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 1992-2011 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-imports 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

Keywords: China shock, import penetration, job flows, local labor markets

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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 .17 for manufacturing, .15 for non-manufacturing, and .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]

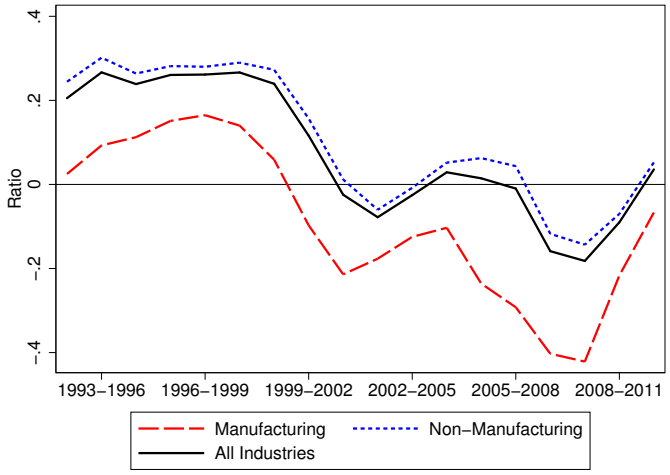


Figure 1: Ratio of U.S. net employment changes to total gross job reallocations (three-year changes)

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 components. To guide our empirical exercise we build on the comprehensive work of Acemoglu, Autor, Dorn, Hanson, and Price (2016)—AADHP herafter—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,

[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 potentially increase costs of adjustment for both firms and workers, but this would be missed by an analysis based on net employment changes.

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) describe 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, while 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 effect (the effect that flows from buying industries to a seller industry). 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 effects have opposite implications in the nonexposed sector's employment, it is not surprising that previous studies based on net employment changes have not found evidence of them (they cancel 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 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 description of the evolution of job flows. Section 4 presents our empirical analysis for the impact of Chinese import penetration on U.S. job flows. Lastly, section 5 concludes.

2 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, 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

[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.

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 business we restrict our NETS data to establishments with 5 or more employees.

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 follows closely their industry classification. At the industry level, the correlation between AADHP's CBP and our NETS data 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.

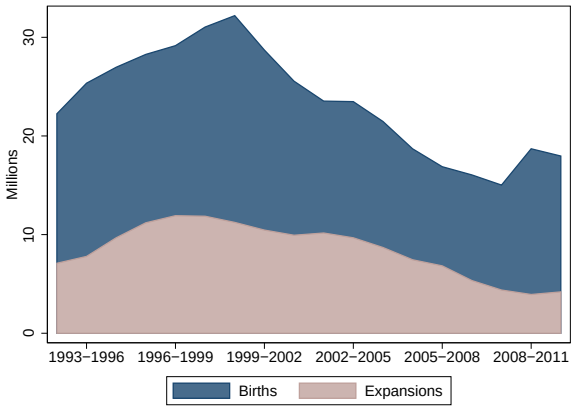
3 A Brief Description of U.S. Job Flows

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

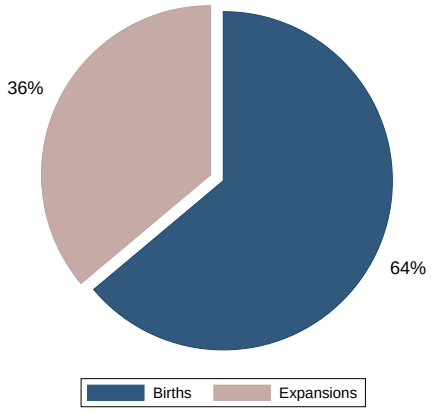
$$\Delta L_{ijt} = \underbrace{(B_{ijt} - D_{ijt})}_{\text{Extensive margin}} + \underbrace{(E_{ijt} - C_{ijt})}_{\text{Intensive margin}}, \tag{1}$$

where ΔL_{ijt} 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.

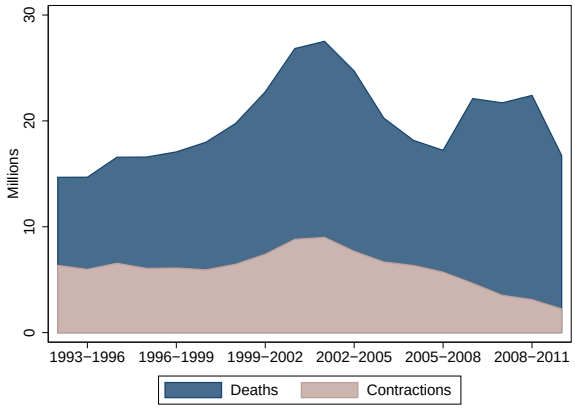
Figure 2 shows the evolutions of job flows after aggregating for all industries. Figure 2a shows that job creation reached its peak in 1998-2001 and that births have been fluctuating more than expansions. In the case of job destruction in Figure 2c, after an increase from the early 1990s, there



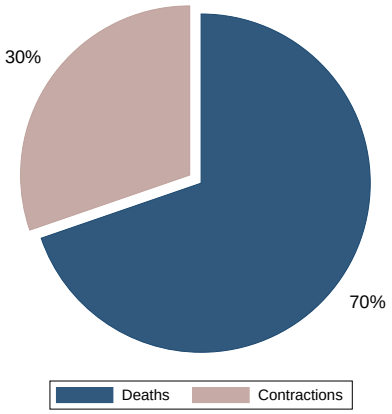
(a) Job creation decomposition



(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)

was a peak in 2000-2003, followed by a sharp decline in deaths until 2005-2008, followed by another sharp increase due to the Great Recession. Contractions in existing establishments, however, saw a steady decline since 2000-2003. Figures 2b and 2d show that, births have an average share of 64 percent in job creation, and deaths have an average share of 70 percent in job destruction. The extensive margin dominates for both job creation and destruction.

Figure 3 shows that for all industries, the net effect at the intensive margin has been positive. The net effect at the extensive margin declines sharply starting in 1998-2001, reaching 0 in 1999-2002 and becoming negative since then. Again, the overall net job creation appears to move closely with the extensive margin.

Figures 4 all show a sharp increase in the death share in job destruction starting from 2005-2008. The birth share in job creation has also experienced a steady increase starting from 2001-2004. The nature of employment dynamics was very different during the Great Recession.

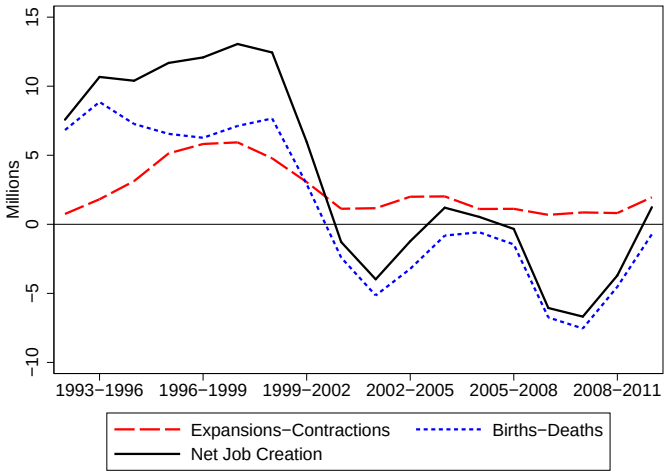


Figure 3: Net employment creation in all industries



Figure 4: Share of births and deaths in job flows in all industries

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 benchmark, and excluding the great recession years (2008-2010) as robustness 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.[3] Therefore, we work instead with a panel on non-overlapping three period differences.

[3]For example, for the long difference 1999-2011 expansions and contractions of employment would be captured only for those firms that are alive in both periods, job flows from deaths would be calculated as the sum of 1999

To remain as close as possible to the period 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.

We start by looking at the responses of manufacturing industry-level employment to Chinese import penetration, then we expand the industry-level analysis to include non-manufacturing industries and upstream and downstream linkages across industries, and lastly 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

Let L_{jt} denote the employment level in industry j in year t, and let

$$IP_{jt} = 100 \left(\frac{M^C_{jt}}{Y_{j91} + M_{j91} - X_{j91}} \right) \tag{2}$$

denote AADHP's measure of Chinese import penetration, where M^C_{jt} are real U.S. imports from China in industry j at year t, and $Y_{j91} + M_{j91} - X_{j91}$ is real domestic absorption of industry j (the industry's real output, plus real imports, less real exports) in 1991.[4] Hence, the specification to study the impact of Chinese import exposure on U.S. industry level net employment growth is

$$\hat{L}_{jt} = \alpha_t + \beta \Delta IP_{jt} + \gamma Z_j + \varepsilon_{jt}, \tag{3}$$

where $\hat{L}_{jt}$ is 100 times the annual employment growth in industry j from t-3 to t (*i.e.*, $\hat{L}_{jt} = \frac{100}{3}\left[\frac{L_{jt}-L_{jt-3}}{L_{jt-3}}\right]$), $\Delta IP_{jt} = \frac{IP_{jt}-IP_{jt-3}}{3}$ is the industry's annual change in Chinese import penetration, Z_j is a vector of time-invariant industry-level controls, and ε_{jt} is the error term.

The net employment growth in industry j can be split into its job-flow components. In particular, as the change in the employment level in industry j from time $t-3$ to time t is due to establishments' expansions, contractions, births and deaths, we can write $\hat{L}_{jt}$ as

$$\hat{L}_{jt} \equiv b_{jt} - d_{jt} + e_{jt} - c_{jt},$$

where b_{jt} denotes the contribution of births to the industry's employment annual growth rate, and the same for deaths (d_{jt}), expansions (e_{jt}), and contractions (c_{jt}). We calculate each term as $\frac{100}{3}$

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 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.

[4] We use the exact AADHP IP measure. To calculate real values they use the personal consumption expenditure index (PCE), nominal output is given by the value of shipments from the NBER productivity database, and imports and exports data is gathered from the United Nations COMTRADE database.

times the change in the industry's employment due to the particular job-flow type (in absolute value) divided by the industry's total employment in $t-3$.

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 $F_{jt} = \{b_{jt}, d_{jt}, e_{jt}, c_{jt}, b_{jt} - d_{jt}, e_{jt} - c_{jt}, b_{jt} + e_{jt}, d_{jt} + c_{jt}\}$. Note that we can also estimate the impact of Chinese import penetration 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 penetration job-flow coefficients spanned from (4) must be equivalent to the coefficient of the net employment growth regression in (3). That is, it must always be the case that

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

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 outcome of a regression. 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 purposes of comparison against NETS data net-employment results, we also estimate equation (3) using AADHP's CBP data. The instrumental variables (IV) regressions use AADHP's instrument, which is based on eight high-income countries' imports from China relative to 1988 U.S. domestic absorption.[5]

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. However, the most important result in column 2 comes from the analysis of the job-flow coefficients. Note that only deaths matter 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. Comparing the magnitudes of the net and deaths coefficients indicate that job destruction by death of establishments explains more than 80 percent of the net decline in employment. Column 3 shows that reducing the sample to exclude the Great Recession period barely changes the results.

[5] 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	-0.13***	-0.26**	-0.25**	-0.73	-0.34**	-0.36***
	(0.05)	(0.11)	(0.10)	(0.46)	(0.13)	(0.13)
Job flows						
Births	0.01	0.01	0.00	0.19	-0.06*	-0.09***
	(0.02)	(0.03)	(0.02)	(0.22)	(0.03)	(0.03)
Deaths	0.12***	0.21**	0.18**	0.54**	0.19**	0.16**
	(0.04)	(0.09)	(0.08)	(0.27)	(0.09)	(0.08)
Expansions	0.01	0.00	-0.01	0.05	-0.02	-0.05**
	(0.02)	(0.03)	(0.02)	(0.20)	(0.03)	(0.02)
Contractions	0.03	0.06	0.06	0.43**	0.08	0.06
	(0.02)	(0.05)	(0.04)	(0.17)	(0.05)	(0.04)
Net extensive margin	-0.11***	-0.21**	-0.18**	-0.34	-0.25**	-0.25***
	(0.04)	(0.09)	(0.07)	(0.31)	(0.10)	(0.09)
Net intensive margin	-0.02	-0.06	-0.07	-0.38	-0.09	-0.11**
	(0.02)	(0.05)	(0.05)	(0.31)	(0.06)	(0.05)
Job creation	0.02	0.01	-0.01	0.24	-0.08	-0.14***
	(0.03)	(0.05)	(0.03)	(0.31)	(0.06)	(0.05)
Job destruction	0.15***	0.27**	0.23**	0.97***	0.26**	0.23**
	(0.05)	(0.11)	(0.10)	(0.30)	(0.11)	(0.11)
Net growth (CBP)	-0.30***	-0.51**	-0.59**	-0.33	-0.48**	-0.59**
	(0.10)	(0.23)	(0.24)	(0.85)	(0.21)	(0.24)
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.

Column 4 uses only data from 1992 from 1998, and shows that an increase in Chinese import exposure during that period was associated with a statistically significant increase in the rates of job destruction by deaths and contractions. However, the net employment results are not statistically significant as the estimation of the job creation margin is very imprecise. Focusing instead on the periods with more Chinese import exposure growth (1998-2010 and 1998-2007), we observe that the effect of the China shock becomes larger in magnitude for net employment growth—it changes from -0.26 in column 2 to -0.34 in column 5. Note also in columns 5 and 6 that Chinese exposure is associated with a statistically significant decline in job creation by births, and also with a statistically significant decline in expansions in column 6. Overall, note that column 6—which covers the 1998-2007 period—yields the strongest results. There we observe that increased Chinese exposure affects negatively both margins of employment, decreases gross job creations, and increase gross job destruction. Deaths continue to be main driver of the Chinese driven employment decline in that period, but the decline in births is also important. In the end, the extensive margin of employment accounts for about 70 percent of the negative net employment growth response.

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. For the statistically significant coefficients (all but one), the $\hat{\beta}$'s from CBP are larger in magnitude than the $\hat{\beta}$'s from NETS. The most likely explanation for this discrepancy is that our NETS data reports on average about 19 percent more manufacturing employment than CBP, along with some remnant effect of the NETS data stickiness described above.

Another result that is worth mentioning regarding the CBP $\hat{\beta}$'s is their lower magnitude when compared to the original results in AADHP. The Chinese import penetration coefficient for the 1991-2011 IV regression in AADHP (the closest to our column 2 regression) is -1.30. If we adjust their regression to start in 1992 (along with 1992 employment weights), the coefficient barely changes to -1.33. Importantly, the dependent variable in AADHP is the annual log difference in employment times 100, while we use the annual employment growth rate times 100; note that we have to use the growth rate for us to be able to cleanly split it into its four job-flow components. Of course, for small employment changes these two variables should be very close to each other, but that is not the case when there are large employment changes. Once we take into account this difference and run AADHP regressions with the annual growth rate (rather than with the log difference), the AADHP coefficient's magnitude drops to -0.71 (but keeps its strong statistical significance). Note that this minor change brings the coefficient much closer to the -0.51 obtained in column 2.

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

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Net growth	-0.26**	-0.21**	-0.25**	-0.27**	-0.22**	-0.21**	-0.21*	-0.07
	(0.11)	(0.10)	(0.11)	(0.12)	(0.11)	(0.10)	(0.11)	(0.07)
Job flows								
Births	0.01	-0.02	-0.01	-0.01	-0.02	-0.03	-0.03	-0.03
	(0.03)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)
Deaths	0.21**	0.15*	0.17**	0.20**	0.14*	0.14*	0.13*	0.04
	(0.09)	(0.08)	(0.08)	(0.09)	(0.08)	(0.08)	(0.07)	(0.06)
Expansions	0.00	-0.01	-0.00	-0.00	-0.02	-0.01	-0.02	-0.00
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Contractions	0.06	0.04	0.07	0.05	0.04	0.04	0.04	-0.00
	(0.05)	(0.05)	(0.06)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
Net extensive margin	-0.21**	-0.16**	-0.17**	-0.21**	-0.16**	-0.17**	-0.15*	-0.07
	(0.09)	(0.08)	(0.08)	(0.09)	(0.08)	(0.08)	(0.08)	(0.08)
Net intensive margin	-0.06	-0.05	-0.07	-0.06	-0.06	-0.05	-0.06	-0.00
	(0.05)	(0.05)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)
Job creation	0.01	-0.03	-0.01	-0.02	-0.04	-0.04	-0.04	-0.03
	(0.05)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.03)
Job destruction	0.27**	0.19**	0.23**	0.25**	0.18*	0.17*	0.17*	0.04
	(0.11)	(0.09)	(0.11)	(0.11)	(0.10)	(0.09)	(0.09)	(0.05)
Net growth (CBP)	-0.51**	-0.23	-0.40**	-0.53**	-0.25	-0.24	-0.22	-0.04
	(0.23)	(0.16)	(0.20)	(0.24)	(0.16)	(0.16)	(0.16)	(0.20)
Manf. sector controls	No	Yes	No	No	Yes	Yes	Yes	No
Production controls	No	No	Yes	No	Yes	No	Yes	No
Pretrend controls	No	No	No	Yes	No	Yes	Yes	No
Industry fixed effects	No	No	No	No	No	No	No	Yes
Observations	2,352	2,352	2,352	2,352	2,352	2,352	2,352	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 (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.

Table 2 builds on column 2 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.

Column 1 in Table 2 replicates the results in Column 2 of Table 1. Note from columns 2 to 7 that across different combinations of industry-level controls the coefficient for the net growth regression remains statistically significant and between -0.27 and -0.21 (the coefficient drops towards -0.21 every time that the one-digit sector dummies are added). The results on job flows give the same story in all specifications from 1 to 7: job destruction by death is the main (and only statistically significant) driver of the net employment growth decline associated with Chinese import exposure from 1992 to 2010. Job destruction by death of establishments explains between 62 percent (in column 7) and 80 percent (in column 1) of the net job destruction.

In comparison, the CBP $\hat{\beta}$'s become closer to the NETS $\hat{\beta}$'s when the one-digit manufacturing sector controls are added, but they become statistically insignificant. An important caveat which requires further exploration is the result in column 8, which shows everything losing statistical significance when industry fixed effects are added. AADHP report a statistically significant coefficient of -0.60 in their equivalent fixed effects regression. Adjusting their period to start in 1992 (with 1992 weights) marginally changes the coefficient to -0.63 and retains its statistical significance. However, if we use the employment growth rate (as in our regressions) instead of the log change in the AADHP fixed effects regression, their coefficient drops in magnitude to -0.22 and becomes statistically insignificant.

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 buyer industries to a seller industry: if the buyers of an industry are negatively affected by the China shock, they will decrease their purchases and hence negatively affect the seller industry. Hence, it is expected that an increase in upstream Chinese exposure drives down U.S. employment. Downstream linkages refer to effects flowing downward from sellers to a buyer industry: if sellers are subject to higher Chinese exposure, some of them will suffer and decrease their sales, but these displaced sales can be replaced by cheaper Chinese inputs, which benefits the buyer industry. Thus, an increase downstream Chinese exposure may decrease or increase U.S. employment.

Most of non-manufacturing firms are non-importing industries and therefore they do not have an associated direct import penetration measure. 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, AADHP use the 1992 input-output table from the Bureau of Economic Analysis (BEA) as follows. Let us denote the use value of industry j's output purchased by industry g as μ^U_{gj}. The upstream weights for industry j can then be computed as $\omega^U_{gj} = \mu^U_{gj} / \sum_{g'} \mu^U_{g'j}$. Hence, the upstream import penetration measure of industry j is calculated as

$$IP^U_{jt} = \sum_g \omega^U_{gj} IP_{gt}, \tag{5}$$

where IP_{gt} is the direct Chinese import penetration in industry g as defined in (2). Similarly, if we denote the use value of industry j's output supplied by industry g as μ^D_{jg}. Then the downstream weights for industry j can be computed as $\omega^D_{gj} = \mu^D_{jg} / \sum_{g'} \mu^D_{g'j}$. The downstream import penetration measure of industry j is then given by

$$IP^D_{jt} = \sum_g \omega^D_{gj} IP_{gt}. \tag{6}$$

Equations (5) and (6) show first-order upstream and downstream import penetration measures. Following Acemoglu, Carvalho, Ozdaglar, and Tahbaz-Salehi (2012), AADHP also consider higher-order upstream and downstream linkages (*e.g.*, an industry is also affected by shocks to one of its buyer's buyers or sellers). Here we focus on first-order linkages and leave the results using higher-order linkages for the Appendix.

We can now expand our specifications in (3) and (4) to include the annual changes in upstream and downstream import penetration from $t-3$ to t: $\Delta IP^U_{jt} = \frac{IP^U_{jt} - IP^U_{jt}}{3}$ and $\Delta IP^D_{jt} = \frac{IP^D_{jt} - IP^D_{jt}}{3}$. Following AADHP, Table 3 separates the industries into manufacturing and non-manufacturing, while Table 4 pools all industries. All regressions in Table 3 include time fixed effects, and all regressions in Table 4 include different time fixed effects for manufacturing industries and non-manufacturing industries.

For manufacturing industries, columns 1 and 3 in Table 3 show similar results to those in Table 2 regarding the impact of direct Chinese exposure on U.S. employment—net destruction driven mostly by deaths of establishments. However, these results become weaker (and not significant) when downstream import exposure is added (in column 2). For upstream import exposure, the net coefficient is only statistically significant in column 1, in which case the net effect is also driven by deaths. Even if the net coefficient on downstream import exposure is not significant, column 2 shows it has statistically significant effects on births, deaths, and contractions: downstream import

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

	Manufacturing Industries			Non-manufacturing Industries	
	(1)	(2)	(3)	(4)	(5)
Net growth — Direct	-0.22**	-0.19	-0.20**		
	(0.11)	(0.14)	(0.10)		
Upstream	-0.75*	-0.65	-0.40	-3.36	-3.37
	(0.44)	(0.51)	(0.27)	(2.39)	(2.43)
Downstream		-0.84			2.05
		(1.32)			(2.75)
Job flows					
Births — Direct	0.02	-0.09***	-0.01		
	(0.03)	(0.04)	(0.02)		
Upstream	-0.20	-0.48***	-0.14	3.05	3.05
	(0.19)	(0.16)	(0.13)	(5.02)	(4.97)
Downstream		2.37***			2.40
		(0.74)			(2.62)
Deaths — Direct	0.19**	0.10	0.14*		
	(0.09)	(0.10)	(0.08)		
Upstream	0.49*	0.27	0.20	8.09**	8.08**
	(0.28)	(0.38)	(0.18)	(3.95)	(3.81)
Downstream		1.83*			3.77
		(0.95)			(2.75)
Expansions — Direct	0.00	-0.01	-0.01		
	(0.03)	(0.03)	(0.03)		
Upstream	-0.03	-0.07	-0.02	3.51***	3.50***
	(0.09)	(0.09)	(0.08)	(1.01)	(0.84)
Downstream		0.36			3.83***
		(0.38)			(1.10)
Contractions — Direct	0.06	-0.02	0.04		
	(0.05)	(0.06)	(0.05)		
Upstream	0.03	-0.17	0.04	1.84	1.84
	(0.18)	(0.20)	(0.13)	(1.27)	(1.24)
Downstream		1.74***			0.41
		(0.46)			(0.84)
Net growth (CBP) — Direct	-0.39*	-0.41	-0.18		
	(0.23)	(0.28)	(0.16)		
Upstream	-2.32***	-2.36***	-1.49***	-7.02***	-7.10***
	(0.66)	(0.69)	(0.39)	(2.50)	(2.60)
Downstream		0.41			-1.81
		(2.23)			(2.79)
Manufacturing sector controls	No	No	Yes	No	No
Observations	2,352	2,352	2,352	522	522

Notes: This table reports results for the effects of direct, upstream, anddownstream Chinese import exposure on annualized three-year net employment changes and job flows. All regressions include time fixed effects. Regressions 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.

exposure increases the rate job destruction by both deaths and contractions, but that effect is watered down by an increase in the rate of job creation due to births. These results show the counteracting forces of downstream import penetration described above.

For non-manufacturing firms, the net effects of upstream and downstream Chinese exposure are not significant. However, for upstream Chinese exposure columns 4 and 5 in Table 3 show statistically significant increases in the rates of job destruction by deaths and job creation by expansions. The effect on deaths is larger in magnitude, but the effect on expansions is large enough to make the net effect not significant. These results indicate possible reallocation of market shares from dying establishments to surviving establishments as a consequence of upstream Chinese exposure.

The CBP net growth results are generally weak for direct exposure, but are very strong for upstream import penetration. They show large and significant net job destruction in both manufacturing and non-manufacturing due to an increase in upstream Chinese exposure.

Table 4 shows that pooling all industries yields similar results to those obtained in Table 3 for the effects of direct Chinese exposure on U.S. employment. The upstream net coefficients, however, become larger in magnitude and statistically significant in all pooled specifications. Although the magnitude of the upstream net coefficients is still well below those obtained with CBP data, they at least provide now a similar conclusion: upstream exposure is significantly associated with U.S. net job destruction. The added value of our job-flow results is that they show that the net effect is driven by deaths of establishments.

The last column in Table 4 uses instead a combined direct-upstream Chinese import penetration measure (the sum of both measures). The net and deaths coefficients on the combined measure are highly significant and yield the same story. Column 2 shows agains that downstream exposure significantly increases job creation by births and job destruction by contractions, but the net coefficient is statistically significant. 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.

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

Table 4: IV Estimation of the Effects of Chinese Import Exposure on U.S. Employment with Upstream and Downstream Linkages — Pooling All Industries

	Pooling All Industries				
	(1)	(2)	(3)	(4)	(5)
Net growth — Direct	-0.21**	-0.23	-0.19*	-0.21**	
	(0.11)	(0.14)	(0.10)	(0.10)	-0.29***
Upstream	-1.00*	-1.04*	-0.71*	-0.79*	(0.11)
	(0.53)	(0.56)	(0.40)	(0.47)	
Downstream		0.37			
		(1.45)			
Job flows					
Births — Direct	0.00	-0.10*	-0.02	-0.01	
	(0.03)	(0.06)	(0.03)	(0.03)	0.01
Upstream	0.11	-0.12	0.19	0.18	(0.03)
	(0.41)	(0.44)	(0.47)	(0.39)	
Downstream		2.14**			
		(1.09)			
Deaths — Direct	0.15*	0.06	0.11	0.13*	
	(0.09)	(0.10)	(0.08)	(0.08)	0.25***
Upstream	1.21**	1.00	1.02*	1.03**	(0.09)
	(0.57)	(0.64)	(0.54)	(0.44)	
Downstream		1.99			
		(1.35)			
Expansions — Direct	-0.01	-0.08*	-0.02	-0.03	
	(0.03)	(0.05)	(0.03)	(0.02)	0.02
Upstream	0.30	0.16	0.35	0.29	(0.03)
	(0.21)	(0.26)	(0.26)	(0.20)	
Downstream		1.35			
		(0.86)			
Contractions — Direct	0.05	-0.00	0.03	0.04	
	(0.05)	(0.06)	(0.05)	(0.04)	0.06
Upstream	0.20	0.08	0.23	0.23	(0.05)
	(0.17)	(0.18)	(0.15)	(0.17)	
Downstream		1.13***			
		(0.42)			
Net growth (CBP) — Direct	-0.36	-0.36	-0.15	-0.47**	
	(0.23)	(0.26)	(0.16)	(0.23)	-0.64***
Upstream	-2.83***	-2.82***	-2.15***	-2.66***	(0.23)
	(0.86)	(0.87)	(0.61)	(0.73)	
Downstream		-0.06			
		(1.64)			
Manufacturing sector controls	No	No	Yes	No	No
Exclude 2007-10	No	No	No	Yes	No
Observations	2,874	2,874	2,874	2,395	2,874

Notes: This table reports results for the effects of direct, upstream, downstream, and combined Chinese import exposure on annualized three-year net employment changes and job flows. All regressions include separate time fixed effects for manufacturing and non-manufacturing industries. Regressions 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.

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,

$$\Delta IP_{it}^{CZ} = \sum_{j} \left(\frac{L_{ijt-3}}{L_{it-3}} \right) \Delta IP_{jt}, \tag{7}$$

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.[6] We use $k = \{1, 2, 3\}$ 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 using k to classify each industry in each commuting zone, we proceed to 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 sector k in commuting zone i from $t-3$ to t as

$$\hat{\ell}_{ikt} = \frac{100}{3} \left[\frac{L_{ikt} - L_{ikt-3}}{P_{it-3}} \right], \tag{8}$$

where L_{ikt} denotes employment in sector k in commuting zone i at year t, and P_{it-3} is the working-age population in commuting zone i at $t-3$. Similar to section 4.1, we can split the change in the employment-to-population ratio into its job-flow components. With minor notation abuse, we split $\hat{\ell}_{ikt}$ as

$$\hat{\ell}_{ikt} \equiv b_{ikt} - d_{ikt} + e_{ikt} - c_{ikt},$$

[6] 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 four percentage points during the same period.

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}). We calculate each term as $\frac{100}{3}$ times the change in sector k–commuting zone i's employment due to the particular job-flow type (in absolute value) divided by total commuting-zone population in $t-3$.

The specifications to estimate the net and gross local-labor-market effects of Chinese import exposure are

$$\hat{\ell}_{ikt} = \alpha_{kt} + \sum_k \beta_k \left[\Delta IP_{it}^{CZ} \times D_k\right] + \gamma_k Z_{ikt} + \varepsilon_{ikt}, \tag{9}$$

$$F_{ikt} = \alpha_{kt}^F + \sum_k \beta_k^F \left[\Delta IP_{it}^{CZ} \times D_k\right] + \gamma_k^F Z_{ikt} + \varepsilon_{ikt}^F, \tag{10}$$

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

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

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

Table 5 shows the estimation of (9) and (10). In addition to sector-time fixed effects, we follow AADHP and add as controls the commuting zone's manufacturing share (at the beginning of each period) interacted with sector dummies, as well as regional Census division dummies interacted with sector dummies. All regression are weighted by total population in 1992.

All regressions show a strong negative response of the employment-to-population ratio in the exposed sector to an increase in the commuting zone's Chinese exposure. The coefficients are almost as large in magnitude as those reported by AADHP in their long-difference regressions. As before, the main driving factor of the ratio decline is an increase in job destruction due to establishment deaths. Other coefficients change in sign, magnitude, and significance as we add the sector-manufacturing shares (from column 1 to 2), but change little as we add the sector-Censor division dummies (from column 1 to 3). Therefore, for the rest of the analysis we focus on the results in columns 3 and 4, which include all controls.

Table 6 replicates the results of columns 3 and 4 in Table 5 and extends them to include the contributions of the net extensive and intensive margins of employment, as well as gross job creation and destruction. The layout of Table 6 also allows for an easier interpretation of the results.

Table 5: IV Estimation of the Local-Labor-Market Effects of Chinese Import Exposure on Employment-to-Population Ratios of Exposed and Nonexposed Sectors

	1992-2010			**1992-2007**
	(1)	(2)	(3)	(4)
Δ(Employment/Population) — Exposed	-1.83***	-1.77***	-1.78***	-1.35***
	(0.35)	(0.46)	(0.50)	(0.30)
Non-exposed tradable	0.08	0.28**	0.30***	0.21**
	(0.07)	(0.11)	(0.11)	(0.10)
Non-exposed non-tradable sector	-0.65*	0.29	0.25	0.49
	(0.35)	(0.49)	(0.49)	(0.39)
Job flows contribution				
Births — Exposed	0.68***	0.16	0.11	0.10
	(0.10)	(0.14)	(0.15)	(0.12)
Non-exposed tradable	-0.06	-0.17***	-0.12**	-0.15***
	(0.04)	(0.06)	(0.06)	(0.05)
Non-exposed non-tradable sector	-1.48***	1.10***	1.18***	0.97**
	(0.54)	(0.42)	(0.43)	(0.39)
Deaths — Exposed	2.01***	1.50***	1.46***	0.97***
	(0.30)	(0.38)	(0.40)	(0.22)
Non-exposed tradable	-0.09	-0.27***	-0.21***	-0.15**
	(0.07)	(0.09)	(0.08)	(0.06)
Non-exposed non-tradable sector	-0.93	1.02	1.04	0.68
	(0.67)	(0.65)	(0.65)	(0.49)
Expansions — Exposed	0.74***	0.12	0.09	0.10
	(0.09)	(0.12)	(0.12)	(0.12)
Non-exposed tradable	-0.05	-0.19***	-0.14***	-0.14***
	(0.04)	(0.05)	(0.05)	(0.05)
Non-exposed non-tradable sector	-0.64*	0.31	0.41	0.28
	(0.38)	(0.30)	(0.32)	(0.25)
Contractions — Exposed	1.24***	0.55***	0.53***	0.58***
	(0.16)	(0.13)	(0.14)	(0.13)
Non-exposed tradable	-0.09	-0.38***	-0.36***	-0.35***
	(0.06)	(0.11)	(0.12)	(0.10)
Non-exposed non-tradable sector	-0.54*	0.11	0.30	0.08
	(0.29)	(0.30)	(0.32)	(0.26)
Δ(Emp/Pop) (CBP) — Exposed	-1.53***	-1.02**	-0.69	-1.33***
	(0.27)	(0.46)	(0.55)	(0.45)
Non-exposed tradable	-0.06	0.07	0.05	-0.10
	(0.10)	(0.15)	(0.15)	(0.14)
Non-exposed non-tradable sector	-1.68**	0.09	-0.51	-0.15
	(0.72)	(0.90)	(0.87)	(0.82)
Sector × manf. emp share at baseline	No	Yes	Yes	Yes
Sector × Census division dummies	No	No	Yes	Yes
Observations	12,996	12,996	12,996	10,830

Notes: This table reports $\hat{\beta}_k$ and $\hat{\beta}_k^F$ from the estimation of specifications (9) and (10), for $F = \{b, d, e, c\}$, and $k \in \{1(\text{exposed}), 2(\text{nonexposed tradable}), 3(\text{nonexposed nontradable})\}$. All regressions include sector-time fixed effects and 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 three-digit industry level. The coefficients are statistically significant at the *10%, **5%, or ***1% level.

Table 6: IV Estimation of the the Effects of Chinese Import Exposure on U.S. Commuting Zones

	1992-2010 (Column 3, Table 5)			1992-2007 (Column 4, Table 5)		
	Exposed	**Nonexposed tradable**	**Nonexposed nontradable**	**Exposed**	**Nonexposed tradable**	**Nonexposed nontradable**
Δ(Employment/Population)	-1.78***	0.30***	0.25	-1.35***	0.21**	0.49
	(0.50)	(0.11)	(0.49)	(0.30)	(0.10)	(0.39)
Job flows contribution						
Births	0.11	-0.12**	1.18***	0.10	-0.15***	0.97**
	(0.15)	(0.06)	(0.43)	(0.12)	(0.05)	(0.39)
Deaths	1.46***	-0.21***	1.04	0.97***	-0.15**	0.68
	(0.40)	(0.08)	(0.65)	(0.22)	(0.06)	(0.49)
Expansions	0.09	-0.14***	0.41	0.10	-0.14***	0.28
	(0.12)	(0.05)	(0.32)	(0.12)	(0.05)	(0.25)
Contractions	0.53***	-0.36***	0.30	0.58***	-0.35***	0.08
	(0.14)	(0.12)	(0.32)	(0.13)	(0.10)	(0.26)
Net extensive margin	-1.34***	0.08	0.13	-0.87***	-0.00	0.29
	(0.46)	(0.06)	(0.44)	(0.22)	(0.05)	(0.32)
Net intensive margin	-0.44***	0.22**	0.11	-0.48***	0.21**	0.20
	(0.16)	(0.10)	(0.28)	(0.16)	(0.09)	(0.16)
Job creation	0.21	-0.26***	1.59**	0.20	-0.29***	1.25**
	(0.24)	(0.10)	(0.68)	(0.22)	(0.09)	(0.59)
Job destruction	1.99***	-0.56***	1.34	1.55***	-0.50***	0.76
	(0.40)	(0.16)	(0.89)	(0.28)	(0.13)	(0.70)
Δ(Emp/Pop) (CBP)	-0.69	0.05	-0.51	-1.33***	-0.10	-0.15
	(0.55)	(0.15)	(0.87)	(0.45)	(0.14)	(0.82)

Notes: This table extends the results of Columns 3 and 4 of Table 5 to include results for the net extensive and intensive margins, and gross job creation and destruction. Standard errors in parentheses are clustered on commuting zone. The coefficients are statistically significant at the *10%, **5%, or ***1% level.

For the full period, the job-flows 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 coefficient is about a third in size of the death coefficient, it is still very large a highly significant. Hence, the ratio decline is a consequence of a large increase in gross job destruction through its two components.

The most interesting results 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 on the two non-exposed sectors. This is not surprising, given that aggregate demand effects and job reallocations from the exposed sector to the non-exposed sectors have opposite effects on the employment-to-population ratio. 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 an statistically significant increase in the employment-to-population ratio after an increase in 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 and 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.

The 1992-2007 regressions in Table 6 show that excluding the Great Recession period causes a decline in magnitude on some of the coefficients, indicating that the large employment changes during the crisis may be causing an upward bias in the magnitude of some of our estimates. However, none of them loses its statistical significance and none of the previous conclusions change. Lastly, the 1992-2010 regression with the CBP data does not yield any significant estimates, but the 1992-2007 regression shows that this changes once we remove the Great recession period. In such a case, the coefficient for exposed industries is very close to the net coefficient using the NETS data.

5 Conclusion

The China shock is associated with net job destruction in the United States. Using job flows calculated from the universe of U.S. establishments, this paper showed with industry-level regressions that this net result is mainly driven by the death of establishments. In addition, a local-labor-market analysis shows that gross job destruction by both deaths and contractions (but mainly by death) are responsible for the decline in the employment-to-population ratio in the sector of the economy exposed to Chinese import competition. 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 at net changes, we showed 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.

With deaths of establishments playing such a crucial job in employment dynamics during the China shock, it is important to learn more about the dying establishment's characteristics. Are they small or large establishments? 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? Answers to these questions would provide guidelines for the design of policies that promote job creation in response to Chinese competition.

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