International Trade and Local Labor Markets: Are Foreign and Domestic Shocks Created Differently?

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Abstract: Despite the attention given to international trade in discussion and analysis of the economic struggles of many regions across the U.S., it is unclear whether international trade shocks impact local economies more and differently than shocks originating from within the domestic economy, thus requiring special policy attention. Therefore, using U.S. county-level data for 1990-2010, this study carefully constructs demand shocks to local economies, isolating international import and export impacts to assess whether trade shocks have different effects from domestic demand shocks. We examine a variety of economic indicators including population growth, employment rates, wage rates and poverty rates. The results suggest that international trade shocks have some different effects than overall domestic shocks, though public perception of trade appears to be more negative than reality. We also find that domestic shocks dominate international trade shocks in explaining variation in regional labor market outcomes over the entire period.

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1. Introduction

Increased trade with developing countries in recent decades has spurred concerns with potential adverse effects of trade on low-skilled labor in the U.S., raising questions regarding potential policy responses. Regions specialized in the production of goods intensive in the use of low-skilled labor may be especially adversely affected by increasing imports from developing countries (Autor and Dorn, 2013). While increased U.S. exports to developing countries could provide offsetting aggregate gains, limited mobility of workers both geographically and across industries can cause idiosyncratic shocks to have large redistributive effects across regions and workers (Partridge et al., forthcoming). Yet, it is not clear whether international demand shocks differ in impacts from correspondingly-sized domestic shocks and whether they are more responsible for regional labor market structural shifts. Shocks emanating from Bangalore or Shanghai may not matter as much or more to U.S. workers than industry employment changes occurring within the country.

There are many reasons why trade could have differential effects across regions. Foremost, regions have different industry compositions with varying international import and export intensities. A primary ingredient of Melitz models of international trade is firm heterogeneity in productivity, in which trade-affected firms could be distributed differently across regions (Bernard et al., 2006; 2007). However, economists have only recently begun to focus on the geographical disparities in the effects of international trade on local labor markets.

Autor et al. (2013) found increased trade with China to be associated with higher unemployment, lower labor force participation, and lower wages in affected U.S. regional labor markets. Significantly negative effects have also been found on the wages of workers in industries and regions affected by increased U.S. imports from NAFTA (McLaren and Hakobyan, 2010). Dauth et al. (forthcoming) report that increased trade exposure of Germany to China and Eastern European countries resulted in a net increase in manufacturing employment in Germany, attributable mostly to increased German exports to Eastern Europe and imports from China serving as substitutes for German imports of labor-intensive goods from other countries.

Leichenko and Silva (2004) found some evidence of expected benefits for manufacturing export-intensive counties and losses in counties containing import-competing manufacturing industries, arising from international trade exposure, though other results were counter to *a priori* expectations. Increased U.S. trade with developing countries has been found to relatively increase the demand and wage premium for high-skilled labor, particularly benefitting counties with a greater high-skill endowment (Kandilov, 2009). From the developing country perspective, Chiquiar (2008) found that regions in Mexico with greater exposure to international markets experienced a decrease in the skill premium with the passage of NAFTA, implying downward pressure on U.S. low-skilled manufacturing wages in competing industries.

Others contend that trade is not the major source of recent difficulties in low-skilled U.S. manufacturing, arguing that low-skilled goods produced in developing countries are not good substitutes for low-skilled manufacturing goods in the U.S. (Lawrence, 2008; Edwards and Lawrence, 2010). Consumer preferences and non-neutral technological progress may underlie the U.S. shift in employment from low-skilled manufacturing jobs to low-skilled service jobs (Autor and Dorn, 2013). Increased trade within the U.S., for example, can be associated with national sectoral shifts, such as increased trucking services (Michaels, 2007). The sectoral reallocation nationally creates spatially-asymmetric labor demand shocks, directly affecting counties employment-intensive in the production of expanding and contracting sectors.

The relative contribution of shocks of domestic versus foreign origin on U.S. local area economies then remains an open question. Does the source of the shock matter in terms of the effects on local economies? Which shocks are the largest? Expectations regarding future employment security in trade-related industries may differentially affect regional labor supply responses to trade-based employment shocks compared to domestic shocks. There also may be differences in distributional effects because of embedded skill-compositional differences in domestic versus trade shocks, particularly for trade with developing countries. Differential regional responses may warrant spatially-oriented policy differences in how to mitigate the negative effects from trade, including differences in policies between metropolitan and non-metropolitan areas.

Therefore, in this paper we assess the regional effects of increased U.S. international trade from 1990 to 2010, including both the effects *relative to* equivalent-sized domestic demand shocks, and their *total* effects after controlling for domestic demand shocks. In contrast to previous studies of the U.S., we examine trade between the U.S. and all other countries and consider both exports and imports. We construct regional measures of exposure to international trade shocks based on regional employment-intensiveness in sectors experiencing changes in national exports and imports. Also different from other similar studies (e.g., Leichenko and Silva, 2004; Autor et al., 2013), we convert changes in national exports and imports into the associated changes in employment. The resulting regional trade measures represent the changes in regional employment that would occur if employment in each of the region's industries changed at the rate predicted nationally because of changes in exports and imports. Controlling for domestic labor demand shocks provides both an assessment of their influence and eliminates bias that would otherwise occur if the trade and domestic shocks are correlated.

In the next section, we follow Autor et al. (2013) in using the theoretical trade model of Eaton and Kortum (2002) to derive an empirical local labor market model. The theoretical model follows in the tradition of comparative advantage driving trade flows, in which productivity shocks and trade agreements exert influence on trade flows. We translate international trade shocks and those arising from sector reallocation nationally to the local level.

Empirical implementation is discussed in Section 3, where we derive separate empirical measures of trade shocks on national employment and overall national sectoral reallocation employment shocks, and translate them to the county level based on industry employment composition. The measures are used in cross-sectional growth equations for several measures of labor market outcomes for 1990-2000 and 2000-2010: employment growth, population growth, employment rate, wage rate, median income and poverty. Econometric estimation of the growth equations reveals the effects of the calculated trade and domestic shocks on local labor markets, which can be geographically uneven because of limited worker mobility across industries and regions (McLaren and Hakobyan, 2010; Autor et al., forthcoming; Partridge et al., forthcoming).

Section 4 contains the econometric results and associated discussion. Among our primary findings, both metropolitan and nonmetropolitan areas that are employment-intensive in sectors with increasing employment nationally (including that attributable to international trade) experience faster employment and population growth over the entire period. Only post-2000, do these areas experience increased employment rates, consistent with reduced population migration responses to the nationally-based employment shocks. Positive shocks likewise significantly increased wages post-2000 and reduced poverty over both decades in metropolitan and nonmetropolitan areas.

Trade-based labor demand shocks generally had the same per unit effect on total county employment growth as did domestically-based shocks, with the exception of nonmetropolitan areas post-2000 where import shocks appeared to have no overall employment effect. Given that domestic shocks dominated trade-based shocks in terms of the variation in total nationally-based shocks, variation in job growth over both decades appeared to be driven primarily by domestically-based shocks. Exposure to export shocks did not differentially affect population responses during the 1990s, but it was associated with less positive population growth responses post-2000. Population growth also was differentially negatively affected by greater exposure to import shocks post-2000, significantly so for metropolitan areas. This is suggestive of workers increasingly avoiding areas with greater exposure to international trade.

The more limited population responses to demand shocks in regions with greater exposure to export shocks generally cause them to have relatively larger positive employment rate effects. Greater exposure to import shocks also generally reduced employment rates more than the average national shock over the entire period. The only differential wage effects were the less negative wage effects of import shocks in the 1990s in both nonmetropolitan and metropolitan areas. Responses in area poverty to import shocks were greater during the 1990s, apparently driven by the differential employment rate effects.

Robustness of the results is examined in Section 5. We examine the sensitivity of the results to alternative measures of employment and demand shocks and consider additional explanations for county employment growth patterns. Section 6 summarizes and concludes the paper.

2. Theory

Our theoretical underpinnings for how international trade shocks affect local labor markets builds on the seminal work of Eaton and Kortum (EK) (2002) and the extension by Autor et al. (ADH) (forthcoming). ADH (forthcoming) notably illustrate how the EK model can be used to specify an empirical local labor market model for examining the regional effects of international trade. Both the model of ADH and our model allow for international trade shocks to have uneven impacts across regions, depending on regional variation in intensities of industries with trade exposure and on interregional labor supply adjustments.

EK employ the Ricardian framework introduced by Dornbusch et al. (1977). Technological/productivity differences drive comparative advantage and trade flows. Region i produces various goods j along a [0, 1] continuum of intensity. In our case, the sum of all regions is the entire world, though like ADH, the regions we examine empirically are U.S. local labor markets. Region i is relatively efficient in producing j, using a constant returns to scale technology, $z_i(j)$. All regions in the U.S. have access to the same technology but there are other reasons for different production efficiencies across regions (agglomeration, distance from markets, natural advantages such as access to natural resources, ports, etc.). Labor is assumed to be the only input, in which free mobility across industries in region i leads to the same unit production costs, w_i. Therefore, the price of one unit of j equals $w_i/z_i(j)$.

Let τ_{nij} be the trade or distance costs of shipping good j from region i to destination n. τ includes shipping costs plus implicit costs related to trade agreements or other institutional barriers. Thus, the price of good j shipped from region i to destination n equals $p_{ni}(j)=(w_i/z_i(j))\tau_{nij}$. Consumers in n buy j from the region(s)/country(ies) with the lowest price.

ADH define the relative efficiency in production of good j for each region as $T_{ij,}$ which combines the region's level of productivity relative to all other regions and the within-region relative efficiency in industry *j* from $z_i(j)$. A larger T_{ij} implies greater efficiency in production for *j* in *i*. Define θ as the measure of dispersion of firm productivity in producing *j* within *i,* which is assumed to be common across all regions. A greater θ suggests *less* variability in productivity across goods *j* in *i*. A larger T_{ij} indicates a stronger technological absolute advantage, whereas a smaller θ suggests that comparative advantage across regions plays a more important trade role.

Let X_{nj} represent expenditures in the destination market *n* for good *j*, where X_n denotes total expenditures in *n*. ADH adapt EK to show that sales for industry *j* from region *i* in destination *n*'s market (X_{nij}) is:

(1) $$X_{nij} = \frac{T_{ij}(w_i\tau_{nij})^{-\theta}}{\Phi_{nj}} X_{nj}$$

where Φ_{nj} is the "toughness of international competition" for good *j*, defined as:

(2) $$\Phi_{nj} \equiv \sum_i T_{ij}(w_i\tau_{nij})^{-\theta}.$$

Region *i*'s sales to destination *n* are positively related to its technology T_{ij} and negatively related to its costs, as reflected by wages w_i and transportation costs τ_{nij}. Likewise, improved technology or reduced labor costs in a competitor nation reduces sales.

Following ADH (forthcoming), total labor demand in region *i,* industry *j* can be written as

(3) $L_{ij} = L^D(w_i, Q_{ij})$,

where Q_{ij} is the production of good *j* in region *i*, in which Q_{ij} is obtained by summing Equation 1 over all destination markets n:

(4) $$Q_{ij} = A_{ij}\sum_n \frac{X_{nj}\tau_{nij}^{-\theta}}{\Phi_{nj}},$$

where A_{ij} is cost-adjusted productivity $T_{ij}(w_i)^{-\theta}$. Total production in a region, Q_i, is the sum of output in Equation (4) across all *j* industries.

Using Equation (4), the following shows how Q_{ij} the first-order response to a demand shock to X_{nj} in market *n*:

(5) $$\hat{Q}_{ij} = (X_{nij}/Q_{ij})\hat{X}_{nj},$$

where $\hat{X}$ is dln*X*. Equation (5) illustrates that the corresponding percent change for Q_{ij} is directly proportional to the share of its production sold in market *n*.

Equation 6 shows the first-order direct change in Q_{ij} for shocks to all *n* destination markets*:*

(6) $\hat{Q}_{ij} = \sum_{n} (X_{nij} / Q_{ij}) \hat{X}_{nj}$.

Now consider that *n* represents all markets: international, national, and local; i.e., the forces affecting international trade above also apply to intra-national trade. This modification allows us to capture the effects of demand shocks on a region from all sources. Suppose that the common (average) shock across all markets for U.S. produced goods and services can be represented as ($\hat{X}_{usj}$). The change in Q_{ij} then equals

(7) $\hat{Q}_{ij} = \hat{X}_{usj}$.

To derive the total change in production in region *i,* $\hat{Q}_{i}$, we first multiply both sides of equation (7) by Q_{ij}*,* and sum across all *j* industries. Then we divide both sides by Q_i to derive:

(8) $\hat{Q}_{i} = \sum_{j} (Q_{ij} / Q_{i}) \hat{X}_{usj}$,

which implies that the common/average shock is the region's industry mix growth rate term from shift-share analysis. For example, if a region is production-intensive in internationally-import competing industries (high shares of Q_{ij}/Q_i in import-intensive industries), increased imports will disproportionately reduce expected growth in that region. If a region's industrial composition is concentrated in industries experiencing declines in domestic demand, expected regional growth would likewise be reduced. In the empirical model, including the industry mix term from shift-share analysis then controls for domestically-based *national* demand shocks (domestic and/or international), that, in turn, may be correlated with the trade shocks impacting the region.

We next illustrate the international component of the total (average) shock. Treating the rest of the world outside of the domestic market as *R* (rest of the world)*,* a trade shock could occur through changes in cost-adjusted productivity and trade costs (aside from shocks through exchange rates). ADH (forthcoming) show that the aggregate effect of these trade shocks on a U.S. (*u*) region *i*'s aggregate production equals:

$$(9)\,\hat{Q}_i = -\sum_j \frac{X_{uij}}{X_{uj}} \frac{X_{uRj}(\hat{A}_{Rj} - \theta\hat{\tau}_{Rj})}{Q_i}$$

The size of the trade shock's impact on region *i*'s production is then positively associated with the region's share of U.S. production of good *j* (X_{uij}/X_{uj}) and positively related to the magnitude of the change in trade imports $X_{uRj}(A_{Rj} - \theta\hat{\tau}_{Rj})$ due to the shock, relative to the region's total production Q_i.

In the empirical implementation of the model, the employment equivalents of the aggregated shocks in Equations (8) and (9) are used as explanatory variables for changes in local labor market outcomes. The shock in Equation (9) is used to assess whether international trade shocks have effects different from, or in addition to, the common/average (domestic and international) shocks of Equation (8), the question of primary interest to this investigation. This also allows us to assess the importance of trade-related shocks relative to domestic shocks for a range of regional outcomes. To the extent that interregional labor market adjustment is limited, the shocks will have uneven regional effects (ADH, forthcoming; Partridge et al., forthcoming).

We follow ADH (forthcoming) in using employment shares to measure local industry intensities. One difference between our model and the base ADH model is that the latter focused on changes in production due to trade, while our model differentiates the associated changes in employment deriving from both domestic and international shocks. Using employment scales the results toward our desired metrics. For example, productivity changes cause adjustments in output to have different-sized employment shocks in periods for industries experiencing differential productivity growth.

There is an important consideration not directly addressed in the EK or ADH (forthcoming) models, and of key importance to our investigation: the role of expectations about the future. There is an extensive labor market literature in which expectations affect migration behavior (Neumann and Topel, 1991). Incorporating expectations reduces the impact of short-term demand shocks on human migration or local labor supply. Rather, short-term shocks primarily manifest themselves in terms of wage changes. In contrast, expectations of long-term shocks more likely stimulate migration and labor supply, rather than affecting the wage rate.

Expectations of strong productivity growth and its effects also may affect labor market adjustment. International competition may spur productivity improvements or offshore sourcing, such that export-intensive firms most actively pursue productivity growth (e.g., Bernard et al., 2007; Egger and Kreickemeier, 2009). Productivity growth increases employment only under certain conditions such as elastic demand for output (Combes et al., 2004). Expectations of local productivity growth (based on dependence on export-intensive sectors, for example) in the presence of a relatively inelastic demand response, may spur out-migration adjustments in anticipation of future employment reductions. Similarly, expectations about future import competition or foreign competition relative to domestic exports also may cause anticipatory migration adjustments in communities exposed to a high-intensity of import or export industries. Such responses would be consistent with McLaren and Hakobyan's (2010) finding that anticipation of future liberalization from NAFTA was sufficient to cause out-migration from localities with high-intensities of industries exposed to NAFTA. However, in a study of trade exposure in Germany, Dauth et al. (forthcoming) find that increased import exposure reduces expected employment duration on the part of manufacturing employees, while higher export exposure increased expected employment duration, with the latter effect being the larger.

3. Empirical Implementation

Our sample consists of over 3,000 counties from the continental U.S. and District of Columbia.[1] We expect differential international trade impacts across rural versus urban counties because of agglomeration effects and differing workforce and industry compositions. Product cycle effects suggest that in the early stages of an innovative product, it will be produced in cities with better access to R&D and specialized workers. As production processes mature production migrates to lower-cost rural settings; a key feature of the geography of U.S. manufacturing employment in the 1970, 1980s, and 1990s was the movement towards lower cost rural areas

[1]In our data, there are cases where independent cities (mostly in Virginia) are merged with the surrounding county to form a more functional region. We omit 43 mostly small rural counties due to missing data.

(Quigley, 2002). Thus, we divide the sample into counties in metropolitan areas (MSAs) and nonmetropolitan areas.[2] Experiments with dividing metropolitan counties into those that are part of larger MSAs (>250,000 population) and smaller MSAs produced similar results.

The use of counties has key advantages such as the aforementioned possibility of considering differences between urban and rural settings. The use of counties also has a long tradition in urban and regional economics and their labor market dynamics are well understood. Typically, a large share of the workforce lives and works in the same county and the county typically plays an important administrative function for policy. In contrast to MSAs or labor market areas, counties have consistent boundaries over time.

Because of our interest in comparing the pre-2000 period, before the dramatic rise of competition from low-wage countries (particularly China), to the post-2000 period, the two primary time periods we consider are 1990-2000 and 2000-2010. For sensitivity analysis, we also estimate some models over the 2000-2007 and 2007-2010 periods to assess whether the Great Recession spawned different patterns.

The dependent variables consist of several measures reflecting county economic outcomes. First, we examine the percentage change in population (from the U.S. Census Bureau) because it is a comprehensive measure that includes both foreign and domestic migration, and population estimates at the county-level data are relatively accurate. Domestic migration may be intertwined with natural increases and immigration, in which immigrants may be attracted to particular locations by the same factors as are domestic migrants, and where each may have causal effects on the other (Partridge et al., 2008; 2009). Population change and net migration are the result of people "voting with their feet" on current conditions and expected future conditions such as international competition.

We next examine the percentage change in total employment to assess whether population (migration) patterns reflect contemporaneous changes in labor market conditions. We use total

[2] A metropolitan area is a county or counties that contain a city of at least 50,000 in population, as well as additional counties with tight commuting linkages with the core urban area. We use the 2003 Census metropolitan area definitions. See the U.S. Census Bureau for details.

employment from the U.S. Bureau of Economic Analysis (BEA). Total employment is the most comprehensive measure because it includes changes in employment that may arise from people who are forced into "necessity" self-employment from negative demand shocks. We also used wage and salary employment in sensitivity analysis, which does not include self-employment, but the results are similar. Then we assess the change in the employment-population ratio over the respective sample periods to confirm the BEA population and employment findings regarding possible changes in regional labor market dynamics. In this case, county employment is from place-of-residence data from the U.S. Bureau of Labor Statistics and population is those 18 and over from the U.S. Census Bureau.

We also assess whether international trade affects the distribution of income by examining the following outcomes: county poverty rates, median household income, and average county wages. These are derived from the 1990 and 2000 Censuses, the U.S. Census Bureau SAIPE estimates, the 2011 American Community Survey (for poverty rates and median household income); and the U.S. Bureau of Economic Analysis for average county wages. The relative distributional consequences of trade are *a priori* ambiguous at the local level. An increase in import competition may particularly adversely affect less-skilled workers, while positively affecting some higher-skilled workers as trade-impacted firms increase their skill requirements. As such, it is possible that both average wages and poverty rates increase, with ambiguous impacts on median household income. As described below, these predictions are relative to a common demand shock that is of either domestic or international origin.

Using the economic outcome measures described above, for the metropolitan and nonmetropolitan sub-samples, our base specification for a given county *i* located in state *s* is:

$$(10)\ \%\mathbf{OUTCOME}_{is(t\text{-}0)} = \alpha + \Box\mathbf{TRADE}_{is0} + \boldsymbol{\lambda}\mathbf{ECON}_{is0} + \boldsymbol{\varphi}\,\mathbf{GEOG}_{is0} + \boldsymbol{\gamma}\mathbf{AMENITY}_{is0} + \boldsymbol{\delta}\mathbf{DEMOG}_{is0} + \sigma_s + \varepsilon_{is(t\text{-}0)},$$

where the dependent variables are measured between periods 0 and *t* (i.e., 1990-2000, 2000-2007, 2007-2010, and 2000-2010). **TRADE** reflects measures of the county's exposure to imports and exports, which may have effects that differ from average common shocks; **ECON** includes other measures of economic activity; **GEOG** includes measures of the location's proximity to larger urban areas; **AMENITY** contains measures of natural amenities; and **DEMOG** contains demographic/human capital attributes. The regression coefficients are α, □, **λ**, **φ**, **γ**, and **δ**; σ_s are state fixed effects that account for common factors within a state; and ε is the residual, which is allowed to be clustered.[3]

The primary variables in the **TRADE** vector are two measures of import and export trade intensity of the local labor market that proxy for the changes in county employment attributable to international exports and import competition. First, we estimate the average amount of employment that is embodied in exports and imports for industry j in the beginning period 0 and ending period t:

(11) $enx_{jt} = nx_{jt} * (eus_{jt}/yus_{jt})$

(12) $enx_{j0} = nx_{j0} * (eus_{j0}/yus_{j0})$

where nx_{jt} is the value of U.S. imports (or exports) in period t for industry j, eus_{jt} is US employment in industry j, and yus_{jt} is U.S. production in industry j. The term in parentheses on the right-hand-side reflects the U.S. employment per dollar of output in industry j in year t. Then by multiplying by the value of imports (or exports) in year t, we derive the expected amount of employment embedded in imports (or exports) of industry j in year t. The underlying assumption is that, within each industry, the labor-intensity of goods that are exported, or domestically produced goods that are also imported, is similar to the national average.[4] We then apportion the export/import employment effects of a trade shock to each region based on its industry employment composition:

(13) $$Trade_i = \sum_{j=1}^{n} (e_{ij0}/e_{i0})((enx_{jt} - enx_{j0})/eus_{j0})$$

where the first term in parentheses is industry j's share of employment in county i in the initial

[3] Using the STATA cluster command, the residual is assumed to be spatially correlated with neighboring counties within its Bureau of Economic Analysis functional economic region but independent of county residuals in other regions. Accounting for spatial autocorrelation only affects the estimated standard errors.

[4] It may be expected that imports are more labor intensive than the national average and exports are less labor intensive, but as long as these effects are not systematically different across regions this is only a scaling issue in interpreting the regression coefficients.

year; use of initial year employment shares reduces the potential for reverse causality. The second term is the predicted national growth rate in industry *j's* employment due to imports/exports over the *0* to *t* period. The summation across all industries creates the expected direct employment growth (or loss) in county *i* due to its shares of changes in national exports/imports. ADH's (forthcoming) base measure of trade is similar, but instead they use the expected amount of change of import (or exports) dollars per worker, which does not reflect the numbers of workers affected, especially if there are differential productivity shifts.[5,6]

ADH (forthcoming) note that changes in import competition in an industry *j* could be correlated with industry demand shocks that affect local economic conditions and could cause estimation bias. There could be a correlation between demand shocks facing a local area and the amount of import competition faced by the industries concentrated in that region – e.g., places manufacturing a product facing strong competition from imports. ADH (forthcoming) address this by instrumenting for Chinese import intensity using Chinese trade patterns with other advanced economies, which was necessary because they did not account for other demand conditions. We instead more fully control for all national/international demand shocks in the **ECON** and **GEOG** vectors to remove the influence of other demand shocks from the residual.[7]

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[5]Others consider similar industry-weighted changes in prices at the regional level (Leichenko and Silva, 2004; Topalava, 2010; McLaren and Hakobyan, 2010). As with ADH (forthcoming), such a measure does not directly measure employment, especially if there are differential productivity effects across industries.

[6]ADH consider an employment measure in sensitivity analysis, but it attributes all indirect employment effects to the affected local area through using the national input-output table. The problem is that a significant share of inputs would be imported from surrounding regions of the United States and thus their measure is an over-estimate of local employment effects in which the measurement error would vary by location and by the industry composition of the local area (which affects the share of local inputs). By contrast, including only the direct industry effects, any local indirect multiplier effects would be part of the regression coefficient.

[7]The correlation of locally-based demand shocks with trade shocks should be relatively small. Suppose there is an international trade shock that indirectly affects local demand for good *j,* perhaps by changing local income through hiring or layoffs. Equation 5 shows that this impact on local production of *j* equals:

$$\hat{Q}_{ij} = \sum_n (X_{nij} / Q_{ij}) \hat{X}_{nj}$$

The locally sold production share (X_{iij}/Q_{ij}) for traded goods is small by definition. For example, Jeeps trucks are assembled in Toledo, Ohio. The share of those Jeeps locally sold in Toledo is very small, which means that import shocks on Jeep sales would have very little feedback effects through affecting local demand for Jeeps. Likewise, the share of corn that is locally consumed in a typical U.S. corn belt county is very small as well, meaning that trade shocks to corn markets would have few spillovers on local corn sales. Hence, local demand shocks on a traded good sector have very little impact on the local production of that good (as a share of total output of the good).

The primary variable in **ECON** is the industry mix employment growth for the period (e.g., 1990-2000; 2000-2010) shown in Equation 8, except in employment terms. The industry mix variable is calculated by summing the products of the initial 1990/2000 industry shares at the four-digit level and the corresponding national U.S. growth rates. Industry mix employment growth represents the overall growth rate that occurs in a county if all of its industries grow at their respective national growth rates (Bartik, 1991). Variation in industry mix employment growth across counties originates from their differing industry compositions at the beginning of the respective period. If an industry experiences a national or international demand shock, the county's industry mix employment growth rate is affected to the extent that this industry is present in the county. The industry mix growth rate captures the overall shock from all sources and the associated coefficient represents the average or common effect of any/all shocks.

The industry mix variable has a long history of use as an exogenous shift measure for local labor demand shocks (Bartik, 1991; Bound and Holzer, 2000). Our specific interest in the particular impact of international trade shocks is captured in our TRADE variable, which allows us to assess whether international trade shocks (a part of the total common shock) have effects that differ from the average or common shock. Controlling for all demand shocks with the industry mix term should eliminate the concern that local exposure to trade is correlated with unaccounted for local demand shocks in the residual.

GEOG includes measures of access to the urban hierarchy that affect local economic conditions. First, are proximity measures to the nearest urban areas differentiated by their importance in the urban hierarchy starting with distance to the nearest metropolitan area with additional variables capturing relative proximity to metropolitan areas of 250,000 to 500,000 people; 500,000 to 1.5 million people; and greater than 1.5 million population. Partridge et al. (2008b, 2009a) provide details of their calculation. **GEOG** also contains county population, population of the nearest/actual urban center to account for competing urbanization economies and congestion effects, and the county land area in square miles.

The vector **AMENITIES** represents the natural amenity attractiveness of the area, which can affect population and employment growth. Amenity attractiveness is measured by a 1-7 scale developed by the U.S. Department of Agriculture based on measures of climate, proximity to water and topography, etc. (McGranahan, 1999). We also include three indicator variables for close proximity (within 50kms) to the Atlantic Ocean, Pacific Ocean, and the Great Lakes to capture other natural amenity and productivity effects. We include state fixed effects to account for state-specific factors such as tax and regulatory policy differences or historic settlement. Not including state fixed effects would likely cause omitted variable bias. With the inclusion of state fixed effects, the other regression coefficients are interpreted as the average response for *within*-state changes in the explanatory variables.

The **DEMOG** vector denotes factors associated with human capital and mobility, all measured in the initial period. There also are five measures of race or ethnicity; four variables measuring the education levels of the county's residents; female percent of the population; percent of the population that is married, and the percent reporting a work disability (see Partridge et al. (2012) for details).

4. Empirical Results

4.1 Geography of Trade

Figures 1 and 2 illustrate the magnitudes of import and export employment shocks from Equation (13) for the 1990-2000 and 2000-2010 periods for U.S. metropolitan and nonmetropolitan counties. For imports, larger positive numbers are associated with larger import shocks and greater predicted job *losses,* while larger positive numbers for export shocks are associated with greater predicted job *gains*.

Panels A and B of Figure 1 reveal a common pattern for metropolitan import job shocks in both decades, namely southeastern and northeastern urban areas were hardest hit. Rustbelt metropolitan areas experienced larger negative shocks in the 1990s and interior California metropolitan areas experienced greater import job shocks after 2000. The nonmetropolitan import job shock patterns in Figure 2 are similar except that the Great Plains region shifted from small import effects to large import shocks post 2000—presumably due to more agricultural imports.

Another difference is that import job losses in nonmetropolitan southeastern counties were more pervasive in the 1990s than in their metropolitan counterparts.

Panels C and D of Figure 1 show that positive metropolitan export employment shocks were largest in the Eastern Great Lakes and Northeast in the 1990-2000 period, suggesting that import losses were partially offset by export gains. A distinct westward shift in the largest (positive) export shocks occurred after 2000. Note the lack of positive *export* employment shocks in the Rustbelt region post-2000, leaving them without offsetting gains for their predicted import losses. The Southeast did not generally experience large export employment shocks in either decade. The nonmetro export shocks follow a similar pattern, except that the Great Plains region fared well in both decades.

4.2 Correlation of Key Variables

Appendix Table 1 reports the metropolitan and nonmetropolitan county correlations for the 1990-2000 and 2000-2010 samples for the industry mix, export, and import employment shock variables. We also include what we refer to as the domestic industry mix employment shock, which nets out the import and export effects by adding the negative import employment shock and subtracting out the positive export shock to produce the domestic industry mix employment growth effect (see below in Equation (14)). Across all samples, the domestic industry mix and the overall industry mix terms are highly correlated, with coefficients ranging between 0.96 and 0.99. There also is a relatively high correlation between exports and imports of 0.53 in the 1990s metropolitan sample, where, in general, the correlation is positive. This cross-trade positive correlation is consistent with exports and imports occurring in the same product groups. The stronger correlation for domestic industry mix suggests that variation in non-trade shocks is the dominant feature in the variation in overall shocks.

Also notable are the negative correlation coefficients for *both* exports and imports with domestic demand shocks and industry mix demand shocks, with the exception of the industry mix and export shocks in the 2000-10 nonmetro sample. This likely occurs because internationally traded goods are concentrated in manufacturing, a sector where employment growth lagged the national average growth across all sectors. The correlation is most notable in the 1990s for import shocks, in which the correlations with both industry mix growth variables ranges between -0.40 and -0.58. One implication is that omitting domestic demand shocks would affect primarily the import estimates for the 1990s, in which the negative correlation suggests that the omission of domestic shocks would negatively bias the import coefficients for the 1990s.

4.3 Regression Results

Table 2 shows the base results for the key variables: (1) industry mix employment growth, (2) change in import employment growth, and (3) change in export employment growth, the latter two being changes in our Trade shock variables (Equation 13). Column 1 shows the metropolitan results for 1990-2000 and column 2 shows those for 2000-2010. Columns 3 and 4 show the corresponding results for nonmetropolitan areas.

Population Growth. Panel A shows the results for the population growth regressions, where for Model 1 only the (domestic and international) common industry mix shock measure is included in the model, while the variables representing export and import shocks specifically are omitted. Both Models 1 and 2 include the other control variables described in the empirical implementation. The industry mix results in column 1 show that 1990-2000 metro area population growth responded roughly proportionately to the demand shock, increasing by one percent for every one percent job change in industry demand, while column 3 shows a somewhat smaller nonmetropolitan population response of about 0.75. The population response falls to just under 0.2 during 2000-2010 in both the metro and nonmetro samples. Migrants appeared to fill nearly all of the newly created jobs in the 1990s, but after 2000, jobs-based interregional migration appears to have greatly diminished, implying that the response was primarily in the form of local labor adjustments (Partridge et al., 2012; Molloy et al., 2013).

Model 2 (Panel A) adds the export and import employment change variables to the Model 1 specification. Because international demand shocks are already captured in the (total) industry mix variable, these trade variable effects are interpreted *relative* to the industry mix coefficient, which reflects the effects of the common or average economic shock on local employment. Greater local exposure to nationally growing export employment contributes to greater industry mix employment growth, while greater exposure to nationally growing imports reduces industry mix employment growth. Thus, a negative 'export shock' coefficient signals a reduction in the positive effect on population growth of a positive demand shock. A negative 'import impact' coefficient indicates an enhanced negative effect of a negative demand shock. The coefficients of the trade variables indicate whether there are trade-shock impacts in addition to those already included in the common industry mix growth rate.

For the 1990s, the trade variables are statistically insignificant in the population growth regressions, except for the positive and significant nonmetropolitan import share coefficient. Because larger imports both imply greater predicted job losses (Equation (13)), and reduce the industry mix growth variable (Equation (8)), the positive coefficient implies that in the 1990s, import-based shock impacts on local nonmetropolitan economies had a *lesser* negative effect on population growth than did a generic equal-sized common demand shock. For 2000-2010, positive export shocks are associated with lower population inflows than the common positive demand shock in both metropolitan and nonmetropolitan counties. Import employment shocks are associated with more population loss relative to losses following a common shock, though the nonmetropolitan coefficient is smaller and insignificant.[8]

Employment Growth. Panel B of Table 2 shows the results for U.S. Bureau of Economic Analysis total (place of work) employment growth. The industry mix employment shock term is consistently positive and highly statistically significant in the employment growth regressions.

The 1990-2000 results for Models 1 and 2 reveal an industry mix growth rate coefficient of over 2 in metropolitan areas, suggesting that for every exogenously added job, there are in total

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[8] We do not weight by county population because our primary interest is in how trade affected the typical metropolitan and nonmetropolitan county, not necessarily the typical metropolitan and nonmetropolitan resident. Nonetheless, we also performed county population-weighted regressions. The results are fairly similar to the unweighted results, with the exception that the industry mix coefficient is much more positive and statistically significant for metropolitan areas post-2000. In addition, we also experimented with using total employment growth as an explanatory variable rather than the industry mix term in instrumental variables estimation, where the industry mix variable serves as the instrument for employment growth. Not surprisingly, the instrumental variables results were almost identical to those when directly using industry mix.

two jobs created—one directly from the shock and another one indirectly created by spillovers such as through supply chain links. For nonmetropolitan areas, the corresponding industry mix coefficient is about 1.4, suggesting smaller spillovers. In both metro and nonmetro samples, the import and export job shock terms are statistically insignificant, suggesting that import and export shocks had generally similar job growth effects as a common demand shock.

For 2000-2010, industry mix employment growth remains statistically significantly related to job growth, although the magnitude of the coefficient decreased. With one exception, the trade employment shock variables are statistically insignificant, suggesting trade employment effects similar to those following a common demand shock. The exception is the positive coefficient for the import shock variable in the nonmetropolitan specification. This suggests that import shocks had smaller than average negative employment effects post-2000; industries in rural areas competing against imports may have had domestic market alternatives, or perhaps imports are not particularly good substitutes for the kinds of products produced in rural areas, consistent with Lawrence (2008) and Edwards and Lawrence (2010).

Panel C reports the results of regressions where we create an alternative domestic-only industry mix employment shock term that is created by differencing out the trade shocks:

(14) DomINDMIX = INDMIX + IMPORTSH – EXPORTSH,

where we add the negative import employment shock and subtract out the positive export shock to produce the domestic industry mix employment growth effect. The coefficients (and their t-statistics) for the trade variables are now their *total* impacts on the dependent variable, including any uniquely trade-shock effects, not the differential or incremental effects relative to the total INDMIX shock as used above, where the coefficients were combined in interpretation of total trade effects. Because the import (export) employment shock is predicted to be a negative shock, the import coefficient would be expected to be *negative (positive)*.

For both the 1990s and post-2000, domestic industry mix employment shocks generate the same positive statistically significant results as for the common demand shocks. For the 1990s, the import employment shock is now associated with negative and statistically significant results, in which the difference from Panel B is that the import coefficient now reflects the total effects of imports (as opposed to indicating whether they have a statistically different effect from the average employment shock). These results illustrate that it is not that imports do not have a statistical effect on total employment (or the other variables) in Panel B, just that imports generally are not statistically different from a common demand shock.

For 2000-2010, there are similar findings for export employment shocks in both metro and nonmetro samples in Panel C compared to Panel B *(the total export effect obtained by adding the industry mix and relative export coefficients together)*. The nonmetropolitan import results indicate that import shocks are statistically significantly different from the common average demand shock in Panel B, but the gross effect is statistically insignificant in Panel C. In Panel C, the extent to which international and domestic demand shocks differ in their total effects is inferred by simply comparing the sizes of their coefficients.

Overall, based on (1) the much larger standard deviation of domestic industry mix employment growth compared to the corresponding employment-translated trade shocks (in Table 1) and (2) the estimated coefficients in the employment growth equations, shocks arising from domestic (rather than international trade) sources were by far the most responsible for the variation in employment growth across U.S. counties. Notably, this pattern essentially remained unchanged from the 1990s to post-2000.

Employment/Population Ratio. Panel D reports the results for the change in the employment/population ratio (emp/pop). For demand shocks to directly affect an area's original residents it is necessary for some combination of unemployment and labor force participation to change; together these responses are evident in changes in the emp/pop ratio. Recall from the previous section that the ratio is calculated for adults and is from a different source than is total employment and population (by place of residence); so, the change in the ratio cannot necessarily be obtained from the results in Panels A and B. Model 1 again only includes the common industry mix demand shock; whereas, Model 2 adds the trade-specific shock variables.

As before, the industry mix coefficient is not much affected by the addition of the trade variables. The common demand shock had little influence on the emp/pop ratio in the 1990s as migrants took most of newly created jobs or left if there were job losses (see Panel A). Yet, post-2000, it appears that many existing residents gained work after a positive demand shock, especially in nonmetro areas, consistent with a declining migration response to economic shocks.

Import employment shocks are associated with statistically significantly greater declines in the emp/pop ratio in the 1990-2000 metropolitan and nonmetropolitan samples compared to a common negative demand shock. Especially in the nonmetropolitan results, this is not unexpected because import shocks are associated with smaller population responses. Export shocks are positive but statistically insignificant in the metropolitan sample, and they are positive and statistically significant at the 10% level in the nonmetro sample.

In both the metropolitan and nonmetropolitan samples, positive export employment shocks are associated with statistically significantly larger increases in the emp/pop rate during the 2000-2010 period than the average demand shock — i.e., not only did the average demand shock (including exports) have a larger impact post 2000, but there were also additional export-specific effects. While population was not specifically responsive to export shocks, the remaining labor force became more intensively employed. Import employment shocks exert a significant negative additional effect (beyond the average negative demand shock effect) on the emp/pop ratio in metropolitan areas.

There are a few noteworthy implications of the Table 2 results. First, import shocks augmented negative migration effects beyond the common demand shocks after 2000, consistent with the narrative of imports becoming more 'harmful' with the rise of low-wage competitor nations such as China. Second, the export effect is consistent with anticipatory migration effects to further productivity improvements and possible fiercer future foreign competition reducing domestic employment needs. Many households may no longer wish to reside in places with high exposure to international trade, regardless of export or import orientation, because of the anticipated future employment loss risks. Public perceptions about the negative effects of trade dependence appear to extend beyond imports and low-wage competitors, but to trade in general.

Third, import competition does not in general have the same incremental negative effects on migration in rural areas, perhaps due to a competitive advantage of lower land and labor costs or because of more domestic alternatives in response to foreign competition.

Change in Poverty Rates. Increased trade has *a priori* ambiguous income distribution effects, depending on how skill composition is affected and how these spillovers manifest themselves in the broader local economy. Job losses among low-skilled workers in import-competing industries could reduce wages across the local economy with the ensuing increase in available labor supply for low-skilled nontraded sectors, increasing poverty rates. These effects among the less skilled may be especially persistent in local economies because of lower geographical mobility of less-skilled workers (Bound and Holzer, 2000). Conversely, growth in the export sector may be associated with up-skilling of existing workers and more-intensive hiring of higher skilled workers. Thus, areas intensive in sectors subject to positive export shocks may have lower poverty rates.

To examine the distributional issues, Panel A of Table 3 reports the results for the change in the poverty rate as the dependent variable for 1990-2000 and 2000-2010. Models 1 and 2 are as before. In both periods, and for both metropolitan and nonmetropolitan counties, average or common positive labor demand shocks significantly reduce poverty in Model 1, with the coefficient insignificant only for metropolitan areas during the 1990s with Model 2. The magnitude of the industry mix coefficient in Model 1 more than doubles after 2000 for metropolitan areas, most likely because of reduced geographical mobility of workers; fewer in-migrants competed for new jobs or there was less offsetting net out-migration following negative demand shocks.

In the 1990s, according to Model 2, import-based shocks are associated with statistically significantly higher poverty rates than are the common or average labor demand shocks in both metropolitan and nonmetropolitan areas, while export shocks are associated with relatively lower poverty rates. During 2000-2010, export shocks reduce poverty more relative to the average shock in metropolitan areas, but not in nonmetropolitan areas. But the impact of the average or common shock more than doubled post-2000, indicating that overall export shocks continued to reduce poverty. Increases in job losses associated with import competition again are positively related to higher poverty rates compared to the average economic shock, but in contrast to the 1990s neither relative import effect is statistically significant.

The larger population response associated with imports appears to have limited the poverty effects in metropolitan areas post-2000, while the stronger poverty effect of exports is likely related to the more limited population response to export shocks, and larger employment rate responses. Thus, for the lower tail of the distribution, increased foreign import competition after 2000 had no more adverse effects than a common demand shock. These results are somewhat supportive of polarization theories of the labor market that mid-skilled workers bear most of the costs of recent trade and technological patterns (Autor and Dorn, 2013) because lower-skilled workers cannot be outsourced or do not actively work in traded sectors. Yet, as the statistically significant industry mix term shows, demand shocks affect poverty rates; it is just that imports have no significant additional effects during the 2000-2010 period.

Median Household Income. Because poverty relates to the lowest tail of the income distribution, we also examine the percentage change in median household income (Panel B of Table 3).[9] For both models and samples, the coefficient on the industry mix variable is positive and significant. However, the trade variables are all statistically insignificant for the1990s indicating that trade employment shocks had effects similar to an average employment shock. Post-2000, export shocks had significantly larger positive effects on median household income, while imports had no statistically different effect. The export result is consistent with lower migration (labor supply) responses in counties that are intensive in export industries, skill-upgrading, or changes in total number of hours.

Average Wages. Panel C of Table 3 assesses the average change in wages for 1990-2000 and 2000-2010. Model 1 shows that the industry mix coefficient is statistically significant during the

[9]For the percentage change in median household income model, we also include a wage mix variable that corresponds to the industry mix term we used to capture employment growth shocks. Specifically, using the county's initial four-digit industry composition to predict the expected wage growth rate if all of the industry wage rates grew at their respective national rate, which should be exogenous in the same manner as the industry mix employment variables. Likewise, we also include the log of the initial-period average wage to account for any disequilibrium or convergence effects. These two additions do not measurably affect our key results.

2000-2010 period but not during the 1990s. The post-2000 results are consistent with the declining overall migration response to economic shocks, where the effects of demand shocks are manifested in smaller labor supply shifts and larger wage increases. In Model 2, the only insignificant industry mix coefficient is for nonmetro areas during the 1990s, while the post-2000 effects remain larger.

The export employment shock coefficient is statistically insignificant, suggesting that much of the positive export-median household income response may be because of higher employment rates. Conversely, the import coefficient is positive and statistically significant in both the metro and nonmetro samples during the 1990s. Thus, there is evidence of skill upgrading in import-intensive sectors, where manufacturing plants with increased exposure to imports from low-wage countries switch production to more capital-intensive activities (Bernard, 2006), and a net reduction in employment rates to leave median household incomes unchanged during the period.[10]

ADH (forthcoming) found that import competition from China was inversely associated with wages. In one sense, this is consistent with our findings in that negative demand shocks—whether due to imports or domestic shocks —are associated with falling median household income. Yet, greater imports have lesser effects on wages than do average or common shocks. What is different is that ADH focused on China and we consider trade in general. We also more fully control for all demand shocks affecting the local area.

5. Tests of Robustness and Alternative Hypotheses

Other Measures of Labor Demand Shocks. We next perform several robustness checks. First we create an alternative demand shock variable based on national occupational or skill-based changes in labor demand rather than national industry employment growth. Occupational changes may be driven by new technologies and other factors that induce up-skilling of the labor force. We construct the predicted employment growth if the county's occupations grew at their respective

[10]We consider as additional outcome variables, changes in educational attainment by examining the change in the percent of the adult population with less-than a high school degree, exactly a high school degree, some college, and bachelor's degree or higher. However, these results were inconclusive, perhaps because of the categories were too broad to adequately represent the skills distribution, and we do not report them

national occupational growth rates.[11] In unreported results, we add this occupational mix shock employment growth rate variable to the base population growth, employment growth, and emp/pop models to assess the robustness of the results. Generally, the industry mix and trade shock coefficients were essentially unchanged by the inclusion of the occupational employment shocks. The occupational employment shocks generally were insignificant, especially in the 1990s, but one notable result was that it was positive and statistically significantly related to higher employment rates, higher median household incomes, and lower poverty rates in the 2000-2010 period.

Next, we omit the overall industry mix demand shock variable from the analysis, Table 4. This specification is more akin to ADH's OLS specifications that did not control for local demand shocks; this specification is indicative of the size of the omitted variable bias from not controlling for local demand shocks. The interpretation again differs because the trade variables reflect their total effect and not whether their effects vary from the effects of the common demand shock.

The results in Panel A of Table 4 suggest that import employment shocks were associated with population losses in both metropolitan and nonmetropolitan areas during the 1990s, but export shocks were insignificant. Not controlling for industry mix (other demand shocks) makes it appear that imports have more negative population effects than suggested by the corresponding results in Panel A in Table 2. For the 2000-2010 period, the results are fairly close to what would be expected by adding the industry mix effect to the export coefficient in Table 2 and subtracting it from the import coefficient.

Panel B reports the corresponding results for total employment growth. Consistent with the results for population growth, we find that imports are much more strongly negatively and statistically significant than what would be expected from the employment growth results in Table 2, again suggesting that omitting local demand shocks greatly increases the estimated negative effects of imports for the 1990-2000 sample. For 2000-2010, we again see that the results are as

[11]The occupational mix employment growth rate is akin to the industry mix measure. Specifically, we use the 1990 and 2000 Census to derive the initial occupational structure for each county based on 14 occupations. Then along with U.S. Department of Labor data, we calculate the national employment growth rates for each of the 14 occupations. Then for each county, we sum across all 14 occupations the product of the initial county occupation share and the corresponding national growth rate for the occupation.

expected from the corresponding results in Table 2, though the effects of imports are smaller than expected. The specifications in Panels C, D, and E respectively use the change in the emp/pop, change in the poverty rate, and the percent change in median income as the dependent variables. Again, with the exception of a smaller than expected negative association between the drop in the poverty rate and the export employment shock in the nonmetro 2000-2010 model, the results are as expected from Table 2. In short, omitting local demand shocks from the model only meaningfully affects the 1990-2000 results for population growth and employment growth, in which the omitted variable bias appears to contribute to an overstated negative import effect.

Increased Labor Market Risk and Trade. Together, the employment growth, and employment rate results suggest that trade is becoming only marginally more detrimental to regional employment over time. But based on the population results, households may be avoiding the most trade-impacted areas because of anticipation of future job losses in import-competing and export industries (McLaren et al., 2010). Yet, one possibility is that trade simply proxies for negative reactions to contemporaneous risk from demand shocks in general—i.e., the previous patterns are not from a particular aversion to trade-intensive industries, but to risk in general.

To test this hypothesis, we create a risk-measure based on the county's industry composition that is akin to the industry mix employment shock variable. We derive for each four-digit industry the standard deviation of its national annual percent change in job growth for the decade. This measures the national variability in job growth for an industry. We then sum across all industries the product of standard deviation of national annual industry employment growth and the county's initial-year employment share in the industry. The result is the predicted *variation* in employment growth assuming the local industries are just as variable as they are at the national level. We then include this variable in the base population growth, employment growth, and emp/pop models in sensitivity analysis (not shown). If simple risk aversion explains the trade results, especially post 2000, we would expect the trade coefficients to greatly diminish in magnitude.

The unreported population growth results suggest that the risk measure is insignificant in the 1990-2000 period, but is positive and statistically significant for 2000-2010. Likewise the emp/pop measure was negatively associated with the risk measure, in which we would expect a positive linkage if labor supply was depressed due to out-migration from risky locations. The import and export employment shock coefficients were slightly reduced in magnitude. Yet, we find little evidence that the overall risk of the county's industry structure underlies the strong negative population migration relationship with both exports and imports post 2000, leaving an aversion to trade-intensive sectors (rather than risk specifically) as a possible explanation for the results, though other possible explanations exist for the lower response of population to export shocks.

Differences pre- and post-Great Recession. The severity of the Great Recession could have produced significantly different responses in the post-recession period, relative to pre-recession. Thus, we separately examine the 2000-2007 and 2007-2010 periods, as reported in Table 5.

Panel A contains the population growth results. They suggest that the negative link between population growth and export-specific employment shocks existed throughout the decade, though the larger negative impact that import-specific shocks had on population growth did not exist during the Great Recession period. The declining magnitude of the industry mix employment shock coefficient between the two periods suggests that while the falling responsiveness of migration to employment shocks began pre-recession, it accelerated during the recession.

Panel B shows the total employment growth results. They suggest a change in the effect of export shocks on employment growth with the influence being negative in the pre-recession period, consistent with exports having lower positive employment shock impacts compared with common shocks, and positive during the recession (though only statistically significant in nonmetropolitan areas). From the results of using domestic industry mix (Panel C), the export coefficient approximately equals the sum of the industry mix and export coefficients in Panel B, showing the lack of correlation of export shocks with overall employment growth pre-recession, and a positive correlation during the recession. Only pre-recession in non-metropolitan areas are import shocks negatively related to total employment growth.

Panel D reports the results using emp/pop as the dependent variable. While it is not generally statistically significant, the positive coefficients on the export shock variable continue to suggest that people avoided export-intensive locations or did not out-migrate following negative shocks. Import shocks were statistically significant and negatively associated with nonmetropolitan emp/pop ratios pre-recession and positively and statistically significantly related during the recession. In general, the Great Recession altered few patterns.[12]

6. Summary and Conclusion

In this paper we compared metropolitan and non-metropolitan county impacts of labor demand shocks between 1990-2000 and 2000-2010 on a range of labor market outcome variables, with the latter period representing the period of increased trade exposure to developing countries. Demand shocks are differentiated between common shocks that include both domestic and international shocks and those specifically attributable to changes in international imports and exports. Measuring the county's trade exposure in terms of employment related to national-level growth of exports and imports allows us to assess whether there is a trade-specific impact relative to domestic labor demand impacts. In addition, controlling for domestic demand shocks that may arise in the same industries where trade exposure is high reduces bias if the domestic and international trade shocks are correlated. Productivity improvements through labor-saving innovations have impacts on regional labor market outcomes regardless of whether the competitive pressures are of domestic or foreign origin.

The population and employment growth results show that both metropolitan and nonmetropolitan areas benefited from higher concentrations of industries with more rapid national employment growth in both time periods. Relative to common demand shocks, export-based shocks have somewhat different effects post-2000 for population growth in both metro and non-metro areas. The positive regional population effect of national employment growth is muted if that employment growth was in export sectors; in the 1990-2000 period export shocks

[12]We also considered the pre- and recession periods for the change in poverty rate. For metropolitan areas, export employment shocks were associated with differentially falling poverty rates both before and during the recession, but with rising poverty rates pre-recession and falling poverty rates during the recession for nonmetropolitan counties. Import shocks were associated with differentially rising metro poverty rates pre-recession, but not during the recession, while there was no clear import pattern for nonmetropolitan counties. We caution that both the 2007 and 2010 poverty rates data are from the U.S. Census Bureau's SAIPE program, which is prone to measurement error.

did not have a significantly different effect from average demand shocks. This finding is supportive of people increasingly avoiding more trade dependent regions in expectation of future employment reductions.

Import shocks also had different pre- and post-2000 effects on population growth, but with opposite patterns for metro and non-metro counties. For metro areas, import employment shocks had a significant negative impact post-2000, relative to common shocks (where import increases will enter as *negative* change). The 'negative' impact suggests that greater import dependence is more "harmful" to regional population growth relative to a common or average negative demand shock. Pre-2000 import shocks did not have different impacts from common shocks in metro areas. In contrast, in non-metro areas import dependence did not have differential effects relative to common shocks post-2000, though there is some evidence of an offsetting positive effect of import dependence (relative to the average or common negative shock) pre-2000. Omitting controls for domestic demand shocks causes an overstatement of the negative effects of imports on population growth during the 1990s, but not post-2000.

Export sector dependence as more detrimental to population growth than dependence on sectors facing import competition is consistent with expectations regarding potential job losses occasioned by productivity improvements in export dependent sectors playing a role in inter-regional migration. Significantly different trade effects were mostly absent for employment growth, except for imports in the post-2000 period in non-metro areas, where import increases had an offsetting effect to common negative demand shocks, contrary to expectations of negative effects of greater dependence on industries experiencing increased import competition.

Employment *rate* impacts of demand shocks reflect the extent to which responses are primarily from local labor market changes in participation rates and unemployment rates, rather than migration. Post-2000, increases in exports have a larger impact on the employment rate relative to a general increase in demand. This would be consistent with more of the new labor demand being met from the local labor pool, rather than from in-migration. Also post-2000, increases in imports have a greater negative effect on the employment rate than would a common or general negative demand shock in metro areas.

Assessment of trade impacts on poverty indicates that there was little differential effect of increased trade post-2000. This, perhaps, is not surprising in that the lowest-skilled may not be readily out-sourced, and corroborates findings of Autor and Dorn (2013). Interestingly, it is during the 1990s where increased exposure to exports and imports was associated with larger poverty responses in both metro and nonmetro areas in the expected directions. Median household income increased more post-2000 in areas with greater export dependence. Yet, there is no evidence of export-specific impacts on average wages beyond overall industry mix employment growth impacts in either period for either metro or non-metro areas. Thus, income effects may have been transmitted through higher employment rates in regions with high export exposure rather than through higher average wages. Import-specific impacts on wages are insignificant post-2000, though positive and significant in the 1990s, possibly related to skills upgrading and shifts to more productive activity.

In summary, regarding our main research question of whether export and import-specific employment demand shocks have differential effects than the average or common employment demand shocks, we conclude that there is some evidence that trade shocks, especially through export-based industries, have a trade-specific negative effect on population growth and that this is apparent primarily post-2000. Regional employment growth generally did not display trade-specific impacts; export demand shocks have a positive effect on employment rates post-2000 but the negative impact of import shocks evident in the 1990s is no longer present post-2000. Poverty, median income and wages exhibit little by way of trade-specific impacts relative to the general or common demand shocks post-2000.

Importantly, our results also reveal the relative sizes of the impacts of domestic and international demand shocks in terms of regional economic outcomes. Generally, trade impacts on employment and population are small relative to those generated by domestic demand shocks. Across both time periods, regional variations in population and employment growth were primarily the result of domestic demand shocks. Nevertheless, although small in magnitude by comparison, trade-specific impacts on regional economies are increasing with greater exposure to international trade, and sensitivity to trade shocks may increase especially if the population growth effects are driven by expectations formed on the basis of observed trade effects. To be sure, the negative population growth responses to exports suggest that households believe that trade exposure will significantly impact local economies.

Place-based policies to stimulate local labor demand or retrain adversely affected workers in the region may be needed when population is less responsive to trade shocks. However, despite much of the public perception that trade has large effects on economic outcomes, to date it is domestic shocks that have the largest impacts, which implies at least on a local level, it still matters more to the worker what is happening to sectors within the nation than to what is happening in Shanghai or Bangalore. National policies to retrain displaced workers for employment in expanding sectors may be in order rather than changes in international trade policy.

References

Autor, D.H. and Dorn D., 2013. "The Growth of Low Skill Service Jobs and the Polarization of the U.S. Labor Market," *American Economic Review* 103(5), 1553-1597.

Autor, D.H. Dorn D. and Hanson G.H. 2013. "The Geography of Trade and Technology Shocks in the United States," *American Economic Review.* 103, 1-8.

Autor, D.H. Dorn D. and Hanson G.H. forthcoming. "The China Syndrome: Local Labor Market Effects of Import Competition in the United States," *American Economic Review.*

Bartik, Timothy J., 1991. Who benefits from state and local economic development policies? Upjohn Institute, Kalamazoo, MI.

Bernard, Andrew B., J. Bradford Jensen, and Peter K. Schott, 2006. "Survival of the Best Fit: Exposure to Low-Wage Countries and the (Uneven) Growth of U.S. Manufacturing Plants," *Journal of International Economics* 68, 219-237.

Bernard, Andrew B., Stephen J. Redding, and Peter K. Schott. 2007. "Comparative Advantage and Heterogeneous Firms," *Review of Economic Studies, 74(1): 31–66.*

Bound J. and Holzer H.J., 2000. "Demand Shifts, Population Adjustments, and Labor Market Outcomes during the 1980s," *Journal of Labor Economics* 18(1), 20-54.

Chiquiar, Daniel, 2008. "Globalization, Regional Wage Differentials and the Stopler-Samuelson Theorem: Evidence from Mexico," *Journal of International Economics* 74, 70-93.

Combes, Pierre-Philippe, Thierry Magnac and Jean-Marc Robin, 2004. "The Dynamics of Local Employment in France," *Journal of Urban Economics* 56, 217-243.

Dauth, Wolfgang, Sebastian Fineisen and Jens Suedekum. Forthcoming. "The Rise of the East and the Far East: German Labor Markets and Trade Integration," *Journal of the European Economic Association*.

Dornbusch, R., S. Fischer, and P. Samuelson. 1977. "Comparative Advantage, Trade, and Payments in a Ricardian Model with a Continuum of Goods," *American Economic Review* 67: 823-839.

Eaton, J. and S. Kortum. 2002. "Technology, Geography, and Trade," *Econometrica. 70:* 1741-1779.

Edwards, Lawrence and Robert Z. Lawrence, 2010. "US Trade and Wages: The Misleading Implications of Conventional Trade Theory," NBER Working Papers 16106, National Bureau of Economic Research, Inc.

Egger, Harmut and Udo Kreickemeier, 2009. "Firm Heterogeneity and the Labor Market Effects of Trade Liberalization," *International Economic Review 50, 187-216*.

Kandilov, Ivan, 2009. "The Effects of Trade with Developing Countries on the Regional Demand for Skill in the U.S.: Evidence from County Data," *Journal of Regional Science* 49(3), 459-482.

Lawrence, Robert Z., 2008. *Blue-Collar Blues: Is Trade to Blame for Rising US Income Inequality?,"* Peterson Institute Press: All Books, Peterson Institute for International Economics, number pa85.

Leichenko, Robin and Julie Silva, 2004. "International Trade, Employment Earnings: Evidence from U.S. Rural Counties," *Regional Studies* 38(4), 355-374.

McGranahan, David A., 1999. Natural amenities drive rural population change. Economic Research Service, U.S. Department of Agriculture, Washington, DC, AER 781.

McLaren, John and Shushanik Hakobyan. 2010. "Looking for the Labor Market Effects of NAFTA," NBER Working Paper 16535.

Michaels, Guy, 2007. "The Effect of Demand for Skill: Evidence from the Interstate Highway System," *The Review of Economics and Statistics* 90(4), 683-701.

Molloy, Raven, Christopher L. Smith and Abigail Wozniak. 2013. "Declining migration within the US: the role of the labor market," Federal Reserve Board Finance and Economics Discussion Series: 2013-27.

Neumann, George R. and Robert H. Topel. 1991. "Employment Risk, Diversification, and Unemployment," *Quarterly Journal of Economics*, 1991, *106*(4), pp. 1341-65.

Partridge, Mark D., Dan S. Rickman, Kamar Ali and M. Rose Olfert. 2008a. "Lost in Space: Population Dynamics in the American Hinterlands and Small Cities," *Journal of Economic Geography* 8, 727-757.

Partridge, Mark D., Dan S. Rickman, and Kamar Ali, 2008b. "Recent immigration and economic outcomes in Rural America," *American Journal of Agricultural Economics* 90(5), 1326-1333.

_____, 2009a. "Recent immigration: the diversity of economic outcomes in metropolitan America," *Cityscape* 11(3), 29-57.

Partridge, Mark D., Dan S. Rickman, Kamar Ali and M. Rose Olfert. 2009b. "Agglomeration Spillovers and Wage and Housing Cost Gradients across the Urban Hierarchy," *Journal of International Economics* 78, 126-140.

Partridge, M.D., D.S. Rickman, M.R. Olfert and K. Ali, 2012. "Dwindling U.S. Internal Migration: Evidence of Spatial Equilibrium or a Structural Shift in Local Labor Markets," *Regional Science and Urban Economics* 42 (1-2), 375-388.

Partridge, Mark D., Dan S. Rickman, M. Rose Olfert and Ying Tan, forthcoming. "When Spatial Equilibrium Fails: Is Place-Based Policy Second Best?" *Regional Studies*.

Quigley, John M., 2002. "Rural Policy and the New Regional Economics: Implications for Rural America," in *The New Power of Regions: A Policy Focus for Rural America*, Federal Reserve Bank of Kansas City: Kansas City, MO.

Topalova, Petia. 2010. "Factor Immobility and Regional Impacts of Trade Liberalization: Evidence on Poverty from India," *American Economic Journal: Applied Economics.* 2: 1-41.

Table 1:Descriptive Statistics

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
Metropolitan Areas					
Industry mix emp. growth 1990-2000	1053	0.168	0.054	-0.209	0.355
Industry mix emp. growth 2000-2007	1053	0.073	0.037	-0.123	0.2
Industry mix emp. growth 2007-2010	1053	-0.04	0.019	-0.144	0.047
Industry mix emp. growth 2000-2010	1053	0.031	0.05	-0.226	0.258
Domestic Indmix empgrw 1990-2000	1053	0.179	0.049	-0.209	0.364
Domestic Indmix empgrw 2000-2007	1053	0.076	0.036	-0.129	0.2
Domestic Indmix empgrw 2007-2010	1053	-0.045	0.021	-0.165	0.039
Domestic Indmix empgrw 2000-2010	1053	0.028	0.05	-0.267	0.256
Total employment growth 1990-2000	1053	0.289	0.366	-0.185	7.672
Total employment growth 2000-2007	1053	0.125	0.16	-0.353	1.358
Total employment growth 2007-2010	1053	-0.028	0.052	-0.196	0.272
Total employment growth 2000-2010	1053	0.096	0.183	-0.382	1.678
Export impact1990-2000	1053	0.008	0.005	-0.005	0.048
Export impact 2000-2007	1053	0.001	0.002	-0.016	0.029
Export impact 2007-2010	1053	0.003	0.004	-0.007	0.051
Export impact 2000-2010	1053	0.004	0.006	-0.02	0.073
Import impact1990-2000	1053	0.019	0.012	0.0004	0.074
Import impact 2000-2007	1053	0.003	0.005	-0.012	0.052
Import impact 2007-2010	1053	-0.002	0.003	-0.035	0.005
Import impact 2000-2010	1053	0.001	0.006	-0.037	0.05
Median HH. income chg. 1990-2000	1053	0.47	0.114	0.198	1.122
Median HH. Income chg. 2000-2010	1053	0.198	0.092	-0.143	0.533
Less than high school chg. 1990-2000	1053	-6.968	3.309	-19.262	4.613
Less than high school chg. 2000-2010	1053	-5.066	2.37	-15.2	1.7
High school chg. 1990-2000	1053	-0.589	2.867	-10.49	9.428
High school chg. 2000-2010	1053	0.326	2.346	-8.6	14.4
Some college chg. 1990-2000	1053	3.748	2.382	-4.551	11.426
Some college chg. 2000-2010	1053	1.61	2.214	-5.9	10.3
College and above chg. 1990-2000	1053	3.807	2.261	-2.752	19.029
College and above chg. 2000-2010	1053	3.135	1.945	-9.1	13.4
Employment population ratio 1990	1053	0.468	0.059	0.122	0.76
Employment population ratio 2000	1053	0.485	0.056	0.154	0.676
Employment population ratio 2007	1053	0.477	0.056	0.129	0.678
Employment population ratio 2010	1053	0.448	0.053	0.149	0.61
Poverty rate 1990[a]	1053	13.268	6.261	2.18	56.84
Poverty rate 2000[a]	1053	11.554	5.193	2.117	35.871
Poverty rate 2000[b]	1053	10.882	4.436	1.7	31.7
Poverty rate 2007[b]	1053	12.708	4.943	2.4	34.5
Poverty rate 2010[b]	1053	14.712	5.194	3.5	35.8
Population growth rate 1990-2000	1053	0.181	0.18	-0.123	1.921
Population growth rate 2000-2007	1053	0.09	0.116	-0.649	0.825
Population growth rate 2007-2010	1053	0.026	0.037	-0.094	0.559
Population growth rate 2000-2010	1053	0.121	0.149	-0.453	1.12

Notes: [a]Poverty rate data from the Census of population; [b]Poverty rate data from US Census Bureau SAIPE.

Table 1:Descriptive statistics (continued)

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
Non-Metropolitan Areas					
Industry mix emp. growth 1990-2000	1971	0.13	0.047	-0.085	0.351
Industry mix emp. growth 2000-2007	1971	0.05	0.043	-0.16	0.269
Industry mix emp. growth 2007-2010	1971	-0.036	0.024	-0.146	0.093
Industry mix emp. growth 2000-2010	1971	0.015	0.058	-0.243	0.336
Domestic Indmix empgrw 1990-2000	1971	0.145	0.042	-0.126	0.356
Domestic Indmix empgrw 2000-2007	1971	0.053	0.04	-0.103	0.269
Domestic Indmix empgrw 2007-2010	1971	-0.044	0.026	-0.16	0.087
Domestic Indmix empgrw 2000-2010	1971	0.008	0.057	-0.202	0.335
Total employment growth 1990-2000	1971	0.165	0.175	-0.394	1.312
Total employment growth 2000-2007	1971	0.033	0.12	-0.283	0.963
Total employment growth 2007-2010	1971	-0.014	0.082	-0.328	0.754
Total employment growth 2000-2010	1971	0.019	0.143	-0.382	1.113
Export impact1990-2000	1971	0.009	0.01	-0.01	0.283
Export impact 2000-2007	1971	0.002	0.003	-0.01	0.046
Export impact 2007-2010	1971	0.007	0.006	-0.003	0.082
Export impact 2000-2010	1971	0.01	0.008	-0.01	0.117
Import impact1990-2000	1971	0.025	0.013	0.0005	0.08
Import impact 2000-2007	1971	0.005	0.006	-0.015	0.054
Import impact 2007-2010	1971	-0.002	0.004	-0.038	0.01
Import impact 2000-2010	1971	0.003	0.007	-0.034	0.055
Median HH. income chg. 1990-2000	1971	0.504	0.123	0.05	1.117
Median HH. Income chg. 2000-2010	1971	0.24	0.113	-0.054	0.957
Less than high school chg. 1990-2000	1971	-8.254	3.396	-18.933	8.439
Less than high school chg. 2000-2010	1971	-6.063	3.049	-20.5	7.5
High school chg. 1990-2000	1971	0.976	3.405	-10.811	14.398
High school chg. 2000-2010	1971	1.304	3.276	-9.8	18.6
Some college chg. 1990-2000	1971	4.713	2.394	-10.023	22.311
Some college chg. 2000-2010	1971	2.603	2.768	-12.8	15.3
College and above chg. 1990-2000	1971	2.57	1.934	-7.305	15.801
College and above chg. 2000-2010	1971	2.152	2.253	-7.4	16.6
Employment population ratio 1990	1971	0.432	0.058	0.195	0.844
Employment population ratio 2000	1971	0.455	0.063	0.19	0.808
Employment population ratio 2007	1971	0.46	0.074	0.191	0.836
Employment population ratio 2010	1971	0.443	0.079	0.183	0.837
Poverty rate 1990[a]	1971	18.531	7.998	2.402	63.118
Poverty rate 2000[a]	1971	15.5	6.616	2.925	52.319
Poverty rate 2000[b]	1971	14.608	5.643	2.7	42.2
Poverty rate 2007[b]	1971	16.402	6.345	3.1	49.3
Poverty rate 2010[b]	1971	17.917	6.358	3.2	49.1
Population growth rate 1990-2000	1971	0.074	0.134	-0.272	0.882
Population growth rate 2000-2007	1971	0.01	0.08	-0.313	0.79
Population growth rate 2007-2010	1971	0.006	0.028	-0.175	0.264
Population growth rate 2000-2010	1971	0.017	0.1	-0.38	0.898

Notes: [a]Poverty rate data from the Census of population; [b]Poverty rate data from US Census Bureau SAIPE.

Table 2: Demand Shock Impacts on Population Growth, Employment Growth and Employment/population Ratio, Metro and Non-Metro, 1990-2000 and 2000-2010

	Metro				**Non-metro**			
	1990-2000		**2000-2010**		**1990-2000**		**2000-2010**	
Panel A:Population model								
Model 1								
Industry mix emp.	1.03***	(8.09)	0.18*	(1.67)	0.75***	(8.62)	0.18***	(3.16)
Model 2								
Industry mix emp.	1.05***	(8.41)	0.24**	(2.44)	0.83***	(8.08)	0.17***	(3.33)
Export impact	-1.32	(-1.35)	-3.97***	(-3.75)	-0.18	(-0.93)	-1.77***	(-6.32)
Import impact	0.42	(0.52)	-1.91***	(-2.59)	0.69*	(1.96)	-0.35	(-1.16)
Panel B:Total emp. growth model								
Model 1								
Industry mix emp.	2.14***	(7.76)	1.61***	(10.38)	1.38***	(12.68)	0.94***	(14.81)
Model 2								
Industry mix emp.	2.07***	(6.68)	1.62***	(10.52)	1.46***	(10.76)	0.96***	(14.03)
Export impact	-0.61	(-0.37)	-1.04	(-1.17)	0.21	(0.72)	0.7	(1.02)
Import impact	-0.73	(-0.59)	-1.11	(-1.54)	0.67	(1.37)	1.12**	(2.54)
Panel C:Total emp. model								
Model 1								
Domestic industry mix emp.	2.22***	(7.41)	1.6***	(9.54)	1.41***	(10.15)	0.93***	(13.72)
Model 2								
Domestic industry mix emp.	2.07***	(6.68)	1.62***	(10.51)	1.46***	(10.76)	0.96***	(14.03)
Export impact	1.46	(0.89)	0.59	(0.67)	1.67***	(5.63)	1.66**	(2.42)
Import impact	-2.79**	(-2.52)	-2.74***	(-4.03)	-0.81**	(-1.94)	0.15	(0.36)
Panel D:Emp./pop. model								
Model 1								
Industry mix emp.	-0.03	(-1.09)	0.22***	(6.11)	0.03	(1.14)	0.42***	(13.6)
Model 2								
Industry mix emp.	-0.06*	(-1.85)	0.21***	(6.13)	-0.001	(-0.02)	0.43***	(13.44)
Export impact	0.25	(0.95)	0.57**	(2.11)	0.127*	(1.71)	0.97***	(3.62)
Import impact	-0.35**	(-2.48)	-0.56**	(-2.04)	-0.29***	(-2.73)	0.34	(1.59)

Notes: Robust t-statistics from the STATA cluster command are in parentheses.*, **, and *** indicates significance at 10%, 5%, and 1% level, respectively. In all models, control variables include: distance to nearest or actual Urban Center; incremental distance to a MA; incremental distances to MA> 250,000, > 500,000, and > 1,500,000 population; county population 1990/2000; population of nearest or actual MA 1990/2000; county area (sq. miles); amenity dummy variable represented by a 1 to 7 scale (USDA);proximity (within 50kms) to the Atlantic Ocean, Pacific Ocean, and the Great Lakes; state fixed effects; demographic variables including five ethnicity shares; four education shares; %females; % married; and % with a work disability.

Table 3: Demand Shock Impacts on Poverty, Income, and Wages, Metro and Non-Metro, 1990-2000 and 2000-2010

	Metro				Non-metro			
	1990-2000		2000-2010		1990-2000		2000-2010	
Panel A:Poverty model								
Model 1								
Industry mix emp.	-3.75**	(-2.24)	-7.58***	(-4.67)	-6.65***	(-3.69)	-6.88***	(-5.53)
Model 2								
Industry mix emp.	-1.98	(-1.13)	-6.74***	(-4.08)	-3.61	(-1.56)	-6.63***	(-5.68)
Export impact	-26.1*	(-1.71)	-38.13***	(-2.82)	-17.38*	(-1.72)	-7.84	(-0.98)
Import impact	22.26**	(2.42)	5.34	(0.48)	26.89***	(3.21)	11.36	(1.18)
Panel B:Median HH income model								
Model 1								
Industry mix emp.	0.35***	(4.27)	0.4***	(5.57)	0.39***	(6.17)	0.61***	(8.87)
Model 2								
Industry mix emp.	0.33***	(4.15)	0.37***	(5.16)	0.45***	(5.52)	0.6***	(8.67)
Export impact	-0.51	(-0.78)	1.49***	(2.82)	0.19	(0.73)	0.98**	(2.28)
Import impact	-0.11	(-0.22)	-0.17	(-0.33)	0.48	(1.59)	-0.16	(-0.49)
Panel C:Average wage model								
Model 1								
industry mix emp.	0.12	(1.12)	0.67***	(4.85)	-0.02	(-0.32)	0.76***	(8.43)
Model 2								
industry mix emp.	0.26**	(2.05)	0.7***	(5.03)	0.09	(1.05)	0.78***	(8.62)
Export impact	0.28	(0.26)	-0.22	(-0.16)	0.18	(0.76)	0.38	(0.83)
Import impact	1.47*	(1.79)	1.29	(1.61)	0.9**	(2.41)	0.8	(1.59)

Notes: For the 1990-2000period, poverty data are from the 1990 and 2000 decennial census; for 2000-2010, they are from SAIPE. Robust t-statistics from STATA cluster command are in parentheses.*, **, and *** indicates significance at 10%, 5%, and 1% level, respectively. In all models, control variables include: distance to nearest or actual Urban Center; incremental distance to a MA; incremental distances to MA> 250,000, > 500,000, and > 1,500,000 population; county population 1990/2000; population of nearest or actual MA 1990/2000; county area (sq. miles); amenity dummy variable represented by a 1 to 7 scale (USDA);proximity (within 50kms) to the Atlantic Ocean, Pacific Ocean, and the Great Lakes; state fixed effects; demographic variables including five ethnicity shares; four education shares; %females; % married; and % with a work disability; wage mix growth for the corresponding period are included as a control variable for both the median hh income, and wage models; log value of median hh income at the initial of the period, and log value of wage level at the initial of the period are included in the median hh income, and wage models as a control variable, respectively.

Table 4: Gross Trade Demand Shock Impacts on Population Growth, Employment and Employment/population Ratio, Metro and Non-Metro, 1990-2000 and 2000-2010

	Metro				Non-metro			
	1990-2000		2000-2010		1990-2000		2000-2010	
Panel A: Population model								
Export impact	-0.17	(-0.18)	-3.59***	(-3.54)	0.11	(0.71)	-1.76**	(-6.11)
Import impact	-1.78**	(-2.32)	-2.1***	(-2.64)	-0.87***	(-2.91)	-0.61**	(-1.96)
Panel B: Total emp. growth model								
Export impact	1.66	(0.98)	-1.38	(1.36)	0.73**	(2.45)	1.01	(1.35)
Import impact	-5.1***	(-4.79)	-2.03*	(-1.83)	-2.09***	(-4.97)	-0.33	(-0.53)
Panel C: Emp./pop. model								
Export impact	0.18	(0.69)	0.83***	(2.86)	0.13*	(1.69)	1.05***	(3.92)
Import impact	-0.22*	(-1.68)	-0.7**	(-2.04)	-0.29***	(-3.36)	-0.24	(-0.94)
Panel D: Poverty model								
Export impact	-28.27*	(1.83)	-50.1***	(-3.49)	-18.66*	(-1.76)	-9.9	(-1.18)
Import impact	26.45**	(3.06)	11.7	(1.26)	33.7***	(5.33)	21.1*	(1.95)
Panel E: Median HH income model								
Export impact	-0.16	(-0.24)	2.02***	(3.79)	0.33	(1.11)	1.3**	(2.39)
Import impact	-0.82*	(-1.71)	-0.37	(-0.81)	-0.36	(-1.49)	-0.93**	(-2.82)

Notes: For the 1990-2000period, poverty data are from the 1990 and 2000 decennial census; for 2000-2010, they are from SAIPE. Robust t-statistics from the STATA cluster command are in parentheses.*, **, and *** indicates significance at 10%, 5%, and 1% level, respectively. In all models, control variables include: distance to nearest or actual Urban Center; incremental distance to a MA; incremental distances to MA> 250,000, > 500,000, and > 1,500,000 population; county population 1990/2000; population of nearest or actual MA 1990/2000; county area (sq. miles); amenity dummy variable represented by a 1 to 7 scale (USDA); proximity (within 50kms) to the Atlantic Ocean, Pacific Ocean, and the Great Lakes; state fixed effects; demographic variables including five ethnicity shares; four education shares; %females; % married; and % with a work disability; wage mix growth for the corresponding period, and log value of the wage level at the initial of the period are included as a control variables in the median hh income model.

Table 5: Trade and Common Demand Shock Impacts on Population Growth, Employment Growth and Employment/population Ratio, Metro and Non-Metro, 2000-2007 and 2007-2010

	Metro				Non-metro			
	2000-2007		2007-2010		2000-2007		2007-2010	
Panel A: Population model								
Model 1								
Industry mix emp.	0.65***	(5.77)	-0.25***	(-3.22)	0.36***	(6.22)	-0.006	(-0.16)
Model 2								
Industry mix emp.	0.68***	(5.09)	-0.26**	(-2.18)	0.41***	(6.66)	0.006	(0.13)
Export impact	-5.73***	(-3.68)	-1.32**	(-2.05)	-2.7***	(-5.03)	-0.78***	(-3.62)
Import impact	-0.46	(-0.61)	1.07**	(2.04)	0.75**	(2.41)	0.28	(1.48)
Panel B: Total emp. growth model								
Model 1								
Industry mix emp.	1.99***	(12.66)	0.92***	(6.88)	1.21***	(17.93)	1.32***	(14.48)
Model 2								
Industry mix emp.	2.08***	(10.53)	0.72***	(5.29)	1.23***	(15.57)	1.01***	(10.24)
Export impact	-3.59**	(-2.21)	0.94	(1.49)	-2.26***	(-2.76)	2.35**	(2.59)
Import impact	0.93	(1.02)	1.32	(1.42)	0.12	(0.32)	1.81***	(2.82)
Panel C: Total emp. growth model								
Model 1								
Domestic mix emp.	2.12***	(11.07)	0.86***	(6.53)	1.29***	(17.18)	1.13***	(13.45)
Model 2								
Domestic mix emp.	2.08***	(10.46)	0.72***	(5.26)	1.23***	(15.63)	1.01***	(10.22)
Export impact	-1.5	(-0.92)	1.65***	(2.63)	-1.03	(-1.27)	3.36***	(3.67)
Import impact	-1.15	(-1.46)	0.6	(0.61)	-1.11***	(-3.07)	0.8	(1.17)
Panel D: Emp./pop. model								
Model 1								
Industry mix emp.	0.146***	(3.57)	0.22***	(3.27)	0.39***	(8.78)	0.5***	(10.29)
Model 2								
Industry mix emp.	0.11***	(2.88)	0.26***	(3.11)	0.35***	(6.42)	0.38***	(7.19)
Export impact	0.51	(1.08)	0.2	(0.81)	0.78*	(1.77)	0.47	(1.55)
Import impact	-0.64	(-1.64)	-0.55	(-1.57)	-0.58**	(-2.36)	0.87***	(3.47)

Notes: Robust t-statistics from the STATA cluster command are in parentheses.*, **, and *** indicates significance at 10%, 5%, and 1% level, respectively. In all models, control variables include: distance to nearest or actual Urban Center; incremental distance to a MA; incremental distances to MA> 250,000, > 500,000, and > 1,500,000 population; county population 2000; population of nearest or actual MA 2000; county area (sq. miles); amenity dummy variable represented by a 1 to 7 scale (USDA);proximity (within 50kms) to the Atlantic Ocean, Pacific Ocean, and the Great Lakes; state fixed effects; demographic variables including five ethnicity shares ; four education shares; %females; % married; and % with a work disability