Export Shocks and Labor Markets: Evidence from the 1997 Asian Crisis

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Abstract

I estimate the effect of exports on local labor markets in the US using the 1997 Asian Crisis as a shock to US exports. I construct a theoretical model to guide my empirical analysis, embedding a Roy model into a specific-factors setting. Empirically, traded employment fell significantly associated with the drop in exports to Crisis-4 countries. This short-run shock had a long-term impact, with effects on traded employment persisting past the Crisis. I find that the shock also impacted aggregate commuting zone employment. Low-education CZs had stronger overall labor market effects. Using the structure of my model I estimate the short run degree of worker heterogeneity parameter that governs differential sector responses to the shock. I find a greater degree of heterogeneity in the short run than the long-run estimates found in the literature. Using this result I compute general equilibrium effects of the shock and find significant losses.

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1 Introduction

There has been much debate in recent years regarding the implications of trade for labor market outcomes. 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 (China Syndrome 2013, 2015, 2016) are prominent examples. This work has generally found that import penetration reduces employment. At the same time, there has been relatively less work on the effect of variation in export demand on labor market activity, especially for large advanced economies like the United States. Existing literature concerning export demand is frequently centered around other countries: examples include McCaig (2011), McCaig and Pavcnik (2018), and Dauth, Findeisen, and Suedekum (2014). Furthermore, the shocks studied in this work are permanent, whereas in this paper I explore the effect of a short-term shock.

In this paper, I examine the relationship between exports and labor market outcomes using US data. The main challenge in considering a large economy like the US, is addressing the potential endogeneity of exports: demand for US exports can potentially be affected by US economic activity. I overcome this identification challenge by exploiting the Asian Crisis of 1997, which I argue can be considered an exogenous shock to US exports. It is a transitory shock, lasting the years 1997-1999, so I am able to demonstrate the short- and long-run effects of this export shock.

The Crisis, discussed in further detail in Section 4, 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 provides a source of exogenous variation in US exports that is heterogeneous across industries.

To identify the effects of export demand on employment I proceed as follows: I develop a theoretical model based on Kovak (2013), Galle, Rodriguez-Clare, and Yi (2018), and Roy (1951) and design an empirical specification based on the guideline of this model. I first construct an industry-weighted commuting zone (CZ) level exposure measure of US exports to Crisis-4 (Indonesia, Thailand, South Korea, and Malaysia) countries. I instrument for it using an analogous measure, except constructed using exports from six other developed countries (Australia, Denmark, Germany, New Zealand, Spain, and Switzerland). I employ a stacked-log-difference empirical design, so I can compare the effect of the drop in exports from 1996-1998 to effect in the pre-period. I find that traded employment fell significantly associated with the drop in exports during the Crisis. I find evidence for aggregate employment effects, and these latter effects are stronger in relatively lower-education CZs. I find robust evidence that the effect of the Crisis shock persisted on traded employment years past the shock itself.
I then use the structure of my model to estimate the Fréchet shape parameter \( \beta \), or the degree of worker heterogeneity in my sample. This parameter governs how sectors differentially respond to the Asian Crisis and can be generalized to guide expectations for heterogeneous responses to other trade shocks. In the context of my model, \( \beta \) must be strictly greater than 1 but there is greater wage dispersion in the face of an export shock when \( \beta \) is close to 1. I find evidence for a strong degree of worker heterogeneity and thus evidence for within-CZ distributional consequences of the shock, with the short run \( \beta \) I estimate between 1 and 1.3. Finally, I use the structure of my model to compute general equilibrium effects of the shock, and, consistent with my initial empirical work, find that traded employment was between 120,000 and 130,000 workers fewer across the US (between 160-190 per CZ) associated with the shock.

Ultimately, this paper quantifies the impact that foreign economic conditions can have on domestic labor markets via the export channel. It differs from much of the literature by studying a large advanced economy as opposed to a developing one. I contribute to the literature by demonstrating the dynamics of a short-run export shock on local labor markets, measuring both short- and long-run effects of the shock. To do so, I makes use of an identification strategy that addresses the possible simultaneous relation between export demand and domestic employment that is more likely to arise for a large advanced economy. I pinpoint the groups that are more dependent on export demand for welfare, and provide a theoretical framework to do so. I provide evidence for both across- and within-CZ distributional effects of the shock.

The paper is structured as follows. In the next section I discuss existing literature. Next, I provide background on the Asian Crisis of 1997 and discuss my measurement of exposure to the Crisis. Next, I discuss my theoretical model. I then discuss my data, and empirical design and results follow. I structurally estimate the short run \( \beta \) parameter and use it to compute general equilibrium effects of the shock. Finally, I provide concluding remarks along with suggestions for further research.

2 Background Literature

This paper follows from an extensive literature regarding the relationship between trade and employment. This question 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.

First, there has been much work studying the relationship between trade liberalization, employment, and wages in developing countries. Revenga (1997) finds that trade liberalization reduced wages and employment in Mexico via a drop in labor demand from import competition. Next, Kovak (2013) develops a model exploring the relationship between trade
liberalization and wages in Brazil from 1990 to 1995. His model predicts that when prices drop due to trade liberalization, wages consequently decrease. In Section 6 I include a theoretical model based on Kovak (2013) and Galle, Rodríguez-Clare, and Yi (2018) to explore labor market effects of exports as related to the degree of worker heterogeneity in a region. The latter paper nests a Roy model into a multi-sector Eaton and Kortum (2002) model (following Costinot, Donaldson, and Komunjer (2012)), and allows for worker heterogeneity. They estimate the subsequent distributional consequences of the China shock. I embed the Roy model used in Galle, Rodríguez-Clare, and Yi (2018) into the specific-factors Kovak (2013) setting.

Dix-Carneiro and Kovak (2015) also further expand Kovak (2013) into a model that predicts the relationship between trade liberalization and the skill premium, or the wage gap between skilled and unskilled workers. They find that trade liberalization, meaning the drop in price from a decrease in tariffs, decreases this gap when skilled labor has a larger share of employment. However, when skilled labor has a smaller share of employment, trade liberalization increases the skill premium. Finally, Topalova (2010) studies the relationship between trade liberalization and poverty in India by exploiting district-level industry variation. She finds that districts more exposed to liberalization experienced declines in both poverty and consumption growth. These effects were strongest amongst the least geographically mobile, and in the areas where it was most difficult to switch between sectors.

In the US, Revenga (1992) finds that import competition led to a decrease in employment and wages. Also, this literature in recent years has been spearheaded by a series of papers by Autor, Dorn, and Hanson (China Syndrome 2013, 2015, and 2016). 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 specification for imports to exports, and I use a part of their data in my analysis.

In other papers (2015, 2016), Autor, Dorn, and Hanson study labor market adjustment to import penetration. They test and develop a theory of reallocation effects. Under the reallocation theory, when employment decreases in an exposed industry, employment should increase in unexposed industries in the same CZ. However, there is an offsetting aggregate demand effect, in which workers who lose their jobs reduce their consumption. There is a multiplier effect as well, so consumption and investment are depressed. They test the reallocation effect by estimating the effect of Chinese import penetration on non-manufacturing employment. They find this effect for below-college education population, but do not find evidence for it on the aggregate.

Next, while there has been less work done on the effect of exports on labor market

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1 This is a limited selection of their papers, consisting of those most relevant to my analysis.
outcomes, McCaig (2011) studies the effect of the US-Vietnam Bilateral Trade Agreement (BTA) on poverty and wages in Vietnam. The agreement decreased US tariffs on Vietnamese goods, leading to an increase in Vietnamese exports. Based on this shock, McCaig finds that increasing exports reduces poverty. Because most of Vietnam’s exports are from industries with low-skilled workers, McCaig’s findings indicate that exports have the effect of alleviating poverty by increasing demand for unskilled labor. Thus, a prediction of McCaig’s paper is that exports are important to unskilled workers in a low income country. Continuing this line of research in Vietnam, McCaig and Pavcnik (2018) find that workers reallocate from the informal to the formal sector in response to the positive export shock. Finally, Dauth, Findeisen, and Suedekum (DFS, 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 (China Syndrome 2013), the authors find significant employment increases as well as lower skilled worker turnover. While these three papers study the effect of exports on labor market outcomes in Vietnam and Germany respectively, these countries have different political, economic, and global makeups than the US and thus respond to trade differently. Furthermore, the shocks studied are all permanent, whereas I exploit a short-term, transitory shock.

In the US, Feenstra, Ma, and Xu (FMX, 2017) study the employment response to import competition from China and global export expansion. They also use a similar methodology to Autor, Dorn, and Hanson (China Syndrome 2013) and find that Chinese imports reduce jobs, but export expansion creates jobs. The identification strategy in this paper differs from DFS and FMX because I employ a stacked log difference technique, directly comparing exposed CZs to their less exposed counterparts, and exploit a temporary exogenous shock.

This paper is first distinguished in the type of trade shock as well as the setting studied: I demonstrate the short- and long-run labor market effects of a transitory export shock. Most of this literature focuses on trade liberalization or import competition, but this paper instead exploits a demand shock driven by the macroeconomic conditions in an export destination. I thus provide empirical evidence for the export channel as a means by which economic shocks can transfer across countries. Second, I conduct my analysis in differences, exploit the Crisis period, and am able to capture a shorter term effect, as the Asian Crisis was a temporary and short term shock. Third, I extend existing theoretical work and provide an additional measurement of the degree of worker heterogeneity (in tradable versus nontradable sectors) in response to a trade shock. In sum, I contribute to the literature on trade and labor markets by finding dimensional effects of the temporary Asian Crisis export shock with respect to time (both short- and long-run impacts) and with respect to geography (both across- and within-CZ distributional consequences).
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%. 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. Thus, the Asian Crisis is a natural experiment by which I can identify the relationship between exports and employment.

Pictured in Figure 1 are total US exports over the period 1991-2000 and exports to Crisis-4 countries over the same period. I display the latter for both the US and for the 6 other countries (on aggregate) that I use as my 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.

Exports to Crisis-4 countries dropped by 13.6 billion dollars between 1997 and 1998,  

\[ \text{Note: Natural log of total exports (green), natural log of US exports to Crisis-4 countries (red), and natural log of 6 other countries’ exports to Crisis-4 countries (black) (Australia, Denmark, Germany, New Zealand, Spain, and Switzerland) over the period 1991-2000.} \]

\[ \text{Exports to Crisis-4 countries dropped by 13.6 billion dollars between 1997 and 1998,} \]

\[ ^2 \text{Robert Barro, “Economic Growth in East Asia Before the Crisis,” NBER Working Paper,} \]

\[ \text{http://unpan1.un.org/intradoc/groups/public/documents/APCITY/UNPAN014330.pdf} \]
a 30.8% 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 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 identifies industries which were among the most affected, and the ones he lists include primary metals and transport equipment.\(^3\)

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.

### 4 Theoretical Model for Employment and Wages

I design a theoretical model as an extension of Kovak (2013). I do so in order to theoretically estimate the effect of the Asian Crisis on local labor markets through the export channel, and measure heterogeneous responses to the shock. Kovak constructs specific-factors model that predicts that when price decreases due to a tariff decline, wages will decrease. These changes are governed by the change in tariffs, the elasticity of substitution between factors, and the cost share of the specific factor.

I modify this model in two major ways. First, I conduct my analysis at the industry-CZ level. Second, I embed a Roy model from Galle, Rodríguez-Clare, and Yi (2018) to determine labor supply. This extension allows me to measure the degree of heterogeneity by sector in response to the Crisis. Furthermore, these modifications yield a regression equation, and I can use the point estimates in my empirical section to compute the shape parameter \(\beta\) (the degree of worker heterogeneity). This parameter helps demonstrate how groups (in the context of the model, tradable and nontradable sectors) respond differentially to the Asian Crisis shock. Accordingly, its estimate in a broader context will shed light on the potential for heterogeneous responses to a possible trade shock. In the context of my data work, I am estimating a short run \(\beta\), relative to the long-run estimates in the literature.

\(^3\)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.
4.1 Setup

The first few steps of this section follow Kovak 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,

\[
T_{ij} = a_{Tij}Y_{ij} \tag{1}
\]

\[
L_{ij} = a_{Lij}Y_{ij} \tag{2}
\]

Taking log differences Equation 2 \((\hat{x} = \text{dln}x)\), letting hats denote proportional changes, and noting the quantity of the specific factor is fixed, we have

\[
\hat{Y}_{ij} = -\hat{a}_{Tij} \tag{3}
\]

Log differencing Equation 1 and substituting 3,

\[
\hat{L}_{ij} = \hat{a}_{Lij} - \hat{a}_{Tij} \tag{4}
\]

Now, from Kovak, the output price is equal to proportional shares of the labor wage and the specific factor price.

\[
a_{Lij}w_{ij} + a_{Tij}R_{ij} = P_{ij} \tag{5}
\]

Log differencing 5, letting \(\theta_j\) be the share of the specific factor in industry \(j\):

\[
(1 - \theta_j)\hat{w}_{ij} + \theta_j\hat{R}_{ij} = \hat{P}_{ij} \tag{6}
\]

The definition of elasticity of substitution between labor and the specific factor:

\[
\hat{a}_{Tij} - \hat{a}_{Lij} = \sigma_{ij}(\hat{w}_{ij} - \hat{R}_{ij}) \tag{7}
\]

Rearranging and plugging 6 and 7 into 4 yields the industry-specific labor term,

\[
\hat{L}_{ij} = \frac{\sigma_{ij}}{\theta_j}(\hat{P}_{ij} - \hat{w}_{ij}) \tag{8}
\]

Equation 8 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.

### 4.2 Roy Model

Departing from Kovak, I allow labor to select into industries using a standard Roy model from Galle, Rodriguez-Clare, and Yi (2018) (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).

Each worker draws a productivity $z_j$ in sector $j$ drawn from a Fréchet distribution with shape parameter $\beta_i$ and scale parameters $A_{ij}$. As GRCY explain, the closer $\beta_i$ 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 productivity draw $z$ takes vector form with a value for each industry, $z = (z_1, \ldots, z_J)$. Let $\Omega_{ij} = \{z : w_{ij}z_j \geq w_{ik}z_k \forall k\}$ so that a worker in commuting zone $i$ will choose to work in industry $j$ if $z \in \Omega_{ij}$. Note that I allow for a commuting zone-industry specific wage rather than industry-specific in GRCY. Finally, let $F_i(z)$ 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

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

(9)

where

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

Log differencing ($\dot{x} = d\ln x$), and noting the $A_{ij}$ are fixed,

$$\dot{\pi}_{ij} = \beta w_{ij} - \dot{\Phi}_i$$

(10)

I assume that labor supply in a CZ is fixed, allowing me to equate $\dot{L}_{ij} = \dot{\pi}_{ij}$. This is a reasonable assumption, because the Crisis was a short-term shock. I will later (in the Appendix) relax this assumption and allow for flexible labor supply. Let $\dot{\Phi}_i$ to be a measure of the change in total labor market conditions in a commuting zone.

Solving yields

$$\dot{L}_{ij} = \frac{\beta \sigma_{ij}}{\beta + \frac{\sigma_{ij}}{\sigma_j}} P_{ij} - \frac{\sigma_{ij}}{\beta + \frac{\sigma_{ij}}{\sigma_j}} \dot{\Phi}_i$$

(11)
\[ \hat{w}_{ij} = \frac{\sigma_i}{\beta + \frac{\sigma_i}{\sigma_j}} \beta + \frac{1}{\beta + \frac{\sigma_i}{\sigma_j}} \hat{\Phi}_i \] (12)

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, 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 \( \beta \).

5 Estimation Design

5.1 Measuring Exposure to the Crisis

Equation 11 informs the regression equation

\[ \Delta \log L_{ij} = \eta \Delta \log P_{ij} + \xi \Delta \log \hat{\Phi}_i + \Delta \epsilon_{ij} \] (13)

Where \( \eta = \frac{\sigma_j}{\beta + \sigma_j} \), \( \xi = \frac{\sigma_i}{\beta + \sigma_j} \), and \( \epsilon_{ij} \) is an industry-CZ error term. To estimate this expression, I follow Autor, Dorn, and Hanson (ADH 2013) and employ a stacked-difference (double-difference) strategy.

Again following ADH, I first 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.\(^4\) The calculation is similar to that of a Bartik (1991) instrument. It is constructed as follows:

\[ \Delta CEPW_{it} = \sum_j \frac{L_{ijt-1}}{L_{Ujt-1}} \Delta X_{jt} \] (14)

In this equation, \( L_{ijt-1} \) is the start of period employment of each industry \( j \) of each CZ \( i \). In my subsequent estimation, I test a range of base years - 1991, 1992, and 1993. I note the US was in recession in 1990-1991.\(^5\) 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

\(^4\) 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.

\(^5\) 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.
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 $\frac{L_{jt}-1}{L_{jt-1}} \Delta X_{jt}$ 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 six developed countries’ exports to Crisis-4 countries (Australia, Denmark, Germany, New Zealand, Spain, and Switzerland). I use this to instrument for my main independent variable. Changes in the six 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. My instrument satisfies both exclusion (change in Crisis-4 exports in those six 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 six 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.

As stated earlier, in my main regressions I 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 my 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 my 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 with later years’ (closer to the Crisis) measures while allowing for the longest pre-period time difference. The final estimation equation is:

$$\Delta LogL_{ijt} = \eta \Delta LogCEPW_{it} + \xi \Delta D_{it} + \phi_i + \phi_t + \Delta \epsilon_{it}$$

(15)

where $D_{it}$ are the start-of-period demographic controls and $\phi$ 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).

I cannot directly estimate Equation 11 because I do not have data on $\Phi_i$, the CZ-wide general equilibrium term. I also do not have data on export prices, so I use export values (price × quantity). Furthermore, I am using change in Crisis-4 exports on the right hand
side rather than change in total exports as my model specifies.

Also, while interpretation of my model is the percent effect of a one percent change in $P_{ijt}$ on $L_{ijt}$, the interpretation of this difference is the log-point effect of a one log-point decline in Crisis-4 exports on industry employment. For small percent changes in $X$, $d\ln X = \log X' - \log X$, but the percent change in Crisis-4 exports in my sample is sufficiently large that the identity does not hold. Note that it does hold for total exports in my sample and I will exploit this in my structural estimation. I note that running a simple log change specification of employment on Crisis-4 exports yields a lower coefficient than the double-log-difference, but the simple log change of employment on total exports yields the same coefficient. Across all empirical specifications I prefer the double-log-difference to the simple log change because it allows me to exploit a comparison between the Crisis period to the pre-period, following Autor, Dorn, and Hanson (2013), for robustness.

To further address these issues in subsequent structural estimation of the $\beta$ parameter I will difference traded and nontraded sectors, use total exports, and convert prices to quantities using the ratio of import price drop to value drop in Crisis-4 imports from Higgins and Klitgaard (2000).

For robustness of the baseline empirical specifications, I employ a range of strategies: I re-compute $CEPW_{it}$ and $CEPW_{oit}$ using a 1996 base for the second period difference, I use 1992 as a base year, I use log of traded employment share of population as the outcome, I employ differences starting in 1991 and 1992 instead of 1993, and I use total per-worker exports as the explanatory variable. My estimates are robust to each of these strategies and the coefficients are similar. Finally, as alternate specifications, I construct bins using 1992 values of $CEPW_{it}$ and estimate a difference-in-difference strategy, directly comparing CZs highly exposed to the Crisis to less exposed CZs.

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. For my structural work I employ the simple 1993 weighting (for both periods) method because it is most model consistent and will therefore obtain the most accurate structural $\beta$ estimates: it allows me to directly compare the pre-period to the Crisis period using the same weights.

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.
5.2 Data

5.2.1 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, Germany’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 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. Second, I use aggregate industry wage data from the Quarterly Census of Employment and Wages (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.”

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.

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.
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 $\beta$, the (short run) degree of worker heterogeneity in my model. I also consider this dataset to contain all traded industries, and accordingly use this designation to distinguish traded employment from nontraded employment.

I obtain data from the US 1990 Census for county-level education numbers. I use this to generate geographic-level education numbers to split my 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. I use the NBER-CES Manufacturing Database for information on manufacturing capital stock, which I use as one proxy for $\Phi_i$ (a parameter in my model governing labor market conditions in a CZ).

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 my data from county to CZ, I use conversion data from Autor, Dorn, and Hanson (China Syndrome 2013). I thus have a dataset at the CZ-industry-year level covering 741 CZs and it contains comprehensive labor market measures. I use years 1993-1998 for my main regressions, and extend to 2009 to explore persistence of the shock.

### 5.2.2 Summary Statistics

Table 1 contains means for my full sample. The average percentage in 1990, the latest Census year prior to the start of the sample, of high-educated workers 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 my data. I drop 7 CZs in my sample which had no trade in 1993.
Table 1: Summary Statistics

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>ExportsPW_{it}</td>
<td>2098.3</td>
</tr>
<tr>
<td>CrisisExportsPW_{it}</td>
<td>127.4</td>
</tr>
<tr>
<td>CrisisExportsPW_{oit}</td>
<td>60.43</td>
</tr>
<tr>
<td>Unemployment Rate</td>
<td>6.157</td>
</tr>
<tr>
<td>Labor Force</td>
<td>182499.1</td>
</tr>
<tr>
<td>Population</td>
<td>361790.9</td>
</tr>
<tr>
<td>% Educated</td>
<td>0.140</td>
</tr>
<tr>
<td>Employment (Annual)</td>
<td>294151.1</td>
</tr>
<tr>
<td>Traded Employment</td>
<td>21572.9</td>
</tr>
<tr>
<td>Non Traded Employment</td>
<td>272578.2</td>
</tr>
<tr>
<td>Wage</td>
<td>430.3</td>
</tr>
<tr>
<td>Traded Wage</td>
<td>517.0</td>
</tr>
<tr>
<td>Non Traded Wage</td>
<td>407.1</td>
</tr>
</tbody>
</table>

Note: Sample means reported over main regression sample period 1993-1998.

6 Empirical Results

6.1 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 5. Table 2 contains the results from these specifications.

Table 2: Traded Employment Response to Asian Crisis

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
<th>(8)</th>
</tr>
</thead>
<tbody>
<tr>
<td>∆LogCEPW_{it}</td>
<td>0.263***</td>
<td>0.347***</td>
<td>0.102***</td>
<td>0.355***</td>
<td>0.142***</td>
<td>0.255***</td>
<td>0.215***</td>
<td>0.231***</td>
</tr>
<tr>
<td></td>
<td>(0.0855)</td>
<td>(0.104)</td>
<td>(0.0306)</td>
<td>(0.0934)</td>
<td>(0.0341)</td>
<td>(0.0739)</td>
<td>(0.0823)</td>
<td>(0.0819)</td>
</tr>
<tr>
<td>Controls</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>CZ FE</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Year FE</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>N</td>
<td>1450</td>
<td>1450</td>
<td>1450</td>
<td>1450</td>
<td>1450</td>
<td>1450</td>
<td>1450</td>
<td>1450</td>
</tr>
<tr>
<td>First Stage F-Stat</td>
<td>33.15</td>
<td>12.04</td>
<td>33.15</td>
<td>31.90</td>
<td>31.90</td>
<td>27.68</td>
<td>33.39</td>
<td>33.06</td>
</tr>
</tbody>
</table>

Note: Stacked difference regressions estimating equation (15) using the log of traded employment on log of \( \text{LogCEPW}_{it} \). All regressions are estimated in changes and \( \Delta \text{LogCEPW}_{it} \) is instrumented using \( \Delta \text{LogCEPW}_{oit} \). Column 1 (preferred specification) bases \( \text{LogCEPW}_{it} \) in 1993 and estimates stacked differences over the periods 1996-1993 and 1998-1996. Column 2 replaces \( \text{LogCEPW}_{it} \) with \( \text{LogEPW}_{it} \) (total per-worker exports). Column 3 uses log traded employment share of working age population as the outcome. Columns 4 and 5 re-calculate \( \text{LogCEPW}_{it} \) 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 \( \text{LogCEPW}_{it} \) in 1992. Finally, Columns 7 and 8 base \( \text{LogCEPW}_{it} \), 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.

Using the specification from Column 4 as my preferred specification, below in Figure 3 is a plot of the first stage of \( \Delta \text{LogCEPW}_{it} \) on \( \Delta \text{LogCEPW}_{oit} \) (left) and the reduced form of \( \Delta \text{LogL}_{ijt} \) on \( \Delta \text{LogCEPW}_{oit} \) (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 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 \( \Delta \log\text{TradedEmp}_{it} \) on \( \Delta \log\text{CEPW}_{it} \).

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 my sample into quintiles of 1993 values of \( \text{CEPW}_{it} \) 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. The coefficients are weakly (though not perfectly) increasing in magnitude by bin number, where Bin 5 is the highest exposed. As an alternate specification in columns 3 and 4, I split my sample into two bins based on median values of 1993 \( \text{CEPW}_{it} \) and employ a difference-in-difference technique. I again find that the highly exposed CZs had greater declines in traded employment during the Asian Crisis. I note that I use OLS to estimate the 5 bins because the instrument is weak with disaggregation, and 1993 US Crisis-4 export distribution is highly likely to be uncorrelated with the later Asian Crisis shock. For the simple difference-in-difference with two bins I am able to use IV.
Table 3: Traded Employment Response to Asian Crisis, Binned Specifications

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crisis-4 Exposure Bin 2</td>
<td>-0.0693</td>
<td>0.0214</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0581)</td>
<td>(0.0277)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crisis-4 Exposure Bin 3</td>
<td>-0.154***</td>
<td>-0.0361</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0544)</td>
<td>(0.0242)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crisis-4 Exposure Bin 4</td>
<td>-0.162***</td>
<td>-0.0379</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0539)</td>
<td>(0.0233)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crisis-4 Exposure Bin 5</td>
<td>-0.173***</td>
<td>-0.0470**</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0541)</td>
<td>(0.0238)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crisis-4 High Exposure</td>
<td>-0.207***</td>
<td>-0.0925***</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0404)</td>
<td>(0.0217)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

|                        |       |       |       |       |
| Controls               | Y     | Y     | Y     | Y     |
| CZ FE                  | Y     | Y     | Y     | Y     |
| Year FE                | Y     | Y     | Y     | Y     |
| N                      | 5075  | 5075  | 5075  | 5075  |
| First Stage F-Stat     | 404.6 | 404.6 |       |       |

*Note:* Binned specifications estimating the effect of the fall in US exports to Crisis-4 countries on local traded employment. Columns 1 and 2 employ 5 CZ bins of 1993 Crisis-4 per-worker exports and Columns 3 and 4 employ 2. Columns 1 and 3 use log of traded employment as the outcome and Columns 2 and 4 use log of traded employment share of working age population. Finally, Columns 1 and 2 report OLS because the instrument is weak for the disaggregated bins, and Columns 3 and 4 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.
6.2 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 high- and low-educated CZs based on percent of college graduates. I then run the specification in Equation 15 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, though the instrument is weak in high-education CZs. I find both traded and nontraded employment in low-education CZs fell significantly. According to the model in Section 4, the latter effect could be driven by changes in the the general-equilibrium Φ term.

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

<table>
<thead>
<tr>
<th>Education Bin 1</th>
<th>Traded Emp</th>
<th>Nontraded Emp</th>
<th>Traded Wage</th>
<th>Nontraded Wage</th>
<th>Total Emp</th>
<th>Unemployment</th>
<th>Labor Force</th>
<th>Population</th>
<th>Working Age</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.344**</td>
<td>0.144</td>
<td>-0.0860</td>
<td>0.0532</td>
<td>-0.0018</td>
<td>-0.0849</td>
<td>0.00030</td>
<td>0.0018</td>
<td>-0.00413</td>
</tr>
<tr>
<td></td>
<td>(0.0887)</td>
<td>(0.0239)</td>
<td>(0.0190)</td>
<td>(0.0119)</td>
<td>(0.0139)</td>
<td>(0.0603)</td>
<td>(0.0057)</td>
<td>(0.0057)</td>
<td>(0.0057)</td>
</tr>
<tr>
<td>Education Bin 2</td>
<td>0.362**</td>
<td>0.0375</td>
<td>0.0032</td>
<td>0.1277</td>
<td>0.0098</td>
<td>0.0014</td>
<td>0.00017</td>
<td>0.0017</td>
<td>-0.00317</td>
</tr>
<tr>
<td></td>
<td>(0.0863)</td>
<td>(0.0260)</td>
<td>(0.0153)</td>
<td>(0.0125)</td>
<td>(0.0144)</td>
<td>(0.0373)</td>
<td>(0.0056)</td>
<td>(0.0063)</td>
<td>(0.0063)</td>
</tr>
<tr>
<td>Education Bin 3</td>
<td>0.354**</td>
<td>-0.0083</td>
<td>-0.00578</td>
<td>0.000602</td>
<td>0.0049</td>
<td>-0.0010</td>
<td>-0.00515</td>
<td>-0.00155</td>
<td>-0.00155</td>
</tr>
<tr>
<td></td>
<td>(0.108)</td>
<td>(0.0201)</td>
<td>(0.0146)</td>
<td>(0.0159)</td>
<td>(0.0141)</td>
<td>(0.0311)</td>
<td>(0.00690)</td>
<td>(0.00969)</td>
<td>(0.00969)</td>
</tr>
</tbody>
</table>

**Note:** Stacked difference regressions estimating equation (X) 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. ∆Log$CEPW_{it}$ is instrumented using ∆Log$CEPW_{oit}$. 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.

6.3 Persistence

Finally, I test if the effects of the Crisis on traded employment lasted past the Crisis years. I use the stacked difference specification from Column 1 of Table 2, base my 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. 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).
I find a sharp drop in traded employment associated with the fall in exports during the Crisis, and effects persisted through at least 2002, five years past the Crisis. I find gradual adjustment to the norm for the rest of my sample. 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. I find that exports to Crisis-4 countries returned to trend in 2000. However, both total and Crisis-4 exports fell again in 2001, likely due to the US recession.
A concern with the estimates from Figure 4 is that I 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 employ the event-study specifications from Columns 3 and 4 of Table 3. Specifically, I interact bins for high exposure to the Crisis shock based on 1990 CZ per-worker Crisis-4 exports with yearly indicators. I run this specification for both log of traded employment and log of traded employment share of population. 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. I plot the coefficient estimates in Figure 6 below.
Figure 6: Time Dynamics of Crisis Effects

Note: Figure 6 contains two event study specifications, where the explanatory variables are bins of exposure to the Crisis shock based on 1990 $CEPW_{it}$, interacted with period indicators. The dependent variable in the left plot is log of traded employment, and the dependent variable in the plot on the right is log of traded employment share of population. Controls are included for log of population, youth share of population, female share of population, nonwhite share of population, and log of working-age population. Commuting zone fixed effects also included, and standard errors are clustered at commuting zone level. Sample from 1991-2009.

In the estimates from Figure 6, I find that the effect of the Crisis on traded employment in highly exposed CZs was largely permanent. The left plot, using log of traded employment as the dependent variable, reflects a discontinuous drop between traded employment from 1997 to 1998 in highly exposed CZs relative to less exposed CZs. The right plot also displays a discontinuous drop. It appears relative employment shares continue to fall past the Crisis years. As the only difference between the left and the right figure is that the right dependent variable is normalized by population, this could reflect trends in population across highly and less exposed CZs particularly associated with the Great Recession. I note that this falling relative share is not significantly different from the 1998 value, and I do not observe the same trend in the left figure. In sum, across Figure 4 and Figure 6 I have found substantial evidence for persistence of the effect of the Asian Crisis on local US traded employment, in years past the Crisis.

7 Model Implied Estimates

7.1 Measuring $\beta$, the [Short Run] Degree of Worker Heterogeneity

Next, I use the theoretical model from Section 4 to measure $\beta$, the degree of worker heterogeneity. In my data, it is a short-run elasticity, rather than the estimates from earlier work which measure longer-run elasticities. From the Fréchet 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 $\beta$ is therefore important when predicting the CZ-wide effects of an export shock.

To estimate $\beta$, I calibrate Equation 11 from my model. As discussed earlier, I do not have a good measurement of $\Phi$. However, what I can do is difference Equation 11 between traded and nontraded employment as nontraded Crisis-4 exports are zero. This method eliminates the $\Phi$ term. Thus I estimate

$$\hat{L}_{itr} - \hat{L}_{int} = \frac{\beta \sigma_j}{\beta + \sigma_j} \hat{P}_{ij}$$

I then run the following specification:

$$\Delta \text{LogTradedEmployment}_{it} - \Delta \text{LogNontradedEmployment}_{it} = \eta \Delta \log \text{CEPW}_{it} + \phi_i + \phi_t + \epsilon_{it}$$ (16)

where $\phi_i$ and $\phi_t$ are CZ and time fixed effects and $\epsilon_{it}$ is a CZ-time error term. For precision, I note again that $P_{ij}$ is a price and $\text{CEPW}_{it}$ is a quantity, so I construct a quantity-to-price conversion using the ratio of import price drop to value drop in East Asian imports from Higgins and Klitgaard (2000). I find that $\hat{P}_{it} = \mu \Delta \log \text{CEPW}_{it}$ where $\mu = 0.45$. Thus the above expression can be written as

$$\Delta \text{LogTradedEmployment}_{it} - \Delta \text{LogNontradedEmployment}_{it} = \frac{\eta}{\mu} \hat{P}_{it} + \phi_i + \phi_t + \epsilon_{it}$$ (17)

I thus solve

$$\frac{\beta \sigma_j}{\beta + \sigma_j} = \frac{\eta}{\mu}$$ (18)

I test using both Crisis-4 exports and total exports as my explanatory variables, but use the results from the latter specification as it my model estimates the effect of total exports. Furthermore, as explained earlier the percent change in total exports in my sample is small, so $d\ln X = \ln X' - \ln X$ and the double-differencing specification captures the effect of $\hat{X}_{ijt}$.

I also test adding the demographic controls from the earlier tables. Table 5 contains these estimates.

I then calibrate my model with a range of values for $\theta$ and $\sigma$. My 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 Zwierschke (2020). In an alternate measurement I employ $\sigma = 0.5$, which is their measurement of the short-run elasticity of substitution. Next, Kovak (2013) measures $\theta$, 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
Table 5: Measuring $\beta$, the Degree of Worker Heterogeneity

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\Delta \log EPW_{it}$</td>
<td>0.323***</td>
<td>0.301***</td>
</tr>
<tr>
<td></td>
<td>(0.0973)</td>
<td>(0.100)</td>
</tr>
<tr>
<td>N</td>
<td>1464</td>
<td>1450</td>
</tr>
<tr>
<td>First Stage F-Stat</td>
<td>12.79</td>
<td>12.04</td>
</tr>
<tr>
<td>$\beta$</td>
<td>1.163</td>
<td>1.039</td>
</tr>
<tr>
<td>$\beta$ - Short Run $\sigma$</td>
<td>1.432</td>
<td>1.248</td>
</tr>
<tr>
<td>Controls</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td>CZ FE</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Year FE</td>
<td>Y</td>
<td>Y</td>
</tr>
</tbody>
</table>

Note: Stacked difference regressions estimating equation 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. $\Delta \log EPW_{it}$ (total per-worker exports) instrumented using $\Delta \log CEPW_{it}$. Estimates used to compute $\beta$ 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.

This labor share to be approximately 0.65 in 1990, so I implement $\theta = 0.35$. Using this calibration, I find estimates of $\beta$ between 1 and 1.3 which is in line with existing literature though on the lower end. Specifically, Adao, Arkolakis, and Espositio (2017), Hsieh, Hurst, Jones, and Klenow (2019), Burstein, Morales, and Vogel (2019), and Galle, Rodríguez-Clare, and Yi (2018) measure $\beta$ 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 $\beta$ and the estimates in Table 3 provide evidence for strong distributional effects of the Crisis in the US, both across- and within-CZ.

7.2 General Equilibrium Effects

7.2.1 Measurement

In this section, using the model from Section 4 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 $\beta$, my calibration of $\sigma$ and $\theta$, $\Delta \log CEPW_{it}$, $\mu$, and $\hat{\Phi}_{it}$.

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
\[ \pi_{itr} = \frac{A_{itr}(w_{itr})^\beta}{A_{itr}w_{itr}^\beta + A_{int}w_{int}^\beta} \] (19)

\[ \pi_{intr} = \frac{A_{int}(w_{int})^\beta}{A_{itr}w_{itr}^\beta + A_{int}w_{int}^\beta} \] (20)

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 \( \Phi \). Then

\[ \dot{\Phi} = d\ln \Phi = \frac{\Phi' - \Phi}{\Phi} \]

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

\[ \frac{w_{itr}' - w_{itr}}{w_{itr}} = -\frac{\sigma}{\beta} \hat{P}_{itr} - \frac{1}{\beta + \frac{\sigma}{\beta}} \hat{\Phi}_i \] (21)

\[ \frac{w_{intr}' - w_{intr}}{w_{intr}} = \frac{\sigma}{\beta} \hat{P}_{intr} - \frac{1}{\beta + \frac{\sigma}{\beta}} \hat{\Phi}_i \] (22)

\[ \frac{w_{itr}' - w_{itr}}{w_{itr}} = \frac{\beta \sigma}{\beta + \frac{\sigma}{\beta}} \hat{P}_{itr} - \frac{\sigma}{\beta + \frac{\sigma}{\beta}} \hat{\Phi}_i \] (23)

Combining (21) with (22) and (23) with (24) yields

Simplifying,

\[ \frac{w_{itr}' - w_{itr}}{w_{itr}} = \frac{\sigma}{\beta + \frac{\sigma}{\beta}} \hat{P} \] (25)

\[ \frac{\pi_{itr}' - \pi_{intr}}{\pi_{intr}} = \frac{\beta \sigma}{\beta + \frac{\sigma}{\beta}} \hat{P} \] (26)

By the definition of \( \pi_{ij} \),

\[ \pi_{itr} = \frac{A_{itr}(w_{itr})^\beta}{A_{itr}w_{itr}^\beta + A_{int}w_{int}^\beta} \] (27)

\[ \pi_{intr} = \frac{A_{int}(w_{int})^\beta}{A_{itr}w_{itr}^\beta + A_{int}w_{int}^\beta} \] (28)

Plugging into Equation 26,
Simplifying and letting $A' = A$ in the short run,

\[
\frac{A'_{itr}(w'_{itr})^\beta}{A_{itr}(w_{itr})^\beta} - \frac{A'_{intr}(w'_{intr})^\beta}{A_{intr}(w_{intr})^\beta} = \frac{\beta \sigma_j}{\beta + \frac{\sigma_j}{\beta} \hat{P}}
\]

Thus the system of equations is

\[
\frac{w'_{itr}}{w'_{intr}} - \frac{w'_{intr}}{w_{intr}} = \frac{\sigma_j}{\beta + \frac{\sigma_j}{\beta} \hat{P}} \tag{29}
\]

\[
\frac{w'_{itr}}{w_{itr}} - \frac{w_{itr}}{w_{intr}} \Phi' = \frac{\beta \sigma_j}{\beta + \frac{\sigma_j}{\beta} \hat{P}} \tag{30}
\]

I can divide the first equation by the second and obtain

\[
\frac{\left[\frac{w'_{itr}}{w_{itr}} - \frac{w_{itr}}{w_{intr}}\right]}{\Phi'} = \frac{\sigma_j}{\beta + \frac{\sigma_j}{\beta} \hat{P}} \tag{30}
\]

Further rearranging yields

\[
\hat{\Phi}_i = \frac{1}{\beta} \left[\frac{w'_{itr}}{w_{itr}} - \frac{w_{itr}}{w_{intr}}\right] \Phi' = 1 - \frac{\beta}{\beta + \frac{\sigma_j}{\beta} \hat{P}} \tag{31}
\]

I can solve this system of Equations 21-24 and 30 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 $\beta$ 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.

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 $\hat{\pi}_{ij} = \hat{L}_{ij} - \hat{L}_i$. My solutions are in the Appendix. The system of equations to be solved (and which I ultimately employ) is:

\[
\frac{w'_{itr} - w_{itr}}{w_{intr}} = \frac{1}{\beta + \frac{\sigma_j}{\beta}} [\hat{\Phi}_i - \hat{L}_i] \tag{32}
\]

\[
\frac{L'_{intr} - L_{intr}}{L_{intr}} = -\frac{\sigma_j}{\beta + \frac{\sigma_j}{\beta}} [\hat{\Phi}_i - \hat{L}_i] \tag{33}
\]

\[
\frac{w'_{itr} - w_{itr}}{w_{itr}} = \frac{\sigma_j}{\beta + \frac{\sigma_j}{\beta}} \hat{P}_{itr} + \frac{1}{\beta + \frac{\sigma_j}{\beta}} [\hat{\Phi}_i - \hat{L}_i] \tag{34}
\]
\[
\frac{L'_{itr} - L_{itr}}{L_{itr}} = \frac{\beta \sigma}{\beta + \frac{\sigma}{\theta}} \hat{P}_{itr} - \frac{\sigma}{\beta + \frac{\sigma}{\theta}} [\hat{\Phi}_i - \hat{L}_i]
\] (35)

\[
\hat{\Phi}_i = [\hat{L}_i + 1] \frac{1}{\beta} \left[ \frac{w_{itr}^\beta w_{intr}^\beta - w_{itr}^\beta w_{itr}^\beta}{w_{itr}^\beta w_{itr}^\beta - w_{intr}^\beta w_{itr}^\beta} \right] \left[ w_{itr}^{1-\beta} w_{intr}^{1-\beta} \right] - 1
\] (36)

\[
\hat{L}_i = \frac{L'_{itr} + L'_{intr} - L_{itr} - L_{intr}}{L_{itr} + L_{intr}}
\] (37)

This is therefore a system of six equations (32-37) which can be solved in Matlab.

7.2.2 Results

Table 6 contains the aggregate results from the simulations, using the flexible labor supply results from Equations 32-37. I find that traded employment fell by between 120,000 and 130,000 workers across the US associated with the Crisis, or between 160 and 190 workers per CZ. I 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.

Furthermore, depending on the size of the short run $\beta$ parameter I find spillover effects to nontraded employment, which I do not find empirically. However, I model the nontraded sector as having zero export shock, but it’s possibly 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.
### Table 6: Aggregate Effects of Asian Crisis on US Local Labor Markets

<table>
<thead>
<tr>
<th></th>
<th>(1) Traded Employment</th>
<th>(2) Traded Wage</th>
<th>(3) Nontraded Employment</th>
<th>(4) Nontraded Wage</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>β = 1.3 - Flexible Labor Supply</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>-131210</td>
<td>-3935.1</td>
<td>136190</td>
<td>-146.48</td>
</tr>
<tr>
<td>Average</td>
<td>-184.03</td>
<td>-5.5191</td>
<td>191.01</td>
<td>-0.20545</td>
</tr>
<tr>
<td>Percent</td>
<td>-0.008434</td>
<td>-0.01054</td>
<td>0.0006</td>
<td>-0.0005</td>
</tr>
<tr>
<td><strong>β = 1.2 - Flexible Labor Supply</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>-128090</td>
<td>-3998.6</td>
<td>87507</td>
<td>-99.713</td>
</tr>
<tr>
<td>Average</td>
<td>-179.64</td>
<td>-5.6081</td>
<td>122.73</td>
<td>-0.13985</td>
</tr>
<tr>
<td>Percent</td>
<td>-0.0082</td>
<td>-0.0107</td>
<td>0.0004</td>
<td>-0.0003</td>
</tr>
<tr>
<td><strong>β = 1.1 - Flexible Labor Supply</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>-123300</td>
<td>-4078.2</td>
<td>56968</td>
<td>-58.954</td>
</tr>
<tr>
<td>Average</td>
<td>-172.93</td>
<td>-5.7198</td>
<td>79.899</td>
<td>-0.082685</td>
</tr>
<tr>
<td>Percent</td>
<td>-0.00795</td>
<td>-0.0109</td>
<td>0.0003</td>
<td>-0.0002</td>
</tr>
<tr>
<td><strong>β = 1 - Flexible Labor Supply</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>-119910</td>
<td>-4143.8</td>
<td>-0.0099</td>
<td>0</td>
</tr>
<tr>
<td>Average</td>
<td>-168.18</td>
<td>-5.8118</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Percent</td>
<td>-0.0077</td>
<td>-0.0111</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

**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.

Figure 5 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.
8 Conclusion

In this paper I examine how a negative shock to exports affects labor market outcomes. During the Asian Crisis of 1997, when exports to those countries dropped, employment and wages in traded industries declined in response. Aggregate labor market effects were driven by the lowest-education subgroup. The short-run shock had a long-run impact: effects on traded employment persisted past the Crisis shock. Finally, I use my data to measure the degree of worker heterogeneity in the US, and find low values (between 1 and 1.3). This suggests strong within-CZ distributional effects associated with a temporary trade shock. I use this parameter and find that the export drop during the Asian Crisis implied between a 120,000 and 130,000 drop in traded employment across the US, or between 160 and 190 jobs per CZ.

Ultimately, this paper implements a unique identification strategy in exploiting the Asian Crisis of 1997, a temporary and exogenous shock to US exports with diverse regional exposure. It does so in a high-income country, a setting less studied in export literature. My estimates ultimately demonstrate both the importance of the export channel for labor markets as well as its ability of exports to transmit economic shocks across countries. I estimate effects of the shock in both the short- and long-run, and provide a short-run estimate of the degree of labor dispersion consistent with that is lower on average than the long-run estimate of this elasticity found in the literature.

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 lose their jobs and receive wage cuts. 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.
A Model Extension - Non-Constant Total Employment

From Equation 8 in the main text I have

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

and

$$\hat{\pi}_{ij} = \beta \hat{w}_{ij} - \hat{\Phi}_i$$ (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 $L_{ij} = \hat{\pi}_{ij} + \hat{L}_i$ where $L_i$ is total employment in a CZ. Thus the solution to my system of equations becomes

Solving yields

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

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

Solving for the expression for $\hat{\Phi}_i$,

Simplifying,

$$\left[ \frac{w_{itr}'}{w_{intr}'} - \frac{w_{itr}'}{w_{intr}'} \right] \frac{L_{itr}'}{L_{intr}'} = \frac{\beta \sigma}{\beta + \frac{\sigma}{\theta}} \hat{P}$$ (42)

Note that $\frac{L_{itr}'}{L_{intr}'} = \frac{\pi_{itr}'}{\pi_{intr}'} \frac{L_i'}{L_i}$ so I can plug in

$$\frac{\pi_{itr}'}{\pi_{intr}'} \frac{L_i'}{L_i} = \frac{\beta \sigma}{\beta + \frac{\sigma}{\theta}} \hat{P}$$

Plugging in for the definition of $\pi_{ij}$ and rearranging,

$$\left[ \frac{w_{itr}'}{w_{intr}'} - \frac{w_{itr}'}{w_{intr}'} \right] \frac{\Phi}{\Phi} \frac{L_i'}{L_i} = \frac{\beta \sigma}{\beta + \frac{\sigma}{\theta}} \hat{P}$$ (44)

Dividing Equation 36 by Equation 38,

$$\left[ \frac{w_{itr}}{w_{intr}} - \frac{w_{itr}}{w_{intr}} \right] \frac{\Phi'}{\Phi} = \frac{1}{\beta} \frac{L_i'}{L_i}$$ (45)
Thus I have

$$\hat{\Phi}_i = [\hat{L}_i + 1] \frac{1}{\beta} \left[ w_{itr}^{w_{intr}} - w_{intr}^{w_{itr}} \right] \left[ w_{itr}^{1-\beta} w_{intr}^{1-\beta} \right] - 1 \quad (46)$$

The system of equations to be solved in Matlab becomes

$$\frac{w_{itr}' - w_{intr}}{w_{intr}} = \frac{1}{\beta + \frac{\sigma}{\beta}} [\hat{\Phi}_i - \hat{L}_i] \quad (47)$$

$$\frac{L_{itr}' - L_{intr}}{L_{intr}} = -\frac{\sigma}{\beta + \frac{\sigma}{\beta}} [\hat{\Phi}_i - \hat{L}_i] \quad (48)$$

$$\frac{w_{itr}' - w_{itr}}{w_{itr}} = \frac{\sigma}{\beta + \frac{\sigma}{\beta}} \hat{P}_{itr} + \frac{1}{\beta + \frac{\sigma}{\beta}} [\hat{\Phi}_i - \hat{L}_i] \quad (49)$$

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

$$\hat{\Phi}_i = [\hat{L}_i + 1] \frac{1}{\beta} \left[ w_{itr}^{w_{intr}} - w_{intr}^{w_{itr}} \right] \left[ w_{itr}^{1-\beta} w_{intr}^{1-\beta} \right] - 1 \quad (51)$$

$$\hat{L}_i = \frac{L_{itr}' + L_{intr}' - L_{itr} - L_{intr}}{L_{itr} + L_{intr}} \quad (52)$$

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

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

and

$$\hat{\pi}_{ij} = \beta \hat{w}_{ij} - \hat{\Phi}_i \quad (54)$$

Solving yields

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

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

$$\hat{\Phi}_i = \frac{1}{\beta} \left[ w_{itr}^{w_{intr}} - w_{intr}^{w_{itr}} \right] \left[ w_{itr}^{1-\beta} w_{intr}^{1-\beta} \right] - 1 \quad (57)$$

$$\hat{L}_i = \frac{L_{itr}' + L_{intr}' - L_{itr} - L_{intr}}{L_{itr} + L_{intr}} \quad (58)$$
B Alternate Specifications and Figures

Table 7: Labor Market Response to Asian Crisis

<table>
<thead>
<tr>
<th></th>
<th>Nontraded Emp</th>
<th>Traded Wage</th>
<th>Total Emp</th>
<th>Unemployment</th>
<th>Labor Force</th>
<th>Population</th>
<th>Working Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>∆Log CEWP (_{it})</td>
<td>0.0387 (\ast)</td>
<td>-0.00178</td>
<td>0.00362</td>
<td>0.0287 (\ast)</td>
<td>-0.0114</td>
<td>-0.00153</td>
<td>-0.000155</td>
</tr>
<tr>
<td>(0.0212)</td>
<td>(0.0140)</td>
<td>(0.0112)</td>
<td>(0.0134)</td>
<td>(0.0309)</td>
<td>(0.00694)</td>
<td>(0.00530)</td>
<td>(0.00592)</td>
</tr>
</tbody>
</table>

Controls
- Y Y Y Y Y Y N N
- Year FE Y Y Y Y Y Y N N
- N 1450 1418 1450 1450 1450 1450 1450 1450

First Stage F-Stat 32.69 32.69

Note: Stacked difference regressions estimating Equation 15 using the log of labor market outcomes on log of CEWP \(_{it}\). All regressions are estimated in stacked differences over the periods 1993-1996 and 1996-1998. ∆CEWP \(_{it}\) is instrumented using ∆CEWP \(_{oit}\). 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: Labor Market Response to Asian Crisis (Education Split)

Panel A: Low Education

<table>
<thead>
<tr>
<th></th>
<th>Nontraded Emp</th>
<th>Traded Wage</th>
<th>Total Emp</th>
<th>Unemployment</th>
<th>Labor Force</th>
<th>Population</th>
<th>Working Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>∆CEWP (_{it})</td>
<td>0.380 (\ast)(\ast)</td>
<td>0.0772</td>
<td>-0.0304</td>
<td>0.0398 (\ast)</td>
<td>0.0211 (\ast)</td>
<td>-0.00314</td>
<td>0.00870</td>
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<tr>
<td>(0.107)</td>
<td>(0.0353)</td>
<td>(0.0229)</td>
<td>(0.0198)</td>
<td>(0.0477)</td>
<td>(0.0126)</td>
<td>(0.00699)</td>
<td>(0.00801)</td>
</tr>
</tbody>
</table>

Controls
- Y Y Y Y Y Y N N
- Year FE Y Y Y Y Y N N
- N 774 774 754 774 774 774 774 774

First Stage F-Stat 27.86 27.86

Panel B: High Education

<table>
<thead>
<tr>
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<th>Nontraded Emp</th>
<th>Traded Wage</th>
<th>Total Emp</th>
<th>Unemployment</th>
<th>Labor Force</th>
<th>Population</th>
<th>Working Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>∆CEWP (_{it})</td>
<td>0.319 (\ast)</td>
<td>0.0143</td>
<td>0.0208</td>
<td>0.0191 (\ast)</td>
<td>-0.0482</td>
<td>-0.000258</td>
<td>-0.0123</td>
</tr>
<tr>
<td>(0.168)</td>
<td>(0.0205)</td>
<td>(0.0226)</td>
<td>(0.0165)</td>
<td>(0.0438)</td>
<td>(0.00877)</td>
<td>(0.00877)</td>
<td>(0.00912)</td>
</tr>
</tbody>
</table>

Controls
- Y Y Y Y Y Y N N
- Year FE Y Y Y Y Y Y Y Y
- N 676 676 664 676 676 676 676 676

First Stage F-Stat 10.57 10.57

Note: Stacked difference regressions estimating equation (X) using the log of traded employment on log of CEWP \(_{it}\). All regressions are estimated in stacked differences over the periods 1993-1996 and 1996-1998. ∆CEWP \(_{it}\) is instrumented using ∆CEWP \(_{oit}\). Outcomes are logs of traded employment, nontraded employment, traded wage, nontraded wage, total employment unemployment rate, labor force, population, and working age population. Sample is split at median 1990 CZ population share with at least a Bachelor’s degree which is 16%.
Figure 8: Comparing $CEPW_{it}$ Base Years

Comparing Base Years for Per-Worker Crisis-4 Exports

<table>
<thead>
<tr>
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<tbody>
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<td>Value</td>
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year

References


