Temporary Foreign Crisis Transmission to Local Labor via Exports: Evidence from the 1997 Asian Crisis

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April 16, 2022

Abstract

This paper exploits the temporary US export drop during the 1997 Asian Crisis to demonstrate that short-run foreign crises can have local labor spillovers via the export channel, and to trace out the accompanying dynamics. Empirically, traded employment fell associated with the drop in exports to Crisis-4 countries, there was sluggish post-Crisis adjustment (4 years), and nontraded employment in lower-education areas also fell. To compute the total effect, I embed a Roy model into a specific-factors setting, so that computational estimates find the shock lowered 1998 US traded employment by 135,000-150,000 workers. Measurement of the Frèchet degree of worker heterogeneity finds that heterogeneity is higher in the short-run than the long-run. *JEL* Codes: F14, F16

1 Introduction

When exports fall briefly due to a temporary foreign demand shock, do firms maintain or contract employment? In the face of a temporary shock, firms could keep employment stable to avoid adjustment frictions, or respond to sub-optimal sales levels with lags; such models would imply small to no employment adjustments when the shock duration is short. On the contrary, this paper demonstrates that temporary foreign macroeconomic shocks lead to local labor declines which are substantial in magnitude relative to the shock size, with employment effects lasting past the years of the shock.

The estimation strategy exploits the US export drop during the Asian Crisis of 1997. A major literature has developed that studies the effect of a change in imports on employment: Revenga (1992), Topalova (2010), and Autor, Dorn, and Hanson (2013, 2015, 2016) are prominent examples. This work has generally found that import penetration reduces employment. There has been relatively less work on the effect of variation in export demand on labor market activity, though recent papers by Dauth, Findeisen, and Suedekum (2014) and Feenstra, Ma, and Xu (2017) estimate the effect of exports on labor. Both papers exploit gradual trade expansions. This paper builds on that literature to show that through the export channel, short-run economic crises in foreign countries can impact local labor markets. Comparing the shock size to the estimated employment drop and dynamic effects is informative about the nature of labor market adjustment to demand shocks.

The Crisis, discussed in further detail in Section 3, was a financial crisis in a select number of Asian countries. It occurred independently of output and employment in the US. The affected countries saw severe drops in both exchange rates and gross domestic product (GDP) per capita. This led to a decline in import demand in those countries, and a resulting drop in exports for a segment of US industries. Thus, the Crisis featured a substantial US export shock.

The empirics employ a Bartik (1991) design, constructing an industry-weighted commuting zone (CZ) level exposure measure of US exports to Crisis-4 (Indonesia, Thailand, South Korea, and Malaysia) countries. Using an instrumental variables approach, the paper exploits an analogous measure constructed using exports from five other developed countries (Australia, Denmark, New Zealand, Spain, and Switzerland).[1] This estimation design is informed by the recent shift-share literature ((Adao, Kolesar, and Morales (2019), Borusyak, Hull, and Jaravel (2020), and Goldsmith-Pinkham, Sorkin, and Swift (2021)).

The main empirical estimation in Section 5 employs a stacked-log-difference empirical design, comparing the effect of the drop in exports from 1996-1998 to the effect in the pre-period. Traded employment fell

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[1] Autor, Dorn, and Hanson (2013) also use Finland, Germany, and Japan. I elect not to use Japan because it may have confounding effects from the Asian Crisis. I choose the five countries because they have the most predictive power of US Crisis-4 exports.

substantially, associated with the drop in exports during the Crisis. Event study estimates suggest it did not fully recover until approximately 2003, four years after the Crisis ended. This latter estimation is informative of the dynamics of labor-market adjustment to demand shocks. I conduct a series of robustness **checks** on these results. There were also aggregate employment effects, and these latter effects are stronger in relatively lower-education CZs.

The empirical analysis suffers from the "missing intercept problem," meaning I can estimate the slope of local employment with respect to localized exports but not the general equilibrium effect. Accordingly, I assign a model structure to this problem, embedding a Roy framework into a specific-factors setting (following Galle, Rodríguez-Clare, and Yi (2021) and Kovak (2013)). This process generates an estimable regression equation from which I can uncover a key structural parameter to solve the model for the general equilibrium effect. I can then compute the total effect of the Asian Crisis shock on local US employment.

The structural parameter of interest is the Frèchet shape parameter in the Roy framework, which functions as the degree of sectoral worker heterogeneity and governs their ability to sort in and out of sectors in the face of shocks. Though the objective in its estimation is to use it to solve for the general equilibrium term and obtain the aggregate effect, its measurement is also interesting. In the regression sample, and considering the nature of the Asian Crisis, the parameter I estimate is for the short-run. The parameter governs how sectors differentially respond to the Asian Crisis and can be generalized to guide expectations for heterogeneous responses to other trade channel shocks. An additional benefit of this parameter estimation is I can compare it to longer-run estimates in the literature to gain an understanding of how short-run adjustment differs from the long-run. The parameter estimate demonstrates evidence for a stronger degree of worker heterogeneity, and therefore stronger within-CZ distributional consequences of a trade shock, in the short-run relative to the long-run.

Armed with this parameter, I use the structure of the model to quantify the general equilibrium effects of the shock. Consistent with initial empirical work, traded employment was between 135,000 and 150,000 workers fewer across the US (between 190-210 per CZ) associated with the shock. This estimate coupled with the size of the Asian Crisis export demand shock ($14.8 billion) and the estimate of labor market persistence (4 years) is informative regarding the nature of labor-market adjustment to demand shocks.

The contribution of this paper is to demonstrate first that even temporary foreign shocks spill-over to domestic local labor markets via exports, and second to exploit the short-term nature of the Asian Crisis to map out the labor market dynamics of a non-permanent shock. The paper is structured as follows. The next section discusses existing literature. Section 3 provides background on the Asian Crisis of 1997; Section 4 discusses measurement and empirical design, and the main empirical results are presented in Section 5. Section 6 contains the theoretical model, its structural estimation, and the subsequent computational analysis

of the aggregate effect. Section 7 contains concluding remarks and suggestions for further research.

2   Background Literature

This paper follows from an extensive literature regarding the relationship between trade and employment. This link has been explored across countries, industries, industries within a country, and regional labor markets within a country. I focus on the literature that explores regional labor market effects.

The literature in recent years has been spearheaded by a series of papers on rising Chinese import penetration by Autor, Dorn, and Hanson (2013, 2015, and 2016).[2] In their flagship paper, the authors find that Chinese import penetration reduced US employment over the period 1990-2007. They exploit variation in CZs, centers of economic activity, for their analysis. I adopt their Bartik (1991) specification for exports, and I use a part of their data in the analysis. I provide more detail on the Bartik estimation in Section 4.1.

Other work such as Revenga (1992, 1997), Topalova (2010), and Kovak (2013) empirically estimate negative labor market and welfare effects of trade liberalization and import competition. The latter paper also develops a specific-factors model exploring the relationship between trade liberalization and wages, and Dix-Carneiro and Kovak (2015) extend it to estimate effects on the skill premium. In this paper, I use the specific-factors structure of the Kovak (2013) model to construct labor demand, and determine labor supply from the Roy (1951) structure used in Galle, Rodríguez-Clare, and Yi (2021). The advantage of this model structure is it yields an estimation equation linking exports with local employment and wages. Furthermore, I can use it to compute both partial and general equilibrium effects of the Asian Crisis shock, as in Galle, Rodríguez-Clare, and Yi (2021).

Work on Chinese import penetration has informed our understanding of the effect of long-run trade shocks on local labor markets. The advantage of using the Asian Crisis shock is that we learn about the nature of short-run temporary shocks. The size of the export shock ($14.8 billion), the estimated employment drop (135,000-150,000 jobs), and measured persistence (4 years) provides a guide for labor market adjustment to external demand shocks. Furthermore, I can estimate a short-run degree of worker heterogeneity (in tradable versus nontradable sectors) in response to a trade shock. This estimate is on the lower end compared to the longer-run estimates found in existing literature (Adao, Arkolakis, and Esposito (2017), Hsieh, Hurst, Jones, and Klenow (2019), Burstein, Morales, and Vogel (2019), and Galle, Rodríguez-Clare, and Yi (2021)).

Next, while there has been less work done on the effect of exports on labor market outcomes, McCaig (2011) studies the effect of the US-Vietnam Bilateral Trade Agreement (BTA) on poverty and wages in Vietnam, finding that increasing exports reduces poverty. McCaig and Pavcnik (2018) find that workers

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[2]This is a limited selection of their papers, consisting of those most relevant to my analysis.

reallocate from the informal to the formal sector in response to the positive export shock. Dauth, Findeisen, and Suedekum (2014) study the effect of the rise in trade between Germany and the East over the period 1998-2008 on German labor market outcomes. Using a similar instrument to Autor, Dorn, and Hanson (2013), the authors find significant employment increases as well as lower skilled worker turnover. In the US, Feenstra, Ma, and Xu (2019) study the employment response to import competition from China and global export expansion. They also use a similar methodology to Autor, Dorn, and Hanson (2013) and find that Chinese import penetration reduces jobs, but export expansion creates jobs. This literature demonstrates there can be a substantial impact of a gradual export expansion on local labor markets.

Relative to the literature, there are two major contributions of this paper. The first is that it demonstrates that short-run foreign crises can actually be transmitted to local labor markets via drops in export demand. The estimated employment adjustment implies that firms dynamically shift their labor demand in the face of short-term, moderate shocks. The second contribution is that the identification strategy in this paper - that the Asian Crisis was temporary, unanticipated, arguably exogenous to US local labor markets - can be used to estimate the dynamics and duration of the shock's impact. The permanent shocks exploited in existing literature do not lend themselves to estimating the hysteresis of a shock in the same way that can be captured by estimating effects of the temporary Asian Crisis. The next section provides more details on the nature of the Asian Crisis shock.

3 The Asian Crisis of 1997

3.1 Background of the Crisis

The Asian Crisis was marked in 1997 when Thailand devalued its currency relative to the dollar. Subsequently, gross domestic product (GDP) in Thailand, Indonesia, South Korea, and Malaysia plummeted by 12%, 16%, 8%, and 10%.[3] These countries, known as the Crisis-4, entered deep recessions. Import demand in those countries dropped as a result. Industries in the US, which had previously strong trading relationships with those countries, saw large drops in exports. However, industries which did not have relationships with those countries did not see changes in exports. By 1999, the Crisis had ended. Thus, the Asian Crisis is a natural experiment by which I can identify the relationship between exports and employment in the context of a short-run, temporary shock.

Pictured in Figure 1 are total US per-worker exports over the period 1991-2000 and per-worker exports to Crisis-4 countries over the same period. I display the latter for both the US and for the five other countries

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[3]Robert Barro, "Economic Growth in East Asia Before the Crisis," NBER Working Paper, http://unpan1.un.org/intradoc/groups/public/documents/APCITY/UNPAN014330.pdf

(on aggregate) that I use for an instrument. There is a slight decline in total US exports over the period 1997-1999 likely due to the sharp drop in exports to Crisis-4 countries in 1998.

Figure 1: Change in Total and Crisis-4 Exports, 1991-2000
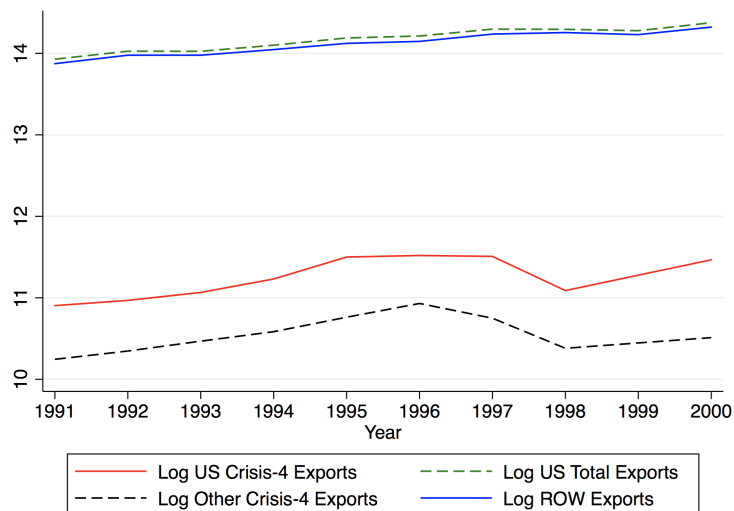
Note: Natural log of total per-worker exports (green), natural log of US exports to Crisis-4 countries (red), and natural log of five other countries' exports to Crisis-4 countries (black) (Australia, Denmark, New Zealand, Spain, and Switzerland) over the period 1991-2000.

Exports to Crisis-4 countries dropped by 14.8 billion dollars between 1997 and 1998, a 30.9% decrease in Crisis-4 exports and a 2% decrease in total exports given the share of Crisis-4 exports was approximately 7% in 1997. Harrigan (2000) and Bernard, Jensen, Redding, and Schott (2009) find that US exports declined in response to the Crisis. Both also find that exports to other countries in the world increased at the same time, though at a much smaller rate. Specifically, Bernard, Jenson, Redding, and Schott (2009) pinpoint a 21% decrease in exports to Crisis-4 countries with a corresponding 3% increase in exports to the rest-of-world over the period 1996-1998. This suggests that the decline in US exports was exogenous and resulted from the Crisis, not internal declines in output in the US. Additionally, Harrigan (2000) identifies industries which were among the most affected, and the ones he lists include primary metals and transport equipment.[4]

The calculated export declines as well as evidence from the literature on the Asian Crisis indicate that this was a substantial shock to US export demand. Furthermore, as the Crisis was caused by a financial crisis in East Asia, and US exports to other countries increased, the drop in demand for US tradable goods was exogenous. In sum, the Asian Crisis of 1997 was a natural experiment which had heterogeneous and significant effects across the US. In the next section, I empirically estimate the effect of this export drop on

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[4]Bernard, Jensen, Redding, and Schott (2009) also document an increase in US imports from Asian countries during the Asian Crisis, suggesting there may have been no significant supply chain or input-output linkage disruptions in the US at the time.

local labor markets.

4   Estimation Design

4.1   Measuring Exposure to the Crisis

The objective in this section is to estimate the effect of industry-level exports to the Crisis-4 countries on commuting zone employment. I follow Autor, Dorn, and Hanson (ADH 2013) and construct a measure of CZ exposure to the Crisis, $CEPW_{it}$. It is a measure of a CZ's per-worker exports to Crisis-4 countries based on its total employment and each of its compositional industries' employment.[5]. It is constructed as follows:

$$\Delta CEPW_{it} = \sum_j \frac{L_{ijt-1}}{L_{Ujt-1}} \frac{\Delta X_{jt}}{L_{it-1}} \tag{1}$$

In this equation, L_{ijt-1} is the start of period employment of each industry j of each CZ i. In the subsequent estimation, I test a range of base years - 1991, 1992, and 1993. I note the US was in recession in 1990-1991.[6] In my preferred specification I use 1993 as a base year because it has the highest correlation with later years' based measures while allowing for the greatest pre-period time difference. This is illustrated by Figure 8 in the Appendix. L_{Ujt-1} is each US (U) industry j's start of period employment. The fraction $\frac{L_{ijt-1}}{L_{Ujt-1}}$ can be thought of as a CZ's start of period share of each industry's employment. Next, X_{jt} is each industry's exports per year to Crisis-4 countries. The fraction $\frac{L_{ijt-1}\Delta X_{jt}}{L_{Ujt-1}}$ is a CZ i's change in share of each industry j's Crisis-4 exports. Then, dividing by each CZ i's start of period employment, L_{it-1}, I obtain each CZ's share of each industry's change in exports weighted by the number of workers in each CZ. I then sum this figure across all industries to obtain $CEPW_{it}$, a measure of each CZ's change in exports to Crisis-4 countries per worker per year.

Finally, I construct an analogous measure ($\Delta CEPW_{oit}$) using five developed countries' exports to Crisis-4 countries (Australia, Denmark, New Zealand, Spain, and Switzerland). I use this to instrument for the main independent variable. Changes in the five countries' exports to Crisis-4 countries was a function of export demand in Crisis-4 countries and unrelated to US labor market conditions. Furthermore, they are highly correlated with US exports (both to Crisis-4 countries and in total) because they are both functions of export demand in Crisis-4 countries. This instrument satisfies both exclusion (change in Crisis-4 exports in those

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[5]Although other countries were affected by the Asian Crisis, I look only at Crisis-4 countries because these countries were the most affected. Exposure to Crisis-4 exports therefore represents the best proxy to exposure to the drop in import demand during the Crisis.

[6]If CZ's were affected differently by the recession, it's possible that the weighting in 1990-1991 would not accurately affect CZ exposure to the Crisis during 1997-1999.

five countries are independent of US labor market conditions) and a strong first stage (Crisis-4 exports from those countries are highly correlated with Crisis-4 exports from the US). It addresses a potential endogeneity threat because import demand in the five other developed countries is independent of local labor markets in the United States. Thus, I am identifying the change in employment and wages associated with a drop in Crisis-4 export demand during the Crisis.

The calculation of these measures is similar to that of a Bartik (1991) instrument. In recent years, a literature has blossomed that explores the implementation of these types of instruments. Three major papers provide guidance on this topic: Adao, Kolesar, and Morales (ADKM, 2019), Borusyak, Hull, and Jaravel (BHJ, 2020), and Goldsmith-Pinkham, Sorkin, and Swift (GPSS, 2021). The first paper provides a standard error correction which accounts for potential share matrix correlation across observations. In the Appendix I replicate the main estimation table using these "Bartik standard errors," and find the estimates are robust to this calculation.

BHJ provide "shock identification" conditions through which a shift-share IV is valid, and provide evidence that the estimation in Autor, Dorn, and Hanson (ADH, 2013) is robust. The two identifying assumptions from BHJ are 1) the shocks are uncorrelated with the error term and 2) the shocks are independent across observations. As argued in the earlier paragraph, the variation from the Crisis demand from non-US countries is exogenous to local employment in the US, satisfying (1). On the second, each commuting zone is composed of different ranges of industries which receive different amounts of the Crisis shock, suggesting the shocks are independent across observations and satisfying (2).

Finally, GPSS demonstrate that a Bartik SSIV is equivalent to GMM with industry shares as instruments. However, if the shares are endogenous then the Bartik estimator may not be a valid IV. I argue that because the Asian Crisis was an unexpected and temporary shock the potential for correlated "unobserved shocks" causing endogeneity of the share identification is not as potent in this case.[7] In sum, the identification in this paper is informed by this novel Bartik literature.

As stated earlier, the main regressions employ a logged stacked-difference empirical strategy. I choose this double-difference specification because it allows me to compare the effect of the drop in Crisis-4 exports from 1996-1998 to the size of the change in exports in the pre period, 1993-1996. In the baseline estimation of the effect of exports on traded employment, I use CZ-wide start-of-period demographic controls and CZ and time fixed effects to balance the sample. In the main regressions, I measure $CEPW_{it}$ and $CEPW_{oit}$ using 1993 as a base year and estimate stacked differences from 1993-1996 and 1996-1998. I choose 1993 as a base year because, as shown in Figure 6 in the Appendix, the 1993 based measure has the highest correlation

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[7]The intuition is that (1) the Asian Crisis was not correlated with other trends in employment in the US, so the likelihood that the shares are correlated with employment adjustment in this window is smaller and (2) the estimation window itself is small, so that the probability of capturing long-run confounding trends is smaller.

with later years' (closer to the Crisis) measures while allowing for the longest pre-period time difference. The final estimation equation is:

$$\Delta LogL_{ijt} = \eta_j \Delta LogCEPW_{it} + \xi_j \Delta D_{it} + \phi_i + \phi_t + \Delta\epsilon_{it} \qquad (2)$$

where D_{it} are the start-of-period demographic controls and ϕ are CZ and time fixed effects. Note I use only two time periods, so two observations per CZ: 1993-1996 and 1996-1998. $LogL_{ijt}$ is the log of employment in each sector (traded and nontraded).

Next, using $CEPW_{it}$, I am able to measure how important Crisis-4 exporting industries were to a CZ's employment before the Crisis. Figure 2 displays this wide geographic variation.[8]

Figure 2: CZ Exposure to Crisis-4 Exports
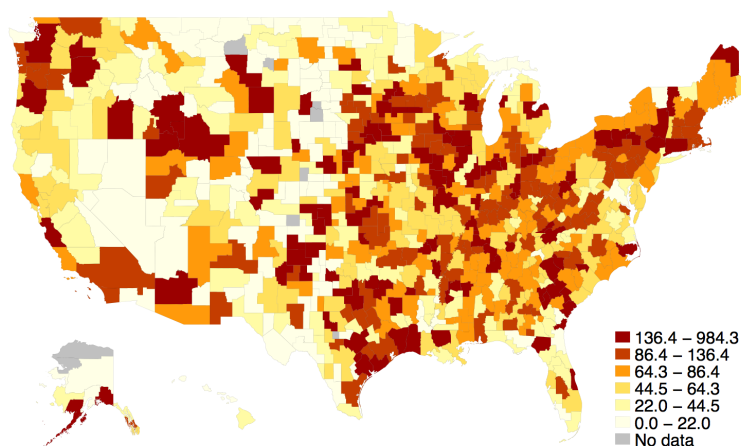
Note: Level of per-worker exports to Crisis-4 countries in 1992 plotted over a map of the US. Darker colors indicate higher levels of exposure.

4.2 Data

4.2.1 Sources

Next, to estimate the effect of the Asian Crisis of 1997 on employment and wages, I obtain data from a range of sources. I pull data from Comtrade on the US's, Australia's, Denmark's, New Zealand's, Spain's, and Switzerland's exports to Crisis-4 countries. This data is at the HS-6 level, and I use David Dorn's crosswalks to convert it to the SIC-87 level and then aggregate to the CZ level.

I use County Business Patterns (CBP) employment data and Quarterly Census of Employment and Wages (QCEW) wage data. I note that a shortcoming of these datasets are that the raw datasets do not include

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[8]As discussed in Section 4.2.2, during cleaning I drop 9 CZ's from the sample which have missing trade data so they are missing in this plot. The 7 CZ's with missing population data are included because they do have trade information.

6-digit NAICS codes for all industries and counties. This occurs because in counties where one company is an entire industry, including employment and wage information would clearly reveal private information about that county. To solve this issue, I use CBP data imputed by Fabian Eckert, who runs an imputation algorithm to fill in missing data. The data is in SIC-87 format until 1997 and then switches to NAICS-6 starting in 1998, so I use a crosswalk from Dorn to convert the data from NAICS-6 to SIC-87.[9] Second, I use aggregate industry wage data from the QCEW. The survey is a Bureau of Labor Statistics (BLS) publication which contains "a quarterly count of employment and wages reported by employers covering 98 percent of US jobs, available at the county, MSA, state and national levels by industry."[10]

Next, I obtain data from Schott (2008) which contains trade data by 6-digit NAICS industry and country. It provides import and export numbers for 463 6-digit industries, agricultural (NAICS 1) and manufacturing (NAICS 3), and 241 countries for the years 1990-2009. It also includes data on exports to Crisis-4 countries. This data comes from the Census, and is comprehensive. I use this total export data for Figure 1 and to provide one measurement of the (short-run) degree of worker heterogeneity in the model. I also consider this dataset to contain all traded industries, and accordingly use this designation to distinguish traded employment from nontraded employment.[11]

I obtain data from the US 1990 Census for county-level education numbers. I use this to generate geographic-level education numbers to split the sample and perform analysis regarding high and low education CZs. This data contains 1990 education numbers for 3,141 counties. Using this data, I classify a highly educated worker as someone who has at least a Bachelor's degree. I use population numbers from this dataset as a base group from which I calculate percent of high and low educated workers.

Next, I obtain data on unemployment by county from Local Area Unemployment (LAU) data from the Bureau of Labor Statistics. I obtain population data from the Surveillance, Epidemiology, and End Results Program (SEER). I aggregate these from the county level to the CZ level. Paired with the employment data, I am able to therefore study a complete picture of what happens to a CZ's inhabitants after an export shock.

Finally, in order to convert the data from county to CZ, I use conversion data from Autor, Dorn, and Hanson (2013). I thus have a dataset at the CZ-industry-year level, covering 741 CZs and it contains

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[9]In the crosswalk, Dorn provides a weight variable which is the percent of the national NAICS 1997 code corresponds to each SIC-87 code. To convert the data from the former to the latter, I multiply employment by this weight variable and then sum across NAICS codes within each SIC code. One problem with this is that in some CZs, only one SIC corresponding to a specific NAICS code is present, so this method may under-count employment for some observations. However, this issue is dispersed across the full sample and is independent of the Crisis-4 export variation. Also, I estimate that in approximately 5% of SIC-CZ pairs, imputed 1998 employment is less than 50% of 1997 employment. Of this 5%, the mean difference in imputed 1997 and 1998 employment is 80 workers. I note that these statistics also include true drops in employment. For additional robustness, in Appendix Table 8 I replicate the preferred specifications from Table 2 after constructing SIC-CZ employment without using the Dorn-NAICS weights (which over- rather than under-counts employment). The results are unchanged and the point estimates are close. Finally, in Section 5.3's event study estimation, I find that traded employment fully recovered 4-5 years after the Crisis. If the weighting change were driving variation, the post-1997 drop would appear permanent.

[10]Bureau of Labor Statistics, Quarterly Census of Employment and Wages, October 4, 2016

[11]For the QCEW aggregate industry wage data, I approximate and designate NAICS 1-digit codes 1, 2, and 3 as tradable because most tradable industries (by the definition used in the rest of the paper) fall into these sectors.

comprehensive labor market measures. I use years 1993-1998 for the main regressions, and extend to 2009 to explore persistence of the shock.

4.2.2 Summary Statistics

Table 1 contains means for the full sample. The average percentage in 1990, the latest Census year prior to the start of the sample, of workers with a Bachelor's degree in a CZ is approximately 14%, suggesting that most CZs were more heavily populated with less-educated workers in 1990. This number ranges up to 39% in the data. There are 741 CZs in the US. I drop 9 CZs which had no trade in 1991 to balance the comparison. In the estimation, there are an additional 7 CZs which I could not match population data for, so they are dropped from analysis. This brings the regression sample to 725 CZs.[12] In the Appendix Table 9, I replicate Table 1 using population-weighted means.

Table 1: Summary Statistics

$ExportsPW_{it}$	2103.6
$CrisisExportsPW_{it}$	115.0
$CrisisExportsPW_{oit}$	58.52
Unemployment Rate	6.148
Population	361790.9
% Educated	0.140
Employment (Annual)	294724.1
Traded Employment	21684.0
Non Traded Employment	273040.1
Wage (Average Weekly)	429.5
Traded Wage (Average Weekly)	515.7
Non Traded Wage (Average Weekly)	406.4
N	5825

Note: Commuting zone means reported over main regression sample period (1993-1998). 725 CZs in regression sample.

5 Empirical Results

5.1 Full Sample Results

In this section, I employ a range of estimation techniques to measure the effect of the drop in US exports during the Asian Crisis on local traded employment, described in Section 4. Table 2 contains the results from these specifications. Column 1 uses 1993 employment weights as discussed in Section 4.1. The rest of the columns in Table 2 contain robustness on this estimate. I employ a range of strategies: re-computing

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[12]The sample is slightly unbalanced, but in the estimation years (1993,1996,1998) the common denominator is 725 CZs.

$CEPW_{it}$ and $CEPW_{oit}$ while calculating a 1996 weighting base for the second period difference, exploiting 1992 as a base year, using log of traded employment share of population as the outcome, measuring differences starting in 1991 and 1992 instead of 1993, or using total per-worker exports as the explanatory variable. The observation count in each column reflects the sample: 725 CZs over two time periods (1993-1996 and 1996-1998). The results in Table 2 show the estimates are robust to each of these strategies and the coefficients are similar.

Table 2: Traded Employment Response to Asian Crisis

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\Delta LogCEPW_{it}$	0.356***	0.356***	0.136***	0.530***	0.191***	0.282***	0.235**	0.211**
	(0.108)	(0.103)	(0.0415)	(0.125)	(0.0511)	(0.0933)	(0.0955)	(0.0910)
Controls	Y	Y	Y	Y	Y	Y	Y	Y
CZ FE	Y	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y	Y
N	1450	1450	1450	1450	1450	1450	1450	1450
First Stage F-Stat	22.61	12.89	22.61	17.52	17.52	19.51	26.09	30.46
ADKM (2019) Bartik SE	(0.0760)	(0.0725)	(0.0293)	(0.104)	(0.0457)	(0.0658)	(0.0674)	(0.0641)

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
Note: Robust standard errors in parentheses, clustered at the commuting zone level. Stacked difference regressions estimating Equation 15 using the log of traded employment on log of $LogCEPW_{it}$. All regressions are estimated in changes and $\Delta LogCEPW_{it}$ is instrumented using $\Delta LogCEPW_{oit}$. Column 1 (preferred specification) bases $LogCEPW_{it}$ in 1993 and estimates stacked differences over the periods 1996-1993 and 1998-1996. Column 2 replaces $LogCEPW_{it}$ with $LogEPW_{it}$ (total per-worker exports). Column 3 uses log traded employment share of working age population as the outcome. Columns 4 and 5 re-calculate $LogCEPW_{it}$ using a 1996 base for the second period difference, with Column 4 using log traded employment and Column 5 using log traded employment share of population as the outcome. Column 6 bases $LogCEPW_{it}$ in 1992. Finally, Columns 7 and 8 base $LogCEPW_{it}$ and begin the first period difference in 1992 and 1991 respectively. All specifications use demographic controls (young share of population, nonwhite share of population, and female share of population) and a control for population. Adao, Kolesar, and Morales (2019) Bartik standard errors alternatively reported, using 1993 industry-CZ share weights.

In subsequent empirical specifications, I employ the 1993 pre-period weighting, 1996 Crisis-period reweighting specification from Column 4. I choose this specification for the empirical estimates because it is consistent with earlier literature such as Autor, Dorn, and Hanson (2013) for this topic and allows for closer correlation between the Crisis period difference and its weights. I note that the estimates using the simple 1993 weight are similar.

Table 2 also reports Bartik standard errors, following Adao, Kolesar, and Morales (2019). These standard errors correct for potential residual correlation due to similar industry structures.[13] These Bartik standard errors I estimate are similar and modestly smaller than those calculated by clustering, which can occur depending on the data's sector-CZ makeup.

Next, using the specification from Column 4 as my preferred specification, below in Figure 3 is a plot of the first stage of $\Delta LogCEPW_{it}$ on $\Delta LogCEPW_{oit}$ (left) and the reduced form of $\Delta LogL_{ijt}$ on $\Delta LogCEPW_{oit}$ (right). I find that Crisis-4 exports from other related countries is highly correlated with US Crisis-4 exports. Furthermore, the reduced form plot on the right also shows a strong relationship between change in traded

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[13]The ADKM code used to compute them requires including a industry-region employment share matrix. Because the preferred weight year is 1993, I construct this matrix using 1993 data.

employment and the Crisis shock.

Figure 3: CZ Exposure to Crisis-4 Exports
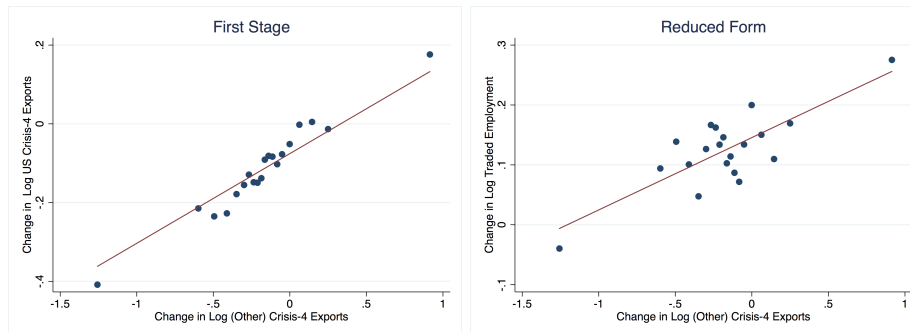
Note: First stage (left) and reduced form (right) of the instrumental variables specification of $\Delta LogTradedEmp_{it}$ on $\Delta LogCEPW_{it}$. Binscatter groups the data points and plots the mean for each bin. The solid line represents the regression estimator.

In this section I also explore persistence of the effect of the Crisis on employment, heterogeneity across highly and relatively less educated CZs, and other labor market effects. In these alternate empirical specifications, I employ the 1993 pre-period weighting, 1996 Crisis-period reweighting specification described above. I choose this specification for the empirical estimates because it is consistent with earlier literature such as Autor, Dorn, and Hanson (2013) for this topic and allows for closer correlation between the Crisis period difference and its weights. I note that the estimates using the simple 1993 weight are similar.

I next measure the effect of the export drop on a range of labor market outcomes: nontraded employment, traded and nontraded wage, total employment, the unemployment rate, labor force size, and population. Table 7 in the Appendix contains these estimates. I find modest effects on nontraded and aggregate employment, but no other labor market indicators, possibly because of the small and temporary nature of the shock.

Next, I split the sample into quintiles of 1993 values of $CEPW_{it}$ and estimate a binned specification, testing whether higher ex-ante exposure to Crisis-4 exports led to a greater drop in employment during the Crisis. Table 3 contains these results. Here I employ a classical difference-in-difference over the full sample period (1993-1999), with indicators for the treatment groups interacted with a post-Crisis dummy. Accordingly, the observation counts in each column reflect this adjustment (725 CZ's over 7 years). I report both OLS (Columns 1 and 3) and the reduced form (Columns 2 and 4) because the instrument is weak with disaggregation.[14] The coefficients are approximately increasing in magnitude by bin number, where Bin 5 is the highest exposed. As an alternate specification in Columns 5 and 6, I split the sample into two bins based on median values of 1993 $CEPW_{it}$ and employ a difference-in-difference technique. I again find that

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[14]In later event-study specifications when estimating shock persistence I only report the reduced form to address potential endogeneity concerns with OLS. Namely, that ex ante US export exposure could be simultaneous with subsequent employment fluctuations due to traded-sector trends.

the highly exposed CZs had greater declines in traded employment during the Asian Crisis. For the simple difference-in-difference with two bins the instrument has more power so I am able to employ IV.

Table 3: Traded Employment Response to Asian Crisis, Binned Specifications

	(1)	(2)	(3)	(4)	(5)	(6)
Crisis-4 Exposure Bin 2	-0.195***	-0.156***	-0.0572**	-0.0372		
	(0.0556)	(0.0550)	(0.0266)	(0.0264)		
Crisis-4 Exposure Bin 3	-0.226***	-0.249***	-0.0844***	-0.0981***		
	(0.0545)	(0.0545)	(0.0255)	(0.0259)		
Crisis-4 Exposure Bin 4	-0.228***	-0.222***	-0.0789***	-0.0789***		
	(0.0545)	(0.0539)	(0.0257)	(0.0256)		
Crisis-4 Exposure Bin 5	-0.246***	-0.226***	-0.0949***	-0.0850***		
	(0.0551)	(0.0548)	(0.0265)	(0.0264)		
Crisis-4 High Exposure					-0.244***	-0.112***
					(0.0469)	(0.0253)
Controls	Y	Y	Y	Y	Y	Y
CZ FE	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y
N	5075	5075	5075	5075	5075	5075
First Stage F-Stat					269.7	269.7

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
Note: Robust standard errors in parentheses, clustered at the commuting zone level. Binned specifications estimating the effect of the fall in US exports to Crisis-4 countries on local traded employment. Columns 1-4 employ 5 CZ bins of 1993 Crisis-4 per-worker exports and Columns 5 and 6 employ 2. Columns 1, 3, and 5 use log of traded employment as the outcome and Columns 2, 4, and 6 use log of traded employment share of working age population. Finally, Columns 1 and 3 report OLS and Columns 2 and 4 report the reduced-form because the instrument is weak for the disaggregated bins, and Columns 5 and 6 report IV. All specifications use demographic controls (young share of population, nonwhite share of population, and female share of population) and a control for population.

5.2 Heterogeneity in High and Low Education CZs

Next, I estimate heterogeneous effects on CZs that differ in composition of worker education. I divide the sample into terciles of 1990 CZ education (percent with at least a Bachelor's degree).[15] I then run the specification in Equation 2 on the split sample. Table 4 contains the estimates from these specification. I find that all of the labor market adjustment occurred in relatively low-education CZs: both traded and nontraded employment in low-education CZs fell significantly.[16]

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[15]I employ terciles rather than quartiles because the instrument loses power with further disaggregation.
[16]In Column 3 there are 1418 rather than 1450 observations in the traded wage sample due to data availability.

Table 4: Heterogeneous Response to Asian Crisis Shock by Education Shares

	Traded Emp (1)	Nontraded Emp (2)	Traded Wage (3)	Nontraded Wage (4)	Total Emp (5)	Unemployment (6)	Labor Force (7)	Population (8)	Working Age (9)
Education Bin 1	0.501***	0.200***	-0.0136	-0.00821	0.0709***	-0.0189	0.00972	0.0105	0.00622
	(0.126)	(0.0320)	(0.0249)	(0.0184)	(0.0195)	(0.0484)	(0.0110)	(0.0118)	(0.0121)
Education Bin 2	0.530***	0.0849***	0.00740	0.0115	0.0460**	-0.0342	0.00242	0.00803	0.00493
	(0.119)	(0.0315)	(0.0213)	(0.0186)	(0.0204)	(0.0513)	(0.0106)	(0.0116)	(0.0120)
Education Bin 3	0.541***	0.0421	-0.00413	-0.00137	0.0377*	-0.0301	-0.00898	0.0190	0.0128
	(0.134)	(0.0295)	(0.0221)	(0.0182)	(0.0207)	(0.0480)	(0.0104)	(0.0186)	(0.0185)
Controls	Y	Y	Y	Y	Y	Y	Y	N	N
CZ FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
N	1450	1450	1418	1450	1450	1450	1450	1450	1450
First Stage F-Stat	5.889	5.889	4.876	5.889	5.889	5.889	5.889	6.022	6.022

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: Stacked difference regressions estimating Equation 15 using the log of traded employment on log of $CEPW_{it}$. All regressions are estimated in stacked differences over the periods 1993-1996 and 1996-1998. $\Delta LogCEPW_{it}$ is instrumented using $\Delta LogCEPW_{oit}$. Outcomes are logs of traded employment, nontraded employment, traded wage, nontraded wage, total employment, unemployment rate, labor force, population, and working age population. Split into 3 bins of 1990 CZ share with a Bachelor's degree. All specifications use demographic controls (young share of population, nonwhite share of population, and female share of population) and a control for population.

5.3 Persistence

Finally, I test if the effects of the Crisis on traded employment lasted past the Crisis years. I use the reduced form of the stacked difference specification from Column 4 of Table 2, base the sample with 1991 Crisis-4 exports so as to extend the time panel, and construct differences from 1996 value of traded employment for each year from 1992-2009.[17] I compare this against the change in Crisis-4 exports from 1996-1998. An advantage of this specification is I can both test for pre trends (did the drop in Crisis-4 exports affect traded employment prior to Crisis years?) and explore persistence of the Crisis past 1998 (did the drop in exports have a permanent effect on employment, or did it adjust back to pre-1998 levels?).

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[17]The instrument is weak with yearly disaggregation, and reporting OLS for this figure would raise the same concern as in Table 2, that change in employment is simultaneous with change in exports.

Figure 4: Time Dynamics of Crisis Effects
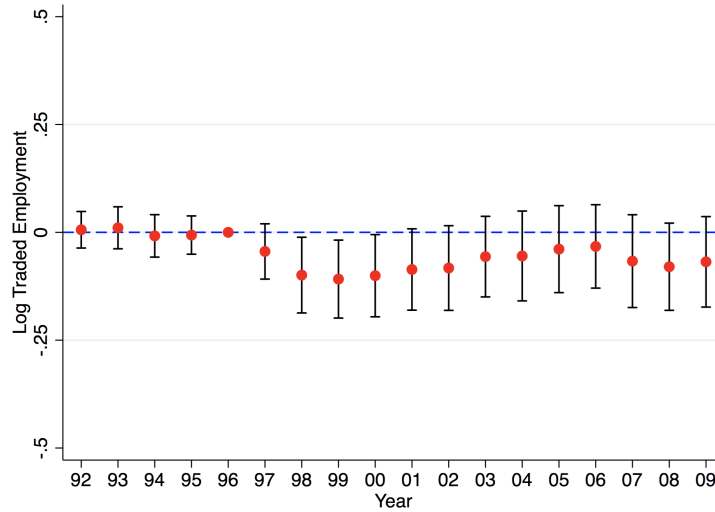
Note: Figure 4 contains a stacked difference specification which is a version of Column 4 of Table 2, where the explanatory variable is the difference in Crisis-4 exports from 1996-1998 stacked with the difference from 1991-1996. The dependent variable is stacked cross-sectional differences of log of traded employment using 1996 as the comparison year. The 1991-1996 coefficient is omitted in order to generate the stacked difference and 1996, the base difference year, is normalized to zero. Sample from 1991-2009. 95 percent confidence intervals, clustered at the commuting zone level.

I find a sharp drop in traded employment associated with the fall in exports during the Crisis, and effects persisted through at least 2000, three years past the start of the Crisis. Coefficients in the rest of the sample are measured slightly imprecisely, but I find that there was gradual adjustment to the norm so that the coefficient point estimate returns to approximately zero by 2005-2006. A concern with these estimates is that perhaps the Crisis shock was not transitory, that exports to Crisis-4 countries fell permanently during the Crisis and did not recover until at least when I observe employment recovery in Figure 4. Below is a plot of log Crisis-4 exports and log total exports aggregated from the industry level from 1990-2010. Note that this is different from Figure 1, which plots per-worker exports.

I find that exports to Crisis-4 countries returned to trend in 2000. This result in itself, when paired with Figure 4, suggests there was some element of sluggish adjustment: in Figure 4, employment remains below trend in 2000. In Figure 5, both total and Crisis-4 exports fell again in 2001, likely due to the US recession. They return to trend in 2004. In Figure 4, the point estimate remains below trend but the confidence interval widens to include zero.
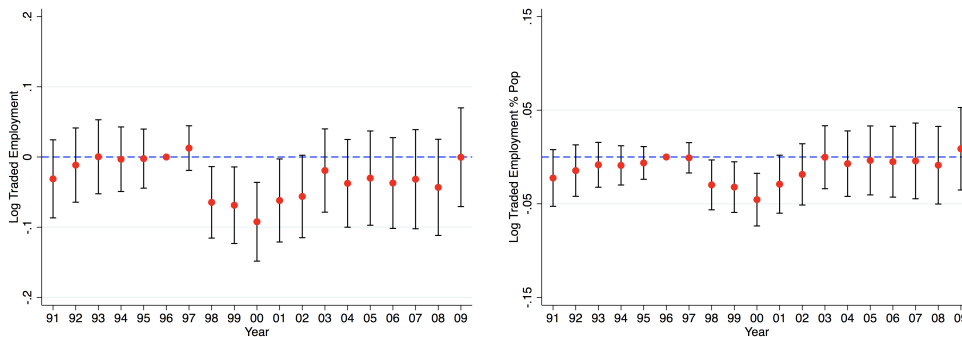
Figure 5: Time Dynamics of Crisis Effects

Log Exports (Total and Crisis-4), 1990-2010

Note: Figure 5 contains of Crisis-4 exports (red) and log of total exports (black dash) plotted from 1990-2010.

Therefore, a concern with the estimates from Figure 4 is that the post-2000 sluggish adjustment could be picking up the effect of the drop in exports during later years when estimating the effect of the drop in exports from 1996-1998. To address this concern, I interact bins for high exposure to the Crisis shock based on 1990 CZ per-worker Crisis-4 exports with yearly indicators. An advantage of this specification is I can directly compare the time trends of more versus less exposed CZs to the Crisis. This specification is not explicitly testing the effect of the export drop during the Crisis; rather, it is exploiting heterogeneity in ex ante exposure to the Crisis. Accordingly it is likely more robust to confounding effects from later years' export declines than the specification from Figure 4.

A concern with simply splitting by start-of-sample Crisis-4 exports is that a high value of Crisis-4 exports is correlated with a high amount of trade, so those estimates would also capture the 2001-2003 fall in US total trade and overestimate persistence. Accordingly, for the event study estimates in Figure 6, I split the sample based on 1990 Crisis-4 exports divided by total US 1990 exports. I employ the reduced form of Crisis-4 exports (from other developed countries) to address potential endogeneity concerns. The "treatment" group for this exercise will therefore be the CZs containing industries for which trade with Crisis-4 countries was relatively important while controlling for the total amount of trade the CZ was engaged in. This design is therefore able to capture the time dynamics of the Crisis while also being robust to potential confounding trends affecting US trade. I run this specification for both log of traded employment and log of traded employment share of population. I plot the coefficient estimates in Figure 6 below.

Figure 6: Time Dynamics of Crisis Effects

In both plots of Figure 6, there is no evidence of pre-trends, and in 1998 traded employment in the treatment CZs discontinuously drops relative to trend. The difference lasts for a couple years but is not permanent: the coefficients return to zero by 2003. Thus the result from Figure 6 is consistent with that of Figure 4, but provides additional robustness in that it also controls for trends to total exports. In sum, the evidence from Figures 4-6 suggest that there was some sluggish US employment adjustment back to the norm after the Crisis shock was transmitted locally via the export channel. Considering the Asian Crisis ended in 1999, this suggests an adjustment period of approximately 4 years post-shock.

6   Aggregate Effects

The estimates in the previous section yield a regression coefficient which is the slope of the local employment change with respect to the localized export shock. However, it does not capture the intercept (the "missing intercept problem") so that it cannot capture the aggregate effect of the Asian Crisis shock on local employment. Accordingly, I design a theoretical model which guides a structural estimation that enables me to capture the aggregate effect.

Namely, I embed the Roy (1951) framework from Galle, Rodríguez-Clare, and Yi (2021) into the Kovak (2013) setting, with two sectors, tradables and nontradables, in a given geography. This setup yields an estimation equation which expresses local labor as a function of prices and a general equilibrium term, and is ultimately governed by the Frèchet shape parameter.

Again considering the Asian Crisis temporary shock setting, I assume no short-run price effect on nontradables and then can difference out the general equilibrium term. Using differenced tradable and nontradable

employment as the outcome, I run a similar regression as in Equation 2, implement a correction to convert export values to prices, and uncover the Frèchet shape parameter. From there, I can computationally solve for the general equilibrium term and compute the aggregate labor and wage effects in the tradable and nontradable sectors. The measurement of the Frèchet parameter is also useful: in this setting, it governs the degree of sectoral worker heterogeneity, and in the Asian Crisis context is a short-run measurement and can be compared to the longer-run estimates in the literature.

This section operates in three steps: Section 6.1 poses the theoretical model, which guides the subsequent structural estimation of the Frèchet parameter in Section 6.2, and ultimately enables computational estimates of the aggregate effect of the Asian Crisis shock on US employment in Section 6.3.

6.1 Theoretical Model for Employment and Wages

6.1.1 Setup

The first few steps of this section follow Kovak (2013) closely, only departing to compute industry (j) - CZ (i) specific terms. For the purposes of analysis, I consider two industries: tradable and nontradable. The tradable sector may be hit with an export shock, whereas the nontradable sector cannot. I let Y_{ij} be output in each industry-CZ, and a_{Tij} and a_{Lij} be the quantities of specific factor and labor used in production. Formally,

$$T_{ij} = a_{Tij}Y_{ij}, \tag{3}$$

and

$$L_{ij} = a_{Lij}Y_{ij}. \tag{4}$$

Taking log differences of Equations 3 and 4 ($\hat{x} = dlnx$), letting hats denote proportional changes, noting the quantity of the specific factor is fixed yields the following identities. As a result, in Equation 5 the change in output is exactly equal to the inverse of the change in specific factor share. Equation 6 then links the change in labor in a CZ-industry to the change in factor shares.

$$\hat{Y}_{ij} = -\hat{a}_{Tij} \tag{5}$$

and

$$\hat{L}_{ij} = \hat{a}_{Lij} - \hat{a}_{Tij}. \tag{6}$$

From Kovak (2013), the output price is equal to proportional shares of the labor wage and the specific factor price.

$$a_{Lij}w_{ij} + a_{Tij}R_{ij} = P_{ij}. \tag{7}$$

Log differencing Equation 7, letting θ_j be the share of the specific factor in industry j, yields the expression in Equation 8. Equation 9 follows from the definition of the elasticity of substitution between the specific factor and labor.

$$(1 - \theta_j)\hat{w}_{ij} + \theta_j \hat{R}_{ij} = \hat{P}_{ij}, \tag{8}$$

and

$$\hat{a}_{Tij} - \hat{a}_{Lij} = \sigma_j(\hat{w}_{ij} - \hat{R}_{ij}). \tag{9}$$

Finally, rearranging and substituting 8 and 9 into 6 yields the industry-specific labor term in Equation 8 below.

$$\hat{L}_{ij} = \frac{\sigma_j}{\theta_j}(\hat{P}_{ij} - \hat{w}_{ij}). \tag{10}$$

Equation 10 is the change in labor in industry j in CZ i for a given change in exports. It indicates that when there is a decline in export prices in the tradable industry, the corresponding employment decline depends on the sizes of the wage decline, the elasticity of substitution between labor and the specific factor, and the cost share of the specific factor. If there is no wage change, the employment change is relatively larger.

6.1.2 Roy Model

Departing from Kovak (2013), I allow labor to select into industries using a standard Roy model from Galle, Rodríguez-Clare, and Yi (2021) (henceforth GRCY). In GRCY, there are G_g groups of workers from country g, but for the purposes of analysis, I model only one country (the US). Additionally, I model the Frèchet draws as training costs for working in a sector, with the assumption that each period requires re-training. GRCY and Burstein, Hanson, Tian, and Vogel (2021) consider efficiency units of labor and efficiency wages; here I assume that worker productivities are fixed but that each worker incurs a cost of participating in an industry. This means that the offered wage by the firm and the received wage by the worker is the same, w_{ij}. These training costs can be thought of as equivalent to the Frèchet draws in Caliendo and Parro (2021) in which workers draw a cost to switching location-sectors, except in this framework I focus on within-commuting zone adjustment. Furthermore, these training costs capture whether certain workers

are more or less ex ante equipped to work in certain industries.

Formally, each worker draws a cost in sector j drawn from a Fréchet distribution with shape parameter β_i and scale parameters A_{ij}. As GRCY explain, the closer β_i is to 1, the greater the degree of labor heterogeneity. Labor supply in a commuting zone (L_i) is fixed, and worker allocation depends on workers selecting into industries (tradable or nontradable).

As in GRCY, the cost draw $\mathbf{z}$ takes vector form with a value for each industry. $\mathbf{z} = (z_1, ..., z_J)$. Let $\Omega_{ij} = \{\mathbf{z} : \frac{w_{ij}}{z_j} \geq \frac{w_{ik}}{z_k} \forall k\}$ so that a worker in commuting zone i will choose to work in industry j if $\mathbf{z} \in \Omega_{ij}$. Note that I allow for a commuting zone-industry specific wage rather than industry-specific in GRCY. Finally, let $F_i(\mathbf{z})$ be the probability distribution of z for workers in commuting zone i. Then the share of employment in commuting zone i that works in industry j is given by

$$\pi_{ij} = \int_{\Omega_{ij}} dF_i(\mathbf{z}) = \frac{A_{ij}(w_{ij})^{\beta_i}}{\Phi_i}, \tag{11}$$

where

$$\Phi_i = \sum_k A_{ik}(w_{ik})^{\beta_i}$$

.

Log differencing ($\hat{x} = dlnx$), and noting the A_{ij} are fixed, we have

$$\hat{\pi}_{ij} = \beta_i \hat{w}_{ij} - \hat{\Phi}_i. \tag{12}$$

I assume that labor supply in a CZ i is fixed, allowing me to equate $\hat{L}_{ij} = \hat{\pi}_{ij}$. The motivation for this assumption is that the Crisis was a short-run shock so that aggregate supply did not immediately adjust. I will later (in the Appendix) relax this assumption and allow for flexible labor supply. Let $\hat{\Phi}_i$ to be a measure of the change in total labor market conditions in a commuting zone. Consider a single elasticity $\beta_i = \beta$. The solution is therefore given by Equations 13 and 14 below:

$$\hat{L}_{ij} = \frac{\beta \frac{\sigma_j}{\theta_j}}{\beta + \frac{\sigma_j}{\theta_j}} \hat{P}_{ij} - \frac{\frac{\sigma_j}{\theta_j}}{\beta + \frac{\sigma_j}{\theta_j}} \hat{\Phi}_i, \tag{13}$$

and

$$\hat{w}_{ij} = \frac{\frac{\sigma_i}{\theta_{ij}}}{\beta + \frac{\sigma_{ij}}{\theta_{ij}}} \hat{P}_{ij} + \frac{1}{\beta + \frac{\sigma_j}{\theta_j}} \hat{\Phi}_i. \tag{14}$$

Thus, when there is a decrease in export prices in the tradable industry, employment and wages in

that industry decrease. The model predicts that employment in the other industry (nontradable) will thus increase. There is a direct effect from exports, and an indirect general equilibrium effect from the shift in CZ labor market conditions ($\hat{\Phi}_i$). As in Kovak (2013), the magnitudes of these changes depend on the cost share of the specific factor and the elasticity of substitution between inputs. As an extension, I also allow these changes to depend on the degree of worker heterogeneity β.

6.2 Measuring β, the [Short Run] Degree of Worker Heterogeneity

Next, I use the theoretical model from the previous section to measure β, the degree of worker heterogeneity. In this data, it is a short-run elasticity, rather than the estimates from earlier work which measure longer-run elasticities. From the Frèchet distribution we know $\beta > 1$. When $\beta \to 1$ the general equilibrium term $\hat{\Phi} \to 0$, so effects of the export shock are concentrated in the traded industry only. Thus, when $\beta \to 1$ there are greater distributional consequences of exporting. Estimating the value of β is therefore important when predicting the CZ-wide effects of an export shock.

To estimate β, I calibrate Equation 14 from the model. Without β I cannot calibrate Φ_{it}, but I can difference Equation 14 between traded and nontraded employment as nontraded Crisis-4 exports are zero. Here I assume that in the short-run price effects on nontradables are zero.[18] This method eliminates the Φ term. Assuming a constant specific factor share $\theta_j = \theta$ and elasticity of substitution $\sigma_j = \sigma$, and that the price of nontradables is constant in the short-run, $\hat{P}_{int} = 0$, I estimate

$$\hat{L}_{itr} - \hat{L}_{int} = \frac{\beta \frac{\sigma}{\theta}}{\beta + \frac{\sigma}{\theta}} \hat{P}_{itr} \tag{15}$$

I then run the following specification:

$$\Delta LogTradedEmployment_{it} - \Delta LogNontradedEmployment_{it} = \eta \Delta logEPW_{it} + \phi_t + \phi_i + \epsilon_{it} \tag{16}$$

where ϕ_i and ϕ_t are CZ and time fixed effects and ϵ_{it} is a CZ-time error term. I calibrate ΔP_{ij} with ΔEPW_{it}, the log-differenced explanatory variable from Section 4 constructed with total exports, adjusted with a quantity-to-price conversion using the ratio of import price drop to value drop in East Asian imports

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[18]In Section 5.2 Table 4 and Appendix Table 7 I find some negative effects on nontraded employment for low-education commuting zones (like tradable employment in Table 2, nontradable employment rises as exports increase). On aggregate, the employment effect is approximately one-quarter of the effect in the tradable sector. This implies that the assumption that the price effects on nontradables are zero may bias the coefficient on the price term downward so that the implied β estimate is larger than the true β. In practice, I estimate a range of β that is close to the lower bound of 1, implying close to zero or even zero tradable employment reallocation to the nontradable sector. This is consistent with the empirical result that nontradable employment did not rise in light of the Asian Crisis shock. However, as I find empirically that nontradable employment fell, I discuss in Section 6.3 that the model may mask other effects on nontradables such as input-output linkages or adjustment frictions.

from Higgins and Klitgaard (2000). This weighting captures the amount that US prices changed during the Crisis relative to the amount that export values changed. I find that $\hat{P}_{it} = \mu \Delta LogCEPW_{it}$ where $\mu = 0.45$. Thus the above expression can be written as

$$\Delta LogTradedEmployment_{it} - \Delta LogNontradedEmployment_{it} = \frac{\eta}{\mu}\hat{P}_{it} + \phi_t + \phi_i + \epsilon_{it} \qquad (17)$$

I thus solve

$$\frac{\beta \frac{\sigma}{\theta}}{\beta + \frac{\sigma}{\theta}} = \frac{\eta}{\mu} \qquad (18)$$

I test using both Crisis-4 exports and total exports as the explanatory variables, but use the results from the latter specification as the model estimates the effect of total exports. I continue to use the stacked-log-difference as in Section 5 because it allows me to exploit a comparison between the Crisis period to the pre-period, following Autor, Dorn, and Hanson (2013), for robustness. I also test adding the demographic controls from the earlier tables.

This structural estimation employs the 1993 weighting (for both periods) method rather than reweighting in 1996 because it is most consistent with the interpretation of the model in Section 6.1.[19]

Table 5: Measuring β, the Degree of Worker Heterogeneity

	(1)	(2)
$\Delta LogEPW_{it}$	0.319***	0.296***
	(0.0941)	(0.0974)
N	1464	1450
First Stage F-Stat	14.20	12.89
β	1.139	1.013
β - Short Run σ	1.395	1.211
Controls	N	Y
CZ FE	Y	Y
Year FE	Y	Y

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
Note: Robust standard errors in parentheses, clustered at the commuting zone level. Stacked difference regressions estimating Equation 16 using the difference of log of traded employment and log nontraded employment on log of EPW_{it} (total per-worker exports). All regressions are estimated in stacked differences over the periods 1993-1996 and 1996-1998. $\Delta LogEPW_{it}$ (total per-worker exports) instrumented using $\Delta LogCEPW_{oit}$. Estimates used to compute β from model in Section 4. Column 2 uses demographic controls (young share of population, nonwhite share of population, and female share of population) and a control for population.

I then calibrate the model with a range of values for θ and σ. The baseline calibration uses $\sigma = 0.65$, the midpoint of the estimate range of the elasticity of substitution between labor and capital from Knoblach, Roessler, and Zwerschke (2020). In an alternate measurement I employ $\sigma = 0.5$, which is their measurement

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[19]A concern with reweighting for the structural estimation is that the model is designed as a single difference (as discussed earlier, the double-difference estimation strategy is employed in this paper for the purpose of identification). Accordingly, for this structural work reweighting in 1996 would alter the regression coefficient point estimate to capture industry makeup shifts over 1993-1996. It would distort away from the true β because the model assumes the weights are constant in the pre-period. Employing 1993 weights across both periods enables a more direct comparison between the pre-period and the Crisis period, more closely follows the model, and allows for a more accurate measurement of β.

of the short-run elasticity of substitution. Next, Kovak (2013) measures θ, the specific factor share, as one minus the inverse of the wage bill share of value added. Autor, Dorn, Katz, Patterson, and Van Reenen (2020) document this labor share to be approximately 0.65 in 1990, so I implement $\theta = 0.35$. Using this calibration, I find estimates of β between 1 and 1.4 which is in line with existing literature though on the lower end. Specifically, Adao, Arkolakis, and Esposito (2017), Hsieh, Hurst, Jones, and Klenow (2019), Burstein, Morales, and Vogel (2019), and Galle, Rodríguez-Clare, and Yi (2021) measure β between 1.1 and 2.2. In this paper, I am measuring a short-term elasticity identified by the effects of a temporary drop in exports. It is possible that in the short term, directly affected industries are mostly adjusting so the distributional effects are greater. Thus, both these estimates for β and the estimates in Table 4 provide evidence for strong distributional effects of the Crisis in the US, both across- and within-CZ.

6.3 General Equilibrium Effects

6.3.1 Measurement

In this section, using the model from Section 6.1 I compute the aggregate effects of the Crisis shock on CZ labor markets. In order to do so, I must solve for $\hat{\Phi}$. Using this measurement, I can compute the aggregate effect of the Asian Crisis on employment using the elasticity β, the calibration of σ and θ, $\Delta LogEPW_{it}$, μ, and $\hat{\Phi}_{it}$.

Next, I relax the assumption that CZ labor supply is fixed and allow for an endogenous total labor supply. In order to do so, I use the identity $\hat{\pi}_{ij} = \hat{L}_{ij} - \hat{L}_i$. The solutions are in the Appendix. The system of equations to be solved (and which I ultimately employ) is:

$$\frac{w'_{intr} - w_{intr}}{w_{intr}} = \frac{1}{\beta + \frac{\sigma_j}{\theta_j}}[\hat{\Phi}_i - \hat{L}_i] \tag{19}$$

$$\frac{L'_{intr} - L_{intr}}{L_{intr}} = -\frac{\frac{\sigma}{\theta}}{\beta + \frac{\sigma}{\theta}}[\hat{\Phi}_i - \hat{L}_i] \tag{20}$$

$$\frac{w'_{itr} - w_{itr}}{w_{itr}} = \frac{\frac{\sigma}{\theta}}{\beta + \frac{\sigma}{\theta}}\hat{P}_{itr} + \frac{1}{\beta + \frac{\sigma_j}{\theta_j}}[\hat{\Phi}_i - \hat{L}_i] \tag{21}$$

$$\frac{L'_{itr} - L_{itr}}{L_{itr}} = \frac{\beta\frac{\sigma}{\theta}}{\beta + \frac{\sigma}{\theta}}\hat{P}_{itr} - \frac{\frac{\sigma}{\theta}}{\beta + \frac{\sigma}{\theta}}[\hat{\Phi}_i - \hat{L}_i] \tag{22}$$

$$\hat{\Phi}_i = [\hat{L}_i + 1]\frac{1}{\beta}\frac{[w'^{\beta}_{itr}w^{\beta}_{intr} - w'^{\beta}_{intr}w^{\beta}_{itr}]}{[w'_{itr}w_{intr} - w'_{intr}w_{itr}]}[w^{1-\beta}_{itr}w^{1-\beta}_{intr}] - 1 \tag{23}$$

$$\hat{L}_i = \frac{L'_{itr} + L'_{intr} - L_{itr} - L_{intr}}{L_{itr} + L_{intr}} \tag{24}$$

This is therefore a system of six equations (19-24) which can be solved computationally.

6.3.2   Results

Table 6 contains the aggregate results from the simulations, using the flexible labor supply results from Equations 19-24. I find that traded employment fell by between 135,000 and 150,000 workers across the US associated with the Crisis, or between 190 and 210 workers per CZ.[20] find that wages across the CZ fell, leading to a corresponding increase in nontraded employment. I note that the point estimates are small (approximately 5-6 dollars per average wage per CZ), which may be why I do not pick up a significant effect on wages in Table 7 of the Appendix.

Depending on the size of the short run β parameter I find some reallocation to nontraded employment, which I do not find empirically. In fact, in Table 4 and Appendix Table 7 I find that in some CZs nontraded employment modestly fell. There are a couple explanations for this discrepancy. First, I model the nontraded sector as having zero export shock, but it is possible that nontraded sectors are more directly affected through input-output linkages or local demand. Furthermore, I do not explicitly model adjustment frictions which may exist in the short run, preventing spillover. Reconciling the estimates in Table 6 with the empirical estimation of nontraded sector effects also suggests that the true short-run β is very close to 1, which is the lower end of the estimated range. Generally, these estimates demonstrate the role of β in capturing that as β falls (a greater degree of cross-sector heterogeneity) effects are more and more concentrated in the traded sector because employment can not as easily move between sectors.

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[20]Due to simulation error when solving the system of equations in Matlab, the true solutions are within approximately 1% of the values reported in Table 6.

Table 6: Aggregate Effects of Asian Crisis on US Local Labor Markets

	(1) Traded Employment	(2) Traded Wage	(3) Nontraded Employment	(4) Nontraded Wage
$\beta = 1.4$ - Flexible Labor Supply				
Total	-150370	-4223	212880	-219
Average	-211	-6	299	-0.31
Percent	-1%	-1.1%	0	0
$\beta = 1.3$ - Flexible Labor Supply				
Total	-146890	-4285	164720	-170
Average	-206	-6	231	-0.20545
Percent	-0.9%	-1.2%	0	0
$\beta = 1.2$ - Flexible Labor Supply				
Total	-143190	-4351	113400	-117
Average	-201	-6	159	-0.16
Percent	-0.9%	-1.2%	0	0
$\beta = 1.1$ - Flexible Labor Supply				
Total	-139240	-4422	58627	-60
Average	-195	-6	82	-0.08
Percent	-0.9%	-1.2%	0	0
$\beta = 1$ - Flexible Labor Supply				
Total	-135010	-4498	0	0
Average	-189	-6	0	0
Percent	-0.9%	-1.2%	0	0

Note: Aggregate effects of Asian Crisis export shock computed for traded and nontraded employment and wages. Panels represent different values of β. Flexible labor supply computation used.

The estimates for $\beta = 1.3, 1.4$ show an increase in nontraded employment slightly greater than the drop in traded employment. Compared to lower measurements of β the CZ is relatively homogeneous so employment fluctuates across sectors more easily. The output price of the nontraded sector rises relative to the traded sector, so the nontraded sector becomes desirable. Because from Table 1 the nontraded sector is approximately ten times larger than the traded sector, and total labor supply is flexible, this implies that in this data the CZ actually slightly grows. In percentage terms, the nontraded sector does not grow substantially. Thus in a model without input-output linkages or adjustment frictions the implied β is very close to 1; perhaps an extension with these tools could allow for a larger β.

Figure 7 below compares $\hat{L}_{ij}$ and $\hat{w}_{ij}$ to $\Delta Log EPW_{it}$. Traded employment and wage has a strong positive (percentage) relationship with change in exports, whereas the larger and less directly affected nontraded sector has a more muted relationship.

Figure 7: General Equilibrium Effects of Asian Crisis Export Shock
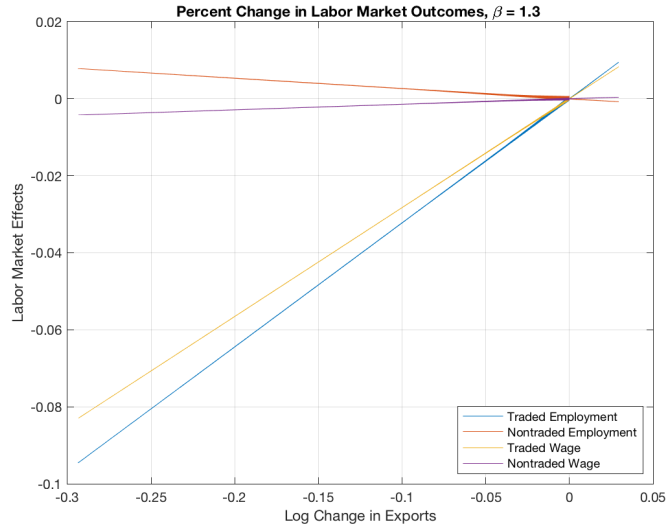
Note: Estimated log change in traded employment, traded wage, nontraded employment, and nontraded wage, relative to the aggregate log export change.

7   Conclusion

The contribution of this paper is to examine how a temporary foreign crisis affects local labor markets via the export channel, and explore the dynamics of a short-run shock. During the Asian Crisis of 1997, when exports to those countries fell, employment in traded industries declined in response. Aggregate labor market effects were driven by the lowest-education subgroup, and there was sluggish post-Crisis adjustment. Computational estimates find traded employment fell between 135,000 and 150,000 workers over the period 1997-1998. I measure the short-run degree of worker heterogeneity in the US, and find low values. Compared to existing literature, this suggests strong within-CZ distributional effects associated with a temporary trade channel shock relative to the long-run. The demand shock (export decline of \$14.8 billion), the estimated employment decline, and measured persistence (4 years) is informative regarding the nature of labor market adjustment to moderate demand shocks.

Additionally, the evidence presented in this paper has important policy implications. As indicated in the above discussion, a major consequence of a negative export shock is that lower education workers in both affected and unaffected sectors lose their jobs. The Trade Adjustment Assistance program (TAA) has both reemployment and income assistance programs, but mainly to adjust for import penetration. It may be desirable to implement a similar program for export effects that stresses reemployment to assist low-income workers. Therefore, the results of this paper have also shed light on certain steps governments can take in order to maintain worker welfare.

26

A   Model Solution

From Section 4,

$$\pi_{ij} = \frac{A_{ij}(w_{ij})^{\beta_i}}{\Phi_i}$$

where

$$\Phi_i = \sum_k A_{ik}(w_{ik})^{\beta_i}$$

Because there are two sectors (tr, nt) , and one $\beta_i = \beta$, these can be written as

$$\pi_{itr} = \frac{A_{itr}(w_{itr})^{\beta}}{A_{itr}w_{itr}^{\beta} + A_{int}w_{int}^{\beta}} \tag{25}$$

$$\pi_{intr} = \frac{A_{int}(w_{int})^{\beta}}{A_{itr}w_{itr}^{\beta} + A_{int}w_{int}^{\beta}} \tag{26}$$

where

$$\Phi_i = A_{itr}w_{itr}^{\beta} + A_{int}w_{int}^{\beta}$$

Now note that $\pi_{itr}, \pi_{int}, w_{itr}, w_{int}, \beta$ are all known either from data or earlier measurement. Thus I can compute Φ. Then

$$\hat{\Phi} = dln\Phi = \frac{\Phi' - \Phi}{\Phi}$$

Fully expanding Equations 11 and 12 and noting $\hat{P}_{intr} = 0$ I have

$$\frac{w'_{intr} - w_{intr}}{w_{intr}} = \frac{1}{\beta + \frac{\sigma_j}{\theta_j}}\hat{\Phi}_i \tag{27}$$

$$\frac{\pi'_{intr} - \pi_{intr}}{\pi_{intr}} = -\frac{\frac{\sigma}{\theta}}{\beta + \frac{\sigma}{\theta}}\hat{\Phi}_i \tag{28}$$

$$\frac{w'_{itr} - w_{itr}}{w_{itr}} = \frac{\frac{\sigma}{\theta}}{\beta + \frac{\sigma}{\theta}}\hat{P}_{itr} + \frac{1}{\beta + \frac{\sigma_j}{\theta_j}}\hat{\Phi}_i \tag{29}$$

$$\frac{\pi'_{itr} - \pi_{itr}}{\pi_{itr}} = \frac{\beta\frac{\sigma}{\theta}}{\beta + \frac{\sigma}{\theta}}\hat{P}_{itr} - \frac{\frac{\sigma}{\theta}}{\beta + \frac{\sigma}{\theta}}\hat{\Phi}_i \tag{30}$$

Combining (27) with (28) and (29) with (30) yields

$$\frac{w'_{itr}}{w_{itr}} - \frac{w'_{intr}}{w_{intr}} = \frac{\frac{\sigma}{\theta}}{\beta + \frac{\sigma}{\theta}}\hat{P} \tag{31}$$

$$\frac{\pi'_{itr}}{\pi_{itr}} - \frac{\pi'_{intr}}{\pi_{intr}} = \frac{\beta\frac{\sigma}{\theta}}{\beta + \frac{\sigma}{\theta}}\hat{P} \tag{32}$$

By the definition of π_{ij},

$$\pi_{itr} = \frac{A_{itr}(w_{itr})^\beta}{A_{itr}w_{itr}^\beta + A_{int}w_{int}^\beta} \tag{33}$$

$$\pi_{intr} = \frac{A_{int}(w_{int})^\beta}{A_{itr}w_{itr}^\beta + A_{int}w_{int}^\beta} \tag{34}$$

Plugging into Equation 32,

$$\frac{\frac{A'_{itr}(w'_{itr})^\beta}{A'_{itr}w_{itr}'^\beta + A'_{int}w_{int}'^\beta}}{\frac{A_{itr}(w_{itr})^\beta}{A_{itr}w_{itr}^\beta + A_{int}w_{int}^\beta}} - \frac{\frac{A'_{itnr}(w'_{nitr})^\beta}{A'_{itr}w_{itr}'^\beta + A'_{int}w_{int}'^\beta}}{\frac{A_{int}(w_{int})^\beta}{A_{itr}w_{itr}^\beta + A_{int}w_{int}^\beta}} = \frac{\beta\frac{\sigma}{\theta}}{\beta + \frac{\sigma}{\theta}}\hat{P}$$

Simplifying and letting $A' = A$ in the short run,

$$\frac{w_{itr}'^\beta}{w_{itr}^\beta}\frac{\Phi}{\Phi'} - \frac{w_{intr}'^\beta}{w_{intr}^\beta}\frac{\Phi}{\Phi'} = \frac{\beta\frac{\sigma}{\theta}}{\beta + \frac{\sigma}{\theta}}\hat{P}$$

Thus the system of equations is

$$\frac{w'_{itr}}{w_{itr}} - \frac{w'_{intr}}{w_{intr}} = \frac{\frac{\sigma}{\theta}}{\beta + \frac{\sigma}{\theta}}\hat{P} \tag{35}$$

$$[\frac{w_{itr}'^\beta}{w_{itr}^\beta} - \frac{w_{intr}'^\beta}{w_{intr}^\beta}]\frac{\Phi}{\Phi'} = \frac{\beta\frac{\sigma}{\theta}}{\beta + \frac{\sigma}{\theta}}\hat{P}$$

I can divide the first equation by the second and obtain

$$\frac{[\frac{w'_{itr}}{w_{itr}} - \frac{w'_{intr}}{w_{intr}}]}{[\frac{w_{itr}'^\beta}{w_{itr}^\beta} - \frac{w_{intr}'^\beta}{w_{intr}^\beta}]}\frac{\Phi'}{\Phi} = \frac{1}{\beta} \tag{36}$$

Further rearranging yields

$$\hat{\Phi}_i = \frac{1}{\beta}\frac{[w_{itr}'^\beta w_{intr}^\beta - w_{intr}'^\beta w_{itr}^\beta]}{[w'_{itr}w_{intr} - w'_{intr}w_{itr}]}[w_{itr}^{1-\beta}w_{intr}^{1-\beta}] - 1 \tag{37}$$

I can solve this system of Equations 27-30 and 36 computationally where the unknowns are $w'_{intr}, w'_{itr}, \pi'_{intr}, \pi'_{itr},$

and $\hat{\Phi}_i$. From there I can compute $\hat{w}_{intr}, \hat{w}_{itr}, \hat{\pi}_{intr}$, and $\hat{\pi}_{itr}$, the total effect of the Asian Crisis on local labor markets. Note when β is exactly 1, $\hat{\Phi}_i = 0$ and there are no general equilibrium effects when $\beta = 1$ and the effects of the Crisis are entirely distributional.

B   Model Extension - Non-Constant Total Employment

From Equation 8 in the main text I have

$$\hat{L}_{ij} = \frac{\sigma_j}{\theta_j}(\hat{P}_{ij} - \hat{w}_{ij}) \tag{38}$$

and

$$\hat{\pi}_{ij} = \beta \hat{w}_{ij} - \hat{\Phi}_i \tag{39}$$

In the main text I assume labor supply in each CZ is fixed, allowing me to equate $\hat{L}_{ij} = \hat{\pi}_{ij}$. In this section I relax this assumption. Note that $\hat{L}_{ij} = \hat{\pi}_{ij} + \hat{L}_i$ where L_i is total employment in a CZ. Thus the solution to the system of equations becomes

Solving yields

$$\hat{L}_{ij} = \frac{\beta\frac{\sigma_j}{\theta_j}}{\beta + \frac{\sigma_j}{\theta_j}}\hat{P}_{ij} - \frac{\frac{\sigma_j}{\theta_j}}{\beta + \frac{\sigma_j}{\theta_j}}[\hat{\Phi}_i - \hat{L}_i] \tag{40}$$

$$\hat{w}_{ij} = \frac{\frac{\sigma_i}{\theta_j}}{\beta + \frac{\sigma_j}{\theta_j}}\hat{P}_{ij} + \frac{1}{\beta + \frac{\sigma_j}{\theta_j}}[\hat{\Phi}_i - \hat{L}_i] \tag{41}$$

Simplifying,

$$\frac{w'_{itr}}{w_{itr}} - \frac{w'_{intr}}{w_{intr}} = \frac{\frac{\sigma}{\theta}}{\beta + \frac{\sigma}{\theta}}\hat{P} \tag{42}$$

$$\frac{L'_{itr}}{L_{itr}} - \frac{L'_{intr}}{L_{intr}} = \frac{\beta\frac{\sigma}{\theta}}{\beta + \frac{\sigma}{\theta}}\hat{P} \tag{43}$$

Note that $\frac{L'_{ij}}{L_{ij}} = \frac{\pi'_{ij}L'_i}{\pi_{ij}L_I}$ so I can plug in

$$\frac{\pi'_{itr}L'_i}{\pi_{itr}L_i} - \frac{\pi'_{intr}L'_i}{\pi_{intr}L_i} = \frac{\beta\frac{\sigma}{\theta}}{\beta + \frac{\sigma}{\theta}}\hat{P}$$

Plugging in for the definition of π_{ij} and rearranging,

$$\left[\frac{w'^{\beta}_{itr}}{w^{\beta}_{itr}} - \frac{w'^{\beta}_{intr}}{w^{\beta}_{intr}}\right]\frac{\Phi}{\Phi'}\frac{L'_i}{L_i} = \frac{\beta\frac{\sigma}{\theta}}{\beta + \frac{\sigma}{\theta}}\hat{P} \tag{44}$$

Dividing Equation 42 by Equation 44,

$$\frac{\left[\frac{w'_{itr}}{w_{itr}} - \frac{w'_{intr}}{w_{intr}}\right]}{\left[\frac{w'^{\beta}_{itr}}{w^{\beta}_{itr}} - \frac{w'^{\beta}_{intr}}{w^{\beta}_{intr}}\right]}\frac{\Phi'}{\Phi} = \frac{1}{\beta}\frac{L'_i}{L_i} \tag{45}$$

Thus I have

$$\hat{\Phi}_i = [\hat{L}_i + 1]\frac{1}{\beta}\frac{[w'^{\beta}_{itr}w^{\beta}_{intr} - w'^{\beta}_{intr}w^{\beta}_{itr}]}{[w'_{itr}w_{intr} - w'_{intr}w_{itr}]}[w^{1-\beta}_{itr}w^{1-\beta}_{intr}] - 1 \tag{46}$$

The system of equations to be solved computationally becomes

$$\frac{w'_{intr} - w_{intr}}{w_{intr}} = \frac{1}{\beta + \frac{\sigma_j}{\theta_j}}[\hat{\Phi}_i - \hat{L}_i] \tag{47}$$

$$\frac{L'_{intr} - L_{intr}}{L_{intr}} = -\frac{\frac{\sigma}{\theta}}{\beta + \frac{\sigma}{\theta}}[\hat{\Phi}_i - \hat{L}_i] \tag{48}$$

$$\frac{w'_{itr} - w_{itr}}{w_{itr}} = \frac{\frac{\sigma}{\theta}}{\beta + \frac{\sigma}{\theta}}\hat{P}_{itr} + \frac{1}{\beta + \frac{\sigma_j}{\theta_j}}[\hat{\Phi}_i - \hat{L}_i] \tag{49}$$

$$\frac{L'_{itr} - L_{itr}}{L_{itr}} = \frac{\beta\frac{\sigma}{\theta}}{\beta + \frac{\sigma}{\theta}}\hat{P}_{itr} - \frac{\frac{\sigma}{\theta}}{\beta + \frac{\sigma}{\theta}}[\hat{\Phi}_i - \hat{L}_i] \tag{50}$$

$$\hat{\Phi}_i = [\hat{L}_i + 1]\frac{1}{\beta}\frac{[w'^{\beta}_{itr}w^{\beta}_{intr} - w'^{\beta}_{intr}w^{\beta}_{itr}]}{[w'_{itr}w_{intr} - w'_{intr}w_{itr}]}[w^{1-\beta}_{itr}w^{1-\beta}_{intr}] - 1 \tag{51}$$

$$\hat{L}_i = \frac{L'_{itr} + L'_{intr} - L_{itr} - L_{intr}}{L_{itr} + L_{intr}} \tag{52}$$

Alternately: $\hat{L}_{ij} = \hat{\pi}_{ij} + \hat{L}_i$, so

$$\hat{\pi}_{ij} + \hat{L}_i = \frac{\sigma_j}{\theta_j}(\hat{P}_{ij} - \hat{w}_{ij}) \tag{53}$$

and

$$\hat{\pi}_{ij} = \beta\hat{w}_{ij} - \hat{\Phi}_i \tag{54}$$

Solving yields

$$\hat{\pi}_{ij} = \frac{\beta \frac{\sigma_j}{\theta_j}}{\beta + \frac{\sigma_j}{\theta_j}} \hat{P}_{ij} - \frac{\frac{\sigma_j}{\theta_j}}{\beta + \frac{\sigma_j}{\theta_j}} \hat{\Phi}_i + \frac{\beta}{\beta + \frac{\sigma_j}{\theta_j}} \hat{L}_i \tag{55}$$

$$\hat{w}_{ij} = \frac{\frac{\sigma_i}{\theta_j}}{\beta + \frac{\sigma_j}{\theta_j}} \hat{P}_{ij} + \frac{1}{\beta + \frac{\sigma_j}{\theta_j}} [\hat{\Phi}_i - \hat{L}_i] \tag{56}$$

$$\hat{\Phi}_i = \frac{1}{\beta} \frac{[w_{itr}'^{\beta} w_{intr}^{\beta} - w_{intr}'^{\beta} w_{itr}^{\beta}]}{[w_{itr}' w_{intr} - w_{intr}' w_{itr}]} [w_{itr}^{1-\beta} w_{intr}^{1-\beta}] - 1 \tag{57}$$

$$\hat{L}_i = \frac{L_{itr}' + L_{intr}' - L_{itr} - L_{intr}}{L_{itr} + L_{intr}} \tag{58}$$

C   Alternate Specifications and Figures

Table 7: Labor Market Response to Asian Crisis

	Nontraded Emp	Traded Wage	Nontraded Wage	Total Emp	Unemployment	Labor Force	Population	Working Age
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\Delta LogCEPW_{it}$	0.0837**	-0.00185	0.00219	0.0462**	-0.0297	-0.00174	0.0141	0.00923
	(0.0331)	(0.0213)	(0.0183)	(0.0202)	(0.0475)	(0.0103)	(0.0150)	(0.0152)
Controls	Y	Y	Y	Y	Y	Y	N	N
CZ FE	Y	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y	Y
N	1450	1418	1450	1450	1450	1450	1450	1450
First Stage F-Stat	17.52	14.34	17.52	17.52	17.52	17.52	17.56	17.56

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
Note: Stacked difference regressions estimating Equation 15 using the log of labor market outcomes on log of $CEPW_{it}$. All regressions are estimated in stacked differences over the periods 1993-1996 and 1996-1998. $\Delta CEPW_{it}$ is instrumented using $\Delta CEPW_{oit}$. Outcomes are logs of nontraded employment, traded wage, nontraded wage, total employment unemployment rate, labor force, population, and working age population. All specifications use demographic controls (young share of population, nonwhite share of population, and female share of population) and a control for population.

Table 8: Traded Employment Response to Asian Crisis - No NAICS-SIC Weighting

	(1)	(2)
$\Delta LogCEPW_{it}$	0.374***	0.592***
	(0.117)	(0.139)
Controls	Y	Y
CZ FE	Y	Y
Year FE	Y	Y
N	1450	1450
First Stage F-Stat	22.61	17.52

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
Note: Stacked difference regressions estimating Equation 15 using the log of traded employment on log of $LogCEPW_{it}$. CZ-SIC employment constructed by summing NAICS employment without using Dorn weights. All regressions are estimated in changes and $\Delta LogCEPW_{it}$ is instrumented using $\Delta LogCEPW_{oit}$. Column 1 (corresponding to Column 1 of Table 2) bases $LogCEPW_{it}$ in 1993 and estimates stacked differences over the periods 1996-1993 and 1998-1996. Column 2 (corresponding to Column 4 of Table 2) re-calculates $LogCEPW_{it}$ using a 1996 base for the second period difference. Both columns use log traded employment as the main outcome. All specifications use demographic controls (young share of population, nonwhite share of population, and female share of population) and a control for population.

Table 9: Summary Statistics

$ExportsPW_{it}$	2150.7
$CrisisExportsPW_{it}$	140.5
$CrisisExportsPW_{oit}$	42.27
Unemployment Rate	6.056
Population	3092555.9
% Educated	0.186
Employment (Annual)	2597765.4
Traded Employment	172323.9
Non Traded Employment	2425441.5
Wage (Average Weekly)	572.9
Traded Wage (Average Weekly)	666.8
Non Traded Wage (Average Weekly)	543.9
N	5825

Note: Commuting zone means reported over main regression sample period (1993-1998). 725 CZs in regression sample. Population weighted means.

Figure 8: Comparing $CEPW_{it}$ Base Years
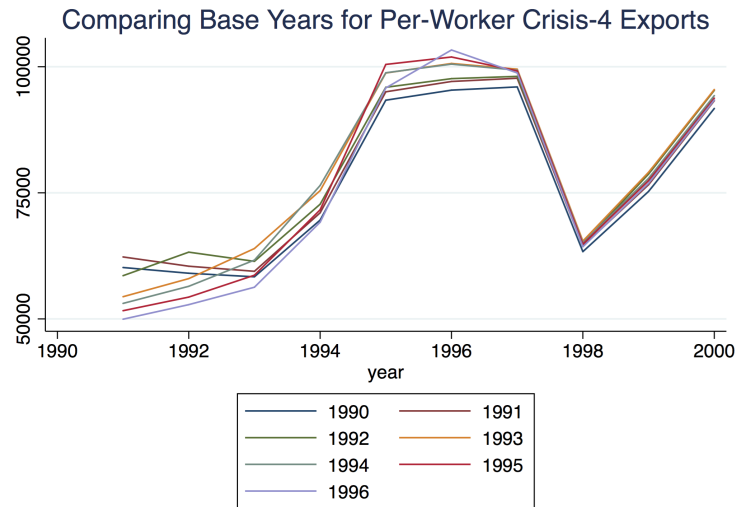
Note: Figure 8 plots $CEPW_{it}$ calculated using 1990-1996 each as a base year and plots the values over the periods 1991-2000.

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