Appendix

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Shock Propagation within Multi-sector Firms

Jay Hyun* University of Alberta

Ziho Park† National Taiwan University

Vladimir Smirnyagin‡ University of Virginia

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*Alberta School of Business, University of Alberta, jungsikj@ualberta.ca, Jungsik Hyun. Postal address: 11211 Saskatchewan Dr NW, Edmonton, Alberta, T6G 2R6, Canada.

†Department of Economics, National Taiwan University, zihopark@ntu.edu.tw. Postal address: No.1, Sec 4, Roosevelt Road, Taipei, 10617, Taiwan.

‡Department of Economics, University of Virginia, vladimir.smirnyagin@virginia.edu. Postal address: Monroe Hall, Charlottesville, VA 22903, USA.

Appendix A Additional Tables

A.1 Summary Statistics at the Sector-level

Table A.1: Summary Statistics: Sector-level

Overall						
Variable	Obs.	Mean	Std. Dev.	P10	P50	P90
$\widetilde{\Delta}$Emp	850	0.198	0.749	-0.645	0.111	1.261
$\widetilde{\Delta}\text{IP}_{\text{non-std}}$	850	0.313	0.936	0	0	0.892
$\widetilde{\Delta}\text{IP (other)}_{\text{non-std}}$	850	0.247	0.175	0.057	0.215	0.490
Emp 1991 (thousand)	850	112.2	369.9	6.2	33.8	208.3
Manufacturing						
Variable	Obs.	Mean	Std. Dev.	P10	P50	P90
$\widetilde{\Delta}$Emp	400	-0.135	0.589	-0.861	-0.175	0.618
$\widetilde{\Delta}\text{IP}_{\text{non-std}}$	400	0.688	1.293	0.002	0.225	1.960
$\widetilde{\Delta}\text{IP (other)}_{\text{non-std}}$	400	0.288	0.181	0.072	0.251	0.528
Emp 1991 (thousand)	400	43.8	64.9	6.3	21.8	97.2
Non-Manufacturing						
Variable	Obs.	Mean	Std. Dev.	P10	P50	P90
$\widetilde{\Delta}$Emp	450	0.471	0.757	-0.407	0.409	1.512
$\widetilde{\Delta}\text{IP (other)}_{\text{non-std}}$	450	0.213	0.162	0.052	0.174	0.415
Emp 1991 (thousand)	450	168.6	489.2	6.2	56.9	339.4

Notes: This table provides sector-level summary statistics for the sample in Section B. These summary statistics are calculated by including all establishments within each sector—i.e., they include both multi-sector and single-sector firms. The data come from the Census Longitudinal Business Database (LBD). $\widetilde{\Delta}$Emp is the sector-level employment growth, $\widetilde{\Delta}$IP is the direct China shock, and $\widetilde{\Delta}$IP (other) is the indirect China shock from other sectors through within-firm linkages. A detailed description of variables can be found in Section 2. All numbers have been rounded in accordance with U.S. Census Bureau disclosure guidelines.

A.2 Regression with Non-standardized Shocks

Table A.2: IV Regressions with Non-standardized Shocks

	(1) $\widetilde{\Delta}$Emp	(2) $\widetilde{\Delta}$Emp	(3) $\widetilde{\Delta}$Emp	(4) $\widetilde{\Delta}$Emp
$\widetilde{\Delta}\text{IP}_{\text{non-std}}$	-0.007***	-0.007***	-0.006***	
	(0.001)	(0.001)	(0.001)	
$\widetilde{\Delta}\text{IP (other)}_{\text{non-std}}$		-0.013***	-0.013***	-0.008***
		(0.002)	(0.002)	(0.002)
N	573,000	573,000	573,000	573,000
IV	✓	✓	✓	✓
F stat (direct)	515.6	520.2	603.6	-
F stat (indirect)	-	665.6	768.7	802.6
Controls	✓	✓	✓	✓
County FE	-	-	✓	✓
Industry FE	SIC 2-digit	SIC 2-digit	SIC 2-digit	SIC 4-digit

Notes: This table repeats Table 2, where we use the original non-standardized direct and indirect exposures to the import competition from China. Standard errors are double clustered at the state and firm levels. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively. All numbers are rounded in accordance with U.S. Census Bureau disclosure guidelines.

A.3 OLS Result

Table A.3: Impact of the Direct and Indirect China Shocks on Employment Growth: OLS Regressions

	(1) $\widetilde{\Delta}$Emp	(2) $\widetilde{\Delta}$Emp	(3) $\widetilde{\Delta}$Emp	(4) $\widetilde{\Delta}$Emp
$\widetilde{\Delta}$IP	-0.033***	-0.033***	-0.031***	
	(0.005)	(0.005)	(0.004)	
$\widetilde{\Delta}$IP (other)		-0.055***	-0.054***	-0.035***
		(0.011)	(0.011)	(0.011)
N	573,000	573,000	573,000	573,000
R-sq	0.092	0.094	0.144	0.192
Controls	✓	✓	✓	✓
County FE	-	-	✓	✓
Industry FE	SIC 2-digit	SIC 2-digit	SIC 2-digit	SIC 4-digit

Notes: $\widetilde{\Delta}$Emp is the establishment-level employment growth defined in Equation (2.7), $\widetilde{\Delta}$IP is the direct China shock defined in Equation (2.2), and $\widetilde{\Delta}$IP (other) is the indirect China shock defined in Equation (2.5). We standardize these shocks using their respective sample means and standard deviations to facilitate interpretation. Controls include manufacturing employment share, quadratic polynomials in establishment and firm age, log of initial establishment employment, log of initial firm employment, log of initial within-firm sectoral employment, and log of average initial employment in other-sector establishments within-firm. All regressions are weighted by initial establishment-level employment. Standard errors are double clustered at the state and firm levels. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively. All numbers are rounded in accordance with U.S. Census Bureau disclosure guidelines.

A.4 Robustness

This section presents a number of robustness checks that we conducted to corroborate our main finding.

Placebo Tests: Pretrend Analysis and Placebo Networks One concern in our analysis regards the selection of firms and establishments. That is, an establishment that is more affected by within-firm sectoral spillover could have been experiencing a declining trend in its employment prior to 1991. We address this concern by conducting a pretrend test. In particular, we follow Autor et al. (2014) and study the relationship between the indirect China shock and the establishment's employment growth between 1976 and 1990. Column (1) of Table A.4 shows no evidence of any pretrend.

What is important for within-firm sectoral spillover is that establishments are connected not to other sectors in general but to other sectors in which the firm is operating. To illustrate this, we follow Giroud and Mueller (2019) and perform a placebo test by constructing counterfactual random within-firm sectoral networks. Specifically, for each establishment we replace sector affiliations of other establishments within a given firm with randomly drawn sectors. We then estimate our main regression equation (2.8) and record coefficient estimates along with standard errors. Column (2) of Table A.4 reports the averaged across 500 repetitions results: Placebo within-firm indirect shocks have no significant effect on establishment-level employment growth.

Table A.4: Placebo Tests: Pretrend Check and Placebo Networks

	(1)	(2)
	Pretrend Check	Placebo Networks
	$\widetilde{\Delta}\text{Emp}_{(76-90)}$	$\widetilde{\Delta}\text{Emp}$
$\widetilde{\Delta}$IP (other)	-0.004	
	(0.008)	
$\widetilde{\Delta}$IP (other, placebo)		-0.000
		(0.005)
N	157,000	573,000
IV	✓	✓
First-stage F stat	664.6	400
Controls	✓	✓
County FE	✓	✓
Industry FE	SIC 4-digit	SIC 4-digit

Notes: This table uses the same specification as in column (4) in Table 2, where (i) column (1) – pretrend check – replaces the dependent variable with the establishment-level employment growth between 1976 to 1990, $\widetilde{\Delta}\text{Emp}_{(76-90)}$, and (ii) column (2) – Placebo networks – replaces the indirect China shock with the Placebo indirect China shock constructed from random within-firm sectoral networks, $\widetilde{\Delta}$IP (other, placebo). All numbers in column (2) are the average of 500 draws of random within-firm sectoral networks and the associated regressions. Standard errors are double clustered at the state and firm level. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively. All numbers have been rounded in accordance with U.S. Census Bureau disclosure guidelines.

Common or Clustered Shocks If a firm operates in industries that experience quantitatively similar exposures to import competition from China, then a negative coefficient on the indirect shock we reported earlier might reflect the impact of a common or clustered sectoral shock that simultaneously affects multiple sectors in which the firm operates. If this is the case, we should find a positive correlation between the direct and indirect China shocks. We, therefore, regress the direct shock on the indirect one to check if there is any systematic correlation between the two. Table A.5 shows no evidence of a statistically significant relation between the shocks (and their corresponding IVs).

Table A.6 provides additional evidence that common or clustered shocks are not driving our main findings. In column (1), we re-construct the within-firm indirect sectoral shock by excluding establishments within-firm that operate in the same SIC 3-digit sector. This way we measure the indirect China shock that arises from sufficiently different (up to SIC 3-digit level) industries. In column (2), we re-construct the indirect shock by excluding establishments within-firm that are located in the same county, thereby allowing us to explore the possibility that our baseline estimates capture the impact of a common regional shock.[1] In both specifications, the resulting estimates are close to the baseline.

[1]Note that in the baseline regression, county fixed effects absorb any *direct* impact of regional shocks on establishment-level employment. However, if a firm's majority of establishments are located in the same county, an establishment could be affected by the regional shock *indirectly* through its impact on other establishments within-firm located in the same county. Column (2) of Table A.6 shows that this is not the case.

Table A.5: Relation between Direct and Indirect Shocks

	(1) $\widetilde{\Delta}$IP	(2) $\widetilde{\Delta}$IP	(3) $\widetilde{\Delta}$IPO
$\widetilde{\Delta}$IP (other)	-0.008		
	(0.014)		
$\widetilde{\Delta}$IPO (other)		0.001	0.012
		(0.002)	(0.011)
N	573,000	573,000	573000
R-sq	0.499	0.499	0.494
Controls	✓	✓	✓
County FE	✓	✓	✓
Industry FE	SIC 2-digit	SIC 2-digit	SIC 2-digit

Notes: $\widetilde{\Delta}$IP is the direct China shock defined in Equation (2.2), $\widetilde{\Delta}$IPO is the IV for direct China shock defined in Equation (2.4), $\widetilde{\Delta}$IP (other) is the indirect China shock defined in Equation (2.5), and $\widetilde{\Delta}$IPO (other) is the IV for the indirect China shock defined in Equation (2.6). Controls include manufacturing employment share, establishment age and age-squared, firm age and age-squared, log of initial establishment employment, log of initial firm employment, log of initial sector employment within a firm, and log of average initial employment in other-sector establishments within-firm. All regressions are weighted by initial establishment-level employment. Standard errors are double clustered at the state and firm level. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively. All numbers have been rounded in accordance with U.S. Census Bureau disclosure guidelines.

Table A.6: Indirect Sectoral Shocks originating from (i) Establishments Operating in Different SIC 3-digit, (ii) Establishments Located in Different Counties

	(1) $\widetilde{\Delta}$Emp	(2) $\widetilde{\Delta}$Emp
$\widetilde{\Delta}$IP (other, exclude same SIC 3-digit)	-0.044***	
	(0.013)	
$\widetilde{\Delta}$IP (other, exclude same county)		-0.040***
		(0.009)
N	573,000	550,000
IV	✓	✓
First-stage F stat	7068	782.2
Controls	✓	✓
County FE	✓	✓
Industry FE	SIC 4-digit	SIC 4-digit

Notes: This table uses the same specification as in column (4) in Table 2, where we construct the indirect shock for a given establishment by (i) excluding establishments within-firm that operate in the same SIC 3-digit sectors—column (1) and (ii) excluding establishments within-firm located in the same county—column (2). Standard errors are double clustered at the state and firm level. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively. All numbers have been rounded in accordance with U.S. Census Bureau disclosure guidelines.

Dropping Firm Affiliation/Industry Switchers We also check whether our findings are robust to organizational changes of firms. Table A.7 re-estimates our baseline specification on a sample without establishments that experienced a change in firm affiliation, or switched an industry. We obtain similar results.

Table A.7: Dropping Establishments with Affiliation or Industry Change

	$\widetilde{\Delta}$Emp			
	(1)	(2)	(3)	(4)
Exclude	Affiliation Change		Industry Change	
$\widetilde{\Delta}$IP	-0.043***		-0.056***	
	(0.006)		(0.006)	
$\widetilde{\Delta}$IP (other)	-0.059***	-0.042***	-0.071***	-0.045***
	(0.014)	(0.011)	(0.011)	(0.010)
N	505,000	505,000	530,000	530,000
IV	✓	✓	✓	✓
F stat (direct)	452.7	-	458	-
F stat (indirect)	720	750.5	676	688.2
Controls	✓	✓	✓	✓
County FE	✓	✓	✓	✓
Industry FE	SIC 2-digit	SIC 4-digit	SIC 2-digit	SIC 4-digit

Notes: This table uses the same specifications as those used in column (3) and column (4) in Table 2, where we drop establishments that changed affiliation (column (1) and column (2)) or changed industry (column (3) and column (4)) during the sample period. Standard errors are double clustered at the state and firm level. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively. All numbers have been rounded in accordance with U.S. Census Bureau disclosure guidelines.

Controlling for Other-Sector Characteristics Within-Firm It is also possible that our indirect propagation effect is confounded by other sectoral characteristics rather than by the shock that originates in other sectors within the firm. For example, an establishment in one sector could experience a larger decline in employment not because of its indirect exposure to the China shock per se but because the firm experienced an increasing labor productivity in other sectors and, thus, decided to reallocate workers to those industries. To address this concern, we control for various other-sector characteristics (the logarithm of average wages as well as the growth in wages and employment shares between 1976 and 1991), which are constructed analogously to the indirect China shock. Table A.8 demonstrates that the estimates remain stable and highly significant.

Table A.8: Controlling for Other-Sector Characteristics Within-Firm

	(1) $\widetilde{\Delta}$Emp	(2) $\widetilde{\Delta}$Emp	(3) $\widetilde{\Delta}$Emp	(4) $\widetilde{\Delta}$Emp
$\widetilde{\Delta}$IP (other)	-0.044***	-0.048***	-0.045***	-0.044***
	(0.010)	(0.011)	(0.010)	(0.011)
Growth in emp. share 1976-1991 (other)	0.230			0.491
	(2.337)			(2.272)
Log wage 1991 (other)		-0.042*		0.013
		(0.022)		(0.027)
Growth in log wage 1976-1991 (other)			-0.127***	-0.142***
			(0.037)	(0.045)
N	573,000	573,000	573,000	573,000
IV	✓	✓	✓	✓
First-stage F stat	794.1	783.7	799	766.2
Controls	✓	✓	✓	✓
County FE	✓	✓	✓	✓
Industry FE	SIC 4-digit	SIC 4-digit	SIC 4-digit	SIC 4-digit

Notes: This table uses the same specification as in column (4) in Table 2, where we additionally control for characteristics of other sectors within a firm. These other-sector characteristics include growth in the sectoral employment share between 1976-1991, log of sector-level wage, and growth in log wage between 1976-1991. Standard errors are double clustered at the state and firm level. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively. All numbers have been rounded in accordance with U.S. Census Bureau disclosure guidelines.

Dropping Industries Exposed to Demand Shocks and Outliers The usage of the instrument introduced in Section 2 rests on the identifying assumption that import demand shocks are not highly correlated between the U.S. and eight developed countries used to construct the instrument. Following Autor, Dorn, and Hanson (2013), we check whether our result holds when we exclude industries that are relatively more susceptible to demand shocks arising from the U.S. and other high-income countries. In particular, we omit computer (SIC 1987 industries 3571, 3572, 3577), construction (3211, 3241, 3312, 3315, 3462, 3493) and apparel (SIC $\in [2211, 2299]$) industries. Table A.9 shows that in all cases the economic and statistical significance of our results is preserved.

Additionally, we check whether our results are robust to outliers in Table A.10. Columns (1) and (2) exclude the bottom and top 10% of firms by size, respectively. Note that the number of observations drops substantially when the largest enterprises are excluded; this occurs because these firms are comprised of a large number of establishments. Furthermore, columns (3) and (4) exclude establishments at the bottom and top deciles of the indirect shock distribution. We find robust results across all these specifications.

Table A.9: Drop Industries Affected by Demand Shocks Hitting High-Income Countries

	$\widetilde{\Delta}$Emp			
	(1)	(2)	(3)	(4)
Dropped industries	No construction	No computer	No apparel	All three
$\widetilde{\Delta}$IP (other)	-0.045***	-0.045***	-0.043***	-0.046***
	(0.010)	(0.010)	(0.010)	(0.010)
N	572,000	573,000	572,000	571000
IV	✓	✓	✓	✓
First-stage F stat	795.8	804.8	781.6	777.3
Controls	✓	✓	✓	✓
County FE	✓	✓	✓	✓
Industry FE	SIC 4-digit	SIC 4-digit	SIC 4-digit	SIC 4-digit

Notes: The specification estimated in this table is the same as the one used in the last column of Table 2. Columns (1), (2), and (3) drop construction (SIC 1987 industries include 3211, 3241, 3312, 3315, 3462, 3493), computer (3571, 3572, 3577) and apparel ($\in [2211, 2299]$) industries from the core sample, respectively. Column (4) drops all three industries from the sample. Standard errors are double clustered at the state and firm level. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively. All numbers have been rounded in accordance with U.S. Census Bureau disclosure guidelines.

Table A.10: Dropping Outliers

	$\widetilde{\Delta}$Emp			
	By Firm Size		By Indirect Shock	
	(1)	(2)	(3)	(4)
Exclude	Bottom 10%	Top 10%	Bottom 10%	Top 10%
$\widetilde{\Delta}$IP	-0.047***	-0.026***	-0.044***	-0.051***
	(0.006)	(0.005)	(0.006)	(0.006)
$\widetilde{\Delta}$IP (other)	-0.068***	-0.018**	-0.071***	-0.066**
	(0.011)	(0.009)	(0.011)	(0.027)
N	564,000	161,000	516,000	516,000
IV	✓	✓	✓	✓
F stat (direct)	602.9	773	416.8	630.7
F stat (indirect)	766.4	1390	650	1292
Controls	✓	✓	✓	✓
County FE	✓	✓	✓	✓
Industry FE	SIC 2-digit	SIC 2-digit	SIC 2-digit	SIC 2-digit

Notes: This table uses the same specification as in column (4) in Table 2, where we drop establishments affiliated with firms in the bottom/top 10% by firm size (column (1) and column (2)) or we drop establishments that faced the bottom/top 10% magnitude of the indirect China shock (column (3) and column (4)). Standard errors are double clustered at the state and firm level. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively. All numbers have been rounded in accordance with U.S. Census Bureau disclosure guidelines.

Shift-share Robust Standard Errors A growing body of literature has recognized the importance of accounting for correlated errors in case of shocks with a shift-share structure (Adao, Kolesár, and Morales, 2019; Borusyak, Hull, and Jaravel, 2022). Provided that we two-way cluster standard errors by state and firm, our framework is not directly nested by the class of empirical models studied in the aforementioned papers. Nevertheless, we estimate standard errors following Adao, Kolesár, and Morales (2019) and report the results in Table A.11. We find that the estimates remain highly significant: In fact, the correction leads to even *smaller* standard errors.

Table A.11: Shift-Share Robust Standard Error following Adao, Kolesár, and Morales (2019)

	$\widetilde{\Delta}$Emp		
	(1)	(2)	(3)
Sample	All	Mnf	Non-mnf
$\widetilde{\Delta}$IP (other)	-0.044***	-0.043***	-0.045**
	(0.007)	(0.008)	(0.015)
N	573,000	121,000	452,000
IV	✓	✓	✓
First-stage F stat	802.6	507.1	435.4
Controls	✓	✓	✓
County FE	✓	✓	✓
Industry FE	SIC 4-digit	SIC 4-digit	SIC 4-digit

Notes: This table uses the same specification as in column (4) in Table 2, where we use a shift-share robust standard error following Adao, Kolesár, and Morales (2019). *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively. All numbers have been rounded in accordance with U.S. Census Bureau disclosure guidelines.

Constructing Weights Using only Manufacturing Employment Our baseline definition of the indirect shock $\widetilde{\Delta}IP^{f}_{91-07}$(other) assumes zero exposure of non-manufacturing establishments to Chinese import competition ($\widetilde{\Delta}IP^{b,f}_{j,91-07} = 0$). This should not pose a serious problem because throughout the analysis we control for *(i)* the firm-level share of the manufacturing employment and *(ii)* the employment share of other establishments within a firm.

Nevertheless, in Table A.12 we experiment with an *alternative* definition of the indirect shock, in which the denominator of the weight does not include non-manufacturing employment. In this case, the weight in Equation (2.5) takes the following form:

$$\omega^{f}_{j',-j,91} \equiv \frac{Emp^{f}_{j',91}}{\sum_{(j''\neq j)\&(j''\in \mathbf{Mfg})} Emp^{f}_{j'',91}}. \tag{A.1}$$

We obtain robust results.

Table A.12: Alternative Definition of the Indirect Shock

	$\widetilde{\Delta}$Emp		
	(1)	(2)	(3)
Sample	All	Mnf	Non-mnf
$\widetilde{\Delta}$IP (other)	-0.042***	-0.039***	-0.041**
	(0.009)	(0.010)	(0.019)
N	573,000	121,000	452,000
IV	✓	✓	✓
First-stage F stat	544.6	441.2	373.7
Controls	✓	✓	✓
County FE	✓	✓	✓
Industry FE	SIC 4-digit	SIC 4-digit	SIC 4-digit

Notes: The underlying equations for columns (1), (2) and (3) in this table are identical to those used in column (4) from Tables 2, A.15 and A.16, respectively. The difference arises due to an alternative definition of the indirect shock: We only consider manufacturing employment to construct the weight in Equation (2.5): $\omega^{f}_{j',-j,91} \equiv \frac{Emp^{f}_{j',91}}{\sum_{(j''\neq j)\&(j''\in \mathbf{Mfg})} Emp^{f}_{j'',91}}$. Standard errors are double clustered at the state and firm level. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively. All numbers have been rounded in accordance with U.S. Census Bureau disclosure guidelines.

Additional Results We conclude this section by mentioning additional exercises that we conducted. First, our main result holds when we aggregate the data to the firm-sector level in Table A.13. We also consider an *unweighted* regression in Table A.14 and show that our results are not driven by large establishments. We also demonstrate that adding various additional controls, such as the degree of within-firm trade, the scope of production and export/import status, has no material impact on the estimates in Tables A.20 and A.22.[2]

[2]These firm characteristics are also used when we explore the heterogeneous treatment effect in Section **??**.

Table A.13: Firm-Sector-level Regression

	(1) $\widetilde{\Delta}$Emp	(2) $\widetilde{\Delta}$Emp
$\widetilde{\Delta}$IP	-0.074***	
	(0.009)	
$\widetilde{\Delta}$IP (other)	-0.071***	-0.039***
	(0.012)	(0.010)
N	183,000	183,000
IV	✓	✓
F stat (direct)	493.7	-
F stat (indirect)	678.4	715.3
Controls	✓	✓
Industry FE	SIC 2-digit	SIC 4-digit

Notes: This table shows the results of running the regression at the firm-sector-level. $\widetilde{\Delta}$Emp is the firm-sector-level employment growth, $\widetilde{\Delta}$IP is the direct China shock defined in Equation (2.2), and $\widetilde{\Delta}$IP (other) is the indirect China shock defined in Equation (2.5). We standardize these shocks using their respective sample means and standard deviations to facilitate interpretation. Controls include manufacturing employment share, quadratic polynomials in firm age, log of initial firm employment, log of initial within-firm sectoral employment, and log of average initial employment in other-sector establishments within-firm. All regressions are weighted by initial firm-sector-level employment. Standard errors are clustered at the firm level. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively. All numbers are rounded in accordance with U.S. Census Bureau disclosure guidelines.

Table A.14: Impact of the Direct and Indirect China Shocks on Employment Growth: Unweighted Regression

	(1) $\widetilde{\Delta}$Emp	(2) $\widetilde{\Delta}$Emp	(3) $\widetilde{\Delta}$Emp	(4) $\widetilde{\Delta}$Emp
$\widetilde{\Delta}$IP	-0.033***	-0.032***	-0.031***	
	(0.004)	(0.004)	(0.004)	
$\widetilde{\Delta}$IP (other)		-0.048***	-0.046***	-0.044***
		(0.015)	(0.016)	(0.013)
N	573,000	573,000	573,000	573,000
IV	✓	✓	✓	✓
F stat (direct)	1242	1381	1440	-
F stat (indirect)	-	288.1	296.2	289
Controls	✓	✓	✓	✓
County FE	-	-	✓	✓
Industry FE	SIC 2-digit	SIC 2-digit	SIC 2-digit	SIC 4-digit

Notes: Column (1) to column (4) in this table use the identical specifications used in column (1) to column (4) in Table 2, respectively, where we consider unweighted regression. Standard errors are double clustered at the state and firm level. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively. All numbers have been rounded in accordance with U.S. Census Bureau disclosure guidelines.

A.5 Spillover Effects Within and Outside Manufacturing

According to our main result, the shock spills across sectors through within-firm sectoral networks. However, an open question is whether the shock propagates mainly within the manufacturing sector or whether it also affects establishments that operate in the non-manufacturing sector. In other words, the effect we have documented can mask a substantial heterogeneity in responsiveness to Chinese import competition across sectors. To further examine this issue, we consider manufacturing and non-manufacturing establishments separately and investigate whether our results hold in each subsample.[3] As noted in a more detailed discussion below, we find that within-firm sectoral spillovers occur both from manufacturing to non-manufacturing industries and across manufacturing industries within-firm.

Spillovers within Manufacturing Sector In Table A.15, we repeat the analysis presented in Table 2 by restricting our sample to manufacturing establishments. We find that a manufacturing establishment reduces employment in response to the indirect China shock that arises from establishments in other manufacturing SIC 4-digit industries within the firm as well as to the China shock that affects the establishment's industry directly. In particular, we find that the coefficient is -0.10 on the direct effect and -0.18 on the indirect one. This is only marginally lower relative to the full sample. Both effects are significant at the 1% level in the tightest specification considered (column (3)). We also find a quantitatively similar result when we saturate the model with SIC 4-digit industry fixed effects, thereby absorbing the direct exposure (column (4)).

Spillovers from Manufacturing to Non-Manufacturing Establishments Table A.16 reports results for the case when we restrict the sample to non-manufacturing establishments. Provided that the direct China shock is defined only for manufacturing industries, we do not estimate the direct effect in this case.

We find that the within-firm indirect shock has an economically and statistically significant impact on employment of non-manufacturing establishments: The coefficient on the indirect effect is bound between -0.25 and -0.14, which is similar in magnitude to the coefficient in the case of the manufacturing sector. This implies that within-firm networks propagate the sectoral shock nearly uniformly to both manufacturing and non-manufacturing establishments. Importantly, this result is not driven by general equilibrium adjustments within regions (e.g., within-region general equilibrium reallocations between manufacturing and non-manufacturing sectors) or county-level regional shocks that could potentially affect both manufacturing and non-manufacturing establishments, thanks to

[3]The shocks are constructed using the baseline sample, including all establishments owned by multi-sector firms that operate at least one manufacturing establishment.

Table A.15: Impact of the Direct and Indirect China Shocks on Employment Growth: Manufacturing Establishments

	(1) $\widetilde{\Delta}$Emp	(2) $\widetilde{\Delta}$Emp	(3) $\widetilde{\Delta}$Emp	(4) $\widetilde{\Delta}$Emp
$\widetilde{\Delta}$IP	-0.047***	-0.047***	-0.045***	
	(0.006)	(0.006)	(0.006)	
$\widetilde{\Delta}$IP (other)		-0.063***	-0.060***	-0.043***
		(0.012)	(0.011)	(0.011)
N	121,000	121,000	121,000	121,000
IV	✓	✓	✓	✓
F stat (direct)	474.8	476.8	559.1	-
F stat (indirect)	-	409.9	560.2	507.1
Controls	✓	✓	✓	✓
County FE	-	-	✓	✓
Industry FE	SIC 2-digit	SIC 2-digit	SIC 2-digit	SIC 4-digit

Table A.16: Impact of the Indirect China Shock on Non-Manufacturing Employment Growth: Establishment-Level

	(1) $\widetilde{\Delta}$Emp	(2) $\widetilde{\Delta}$Emp	(3) $\widetilde{\Delta}$Emp
$\widetilde{\Delta}$IP (other)	-0.081***	-0.081***	-0.045**
	(0.021)	(0.02)	(0.019)
N	452,000	452,000	452,000
IV	✓	✓	✓
First-stage F stat	394.2	411.5	435.4
Controls	✓	✓	✓
County FE	-	✓	✓
Industry FE	SIC 2-digit	SIC 2-digit	SIC 4-digit

Notes: $\widetilde{\Delta}$Emp is the establishment-level employment growth defined in Equation (2.7), $\widetilde{\Delta}$IP is the direct China shock defined in Equation (2.2), and $\widetilde{\Delta}$IP (other) is the indirect China shock defined in Equation (2.5). We standardize these shocks using their respective sample means and standard deviations to facilitate interpretation. Controls include manufacturing employment share, establishment age and age-squared, firm age and age-squared, log of initial establishment employment, log of initial firm employment, log of initial sector employment within firm, and log of average initial employment in other-sector establishments within-firm. All regressions are weighted by initial establishment-level employment. Standard errors are double clustered at the state and firm level. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively. All numbers have been rounded in accordance with U.S. Census Bureau disclosure guidelines.

county and industry fixed effects.[4]

Continuing with the anecdotal evidence based on Summitville Tile Inc. from the main text, we confirmed that the tile industry was in the top quartile of industries in terms of exposure to the direct China shock.[5] We also verified using an alternative dataset—the National Establishment Timeseries Database (NETS)—that Summitville indeed closed multiple non-manufacturing establishments between 1991 and 2007 which we plausibly identify as distribution centers that Summitville CEO mentioned.

[4] Our results are distinct from those of Bloom et al., 2019, who conducted commuting-zone-level analysis, rather than establishment-level analysis as in our work. Workers who are not geographically mobile may enter local non-manufacturing sector in response to the depressed local manufacturing industry. This, however, does not imply that they will be re-employed by a service establishment of the same firm.

[5] A quote from the speech of the Summitville Tile CEO: "Little did we know in the year 1990 when we opened the doors to this facility that imports would rise from 40% to 80% of the U.S. ceramic tile market in one decade. (...) We shut down two of our four factories. We shut down eleven distribution centers. We laid off 450 employees. (...) Within the ceramic industry alone imports are at an all-time high and prices at an all-time low and most of the industry is just about finished. (...) I would conclude by saying that as one of the last remaining tile manufacturers in the United States we are fighting a titanic battle for survival. (...) I pray that the leaders in Washington on both sides of the aisle will recognize the reality and sheer scope of the unfair, misguided trade practices that are at play today in nations like China and others."

A.6 Extensive and Intensive Margins Decomposition

Recent work by Asquith et al. (2019) demonstrates that the direct China shock affected U.S. employment mainly through establishment exit. In this section, we investigate how firms adjust to the shock that arises through within-firm networks. To this end, we decompose the growth in employment into intensive and extensive margins. Along the intensive margin, multi-sector firms can choose to adjust employment in continuing establishments. Along the extensive margin, firms can decide to close some establishments. Firms can undo intensive margin adjustments with relative ease once the business environment changes favorably, but extensive margin adjustments are more permanent.[6] Thus, understanding the way firms respond to the indirect China shock can shed light on how persistent the impact of that shock was on the U.S. private business sector.

To address this issue, we first decompose the establishment-level employment growth into two margins, and then separately re-estimate our main specification (2.8) for each margin. Provided that the arc-growth measure (2.7) used in this paper allows for the unified treatment of continuing and exiting establishments, the decomposition of the establishment-level employment growth into these two margins is straightforward.

Table A.17 reports the result. In line with Asquith et al. (2019), we find that the direct shock mainly propagates through the extensive margin. Importantly, the data reveal that the indirect shock also operates through the extensive margin. The result holds regardless of whether the direct shock is controlled for (Columns 1-3) or absorbed (Columns 4-6). This implies that the economic, social, and political consequences of the rising import competition from China documented in the literature could be even larger because of the within-firm propagation channel.[7]

One dimension that is absent in the above decomposition is the entry margin, which has been highlighted in many contexts including the literature on import competition (e.g., Magyari, 2017).[8] To incorporate the entry margin, we augment our baseline sample with a set of establishments that entered after 1991 and reported positive employment in 2007. We follow Davis, Haltiwanger, and Schuh (1996), which allows for a unified treatment of establishment exit and entry by assigning -2 to those that exit during our sample period and 2 to those that enter after 1991. Then we separately re-estimate Equation (2.8) for all three margins (intensive, exit and entry). Following the convention, to accommodate establishments that did not exist in 1991, we weigh observations by the mid-point employment between 1991 and 2007. Table A.19 further demonstrates that the exit margin remains

[6] Establishment exit can lead to many adverse consequences, including higher worker mortality and income inequality (see Herzog Jr. and Schlottmann, 1995, Hu and Taber, 2011, Pierce and Schott, 2020, among others).

[7] Table A.18 further decomposes the exit margin into (i) firm exit and (ii) establishment exit conditional on firm survival margins. We find both margins to be quantitatively pronounced, although establishment exit conditional on firm survival turns out to be slightly stronger than the firm exit margin.

[8] A number of recent papers show the importance of the entry margin for the propagation of aggregate shocks (e.g., Clementi and Palazzo, 2016; Smirnyagin, 2023).

highly significant and it accounts for the overall effect. We do not find a strong role of the entry margin for within-firm sectoral spillovers.

Table A.17: Extensive versus Intensive Margin of Employment Adjustments

	$\widetilde{\Delta}$Emp			$\widetilde{\Delta}$Emp		
	(1)	(2)	(3)	(4)	(5)	(6)
Margin	Overall	Extensive	Intensive	Overall	Extensive	Intensive
$\widetilde{\Delta}$IP	-0.047***	-0.057***	0.010**			
	(0.006)	(0.007)	(0.004)			
$\widetilde{\Delta}$IP (other)	-0.068***	-0.069***	0.001	-0.044***	-0.048***	0.005
	(0.011)	(0.012)	(0.006)	(0.010)	(0.012)	(0.006)
N	573,000	573,000	573,000	573,000	573,000	573,000
IV	✓	✓	✓	✓	✓	✓
F stat (direct)	603.6	603.6	603.6	-	-	-
F stat (indirect)	768.7	768.7	768.7	802.6	802.6	802.6
Controls	✓	✓	✓	✓	✓	✓
County FE	✓	✓	✓	✓	✓	✓
Industry FE	SIC 2-digit	SIC 2-digit	SIC 2-digit	SIC 4-digit	SIC 4-digit	SIC 4-digit

Notes: $\widetilde{\Delta}$Emp (Overall) is the establishment-level employment growth defined in Equation (2.7). $\widetilde{\Delta}$Emp (Extensive) indicates employment growth from establishment closures, and $\widetilde{\Delta}$Emp (Intensive) indicates employment growth from continuing establishments. $\widetilde{\Delta}$IP is the direct China shock defined in Equation (2.2), and $\widetilde{\Delta}$IP (other) is the indirect China shock defined in Equation (2.5). We standardize these shocks using their respective sample means and standard deviations to facilitate interpretation. Controls include manufacturing employment share, establishment age and age-squared, firm age and age-squared, log of initial establishment employment, log of initial firm employment, log of initial sector employment within firm, and log of average initial employment in other-sector establishments within-firm. All regressions are weighted by initial establishment-level employment. Standard errors are double clustered at the state and firm level. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively. All numbers have been rounded in accordance with U.S. Census Bureau disclosure guidelines.

Table A.18: Further Decomposition of Exit Margin into Firm-Exit and Establishment-Exit Conditional on Firm-Survival

	$\widetilde{\Delta}$Emp				$\widetilde{\Delta}$Emp			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Margin	Overall	Firm Exit	Estab. Exit	Intensive	Overall	Firm Exit	Estab. Exit	Intensive
$\widetilde{\Delta}$IP	-0.047***	-0.013***	-0.045***	0.010**				
	(0.006)	(0.004)	(0.006)	(0.004)				
$\widetilde{\Delta}$IP (other)	-0.068***	-0.023***	-0.045***	-0.001	-0.044***	-0.020**	-0.026**	0.002
	(0.011)	(0.008)	(0.013)	(0.006)	(0.010)	(0.009)	(0.012)	(0.006)
N	573,000	573,000	573,000	573,000	573,000	573,000	573,000	573,000
IV	✓	✓	✓	✓	✓	✓	✓	✓
F stat (direct)	603.6	603.6	603.6	603.6	-	-	-	-
F stat (indirect)	768.7	768.7	768.7	768.7	343.6	343.6	343.6	343.6
Controls	✓	✓	✓	✓	✓	✓	✓	✓
County FE	✓	✓	✓	✓	✓	✓	✓	✓
Industry FE	SIC 2-digit	SIC 2-digit	SIC 2-digit	SIC 2-digit	SIC 4-digit	SIC 4-digit	SIC 4-digit	SIC 4-digit

Notes: $\widetilde{\Delta}$Emp (Overall) is the establishment-level employment growth defined in Equation (2.7). $\widetilde{\Delta}$Emp (Firm Exit) indicates employment growth from establishment closures driven by firm exit, $\widetilde{\Delta}$Emp (Estab. Exit) indicates employment growth from establishment closures conditional on firm survival, and $\widetilde{\Delta}$Emp (Intensive) indicates employment growth from continuing establishments. $\widetilde{\Delta}$IP is the direct China shock defined in Equation (2.2), and $\widetilde{\Delta}$IP (other) is the indirect China shock defined in Equation (2.5). We standardize these shocks using their respective sample means and standard deviations to facilitate interpretation. Controls include manufacturing employment share, establishment age and age-squared, firm age and age-squared, log of initial establishment employment, log of initial firm employment, log of initial sector employment within firm, and log of average initial employment in other-sector establishments within-firm. All regressions are weighted by initial establishment-level employment. Standard errors are double clustered at the state and firm level. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively. All numbers have been rounded in accordance with U.S. Census Bureau disclosure guidelines.

Table A.19: Decomposition with Entry Margin

	$\widetilde{\Delta}$Emp				$\widetilde{\Delta}$Emp			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Margin	Overall	Exit	Intensive	Entry	Overall	Exit	Intensive	Entry
$\widetilde{\Delta}$IP	-0.075***	-0.067***	-0.009	0.001				
	(0.012)	(0.009)	(0.006)	(0.005)				
$\widetilde{\Delta}$IP (other)	-0.079***	-0.055***	-0.011	-0.013	-0.072***	-0.046***	-0.010*	-0.016
	(0.021)	(0.010)	(0.007)	(0.011)	(0.022)	(0.010)	(0.005)	(0.012)
N	1,073,000	1,073,000	1,073,000	1,073,000	1,073,000	1,073,000	1,073,000	1,073,000
IV	✓	✓	✓	✓	✓	✓	✓	✓
F stat (direct)	1364	1364	1364	1364	-	-	-	-
F stat (indirect)	463.8	463.8	463.8	463.8	343.6	343.6	343.6	343.6
Controls	✓	✓	✓	✓	✓	✓	✓	✓
County FE	✓	✓	✓	✓	✓	✓	✓	✓
Industry FE	SIC 2-digit	SIC 2-digit	SIC 2-digit	SIC 2-digit	SIC 4-digit	SIC 4-digit	SIC 4-digit	SIC 4-digit

Notes: $\widetilde{\Delta}$Emp (Overall) is the establishment-level employment growth defined in Equation (2.7). $\widetilde{\Delta}$Emp (Extensive) indicates employment growth from establishment closures, $\widetilde{\Delta}$Emp (Intensive) indicates employment growth from continuing establishments, and $\widetilde{\Delta}$Emp (Entry) indicates employment growth from newly-entering establishments. $\widetilde{\Delta}$IP is the direct China shock defined in Equation (2.2), and $\widetilde{\Delta}$IP (other) is the indirect China shock defined in Equation (2.5). We standardize these shocks using their respective sample means and standard deviations to facilitate interpretation. Controls include manufacturing employment share, establishment age and age-squared, firm age and age-squared, log of initial establishment employment, log of initial firm employment, log of initial sector employment within firm, and log of average initial employment in other-sector establishments within-firm. All regressions are weighted by mid-point establishment-level employment: $\frac{1}{2}(\text{Emp}_{91} + \text{Emp}_{07})$. Standard errors are double clustered at the state and firm level. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively. All numbers have been rounded in accordance with U.S. Census Bureau disclosure guidelines.

A.7 Additional Results on Heterogeneous Treatment Effects

Table A.20: Robustness of Main Result by Controlling Within-firm Trade and Scope

	$\widetilde{\Delta}$Emp			
	Within-firm Trade		Scope	
	(1)	(2)	(3)	(4)
Z_f is	Use=1	Supply=1	Num. Sectors	1-HHI
$\widetilde{\Delta}$IP (other)	-0.040***	-0.040***	-0.041***	-0.038***
	(0.011)	(0.010)	(0.010)	(0.010)
Z_f	0.008	-0.043	-0.081*	-0.154*
	(0.026)	(0.050)	(0.044)	(0.083)
Establishment Size	0.041***	0.041***	0.041***	0.041***
	(0.008)	(0.008)	(0.008)	(0.008)
Firm Size	-0.059***	-0.055***	-0.010	-0.043***
	(0.008)	(0.008)	(0.024)	(0.008)
N	573,000	573,000	573,000	573,000
IV	✓	✓	✓	✓
F stat (indirect)	4170	4157	813.4	831.5
Controls	✓	✓	✓	✓
County FE	✓	✓	✓	✓
Industry FE	SIC 4-digit	SIC 4-digit	SIC 4-digit	SIC 4-digit

Notes: This table repeats column (1) to column (4) in Table 5, where we drop the interaction terms. We did not repeat column (5) and column (6) because that will simply produce column (4) in Table 2. Standard errors are double clustered at the state and firm level. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively. All numbers have been rounded in accordance with U.S. Census Bureau disclosure guidelines.

Robustness to Controlling for measures of Within-firm Trade and Scopes Table A.20 shows that the main results are robust to additionally controlling for measures of within-firm trade and scopes, together with measures of establishment and firm size.

Table A.21: Heterogeneous Treatment Effects:
Financial Constraint, Distance, Intensity, and Size

	$\widetilde{\Delta}$Emp					
	Financial Constraint	Distance	Intensity		Size	
	(1)	(2)	(3)	(4)	(5)	(6)
Z_f is	Firm Leverage	Avg. Log Miles	Capital Intensity	Skill Intensity	Estab. Size	Firm Size
$\widetilde{\Delta}$IP (other) $\times$ Z_f	0.171	0.005	-0.009	-0.005	-0.011**	-0.006
	(0.100)	(0.004)	(0.011)	(0.011)	(0.005)	(0.005)
$\widetilde{\Delta}$IP (other)	-0.094**	-0.069***	-0.058***	-0.053***	0.044	0.003
	(0.038)	(0.024)	(0.012)	(0.011)	(0.071)	(0.098)
Z_f	-0.167	-0.018***	0.004	-0.051*	0.041***	-0.058***
	(0.103)	(0.005)	(0.025)	(0.029)	(0.008)	(0.008)
N	223,000	573,000	121,000	121,000	573,000	573,000
IV	✓	✓	✓	✓	✓	✓
F stat (indirect x Z_f)	90	812.2	444.6	1082	545.8	1352
F stat (indirect)	120	1008	639	453.2	481.9	1787
Controls	✓	✓	✓	✓	✓	✓
County FE	✓	✓	✓	✓	✓	✓
Industry FE	SIC 4-digit	SIC 4-digit	SIC 4-digit	SIC 4-digit	SIC 4-digit	SIC 4-digit

Notes: $\widetilde{\Delta}$Emp is the establishment-level employment growth defined in Equation (2.7). $\widetilde{\Delta}$IP (other) is the indirect China shock defined in Equation (2.5). We standardize the shock using its sample mean and standard deviation to facilitate interpretation. Firm-level leverage in column (1) is sourced from Compustat and is equal to the ratio of total debt (short- and long-term) to total assets. Distance in column (2) measures the (weighted) average distance (in log miles) from establishments operating in other sectors within a firm. Capital and skill intensities are based on the NBER-CES Manufacturing Database. Capital intensity in column (3) is the ratio of capital to total employment, and skill intensity in column (4) is the ratio of non-production workers to total number of employees. In columns (5) and (6), we consider the log of initial employment of the establishment and the firm, respectively. Controls include manufacturing employment share, establishment age and age-squared, firm age and age-squared, log of initial establishment employment, log of initial firm employment, log of initial sector employment within firm, log of average initial employment in other-sector establishments within-firm. All regressions are weighted by initial establishment-level employment. Standard errors are double clustered at the state and firm level. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively. All numbers have been rounded in accordance with U.S. Census Bureau disclosure guidelines.

Financial Conditions Financial constraints were shown to play an important role in firms' ability to adjust to shocks; for example, Giroud and Mueller (2019) demonstrate this in the context of the within-firm propagation of regional housing price shocks. To evaluate the role played by financial

conditions, we draw on Compustat and construct a measure of a firm-level leverage.[9] Subsequently, we merge the Compustat extract into our sample using the Compustat Bridge, thereby restricting the sample to establishments that are part of publicly-traded firms. Column (1) in Table A.21 shows the interaction of the initial firm leverage and the indirect shock. We find no support in favor of financial constraints; in our sample, the indirect mechanism works similarly across firms with different measured financial conditions.[10]

Distance from the Shock Origination We also evaluate how the impact of the indirect shock depends on the physical distance from the shock origination. To this end, we interact the indirect shock with the average (weighted by employment) distance of a given establishment from other establishments within-firm operating in other SIC 4-digit sectors. Column (2) in Table A.21 shows that the interaction term is insignificant; that is, the impact of the indirect sectoral shock on the establishment-level employment is broadly independent of the location of other establishments within-firm. This result is also consistent with our earlier finding that spatial linkages are less important than sectoral networks in the context of the China shock propagation (see discussion in Section 4.2).

Capital and Skill Intensities In response to the increased import competition from China, multi-sector U.S. firms may choose to switch from labor-intensive to more capital-intensive activities, and they do so because China has a comparable advantage in labor-intensive products due to its cheaper labor force. In this case, we would see a weaker employment response of establishments that operate in more capital-intensive industries. Drawing on the NBER-CES Manufacturing Database, we construct a measure of capital intensity and interact it with the indirect shock. Column (3) of Table A.21 shows that the employment response was similar across establishments that had different capital intensities.[11] Similarly, U.S. firms may focus on more complex products, leveraging the advantage of having a more skillful labor force. However, this possibility is not supported by the data in Column (4) of Table A.21.

Establishment and Firm Size Several recent papers have documented a stronger response of larger establishments to the *direct* China shock (Argente et al., 2020; Park, 2020). Holmes

[9]The firm leverage is defined as a ratio of total debt (short-term and long-term) to total assets. We experimented with several other metrics of financial constrains, including the Kaplan and Zingales (1997) index, but did not find a significant result.

[10]The results are similar if we use the average firm-level leverage between the initial and the end periods instead of using the initial period leverage. Also, in the previously circulated version, we considered measuring financial constraints at the yearly level and interacting them with yearly measures of direct and indirect China shocks. Such specification incorporates potential time-variation of financial constraints at the yearly frequency. We did not find any significant role of financial constraints.

[11]Capital intensity is the ratio of capital to total employment, while skill intensity is the ratio of non-production workers to the total number of employees.

and Stevens (2014) argue that this occurs because large establishments—which tend to produce standardized goods—are more likely to face fierce competition from China, which in the early phase of its development mainly exported standardized goods.

Columns (5) shows that large establishments do, indeed, reduce their employment more strongly in response to the indirect China shock, consistent with the logic of the aforementioned papers. However, firm's size (column (6)) does not play a significant role. This can reflect the highly diversified nature of multi-sector firms; while some establishments are small and niche-product-oriented, the remaining establishments within a firm can produce standardized goods.

Table A.22: The Role of Trade Status (Offshoring)

	$\widetilde{\Delta}$Emp			
	(1)	(2)	(3)	(4)
$\widetilde{\Delta}$IP (other) × Exporter		0.049		0.044
		(0.048)		(0.048)
$\widetilde{\Delta}$IP (other) × Importer			0.097	0.075
			(0.102)	(0.087)
$\widetilde{\Delta}$IP (other)	-0.063***	-0.067***	-0.067***	-0.067***
	(0.019)	(0.021)	(0.019)	(0.021)
Exporter	0.347***	0.334***		0.330***
	(0.036)	(0.037)		(0.037)
Importer	0.418***		0.465***	0.377***
	(0.102)		(0.153)	(0.128)
N	290,199	290,199	290,199	290,199
IV	✓	✓	✓	✓
F stat	343.9	359.9	180.1	263.9
Controls	✓	✓	✓	✓
County FE	✓	✓	✓	✓
Industry FE	SIC 4-digit	SIC 4-digit	SIC 4-digit	SIC 4-digit

Notes: $\widetilde{\Delta}$Emp is the establishment-level employment growth defined in Equation (2.7). $\widetilde{\Delta}$IP (other) is the indirect China shock defined in Equation (B.1). We standardize the shock using its sample mean and standard deviation to facilitate interpretation. Controls include manufacturing employment share, firm age and age-squared, log of initial establishment employment, log of initial firm employment, log of initial sector employment within firm, log of average initial employment in other-sector establishments within-firm. All regressions are weighted by initial establishment-level employment. Standard errors are clustered at the state and firm level. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

Exporter/Importer Status Indirectly exposed establishments may choose to offshore their production, thereby accounting for the effect we documented. Provided that the trade status is likely to be correlated with the ease of engaging in offshoring, in this section we explore how employment response to the indirect China shock depends on the exporter/importer status of an establishment.

Since the LBD does not contain international trade information, we draw on the NETS; this database provides the export and import status for each establishment—and not merely for each firm. We augment our baseline specification (2.8) with an interaction term between the indirect

China shock and the initial exporter/importer status.[12,13] Table A.22 shows no evidence that the employment response to the indirect shock depends on the trade status of an establishment.

We would like to take a moment and acknowledge certain limitations of this approach. In particular, we are unable to observe key trade information, including trade volumes and origin/destination records. Thus, we cannot firmly reject the offshoring mechanism; rather, we view this as suggestive evidence. The role of offshoring in the propagation of the indirect China shock remains an open question, and calls for more detailed data to bear.

[12] US Census' LFTTD data provide export and import information for each firm but not for each establishment.

[13] The accuracy of exporter/importer status information in the NETS has been explored in Park (2020); in particular, he finds a correlation of 0.8-0.9 in the share of exporters and importers by sector between the NETS and LFTTD data (corresponding moments from the Census data were reported by Bernard et al., 2007 and Bernard et al., 2018).

Appendix B Sector-Level Analyses

In this section, we investigate whether indirect shock survives aggregation to the sector level. That is, we study how sector-level employment responds to the shock propagated through within-firm networks.

B.1 Empirical Specification

We start by constructing a measure of indirect exposure for each sector j: This is the weighted average of shocks that hit other industries $j' \neq j$ and propagate to industry j through within-firm sectoral networks.[14] Formally, the measure is constructed as

$$\widetilde{\Delta} IP_{j,91-07} \text{ (other)} = \sum_{j' \neq j} \lambda_{j',-j,91} \times \widetilde{\Delta} IP_{j',91-07}, \tag{B.1}$$

where $\lambda_{j',-j,t}$ is a weight assigned to industry $j' \neq j$ and $\widetilde{\Delta} IP_{j',91-07}$ is an import penetration measure for industry j' defined as in Equation (2.1). On the conceptual level, the construction of the sector-level shock is similar to that of the establishment-level indirect shock in Equation (2.5).

We define sector j' weight $\lambda_{j',-j,t}$ as follows:

$$\lambda_{j',-j,t} \equiv \sum_{f} \frac{Emp^{f}_{j,t}}{\sum_{f'} Emp^{f'}_{j,t}} \times \omega^{f}_{j',-j,t}, \tag{B.2}$$

where the term $\omega^{f}_{j',-j,t}$ is the same as in Equation (2.5):

$$\omega^{f}_{j',-j,t} \equiv \frac{Emp^{f}_{j',t}}{\sum_{j'' \neq j} Emp^{f}_{j'',t}}.$$

Therefore, the weight $\lambda_{j',-j,t}$ is constructed by averaging firm-level employment shares in sector j' for each firm f (term $\omega^{f}_{j',-j,t}$) according to the relative employment size of firms in sector j. Intuitively, we first measure how "important" sector j' is for each firm, and then average that across firms with respect to their presence in sector j. Thus, one can interpret $\lambda_{j',-j,t}$ as the extent to which industry j is exposed to industry j' through within-firm sectoral networks created by multi-sector firms.

Guided by the same considerations as before, we instrument $\widetilde{\Delta} IP_{j,91-07}$ (other) by the indirect shock based on the exposure of other high income countries to the import competition from China:

$$\widetilde{\Delta} IPO_{j,91-07} \text{ (other)} = \sum_{j' \neq j} \lambda_{j',-j,91} \times \widetilde{\Delta} IPO_{j',91-07}. \tag{B.3}$$

[14] Our approach is reminiscent of that assumed by Giroud and Mueller (2019).

Table A.23: Sectoral Aggregate Impact of the Direct and Indirect China Shocks on Manufacturing Employment Growth

	$\widetilde{\Delta}$Emp				
Margin	Overall	Overall	Exit	Intensive	Entry
$\widetilde{\Delta}$IP	-0.092**	-0.085**	-0.025**	-0.020	-0.040
	(0.039)	(0.039)	(0.013)	(0.016)	(0.029)
$\widetilde{\Delta}$IP (other)		-0.133*	-0.063***	0.012	-0.082
		(0.077)	(0.021)	(0.030)	(0.056)
N	400	400	400	400	400
IV	✓	✓	✓	✓	✓
F stat (direct)	41.9	45	45	45	45
F stat (indirect)	-	228.9	228.9	228.9	228.9
Controls	✓	✓	✓	✓	✓
Industry FE	SIC 2-digit	SIC 2-digit	SIC 2-digit	SIC 2-digit	SIC 2-digit

Notes: $\widetilde{\Delta}$Emp (Overall) is the sector-level employment growth. $\widetilde{\Delta}$Emp (Exit) indicates sector-level employment growth from establishment closures, $\widetilde{\Delta}$Emp (Intensive) indicates sector-level employment growth from continuing establishments, and $\widetilde{\Delta}$Emp (Entry) indicates sector-level employment growth from establishment entry. $\widetilde{\Delta}$IP is the direct China shock defined in Equation (2.2), and $\widetilde{\Delta}$IP (other) is the indirect China shock defined in Equation (B.1). We standardize these shocks using their respective sample means and standard deviations to facilitate interpretation. Controls include the logarithm of initial employment and the share of the industry-level employment accounted for the baseline sample described in Section 3.2. All regressions are weighted by initial sector-level employment. Standard errors are clustered at the SIC 2-digit level. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively. All numbers have been rounded in accordance with U.S. Census Bureau disclosure guidelines.

Our industry-level specification takes the following form:

$$\widetilde{\Delta}Emp_{j,91-07} = \beta_0 + \beta_1 \widetilde{\Delta}IP_{j,91-07} + \beta_2 \widetilde{\Delta}IP_{j,91-07} \text{ (other)} + \beta_3 Z'_{j,0} + \delta_j + \varepsilon_{j,91-07}, \tag{B.4}$$

where $\widetilde{\Delta}Emp_{j,91-07}$ is the arc-growth in sector j's employment between 1991 and 2007. The vector of sector-level controls $Z_{j,0}$ includes the logarithm of initial employment as well as the share of the industry-level employment accounted for by our sample. δ_j indicates sector fixed effects at the SIC 2-digit level. Observations are weighted by initial sector-level employment.

B.2 Sector-Level Results

We estimate Equation (B.4) for all industries as well as for the manufacturing sector separately. Our results are the strongest when we focus on manufacturing industries, whereas the coefficients are less precisely estimated in case the non-manufacturing sector is included; this reflects the fact that multi-sector firms in our sample account for three-quarters of the manufacturing employment but for

only about 20 percent of the overall employment. In what follows, the results for the manufacturing sector are described. The results for all sectors are broadly reserved for Appendix (Table A.24).

Table A.23 reports our findings. Column (1) only includes the direct China shock and demonstrates that our results are consistent with the literature that documents the adverse impact of rising import competition from China on U.S. employment. Furthermore, column (2) adds the indirect sector-level China shock and shows that it is large in magnitude and statistically significant at the 10 percent level. This finding implies that within-firm networks are quantitatively important for the propagation of shocks not only across establishments within-firm but also across sectors of the aggregate economy.

Columns (3), (4) and (5) decompose the growth in the sector-level employment into exit, intensive and entry margins, respectively. The data reveal that, similar to the establishment-level decomposition analysis in Section A.6, the exit margin is large in magnitude and is statistically significant at the 1 percent level. Thus, the establishment-level results reported above carry over to the sector-level.[15]

[15]Table A.24 in Appendix **??** shows that the importance of the exit margin is preserved even if we consider both manufacturing and non-manufacturing sectors.

Table A.24: Sectoral Aggregate Impact of the Direct and Indirect China Shocks on Overall Employment Growth

	$\widetilde{\Delta}$Emp				
Margin	Overall	Overall	Exit	Intensive	Entry
$\widetilde{\Delta}$IP	-0.104**	-0.104**	-0.023*	-0.024	-0.056*
	(0.044)	(0.044)	(0.013)	(0.017)	(0.034)
$\widetilde{\Delta}$IP (other)		0.007	-0.048*	0.016	0.039
		(0.058)	(0.029)	(0.038)	(0.048)
N	850	850	850	850	850
IV	✓	✓	✓	✓	✓
F stat (direct)	39.8	41.8	41.8	41.8	41.8
F stat (indirect)		120	120	120	120
Controls	✓	✓	✓	✓	✓
Industry FE	SIC 2-digit	SIC 2-digit	SIC 2-digit	SIC 2-digit	SIC 2-digit

Notes: $\widetilde{\Delta}$Emp (Overall) is the sector-level employment growth. $\widetilde{\Delta}$Emp (Exit) indicates sector-level employment growth from establishment closures, $\widetilde{\Delta}$Emp (Intensive) indicates sector-level employment growth from continuing establishments, and $\widetilde{\Delta}$Emp (Entry) indicates sector-level employment growth from establishment entry. $\widetilde{\Delta}$IP is the direct China shock defined in Equation (2.2) and $\widetilde{\Delta}$IP (other) is the indirect China shock defined in Equation (B.1). We standardize these shocks using their respective sample means and standard deviations to facilitate interpretation. Controls include the logarithm of initial employment and the share of the industry-level employment accounted for in the baseline sample described in Section 3.2. All regressions are weighted by initial sector-level employment. Standard errors are clustered at the SIC 2-digit level. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively. All numbers have been rounded in accordance with U.S. Census Bureau disclosure guidelines.

Appendix C Discussion: Connecting Our Research to Autor, Dorn, and Hanson (2013) and Bloom et al. (2019)

In this section, we discuss how our paper connects to and differentiates from the two seminal research on the impact of Chinese import competition in the US: Autor, Dorn, and Hanson (2013) and Bloom et al. (2019).

We begin with Autor, Dorn, and Hanson (2013) (hereafter ADH). Our main contribution is to empirically examine the role of within-firm sectoral networks in propagating economic shocks, a channel that is new to the literature. To further demonstrate the importance of our channel and compare our results with those in ADH, in Section 4.3, we analyze the impact of indirect sectoral shock on local market dynamics at the commuting-zone (hereafter CZ) level as in the framework of ADH. Specifically, we jointly incorporate both the original ADH's CZ-level China shock and the CZ-level within-firm indirect sectoral shock and confirm that our shock generates a distinct and economically significant channel through which Chinese import competition affects local labor markets.

Bloom et al. (2019) (hereafter BHKL) is another important and relevant paper. Specifically, BHKL show that, at the CZ-level, the China shock caused manufacturing employment to decline among firms that expanded in service sectors (see Table 7 in BHKL). This may seem at odds with one of our results, which suggests that the China shock propagates toward non-manufacturing establishments within the same firm. However, there are several reasons why we believe our results are consistent with BHKL.

First, we would like to emphasize that the level of analysis matters. For instance, in our work, we do not find a significant negative propagation of the China shock to non-manufacturing establishments at the *sectoral aggregate level*, although we do find it at the *establishment level*.[16] Given that BHKL conduct analysis at the aggregate CZ level, our *establishment level* results do not necessarily contradict those of BHKL.

Second, and more importantly, BHKL find that establishments that switch their industries from manufacturing to non-manufacturing (i.e., manufacturing in 1991 but switching to non-manufacturing by 2007) account for one-third of the manufacturing employment decline caused by the China shock (see Table 3 in BHKL). This does not necessarily contradict our finding on within-firm spillovers to non-manufacturing sectors, as our result is not about industry switching for a given establishment but rather about spillovers from one sector to another within a firm.

[16] In Table A.23 and Table A.24, we report the effects of the indirect China shock at the sectoral aggregate level for the manufacturing sector and the entire economy, respectively. Our results show that, at the sectoral aggregate level, the indirect shock does not significantly impact non-manufacturing employment, although it has a strong negative impact on manufacturing employment. One reason the sectoral aggregate-level and establishment-level results differ for the non-manufacturing sector is that the aggregate sectoral analysis does not restrict the sample to multi-sector firms.

Table R.25: Illustration - Multi-sector Firm

		1991	2007
Establishment 1	Indutry	Mfg (hit by China shock)	Non-mfg
	Employment	100	50
Establishment 2	Indutry	Non-mfg	Non-mfg
	Employment	50	20

To illustrate this point, consider the example in Table R.25. This firm consists of two establishments. Establishment 1 operated in a manufacturing industry and was directly impacted by the China shock in 1991. It reduced its workforce from 100 to 50 and, at the same time, switched from a manufacturing factory to a non-manufacturing facility by 2007. Establishment 2, which had 50 workers in 1991 and operated in a non-manufacturing industry at that time, reduced its workforce to 20 by 2007. This firm experienced a spillover of the China shock from Establishment 1 to its non-manufacturing Establishment 2, consistent with our findings in Table A.16. At the same time, the firm saw a decline of 100 in manufacturing employment while gaining an additional 20 non-manufacturing jobs ($= 70 - 50$), which aligns with BHKL.

Finally, the nature of samples matters. Our focus is on documenting within-firm shock spillovers to establishments operating in *other* industries. Therefore, we do not include establishments owned by single-industry firms in the initial time period. Importantly, our sample in Table A.16 is restricted to non-manufacturing establishments owned by firms that operated in manufacturing in 1991 (see Section 3.2 for the sample description). In contrast, BHKL consider CZ-level employment, which encompasses a much broader set of firms.[17]

[17]Thus, for example, manufacturing-only firms who later switched to non-manufacturing only contribute to BHKL but not to our results since Table A.16 requires firms to have both manufacturing and non-manufacturing establishments in the initial time period.

Appendix D Calculation of Counterfactual Employment Loss

To gauge the economic significance implied by our estimates, we follow Acemoglu et al. (2016) (AADHP) to calculate the counterfactual employment loss implied by our estimated coefficients. Note that this method requires using the original mean value of (non-standardized) shocks. Therefore, whenever we calculate the counterfactual loss of employment, we run the same regression as our baseline but with the original non-standardized shocks.

We follow the procedure in AADHP closely. The difference between ours and AADHP arises from the way growth rates are defined: We use the Davis, Haltiwanger, and Schuh (1996) growth rate while AADHP use typical log-difference growth rate. However, the intuition of the method in AADHP applies to our calculation.

We first calculate the counterfactual employment loss at the establishment level and then aggregate them across establishments.

- Step 1: Note that the Davis, Haltiwanger, and Schuh (1996) growth rate of employment of establishment b of firm f, Equation (2.7), is given by

$$\tilde{\Delta} Emp^{b,f}_{91-07} \equiv \frac{Emp^{b,f}_{07} - Emp^{b,f}_{91}}{\frac{1}{2}\left(Emp^{b,f}_{07} + Emp^{b,f}_{91}\right)}.$$

  Similarly, we can define the counterfactual employment growth that is driven by the within-firm sectoral shock as

$$G^b \equiv \tilde{\Delta} Emp^{b,f}_{07} \equiv \frac{(Emp^{b,f}_{07} - Emp^{b,f,Counter}_{07})}{0.5(Emp^{b,f}_{07} + Emp^{b,f,Counter}_{07})},$$

  where $Emp^{b,f}_{07}$ is the actual employment in 2007 and $Emp^{b,f,Counter}_{07}$ is the counterfactual employment in 2007 that would have been *in the absence of* within-firm sectoral shock. Then, it is straightforward to show that $Emp^{b,f,Counter}_{07} = \frac{1-0.5G^b}{1+0.5G^b} Emp^{b,f}_{07}$ and

$$Emp^{b,f}_{07} - Emp^{b,f,Counter}_{07} = Emp^{b,f}_{07}\left(\frac{G^b}{1+0.5G^b}\right).$$ [18]

  Our aim is to calculate $Emp^{b,f}_{07} - Emp^{b,f,Counter}_{07}$ by measuring $Emp^{b,f,Counter}_{07}$.

- Step 2: Similar to the procedure in AADHP, we tease out $\tilde{\Delta} IP^{f}_{j,91-07}$ (others) in Equation (2.5) that is "exogenous". This is done by deflating $\tilde{\Delta} IP^{f}_{j,91-07}$ (others) using the partial R^2

[18] Note that under the conventional growth rate $g^b \equiv \frac{Emp^{b,f}_{07} - Emp^{b,f,Counter}_{07}}{Emp^{b,f,Counter}_{07}}$, this formula corresponds to $Emp^{b,f}_{07} - Emp^{b,f,Counter}_{07} = Emp^{b,f}_{07}\left(\frac{g^b}{1+g^b}\right)$.

obtained from the first-stage of IV regression associated with Column (4) of Table 2, where we use the non-standardized shock instead of standardized one (therefore, it corresponds to the first stage of Column (4) in Appendix Table A.2). We denote the exogenous component of $\tilde{\Delta}IP^{f}_{j,91-07}$ (others) as $\hat{\Delta}IP^{f}_{j,91-07}$ (others).

- Step 3: After getting $\hat{\Delta}IP$ (others) and the estimated coefficient of our baseline regression (but with non-standardized shock), $\hat{\beta}$, we can calculate the counterfactual employment growth (in percentage point) that is driven by the within-firm sectoral shock. By treating our growth rate approximately equal to the log-difference growth, this corresponds to G^b, that is, $G^b \approx \hat{\beta}\hat{\Delta}IP$ (others).[19]

- Step 4: By using the formula from Step 1, we get the counterfactual employment loss as:

$$Emp^{b,f}_{07} - Emp^{b,f,Counter}_{07} = Emp^{b,f}_{07}\left[\frac{\hat{\beta}\hat{\Delta}IP \text{ (others)}}{1 + 0.5\hat{\beta}\hat{\Delta}IP \text{ (others)}}\right] (< 0)$$

since $\hat{\beta} < 0$.

- Step 5: Counterfactual loss of employment at the aggregate level is obtained by

$$\sum_b \left(Emp^{b,f}_{07} - Emp^{b,f,Counter}_{07}\right).$$

Note. The above procedure follows that of AADHP closely. In AADHP,

$$\log \frac{Emp_{07}}{Emp^{Counter}_{07}} = \hat{\beta}\hat{\Delta}IP$$

$$\Rightarrow \frac{Emp^{Counter}_{07}}{Emp_{07}} = e^{-\hat{\beta}\hat{\Delta}IP}$$

$$\Rightarrow -Emp^{Counter}_{07} = -Emp_{07} \times e^{-\hat{\beta}\hat{\Delta}IP}$$

$$\Rightarrow Emp_{07} - Emp^{Counter}_{07} = Emp_{07} \times [1 - e^{-\hat{\beta}\hat{\Delta}IP}].$$

[19] Under the log-difference growth rate, the relationship between percentage point change and percentage change becomes exact. Since, we use Davis, Haltiwanger, and Schuh (1996) growth rate, this becomes an approximate relationship.

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