiring and being born at a lower pace, but dying and contracting at an even lower rate, the net result is a significant increase in the sector's employment-to-population ratio.

The nonexposed nontradable sector does not have a statistically significant increase in the employment-to-population ratio. However, the job flows regressions show a very large and statistically significant increase in the rate of job creation by births. This can also be part of job reallocation effects: as the exposed sector sheds jobs (mainly through deaths), some of the released workers create new establishments in the nonexposed sector; there may even be previously exposed-sector establishments that are reborn in a different nonexposed industry. Although the increase in the gross rate of job creation in the nonexposed nontradable sector is very large and significant, the high but imprecise change in the rate of job destruction renders the net effect positive but insignificant.[13]

With the NETS data we obtain the same qualitative results for exposed and unexposed sectors during both periods. The only difference that is worth pointing out between the 1992-2010 and 1992-2007 NETS regressions, is that excluding the Great Recession period causes a large decline in the size of some coefficients. Notably, the import-exposure coefficient on deaths for the exposed sector declines from 1.46 to 0.97, which drives a change in the net coefficient from -1.78 to -1.35. This difference suggests that the large employment losses during the Great Recession may be causing an upward bias in the magnitude of the deaths' import-exposure coefficient.

The Great Recession period has an even greater impact in the estimation with CBP data. In the last row of Table 4, the 1992-2010 regression does not yield any significant estimates, but the

[13] This is an example that shows that even if a shock's net effect on employment is not significant, you can still have strong effects on gross job flows with possible strong implications on adjustment costs and welfare.

1992-2007 regression shows that this changes once we remove the Great Recession period. In such a case, the coefficient for the exposed sector is not only highly significant, but is also very close to the net coefficient estimated using the NETS data. As in AADHP, the three-year difference estimation with CBP data does not produce statistically significant import-exposure coefficients for the nonexposed sectors.

Table 5 shows Chinese-induced predicted employment changes from the specifications in Table 4. Given that the dependent variable is now based on the employment-to-population ratio, we can no longer use a formula analogous to (6). Instead, the predicted net employment change in sector k from the change in commuting-zone import penetration during the 1992-2010 period is given by

$$\textit{Predicted employment change in sector } k = \sum_i \hat{\beta}_k \left(IP_{i10}^{CZ} - IP_{i92}^{CZ} \right) \rho P_{i10}, \tag{13}$$

where $\hat{\beta}_k$ is the net estimated coefficient either from NETS or CBP, $IP_{i10}^{CZ} - IP_{i92}^{CZ}$ is the change in import exposure for commuting zone i from 1992 to 2010, P_{i10} is the working-age population in commuting zone i in 2010, and $\rho = 0.46$ (we follow AADHP in using the same ρ for all the calculations of predicted employment changes). We use a similar formula for the 1992-2007 period.

For the 1992-2010 period, Chinese-induced net predicted losses are about 2.817 million jobs in the exposed sector, but there are also significant net predicted gains of 472,000 jobs in the nonexposed tradable sector. The nonexposed nontradable sector creates 1.75 million jobs from births of establishments—a sign of job reallocation from the exposed sector—but this effect is canceled out by large (but not statistically significant) job destruction from deaths and contractions. Comparing these results against those obtained in our AADHP replication in Appendix B for the 1992-2011 period, we find that net predicted losses in the exposed sector are almost equal to those obtained here (2.822 million jobs). Given our discussion above about the large reduction in the size of the deaths' import-exposure coefficient when we exclude the Great Recession period, we are cautious about this almost-perfect match.

For the 1992-2007 period, net predicted losses in the exposed sector due to Chinese import exposure are 1.599 million jobs, and net predicted gains in the nonexposed tradable sector are 239,000 jobs. The nonexposed nontradable sector creates 1.115 million jobs from establishments' births, but the net effect is not significant. When using the CBP data, the net predicted losses in the exposed sector are 1.449 million jobs, which are about 9 percent smaller than the net losses when using the NETS data. Hence, although the industry-level analysis consistently predicted considerably smaller net losses with NETS, the local-labor-markets analysis produces more balanced employment predictions.

Table 5: Predicted U.S. Employment Changes due to Chinese Import Exposure (in Thousands)

		NETS data						CBP data
Specification	*Exposure type—Sector*	*Net change*	*Births*	*Deaths*	*Expan.*	*Contr.*	$\hat{\delta}$	*Net change*
1992-2010:								
Table 1, col. 2	Direct—*Manufacturing*	**-190**	6	**-153**	6	-49	0.71	**-249**
Table 3, col. 2	Combined I—*Total*	**-332**	21	**-301**	31	-83	0.69	**-596**
Table 3, col. 5	Combined II—*Total*	**-418**	97	**-459**	84	**-139**	0.59	**-822**
Table A.2, col. 2	Combined I (HO)—*Total*	**-461**	54	**-448**	54	-122	0.66	**-881**
Table A.2, col. 5	Combined II (HO)—*Total*	**-623**	161	**-703**	**141**	**-221**	0.57	**-1,249**
Table 4, cols. 1-3	Local—*Exposed*	**-2,817**	176	**-2,305**	160	**-848**	0.66	-990
	Nonexposed tradable	**472**	**-195**	**325**	**-228**	**569**	0.25	71
	Nonexposed nontradable	354	**1,754**	-1,569	631	-461	0.36	-766
1992-2007:								
Table 1, col. 3	Direct—*Manufacturing*	**-193**	7	**-145**	-7	-48	0.70	**-360**
Table 3, col. 3	Combined I—*Total*	**-314**	22	**-260**	11	-76	0.71	**-716**
Table 3, col. 6	Combined II—*Total*	**-392**	**73**	**-377**	44	**-131**	0.60	**-965**
Table A.2, col. 3	Combined I (HO)—*Total*	**-421**	44	**-377**	29	-116	0.67	**-1,014**
Table A.2, col. 6	Combined II (HO)—*Total*	**-570**	**127**	**-591**	84	**-211**	0.58	**-1,449**
Table 4, cols. 4-6	Local—*Exposed*	**-1,599**	107	**-1,137**	118	**-687**	0.55	**-1,449**
	Nonexposed tradable	**239**	**-170**	**170**	**-148**	**386**	0.19	-102
	Nonexposed nontradable	527	**1,115**	-815	336	-108	0.34	-203

Notes: Reported quantities represent the change in employment attributed to instrumented changes in import exposure in the specifications described in the first column. Negative values indicate that import exposure reduces employment. Equation (6) shows a general formula to calculate predicted employment changes from Tables 1, 3, and A.2, and equation (13) shows the general formula to calculate predicted employment changes from Table 4. The numbers in bold denote predicted changes corresponding to statistically significant coefficients in the corresponding tables.

The 1992-2007 replication of the equivalent AADHP's long-difference specification predicts net losses in the exposed sector of 2.467 million jobs. This corresponds to 70 percent more net employment losses when compared to the CBP prediction from our three-year difference specification. The following section discusses a possible source of this inconsistency.

5 Past Employment Changes and Future Import Exposure: A Falsification Exercise

The main difference between the econometric specifications in this paper and those in AADHP is that here we use three-year differences from 1992 to 2010, with most regressions having either five or six non-overlapping periods, while AADHP use long differences with two stacked periods (1991-1999 and either 1999-2011 or 1999-2007).[14] To be closer to our period of study, the AADHP replication we carry over in Appendix B starts in 1992 rather than in 1991. In all specifications, the dependent variable and import-exposure regressors are annualized; thus, the import-exposure coefficients from our three-year difference framework are directly comparable to those obtained using the long-difference framework.

Throughout section 4 we found that the Chinese-exposure coefficients of the CBP three-year difference regressions are smaller in magnitude than those from the AADHP long-difference replication. As a consequence, Chinese-induced net job losses from AADHP's long-difference approach are between 1.7 and 3.3 times larger than those predicted with our three-year difference approach. A strong argument supporting the large discrepancy is that changes in import exposure take a long time to be absorbed by labor markets, so that a long-difference approach better captures these long-term effects. On the other hand, such long differences (ranging between seven-year and twelve-year differences) may confound past employment changes with future increases in import exposure.

Conveniently, the last point can be easily tested with a falsification exercise that barely alters our econometric specifications: we simply replace the Chinese import exposure regressor in each specification with its three-year lead. Hence, the specification in (3) becomes

$$\Delta \ln L_{jt} = \alpha_t + \beta \Delta IP_{jt+3} + \gamma Z_j + \varepsilon_{jt}, \tag{14}$$

and the same for our specifications in (4), (10), and (12). Using employment data from 1992 to 2007, and thus import exposure data from 1995 to 2010, Table 6 shows the results of the falsification

[14] Recall that the main reason for using three-year differences, rather than the long differences of AADHP, is that long differences artificially increase the importance of the extensive margin of employment.

Table 6: Falsification Exercise — IV Estimation of the Effects of *Future* Chinese Import Exposure on *Past* U.S. Employment, 1992-2007

	Table 1	**Table 3**		**Table 4, cols. 4-6**		
	Column 3	*Column 3*	*Column 6*	*Exposed*	*Nonexp. tradable*	*Nonexp. nontrad.*
Net growth/Δ(Emp/Pop)	-0.24**	-0.24***	-0.16*	-0.44	0.12	1.72***
	(0.10)	(0.09)	(0.08)	(0.28)	(0.12)	(0.47)
Job flows						
Births	0.04	0.05	0.13**	0.63***	-0.12**	1.71***
	(0.04)	(0.04)	(0.06)	(0.17)	(0.06)	(0.55)
Deaths	0.20**	0.23***	0.25***	1.09***	-0.09	0.82
	(0.08)	(0.08)	(0.09)	(0.24)	(0.08)	(0.63)
Expansions	-0.02	0.00	0.05	0.46***	-0.16**	0.98**
	(0.02)	(0.03)	(0.05)	(0.13)	(0.07)	(0.40)
Contractions	0.06	0.07	0.09**	0.44***	-0.30***	0.15
	(0.05)	(0.05)	(0.04)	(0.15)	(0.11)	(0.34)
Net extensive margin	-0.16**	-0.18**	-0.12**	-0.46**	-0.03	0.89**
	(0.08)	(0.08)	(0.06)	(0.18)	(0.07)	(0.36)
Net intensive margin	-0.08	-0.06	-0.04	0.02	0.14	0.83***
	(0.05)	(0.05)	(0.05)	(0.16)	(0.10)	(0.26)
Job creation	0.02	0.05	0.17*	1.09***	-0.27**	2.69***
	(0.04)	(0.04)	(0.09)	(0.27)	(0.11)	(0.90)
Job destruction	0.26**	0.30***	0.34***	1.53***	-0.39**	0.97
	(0.11)	(0.11)	(0.11)	(0.36)	(0.16)	(0.92)
CBP data:						
Net growth/Δ(Emp/Pop)	-0.52**	-0.62**	-0.50**	-1.56***	-0.06	0.35
	(0.26)	(0.26)	(0.21)	(0.49)	(0.14)	(1.21)
Observations	1,960	2,395	2,395		10,830	

Notes: This table reports the outcome of the falsification exercise that replaces the contemporaneous Chinese import-exposure regressors with their three-year leads for the specifications indicated in the columns' titles. All regressions in the first three columns are weighted by 1992 employment, and their standard errors are clustered at the three-digit industry level. All regressions in the last three columns are weighted by 1992 commuting-zone population, and their standard errors (in parentheses) are clustered at the commuting-zone level. The coefficients are statistically significant at the *10%, **5%, or ***1% level.

exercise. Each column's title indicates the equivalent specification—with the contemporaneous Chinese-exposure regressor—from section 4.

Here we start by looking at the net outcomes with CBP data in the last row of Table 6. For the industry-level analysis, the coefficients in columns 1-3 are negative, highly significant, and between 25 and and 37 percent smaller in size than their counterparts in section 4. Interestingly, if we add the "false" coefficients in columns 1-3 to their section 4 counterparts, we obtain coefficients that are closer to those obtained in the long-difference specifications; incidentally, the sum of the false CBP coefficient in the first column of Table 6 (-0.52) and the corresponding coefficient in Table 1 of column 3 (-0.74), is equal to the 1992-2007 coefficient of the AADHP replication in Appendix B (-1.26). As well, the commuting-zone level false CBP regression yields similar qualitative results to those in Table 4 and in the AADHP analysis—a negative and highly significant coefficient for the exposed sector, and non-significant coefficients for the nonexposed sectors—but the false exposed-sector coefficient is 17 percent higher in magnitude than its counterpart in Table 4. These findings suggest that an important component of the Chinese-induced net losses calculated by AADHP are the result of predicting past employment changes with future import exposure.

As with the CBP data, the NETS industry-level estimation in columns 1-3 of Table 6 indicates that future changes in Chinese exposure are significantly associated with past net job destruction. As in our main findings, deaths of establishments are the main driver of this result. On the other hand, the commuting-zone level false estimation with NETS produces net results that are different in significance and size from their counterparts in Table 4. We observe, however, substantial and significant false action in the job flows regressions, which suggests that the long-difference approach generates an important amount of false job reallocations.

6 Concluding Remarks

The China shock is associated with net job destruction in the United States. Using job flows calculated from the universe of U.S. establishments, our industry-level analysis shows that the net job destruction is mainly driven by the death of establishments. An alternative local-labor-market analysis shows that deaths play the dominant role in the decline in the employment-to-population ratio in the sector of the economy exposed to Chinese import competition, but that this import competition also led to some gross job destruction via contractions of existing establishments.

A novelty of this paper is that it provides evidence of job reallocations from the exposed sector to the nonexposed sectors of the commuting area. Highlighting the importance of looking at job flows, rather than only at net changes, our results show that the reallocation of jobs toward the nonexposed tradable sector happened even with a significant reduction in the gross rate of the sector's job creation, because of an even higher reduction in the gross rate of job destruction.

Our finding that the China shock is mostly felt through plant closings can improve our understanding of the costs associated with this trade. At the worker level, the long-run outcome may be better after a death than after a contraction (Stevens, 1997), in part because mass layoffs may reflect firms getting rid of lower-productivity workers first and thus giving a negative signal about the fired workers' quality (Gibbons and Katz, 1992). On the other hand, Abowd, McKinney, and Vilhuber (2009) find that closings are more likely for firms that disproportionately hire workers from the bottom quartile of the human capital distribution.

Moreover, there is evidence of more adverse effects of plant closings on minorities and women. Black men experience larger earning losses than white men after plant closings (Hu and Taber, 2011), and more women report depression after plant closings than men (Brand, Levy, and Gallo, 2008). Hence, policy makers looking to tailor their response to adversely-affected groups may worry more about traditionally-disadvantaged groups after an establishment death than after a contraction.

From a local-labor-markets point of view, regional economies are likely to suffer more from deaths than from contractions (which tend to be one-off events or cyclical) because closed establishments can more permanently reduce local employment. Herzog and Schlottmann (1995) find, for example, that displaced workers have the lowest reemployment rates in areas that have suffered higher plant closing rates. As well, wage reductions among displaced workers are in part due to poorly performing local economies (Carrington, 1993). Therefore, the persistent effects of establishments' deaths in local labor markets make a case for strengthening relocation incentives in the U.S. government's Trade Adjustment Assistance (TAA) program.

With deaths playing such a crucial role in Chinese-induced employment dynamics, it is important to learn more about the dying establishment's characteristics. Are they small or large? Are they young or mature? If they are young, are they dying too soon (before realizing their potential) or are they old and dying as part of a healthy process of creative destruction? Previous research by Bernard and Jensen (2002) show that the kinds of plants most likely to die after exposure to import competition from low-income countries are low-wage, labor-intensive plants within exposed industries, and those owned by multi-plant, multinational firms (Bernard and Jensen, 2007). Relatedly, Magyari (2017) indicates that plant closures from the China shock are mostly among multinational firms that are redistributing the jobs between their factories. Further answers to these types of questions would deepen our understanding of the costs and benefits of trade with China.

Finally, an important caveat is that our paper does not assess the overall consequences of trade on job flows, but is restricted to the analysis of trade with one country (albeit the largest U.S. trading partner). And the fact that we find some positive reallocation effects highlights the fact that trade has beneficial effects on some sectors and firms. There are likely larger net beneficial effects from trade with other countries for which exports are larger relative to imports. Thus, although our research is focused on U.S. trade with one country, policy should focus more on the overall effects of trade. Our evidence suggests that trade with China has led to some "rusted-out factories ... across the landscape of our nation." But this is not the whole story.

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A Appendix: Supporting Tables and Figures

Table A.1: Job Flows Decomposition in All Industries (in Thousands)

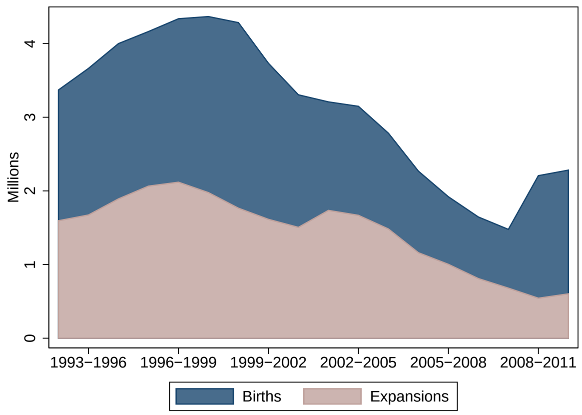
	1992-95	**1993-96**	**1994-97**	**1995-98**	**1996-99**	**1997-00**	**1998-01**	**1999-02**	**2000-03**
Employment at initial year	94,206	95,475	100,053	101,784	106,147	110,449	113,468	118,230	123,506
Employment at final year	101,784	106,147	110,449	113,468	118,230	123,506	125,909	124,201	122,226
Change in employment									
Due to births	15,152	17,561	17,290	17,071	17,235	19,178	20,961	18,251	15,616
Due to deaths	-8,326	-8,705	-10,022	-10,521	-10,968	-12,055	-13,299	-15,341	-18,022
Due to expansions	7,095	7,788	9,675	11,195	11,917	11,862	11,236	10,459	9,937
Due to contractions	-6,343	-5,972	-6,547	-6,061	-6,100	-5,929	-6,457	-7,398	-8,811
Net changes									
Net extensive margin	6,827	8,856	7,268	6,550	6,267	7,123	7,662	2,910	-2,406
Net intensive margin	751	1,815	3,128	5,134	5,817	5,933	4,779	3,061	1,126
Net employment change	7,578	10,672	10,396	11,684	12,084	13,056	12,441	5,970	-1,280
	2001-04	**2002-05**	**2003-06**	**2004-07**	**2005-08**	**2006-09**	**2007-10**	**2008-11**	**2009-12**
Employment at initial year	125,909	124,201	122,226	121,929	122,975	123,431	122,467	122,641	117,375
Employment at final year	121,929	122,975	123,431	122,467	122,641	117,375	115,785	118,937	118,612
Change in employment									
Due to births	13,372	13,805	12,778	11,250	10,053	10,712	10,641	14,771	13,772
Due to deaths	-18,519	-17,028	-13,593	-11,823	-11,508	-17,454	-18,183	-19,291	-14,490
Due to expansions	10,161	9,674	8,690	7,448	6,829	5,338	4,380	3,929	4,193
Due to contractions	-8,994	-7,677	-6,669	-6,337	-5,708	-4,652	-3,520	-3,114	-2,238
Net changes									
Net extensive margin	-5,147	-3,223	-816	-573	-1,454	-6,742	-7,542	-4,519	-718
Net intensive margin	1,167	1,997	2,021	1,111	1,121	686	860	816	1,955
Net employment change	-3,980	-1,226	1,206	538	-334	-6,056	-6,682	-3,704	1,237

Notes: This table reports employment levels and three-year job flows for the overall U.S. economy. It uses NETS data from the universe of U.S. establishments with five or more employees in at least one year during the 1992-2012 period.

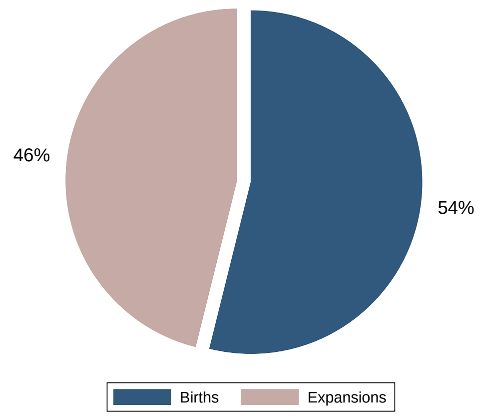
Table A.2: IV Estimation of the Effects of Chinese Import Exposure on U.S. Employment — with Higher-Order Upstream and Downstream Linkages Across Industries

	Combined measure I *(direct+upstream)*			**Combined measure II** *(direct+upstream+downstream)*		
	(1)	(2)	(3)	(4)	(5)	(6)
Net employment growth	-0.28**	-0.34***	-0.29***	-0.28***	-0.31***	-0.27***
	(0.11)	(0.12)	(0.11)	(0.10)	(0.10)	(0.10)
Job flows						
Births	0.03	0.04	0.03	0.06	0.08	0.06*
	(0.05)	(0.04)	(0.03)	(0.05)	(0.05)	(0.04)
Deaths	0.26**	0.33***	0.26***	0.31***	0.35***	0.28***
	(0.11)	(0.12)	(0.10)	(0.12)	(0.11)	(0.09)
Expansions	0.04	0.04	0.02	0.06	0.07*	0.04
	(0.03)	(0.03)	(0.02)	(0.05)	(0.04)	(0.03)
Contractions	0.07	0.09	0.08	0.09*	0.11**	0.10**
	(0.05)	(0.06)	(0.05)	(0.05)	(0.05)	(0.05)
Net extensive margin	-0.24**	-0.29***	-0.23***	-0.25***	-0.27***	-0.22***
	(0.10)	(0.11)	(0.09)	(0.09)	(0.09)	(0.08)
Net intensive margin	-0.04	-0.04	-0.06	-0.03	-0.04	-0.06
	(0.05)	(0.05)	(0.05)	(0.05)	(0.04)	(0.04)
Job creation	0.06	0.08	0.05	0.12	0.15*	0.10*
	(0.06)	(0.06)	(0.04)	(0.09)	(0.08)	(0.06)
Job destruction	0.34**	0.42***	0.35***	0.40***	0.46***	0.37***
	(0.14)	(0.14)	(0.13)	(0.14)	(0.14)	(0.13)
CBP data:						
Net employment growth	-0.49**	-0.83***	-0.85***	-0.51***	-0.77***	-0.81***
	(0.22)	(0.28)	(0.29)	(0.19)	(0.22)	(0.26)
Sector × period controls	Yes	Yes	Yes	Yes	Yes	Yes
Manf. sector controls	Yes	No	No	Yes	No	No
Exclude 2007-2010	No	No	Yes	No	No	Yes
Observations	2,874	2,874	2,395	2,874	2,874	2,395

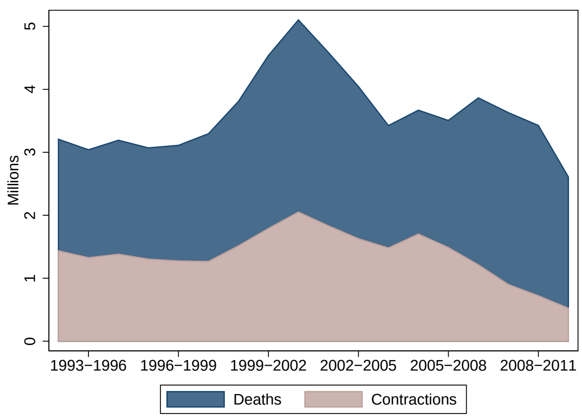
Notes: This table reports results for the effects of *direct + upstream*, and *direct + upstream + downstream* higher-order Chinese import exposure on annualized three-year log-employment changes and job flows. Regressions are weighted by 1992 employment. The net growth regression with CBP data is weighted by 1992 CBP employment. Standard errors (in parentheses) are clustered at the three-digit industry level. The coefficients are statistically significant at the *10%, **5%, or ***1% level.



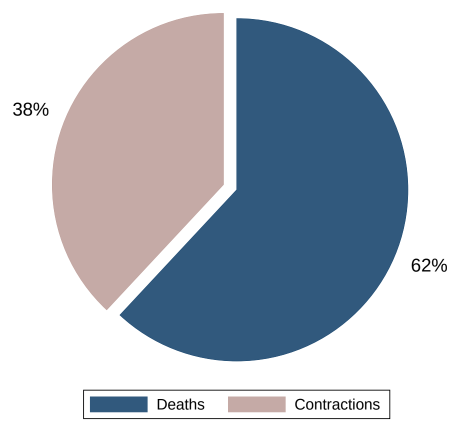
(a) Job creation decomposition



(b) Job creation shares (average)

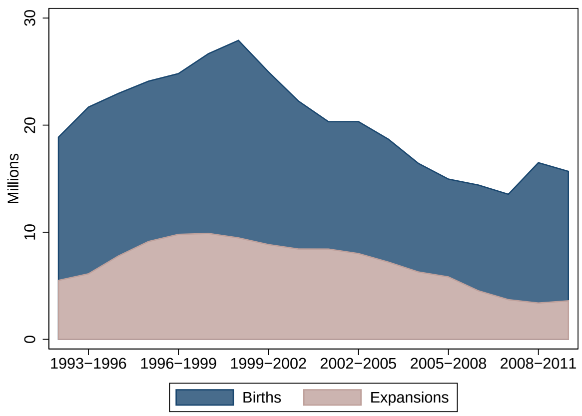


(c) Job destruction decomposition

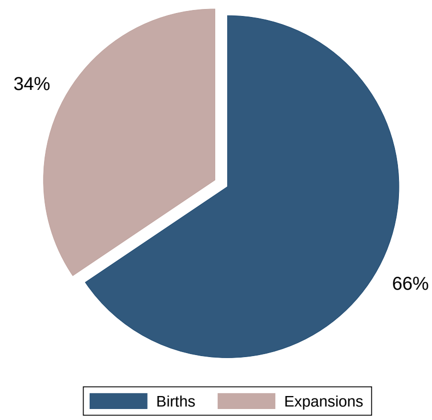


(d) Job destruction shares (average)

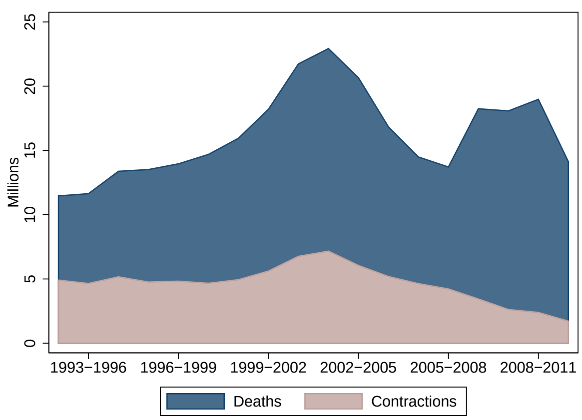
Figure A.1: Employment creation and destruction in the manufacturing industry (three-year windows)



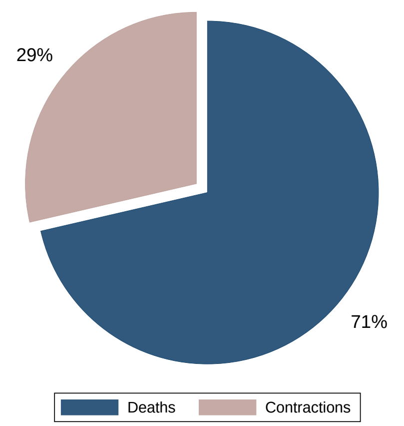
(a) Job creation decomposition



(b) Job creation shares (average)



(c) Job destruction decomposition



(d) Job destruction shares (average)

Figure A.2: Employment creation and destruction in the non-manufacturing industry (three-year windows)