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

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Abstract: This paper examines the effect of export demand variation on a range of local labor market outcomes using United States data. To address the potential simultaneity problem, I use the 1997 Asian Crisis as an exogeneous source of variation in export demand facing US industries. Prior to the Crisis, some US industries had strong trading relations with the Crisis countries, and commuting zones (CZs) differed in their pre-Crisis industry composition. My empirical analysis takes advantage of both the timing of the Crisis as well as differential CZ composition of affected industries for identification. I find that in CZs with strong trading relations with Crisis-4 countries, during the Crisis there were 10% greater declines in traded employment and 5.6% greater declines in traded wage than in their less-exposed counterparts. These effects were strongest in relatively low-education CZs, evidence for across-CZ distributional consequences of the shock. Finally, I pair a theoretical model with my empirical framework to measure the degree of worker heterogeneity in my sample, and measure elasticities ranging from 1.05 to 2.16 which imply strong within-CZ distributional effects. I use these estimates to measure partial equilibrium effects of declines in exports to China during the recent trade war, and find significant employment and wage 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 often centered around smaller or developing countries: examples include McCaig (2011), McCaig and Pavcnik (2018), and Dauth, Findeisen, and Suedeukum (2014).

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.

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 first construct an industry-weighted commuting zone (CZ) level exposure measure of US exports to Crisis-4 (Indonesia, Thailand, South Korea, and Malaysia) countries, and split my sample based on high or low values of this measure. 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 interact these variables with a dummy for the Crisis period in order to capture the differential effect of the Crisis on more versus less exposed CZs. I then estimate the effects of the export shock on employment and wages and find significant effects. Namely, CZs which had stronger trading relations to Crisis-4 countries saw 10% larger declines in traded employment and 5.6% larger declines in traded wage during the Crisis. I find no evidence of employment reallocation to nontraded industries or changes in unemployment in affected CZs. Instead, I find decreases in population in these CZs. I then estimate heterogeneous effects on skilled and unskilled workers, split by CZ education numbers, and find evidence for across-CZ distributional effects. Specifically, I find stronger effects in the lower education sample.
Finally, I construct a theoretical model based on those of Kovak (2013), Galle, Rodriguez-Clare, and Yi (2018), and Roy (1951) which provides a framework for my empirical estimates and allows me to measure the Fréchet shape parameter, or the degree of worker heterogeneity in my sample. I find evidence for a strong degree of worker heterogeneity and thus evidence for within-CZ distributional consequences of the shock, with an elasticity $\beta$ between 1.05 and 2.16. I use this estimate to calibrate my model and estimate the partial equilibrium effects of decreases in exports to China during the recent trade war. I compute 48,500 fewer jobs in tradable industries across the US associated with this decline. Notably, the hardest hit states were mostly Republican and swing states, with between 1000 and 12000 less jobs in each.

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. To do so, it 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. Finally, I demonstrate how this framework can be generalized to studying a range of export shocks.

The paper is structured as follows. In the next section I discuss existing literature. After, I discuss the theoretical model that provides the basis for my analysis. Next, I provide background on the Asian Crisis of 1997 and discuss my measurement of exposure to the Crisis. I then discuss my data. My empirical design and results follow. After, I provide concluding remarks along with suggestions for further research.

## 2 Literature Review

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 3 I include a theoretical model based on Kovak (2013) and Galle, Rodriguez-Clare, and Yi (2018) to explore

$^{1}$As Galle, Rodriguez-Clare, and Yi (2018) explain, a value of infinity would imply perfect worker homogeneity, whereas a value close to 1 would imply strong distributional effects.

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. In this paper, I also find no aggregate reallocation effects.

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. 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

\footnote{This is a limited selection of their papers, consisting of those most relevant to my analysis.}
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 (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.

In the US, Feenstra, Ma, and Xu (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 classical difference-in-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. 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. I find evidence for both across- and within-CZ distributional consequences of the shock. Finally, I am able to generalize my framework to measure the impact of other export shocks.

3 Theoretical Model for Employment and Wages

I design a theoretical model as an extension of Kovak (2013). 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 embed a Roy model from Galle, Rodríguez-Clare, and Yi (2018) to determine labor supply. Second, I conduct my analysis at the industry-CZ level. 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).

### 3.1 Setup

The first few steps of this section follow Kovak closely, only departing to compute industry (j) - CZ (i) specific terms. 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,

\[ a_{Tij}Y_{ij} = T_{ij} \]  
\[ L_{ij} = a_{Lij}Y_{ij} \]

Differentiating equation 1 ($\hat{x} = dlnx$), letting hats denote proportional changes, and noting the quantity of the specific factor is fixed, we have

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

Differentiating equation 2 and substituting 3,

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

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

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

Differentiating 5 , letting $\theta_j$ be the share of the specific factor in industry j:

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

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

\[ \hat{a}_{Tij} - \hat{a}_{Lij} = \sigma_{ij}(\hat{w}_{ij} - \hat{R}_{ij}) \]
Rearranging and plugging 6 and 7 into 4 yields the industry-specific wage term,

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

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 industry j, 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.

### 3.2 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 \( G_i \) groups of workers from country \( i \). Instead, I assume there is one group of worker per commuting zone, which allows me to estimate a single elasticity of worker heterogeneity \( \beta \).

Each worker draws a productivity \( z_j \) in sector \( j \) drawn from a Fréchet distribution with shape parameter \( \beta \) and scale parameters \( A_{ij} \). As GRCY explain, the closer \( \beta \) 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.

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 \( z \in \Omega_{ij} \). 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

\[ \pi_{ij} = \int_{\Omega_i} dF_i(z) = \frac{A_{ij}(w_{ij})^{\beta}}{\Phi_i} \]  

where

\[ \Phi_i = \sum_k A_{ik}(w_{ik})^{\beta} \]

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

\[ \ddot{\pi}_{ij} = \beta \dot{w}_{ij} - \dot{\Phi}_i \]

I assume that labor supply in a CZ is fixed, allowing me to equate \( \hat{L}_{ij} = \hat{\pi}_{ij} \). This is a reasonable
assumption, because the Crisis was a short-term shock. Let $\Phi_i$ to be a measure of the change in total labor market desirability in a commuting zone.

Solving yields

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

(10)

$$\hat{w}_{ij} = \frac{\sigma_j}{\beta + \frac{\sigma_j}{\theta_{ij}}} \hat{P}_{ij} + \frac{1}{\beta} \hat{\Phi}_i$$

(11)

Thus, when there is a decrease in export prices in an industry, employment and wages in that industry decrease. 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 $\beta$.

4 The Asian Crisis of 1997

4.1 Background of the Crisis

I use the Asian Crisis of 1997 to test the predictions of the theoretical model. The financial 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. 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 14.5 billion dollars between 1997 and 1998, a 30.5% decrease in Crisis-4 exports and a 2% decrease in total exports given the share of Crisis-4 exports was approximately 7% in 1997. I calculate the hardest hit industries by dividing the export drop between 1997-1998 by an industry’s 1997 exports. Based on this method, I find that the hardest hit industries in the US were Hog and Pig Farming (1122), Manufacturing and Reproducing Magnetic and Optical Media (3346), Spring and Wire Product Manufacturing (3326), Oil and Gas Extraction (2111), and Boiler, Tank, and Shipping Container Manufacturing (3324). These industries all saw drops in exports to Crisis-4 countries that accounted for a 8% or greater drop in total exports. Generally, heavily affected industries mirror this selection: they include agricultural, mining, and manufacturing industries.

Finally, 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.

From the past two paragraphs, 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.

### 4.2 Measuring Exposure to the Crisis

In order to measure the effects of the Asian Crisis of 1997, I construct a measure of CZ exposure to the Crisis, \( \text{CrisisExportsPW}_{it} \). 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. This measure is based on a model by Autor, Dorn, and Hanson (China Syndrome 2013) for an import penetration by CZ measure. The calculation is similar to that of a Bartik (1991) instrument. It is constructed as follows:

\[
\text{CrisisExportsPW}_{it} = \frac{\sum_{j} \frac{L_{ij1992}}{L_{Uj1992}} X_{jt}}{L_{i1992}}
\]  

In this equation, \( L_{ij1992} \) is the start of period (1992) employment of each industry \( j \) of each CZ \( i \). I choose 1992 as my base year because the US was in recession in 1990-1991. \( L_{Uj1992} \) is each US (U) industry \( j \)’s start of period employment. Note that I start my regression sample two years later, in 1994 and estimate through 1999 (the final year of the Crisis) to capture three years prior to the crisis and three years during the Crisis. The fraction \( \frac{L_{ij1992}}{L_{Uj1992}} \) can be thought of as a CZ’s share of each industry’s employment. Next, \( X_{jt} \) is each industry’s exports per year to Crisis-4 countries. The fraction \( \frac{L_{ij1992}}{L_{Uj1992}} X_{jt} \) 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, \( L_{i1992} \), 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 \( \text{CrisisExportsPW}_{it} \), a measure of each CZ’s change in exports to Crisis-4 countries per worker per year.

I split the sample at the 90th percentile to designate highly exposed CZs to the Crisis and use this as my main independent variable. I choose the 90th percentile because many CZs do not have strong trading relations with Crisis-4 countries. I then construct an analogous measure \( \text{CrisisExportsPW}_{oit} \) 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. I then interact these variables with an indicator for the Crisis period (1998 and 1999) in order to exploit the timing from the crisis. This interaction term measures the differential labor market effects of highly exposed CZs during the Crisis period.

I choose this binned specification rather than using levels of exports because it allows me to better exploit the timing of the Crisis for identification. To do so using continuous exports, I would interact the export values with an indicator for the Crisis period. However, such an interaction term would capture the change in
slope between exports and employment (for example) during the Crisis period. I do not expect this difference to be significantly greater or less than zero. That is, the relationship between exports and labor markets is the same before and during the Crisis. Using the bin cutoff based on trading relations with Crisis-4 countries allows me to measure preexisting exposure to the Crisis, and how these CZs were differentially affected when it occurred.

In a final specification, to measure the shape parameter of the Fréchet distribution, or degree of worker heterogeneity in a CZ from my model, (β), I use $\text{CrisisExportsPW}_{it}$ and instrument for it using $\text{CrisisExportsPW}_{oit}$. Here I am using continuous exports in order to calibrate $\hat{\beta}_{ij}$, but I do not include an interaction term here for the Crisis period. This is because I do not expect it to be significantly different from zero (and empirically, it is not). I use the coefficient measured in this specification and Equation (10) from my model to measure this β.

I use $\text{CrisisExportsPW}_{oit}$ to construct instruments for both specifications because 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.

Using $\text{CrisisExportsPW}_{it}$, 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.

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.

Finally, to explore which CZs were most heavily affected by the Crisis, I multiply the above measure by the size of the drop in Crisis-4 exports between 1997 and 1998. By this metric, an example of a hard-hit CZ was Gastonia, North Carolina (800). Gastonia is mostly agricultural. Altogether it had a population of 382204 in 1994. It had 7434 employees in affected industries in 1994 in total, 7.5% of its employment. Accordingly,
when the Asian Crisis of 1997 hit, Gastonia was severely affected. Between 1997 and 1998 affected industry employment declined by 805 workers, and by 1999 employment reductions in those industries totaled to 1017 people. This amounted to 14% of Gastonia’s pre-crisis affected-industry employment. Other examples of severely affected CZs were Fort Stockton City, Texas (31403), Littlefield City, Texas (30902), and Greenwood City, Mississippi (4701). Overall, affected CZs range in size, and predominant industries generally include sectors in agricultural, mining, or manufacturing.

5 Data

5.1 Sources

Next, to estimate the effect of the Asian Crisis of 1997 on employment and wages, I obtain data from a range of sources. The employment and wage data comes 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.”\(^4\) I use the county-level employment and wage data for the years 1990-2001. In the data are 1,196 NAICS 6-digit industries.

A shortcoming of this data is that it does not include 6-digit NAICS codes for all counties and industries. 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. The problem is milder for 4-digit industries, so I use only industries at this level. Furthermore, the missing data problem does not bias my results, as the missing data is consistent throughout the sample. It does not change during or around the years of the shock.\(^5\) Overall, this data contains 330 industries and 3,136 counties over the years 1990-2001.

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 1990-2001. It also includes data on exports to Crisis-4 countries. This data comes from the Census, and is comprehensive. I aggregate the industries from 463 6-digit industries to 102 4-digit industries in order to create a correspondence across datasets. I then collapse to the industry-year level. I use this total export data for Figure 1 and to provide one measurement of \(\beta\). I also consider this dataset to contain all traded industries, and accordingly use this designation to distinguish traded employment from nontraded employment (and traded wage from nontraded wage).

\(^5\) A way to test this further would be to use 1992 nonmissing employment data by county-industry, calculate exposure to the Crisis, and compare the missing counties to the nonmissing counties. However, to my knowledge there is currently no existing nonmissing data at the county-NAICS level.
To run my main regressions, 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. To construct employment weights, I convert the QCEW data to the SIC-87 level.

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, or a skilled 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 $\Phi_i$.

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 Census Intercensal County Population Data, which I accessed through the National Bureau of Economic Research (NBER). 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. It covers 741 CZs and 330 4-digit industries, 102 traded and 228 non-traded, for 6 years (1994-1999), and it contains comprehensive labor market measures.

5.2 Summary Statistics

Table 1 contains means for my full sample and then split into treated and nontreated groups. These statistics look similar across the two groups, though the treated group trades more on average. Also, nontraded industries have significantly larger employment than traded industries. Furthermore, manufacturing share of employment is on average 6% in my sample. Autor, Dorn, and Hanson (China Syndrome 2013) document a 12.69% average manufacturing share of employment in 1990. This inconsistency in my data could be a result of the BLS’s hiding some industries in the QCEW even at the 4-digit level. As a result, the proportions of nontraded industries and manufacturing industries are incorrect approximations. However, as this data is missing throughout my entire sample, it does not bias my results.

The average percentage in 1990, the latest Census year prior to the start of the sample, high-educated workers in a CZ is around 15%, suggesting that most CZs were more heavily populated with less-educated
workers in 1990. This number ranges up to 39% in my data. Similarly, the percentage of high skilled workers is on average 26% which ranges up to 49%.

Finally, 143 CZs had no trade in 1991, the year prior to my base year, 1992. I drop these from my analysis because they are affected by trade differently than CZs with traded industries, so they do not provide useful comparison.

Table 1: Summary Statistics

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<th>Low Exposure</th>
<th>High Exposure</th>
<th>Total</th>
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<td>ExportsPW_{it}</td>
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<td>6313.3</td>
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<td>701.0</td>
<td>514.2</td>
</tr>
<tr>
<td>Non Traded Wage</td>
<td>404.2</td>
<td>440.2</td>
<td>406.6</td>
</tr>
<tr>
<td>Manufacturing Capital Stock</td>
<td>31414.6</td>
<td>57689.0</td>
<td>33128.2</td>
</tr>
<tr>
<td>Agriculture, Forestry, Fishing, and Hunting (1)</td>
<td>0.0360</td>
<td>0.0153</td>
<td>0.0347</td>
</tr>
<tr>
<td>Mining, Utilities, and Construction (2)</td>
<td>0.0855</td>
<td>0.109</td>
<td>0.0870</td>
</tr>
<tr>
<td>Manufacturing (3)</td>
<td>0.0580</td>
<td>0.0991</td>
<td>0.0607</td>
</tr>
<tr>
<td>Wholesale, Retail, and Transportation (4)</td>
<td>0.263</td>
<td>0.247</td>
<td>0.262</td>
</tr>
<tr>
<td>Finance, Real Estate, Technical, Management, and Administrative Services (5)</td>
<td>0.142</td>
<td>0.156</td>
<td>0.143</td>
</tr>
<tr>
<td>Educational, Health, and Social Services (6)</td>
<td>0.131</td>
<td>0.134</td>
<td>0.131</td>
</tr>
<tr>
<td>Arts, Accommodation, and Food Services (7)</td>
<td>0.160</td>
<td>0.130</td>
<td>0.158</td>
</tr>
<tr>
<td>Other Services (8)</td>
<td>0.0392</td>
<td>0.0397</td>
<td>0.0392</td>
</tr>
<tr>
<td>Public Administration (9)</td>
<td>0.0861</td>
<td>0.0698</td>
<td>0.0850</td>
</tr>
<tr>
<td>Observations</td>
<td>3588</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Sample means reported for full regression sample (598 CZs over 1994-1999), and split by high and low exposed CZs. A highly exposed CZ is defined as having above 90th percentile 1992 Crisis-4 exports.

Next, Figure 3 illustrates the comparable trends in Crisis-4 and rest-of-world exports in both sets of CZ. Treatment CZs have higher shares of Crisis-4 exports. The trends across the two types of CZ are similar until 1997 when the Crisis hit. At that point, the treatment group’s exports to Crisis-4 countries dropped significantly more than those of the untreated group. The treatment group’s exports to the rest of the world did increase, but by less than the amount exports to Crisis-4 countries decreased.
6 Empirical Results

6.1 Full Sample Results

In all regressions in this section, I exploit both heterogeneity across CZs in exposure to the Crisis as well as the timing of the Crisis. My regression sample contains the years 1994-1999, three years prior and three years during the Crisis. I interact a dummy for having above the 90th percentile of exports to Crisis-4 countries in 1992 with a dummy for the Crisis. This interaction term captures the gap in the change in employment (or wages) during the Crisis across highly exposed and less exposed CZs. I instrument for this using an analogous measure, constructed using exports from six developed countries (Australia, Denmark, Germany, New Zealand, Spain, and Switzerland) to 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). Thus, I am identifying the change in employment and wages associated with a drop in Crisis-4 export demand during the Crisis.

I run CZ level regressions of employment for traded and nontraded industries in CZ \( i \) at time \( t \), \( \ln Emp_{it} \), on the constructed exposure measure. I then explore the effect of the export shock on the log of wages for traded and nontraded industries in CZ \( i \) at time \( t \), \( \ln Wage_{it} \). In alternate specifications, I estimate effects on log of unemployment and log of population. I include a year fixed effect in all regressions to extract time
trends. I also include controls for three 1-digit traded industries’ (agriculture, manufacturing, mining) share of population to capture time trends in commuting zone industry makeup. Next, I include a commuting zone fixed effect in all specifications in order to extract the location-specific trend from my estimate. Finally, I cluster standard errors by CZ in order to account for within-CZ correlation.

\[
\text{LnTradedEmp}_{it} = \alpha + \eta \text{HighExposure}_i \times \text{Crisis}_t + \xi \bar{X}_{it} + \phi_t + \gamma_i + \epsilon_{it}
\]  

(13)

Table 2 contains the estimates for employment and wages for both traded and nontraded industries. Column 1 indicates that CZs with strong trading relations to Crisis-4 countries had 10% higher losses in traded employment during the Crisis than less exposed CZs. Additionally, these CZs had 5.6% larger wage losses than their counterparts. I find no spillover to nontraded industries and no increases in unemployment. However, I find that population declined by 1.9% more in affected CZs during the Crisis.

Table 2: Baseline Results

<table>
<thead>
<tr>
<th></th>
<th>Employment (1)</th>
<th>Employment (2)</th>
<th>Wage (3)</th>
<th>Wage (4)</th>
<th>Unemp (5)</th>
<th>Pop (6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traded</td>
<td>-0.100**</td>
<td>-0.00557</td>
<td>-0.0559**</td>
<td>-0.00353</td>
<td>-0.0314</td>
<td>-0.0188***</td>
</tr>
<tr>
<td>Nontraded</td>
<td></td>
<td>(0.0377)</td>
<td>(0.0237)</td>
<td>(0.00779)</td>
<td>(0.0354)</td>
<td>(0.00583)</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>
</tr>
<tr>
<td>CZ FE</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Controls</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>3588</td>
<td>3588</td>
<td>3588</td>
<td>3588</td>
<td>3588</td>
<td>3588</td>
</tr>
<tr>
<td>First Stage F-Stat</td>
<td>50.21</td>
<td>50.21</td>
<td>50.21</td>
<td>50.21</td>
<td>50.21</td>
<td>50.21</td>
</tr>
</tbody>
</table>

**Note:** Robust standard errors in parentheses, clustered by commuting zone. Difference-in-difference regressions over the period 1994-1999, where the main independent variable is interacted with a dummy for the Crisis period (1997-1999). Outcomes are logs of traded employment, nontraded employment, traded wage, nontraded wage, unemployment, and population. Main independent variable is an indicator for having a high CZ share of exports to Crisis-4 countries in 1992, interacted with an indicator for the Crisis period. I instrument this variable with its counterpart constructed using 6 other developed countries’ exports to Crisis-4 countries. All regressions include year and commuting zone fixed effects, and three controls for agriculture, mining, and manufacturing industries’ shares of population.

Figure 4 is an event study plot of log of traded employment and traded wage before, during, and after the Crisis period. Each point represents the difference in traded employment across high and low exposed commuting zones in that year, after partialling out commuting zone and yearly trends. The lines are 95% confidence bands, and the year 1996 is omitted as the base year. Note that prior to the Crisis, the differences in traded employment and traded wage across highly and less exposed commuting zones is not significantly different from zero (or the coefficient on 1996, the base year), whereas during the Crisis they are strictly negative. There also appears to be some persistence of the effect of the Crisis past 1998-1999: traded
employment and wage are relatively lower in highly affected commuting zones in 2000.

Figure 4: Event Study of Traded Employment and Wage

Note: Figure 4 contains event study plots of log of traded employment (left) and log of traded wage (right) over the period 1994-2000. An indicator for being highly exposed to US Crisis-4 exports is interacted with yearly indicators and instrumented with its counterpart, constructed with exposure to non-US Crisis-4 exports. Fixed effects for commuting zone and year as well as controls for three one-digit industries’ share of population included. 95% confidence bands are at the commuting zone level. The year 1996 (prior to the Crisis) is normalized to zero as the base year.

6.2 Heterogeneity in High and Low Education CZs

Next, I estimate heterogeneous effects on CZs that differ in composition of skilled and unskilled workers. In order to do so, I divide the sample into high- and low-educated CZs based on percent of college graduates. I then run the specification in equation (13) on the split sample.

Table 3 contains the estimates of employment and Table 4 contains estimates for wages for each industry segment of high and low skilled CZs. I define a “high education” CZ based on an above-50th percentile share of population with a bachelor’s degree. I split my sample in this way, and run my employment and wage regressions on the split sample.
Table 3: High vs. Low Education

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Traded</td>
<td>Nontraded</td>
<td>Traded</td>
<td>Nontraded</td>
<td>Traded</td>
<td>Nontraded</td>
<td>Traded</td>
<td>Nontraded</td>
</tr>
<tr>
<td>Highly Exposed × Crisis</td>
<td>-0.102**</td>
<td>-0.0135</td>
<td>-0.0640</td>
<td>0.00925</td>
<td>-0.0717***</td>
<td>-0.00410</td>
<td>-0.0179</td>
<td>0.00106</td>
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<tr>
<td></td>
<td>(0.0501)</td>
<td>(0.0127)</td>
<td>(0.0416)</td>
<td>(0.0166)</td>
<td>(0.0223)</td>
<td>(0.00897)</td>
<td>(0.0574)</td>
<td>(0.0150)</td>
</tr>
<tr>
<td>Year FE</td>
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<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>Controls</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
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<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Education</td>
<td>Low</td>
<td>Low</td>
<td>High</td>
<td>High</td>
<td>Low</td>
<td>Low</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>N</td>
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<tr>
<td>First Stage F-Stat</td>
<td>44.09</td>
<td>44.09</td>
<td>9.216</td>
<td>9.216</td>
<td>44.09</td>
<td>44.09</td>
<td>9.216</td>
<td>9.216</td>
</tr>
</tbody>
</table>

Note: Robust standard errors in parentheses, clustered by commuting zone. Difference-in-difference regressions over the period 1994-1999, where the main independent variable is interacted with a dummy for the Crisis period (1997-1999). Outcomes are logs of traded and nontraded employment and wage. Main independent variable is an indicator for having a high CZ share of exports to Crisis-4 countries in 1992, interacted with an indicator for the Crisis period. I instrument this variable with its counterpart constructed using 6 other developed countries’ exports to Crisis-4 countries. All regressions include year and commuting zone fixed effects, and three controls for agriculture, mining, and manufacturing industries’ shares of population. Split by median levels of 1990 CZ education shares.

I find evidence for across-CZ distributional consequences of the shock. Specifically, in Column 1 of Table 3, traded industries in the low-education exposed CZs see 10% larger reductions in employment than their counterparts, whereas the difference for high-education CZs in Column 3 is much smaller (and imprecise). In Columns 5 and 7 of Table 3, I find that low-education exposed CZs see relatively larger decreases in wage, whereas high-education CZs see no such adjustment. Neither group sees adjustment in nontraded employment or wage.

Figure 5 is a panel of event study plots of the regressions from Columns 1 and 3 of Tables 3 and 4, with 95% confidence bands. Alternatively, it is Figure 4, split by education. They illustrate the relative decline in traded employment and wage during the Crisis for low-education CZs, and the near-zero change for high-education CZs.
Figure 5: Event Study of Traded Employment and Wage, by Education Group

Note: Figure 5 contains event study plots of log of traded employment (top) and log of traded wage (bottom) over the period 1994-2000. The left panel contains estimates for low-education CZs, and the right panel contains estimates for high-education CZs. An indicator for being highly exposed to US Crisis-4 exports is interacted with yearly indicators and instrumented with its counterpart, constructed with exposure to non-US Crisis-4 exports. Fixed effects for commuting zone and year as well as controls for three one-digit industries’ share of population included. 95% confidence bands are at the commuting zone level. The year 1996 (prior to the Crisis) is normalized to zero as the base year.

6.3 Alternate Specifications

I provide two robustness tests to check that my specific parameter choices are not driving my results. These tables can be found in Appendix A. To check that the specific timing of my sample is not driving my results (e.g. there is not one year changing my point estimates) I run my regressions shortening (1995-1999) and widening (1992-1999) the sample. I report the estimates for the 1992-1999 sample, and note that they are very similar to the 1994-1999 sample. These results in Table 6 are very similar to the original results in Table 2.

The second test I provide is to check whether or not specific definitions of high education CZs are driving the heterogeneity. For example, a concern would be that changing the cutoff for high education slightly could change the results. To test this, I redefine “high education” CZ at the 75th percentile cutoff. Table 7
reports the consequential employment results. I note they are very similar to those in Table 3.

7 Model Implied Estimates

7.1 Measuring $\beta$, the Degree of Worker Heterogeneity

Next, I use the theoretical model from Section 3 to measure $\beta$, the degree of worker heterogeneity, with $\beta \to 1$ implying strong within-CZ distributional effects, and $\beta \to \infty$ implying homogeneous effects. Recall the prediction is

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

I estimate this elasticity $\beta$ in two ways. First, I use total US exports, instrumented using US exports to Crisis-4 countries. I choose this method first because my model derives $\hat{L}_{ij}$ and $\hat{w}_{ij}$ based on percent change in total exports.

$$\ln\text{TradedEmp}_{it} = \alpha + \eta \ln\text{ExportsPW}_{it} + \xi \Phi_{it} + \phi_t + \gamma_i + \epsilon_{it} \tag{14}$$

where $\ln\text{ExportsPW}_{it}$ is either total US exports or US exports to Crisis-4 countries. I include a fixed effect for CZ and year, and I shift my sample by one year so that I can capture post-Crisis years. As a proxy for $\Phi_{it}$ (a measure of the industry conditions in a commuting zone), I use log of capital stock in manufacturing industries. As a second approach, I use US exports to Crisis-4 countries and instrument for them using the other 6 developed countries’ Crisis-4 exports. This latter approach is analogous to that of in the estimates in section 6, except using level changes in exports rather than bins. It takes the form

$$\ln\text{TradedEmp}_{it} = \alpha + \eta \ln\text{CrisisExportsPW}_{it} + \xi \Phi_{it} + \phi_t + \gamma_i + \epsilon_{it} \tag{15}$$

This is the same as the first specification in equation 14, except using Crisis-4 exports (and instrumenting using other countries’ Crisis-4 exports) rather than total exports. Both regression estimates are in Table 4. I let the coefficient

$$\eta = \frac{\beta \sigma_j}{\beta + \frac{\sigma_j}{\theta_j}} \tag{16}$$

Note that for the former approach I can directly pull $\eta$ from the regression estimate in Column 1, since it measures the effect of a change in total exports. For the second approach, I scale $\eta$ by the share of Crisis-4
exports in total US exports, which I measure to be approximately 13% of the per-worker values. This is because my model measures the effect of a change in total exports and thus allows me to define η in the context of my model and as in equation 16.

I then calibrate my model with a range of values for θ and σ, and find estimates between 1.05 and 2.16\(^6\), which is in line with existing literature (Adao et al (2017), Hsieh et al (2013), Burstein et al (2019), Galle et al (2018)).

Table 4: Measuring \(β\), the Degree of Worker Heterogeneity

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Emp</td>
<td>Emp</td>
</tr>
<tr>
<td>Log Exports</td>
<td>0.622***</td>
<td>0.0907***</td>
</tr>
<tr>
<td></td>
<td>(0.223)</td>
<td>(0.0318)</td>
</tr>
<tr>
<td>Year FE</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>CZ FE</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>N</td>
<td>4186</td>
<td>4186</td>
</tr>
<tr>
<td>First Stage F-Stat</td>
<td>9.872</td>
<td>22.78</td>
</tr>
<tr>
<td>Φ(_i) proxy</td>
<td>Capital Stock</td>
<td>Capital Stock, Industry Shares</td>
</tr>
<tr>
<td>Export Destination</td>
<td>World</td>
<td>Crisis-4</td>
</tr>
<tr>
<td>% Total Exports</td>
<td>100%</td>
<td>13%</td>
</tr>
<tr>
<td>Implied η</td>
<td>0.622</td>
<td>0.684</td>
</tr>
<tr>
<td>(β (σ = 1, \ θ = 0.75))</td>
<td>1.17</td>
<td>1.40</td>
</tr>
<tr>
<td>(β (σ = 1, \ θ = 0.5))</td>
<td>0.90</td>
<td>1.05</td>
</tr>
<tr>
<td>(β (σ = 0.5, \ θ = 0.5))</td>
<td>1.65</td>
<td>2.16</td>
</tr>
</tbody>
</table>

Note: Robust standard errors in parentheses, clustered by commuting zone. Instrumental variable regressions over the period 1994-2000. Outcome is log of traded employment. In Column 1, independent variables log of US exports, instrumented using log of exports to Crisis-4 countries. In Column 2, main independent variable is log of exports to Crisis-4 countries using exports from 6 other developed countries to Crisis-4 countries. All regressions include year and commuting zone fixed effects. In Column 1, the proxy for Φ\(_i\) is capital stock in manufacturing industries. In Column 2, I again use capital stock but also add 1-digit NAICS industry shares of population to the proxy. I use η from the Column 1 regression, and adjust the Column 2 regression by the share of per-worker Crisis-4 exports in total per-worker exports. Worker elasticities of substitution across industries computed by calibrating model using coefficient estimates and denoted values of σ and θ.

Furthermore, \(β \rightarrow 1\) implies that there is strong worker heterogeneity, and therefore potent within-CZ distributional consequences of the shock. Thus, both these estimates for \(β\) 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 Model Implied Trade War Estimates

Finally, I conduct counterfactual estimates using my calculated \(β\) to estimate the partial equilibrium effects of the Trump trade war with China. Specifically, I estimate traded employment and wage losses coming from the decrease in exports to China due to retaliatory tariffs or other implications of the trade

\(^6\)Note that \(β > 1\) in the model, so I attribute the single 0.90 estimate to parameter misspecification.
war. Using aggregate data from the Census, I calculate the percent change in exports from the US to China from 2017 to 2018 and 2019. I find this number to be approximately a 1% decrease in total exports by 2019.\textsuperscript{7} Next, I compute expected percent change in traded employment and wage using my estimates of $\beta$ from Column 2 of Table 4. Below are two plots of predicted percent changes in traded employment and traded wage. I test a range of values for $\beta$, noting that the value for traded employment is the same regardless of the value I choose (as $\beta$ is computed using the coefficient $\eta$ from Table 4).

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figure6.png}
\caption{Partial Equilibrium Effects of Trade War on Traded Employment and Wage}
\end{figure}

Note: The left represents the computed partial equilibrium percent change in traded employment due to the decrease in exports to China over the 2017-2019 period. The right represents computed percent changes in traded wage over the same period. For the latter, I provide a range of estimates dependent on different values of $\beta$ (detailed in the legend).

I have documented an (approximate) 1% loss in total exports due to the decreases in exports to China. I find that the partial equilibrium effect of this drop is to lead to a 0.67\% decline in traded employment, and between a 0.3\% and an 0.65\% decrease in traded wage. I next estimate these changes on a state-level basis by calculating each state’s change in exports to China and imputing associated change in traded employment.

Below is a figure depicting the geographic distribution of the model-estimated changes in traded employment associated with the decline in exports to China after the tariffs were implemented. I construct a measure of per-worker exports to China as in equation (12), using 2017q4 as the base and data from Comtrade. I measure the change in per-worker exports from 2017-2019, and impute the model-implied changes in employment using the measured $\beta$s from Column 2 of Table 4 and equation 10 from my model.

\footnotesize\textsuperscript{7}This estimate is if US exports to other countries did not change over this period.
Figure 7: Geographic Distribution of Model Implied Employment Losses

Note: Computed employment change due to the change in exports to China after the tariffs were implemented, plotted over a map of the US. Left map plots percent changes and right map plots changes in number of jobs. Darker colors indicate larger employment losses. Change is measured over the period 2017-2019.

Over half the states suffer employment losses associated with the export shock. In Figure 7, the left plot is in terms of percent change in employment, and the right is in terms of change in number of jobs. The harder hit states are in darker colors in both plots. In these states, estimates range from 1000 to 12000 fewer jobs (in the partial equilibrium of the export shock) in tradable sectors. On aggregate, I measure 48500 fewer jobs in tradable industries due to the export declines.

Note that in both figures, the darker colored states are mostly Republican and swing states. This is consistent with the evidence from Fajgelbaum et al (2019), that China targeted mostly Republican states with retaliatory tariffs.

Ultimately, the losses documented in this section do not capture the full impact of the Trump trade war. However, these estimates do illustrate that the export side of trading partnerships has important labor market implications. They emphasize the importance of weighing the value of bilateral export partnerships when considering a new trade policy.

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. I find no worker reallocation or unemployment effects, but I do find population decreases. Importantly, these changes were heterogeneous by education level. Lower-education CZs saw significantly larger employment and wage losses than their higher-education counterparts, evidence for across-CZ distributional impacts of the shock. Finally, I use my data to measure the degree of worker heterogeneity in the US, and find low values (between 1.05 and 2.16). This suggests strong within-CZ distributional effects.
associated with the shock. Armed with these elasticities, I estimate the partial equilibrium effects of the export declines to China during the Trump trade war and find significant losses.

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 generally under-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. Also, the heterogeneous effects regarding high- and low- skilled CZs untangled in this work is relevant to other labor market literature. I provide an additional estimate of the degree of labor dispersion consistent with existing work. I thus provide evidence for both across- and within-CZ distributional consequences of the shock. Finally, I demonstrate the ability to generalize this framework to other settings.

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 Alternate Specifications

Table 5: Baseline Results (Different Sample)

<table>
<thead>
<tr>
<th>Highly Exposed × Crisis</th>
<th>Employment (1)</th>
<th>Employment (2)</th>
<th>Wage (3)</th>
<th>Wage (4)</th>
<th>Unemp (5)</th>
<th>Pop (6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traded</td>
<td>-0.163***</td>
<td>0.00100</td>
<td>-0.0533**</td>
<td>-0.00554</td>
<td>-0.0458</td>
<td>-0.0203***</td>
</tr>
<tr>
<td>Nontraded</td>
<td>(0.0484)</td>
<td>(0.0121)</td>
<td>(0.0253)</td>
<td>(0.00967)</td>
<td>(0.0368)</td>
<td>(0.00733)</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>
</tr>
<tr>
<td>CZ FE</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
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Note: Robust standard errors in parentheses, clustered by commuting zone. Difference-in-difference regressions over the period 1992-1999, where the main independent variable is interacted with a dummy for the Crisis period (1997-1999). Outcomes are logs of traded employment, nontraded employment, traded wage, nontraded wage, unemployment, and population. Main independent variable is an indicator for having a high CZ share of exports to Crisis-4 countries in 1992, interacted with an indicator for the Crisis period. I instrument this variable with its counterpart constructed using 6 other developed countries’ exports to Crisis-4 countries. All regressions include year and commuting zone fixed effects, and three controls for agriculture, mining, and manufacturing industries’ shares of population.

Table 6: High vs. Low Education (Different Sample)

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<td>-0.00839</td>
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<td>54.82</td>
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</table>

Note: Robust standard errors in parentheses, clustered by commuting zone. Difference-in-difference regressions over the period 1992-1999, where the main independent variable is interacted with a dummy for the Crisis period (1997-1999). Outcomes are logs of traded and nontraded employment and wage. Main independent variable is an indicator for having a high CZ share of exports to Crisis-4 countries in 1992, interacted with an indicator for the Crisis period. I instrument this variable with its counterpart constructed using 6 other developed countries’ exports to Crisis-4 countries. All regressions include year and commuting zone fixed effects, and three controls for agriculture, mining, and manufacturing industries’ shares of population. Split by 75th percentile of 1990 CZ education shares.
References


