

# A RISING TIDE? THE LOCAL INCIDENCE OF THE SECOND WAVE OF GLOBALIZATION\*

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## Abstract

We estimate the short- and long-run local labor market impacts of the large increase in U.S. imports and exports that occurred over the 1970s. We exploit the sequential opening of overseas shipping container ports over the period, which generated export and import shocks that were largely non-overlapping across U.S. labor markets thereby providing substantial variation to distinguish their effects. We find that the average net impact on the employment-to-population ratio was positive and concentrated in the initial decade, with little longer-run impact. At the same time, in-migration due to the export shock greatly exceeded out-migration due to the import shock. We show that these different migration responses were largely due to asymmetry in the housing supply curve. The largest gains accrued to residents of labor markets that simultaneously experienced a relatively large export shock, had a relatively low housing supply elasticity, and had a relatively high home-ownership rate.

**Key Words:** Containerization; International Trade; Housing

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# 1 Introduction

An important topic in current policy debates is the effect that international trade has on standards of living. We provide new evidence on the short- and long-run effects of trade by exploiting discontinuous shifts in U.S. trade flows arising from innovations in shipping technologies in the 1970s. These shifts exposed some U.S. labor markets to new export opportunities while others faced greater import competition, with a high degree of non-overlapping exposure to each of these shocks. We find that the average net impact of the shocks on the employment-to-population ratio was positive and concentrated in the initial decade, with little longer-run impact. Since in equilibrium changes in the employment rate are approximately proportional to changes in real income (Amior and Manning (2018), Galle et al. (2017)) the net impact of the trade shock implies an overall rise in welfare. At the same time, we find that in-migration due to the export shock greatly exceeded out-migration due to the import shock. We show that these different migration responses were driven by asymmetry in the housing supply curve, consistent with the findings of Glaeser and Gyourko (2005) and Notowidigdo (2020). This finding has important implications for the allocation of the incidence of labor market exposure to export versus import shocks.

Our research design exploits the fact that the decade of the 1970s witnessed a doubling in the share of international trade in U.S. GDP, from four to eight percent, beginning what would become known as the second wave of globalization (see Figure 2). This rapid growth in trade was driven in large part by the widespread adoption of shipping containers to transport goods and the complementary investments in port and rail technologies that accompanied it.<sup>1</sup> The spread of these technologies was rapid and generated growth in trade that was roughly balanced between imports and exports nationally but was largely non-overlapping across U.S. commuting zones, providing a unique natural experiment to explore both positive and negative labor demand shifts arising from a common trade shock.<sup>2</sup>

Since foreign adoption of container port technologies occurred quickly and was effectively complete by 1980, the sequence of port technology adoption around the world provides a well-defined, short-run historical shock that is well suited to an impulse-response research design. To do this, we exploit two features of this historical episode: first, the adoption of container port technologies in a foreign country generated a sudden and discontinuous rise in bilateral trade flows between the U.S. and that country (see Figures 3a and 3b); and second, the variation in trade flows due to the new port technologies differentially affected local labor markets in the U.S. due to differences in their pre-period industrial composition. In practice, we use this variation to construct measures of foreign-port-driven exposure to import and export shocks, a plausibly exogenous source of variation

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<sup>1</sup>See, e.g., Bernhofen et al. (2016) who estimate the contribution of containerization of trade flows to global trade growth over this period. The late 1960s and early 1970s also saw the phase in of the Kennedy Round of negotiations as part of the General Agreement on Trade and Tariffs (GATT). So policy changes undoubtedly generated some portion of this trade growth.

<sup>2</sup>Over the period 1966 to 1980, U.S. imports rose by a factor of 10 and exports by a factor of 8; for comparison, over the 1991 to 2007 period imports from China rose by a factor of 11.5 (see Autor et al. (2013)).

in trade flows that we can then use as instruments for observed local labor market exposure to trade.<sup>3</sup>

We estimate the contemporaneous (1970-1980), medium-run (1970-1990), and long-run (1970-2000) impact of export and import exposure on the employment to working-age population ratio (employment rate), median income and median home and rental prices across labor markets. First, we estimate that the export shock raised the employment rate by 1.83 percentage points over the decade of the 1970s, whereas the import shock reduced it by 1.24 percentage points, effects that were entirely concentrated in the manufacturing sector and possibly offset to an extent by small non-manufacturing gains in the longer term.

At the same time, we find substantial in-migration in response to increased export exposure, but very limited out-migration in response to increased import exposure. We provide evidence that this migration asymmetry is largely driven by an asymmetry in the housing supply curve. Specifically, home-building rose due to the export shock but declined very little due to the import shock, even in the longer run, a pattern that is consistent with a model in which there are significant costs associated with reducing the housing stock, a point that is the focus of Glaeser and Gyourko (2005). In that model, the housing supply curve exhibits a kink at the current level of supply (see Figure 1). Since the housing stock cannot easily contract, except via slow depreciation, a negative labor demand shock leads to a decline in rental prices that is sufficient to offset the decline in income, but leads to little reduction in the housing stock and little out-migration (Figure 1). More recently, Notowidigdo (2020) explores this idea in a more complex setting, showing that this asymmetry in the migration response could arise due to the costs of migrating, even if the housing supply curve was symmetric. However, neither his, nor our, findings are consistent with this model.

As a more direct proxy for welfare changes we estimate the impact on median income and housing rents.<sup>4</sup> We find a modest net rise in median income due to the export and import shocks equal to \$2,692 (in 2012 \$) on average over two decades. We also find nearly symmetric effects of the export and import shocks on median rental prices. Together, the income and rental price estimates imply modest welfare gains that are of similar magnitude to those implied by the change in the employment rate.

The finding of a highly inelastic portion of the housing supply curve further implies that the incidence of import competition was, on average, borne by property owners (land) relative to workers (labor), which brings the extent of local property ownership to the fore when thinking about the policy implications of import competition. In particular, for workers who were also property owners, rental price declines compounded income losses, while for renters they compensated for lost income. Given the wide variation in home ownership rates across U.S. labor markets (Figure 7) the relatively large, negative impact on property owners also produced

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<sup>3</sup>As a robustness check, we generate the shift-share measure using a “double-lasso” approach (Belloni et al. (2012)), a method to select the best predictors of the dependent variable without over-fitting. This approach produces very similar results using a different source of underlying variation, supporting the robustness of our shift-share instruments (see Borusyak et al. (2018), Goldsmith-Pinkham et al. (2018), and Adao et al. (2019b)).

<sup>4</sup>As is common in the literature, we use rents as a proxy for the user cost of home ownership when considering welfare consequences.

large *regional* variation in welfare losses due to import competition.

In contrast, the gains from the export shock accrued to property owners relative to renters. But in this case the gains were mediated by differential local housing supply elasticities above the current level of supply (Figure 1). We proxy local housing supply elasticities with highly disaggregated differences in land unavailability from Lutz and Sand (2017) and, intuitively, find that locations with a larger housing supply elasticity see smaller adjustments in home and rental prices due to the export shock.<sup>5</sup> We calculate that the average housing and rental supply elasticities due to the export shock are around 1.3 and 1.8, respectively. Consistent with a kinked housing supply curve, we confirm that the size of the local housing supply elasticity has almost no impact on the home and rental price response to the import shock.

In a final section we discuss the implications of our findings. We show that the largest predicted relative gains accrued to residents of labor markets that simultaneously experienced a relatively large export shock, had a relatively low housing supply elasticity, and had a relatively high home-ownership rate – Charlotte, Houston, Los Angeles, and Atlanta are examples from the top ten. As a result of these features, housing markets in these areas saw large increases in property prices that benefited a large share of residents. In contrast, the largest predicted losses accrued to residents of markets that simultaneously experienced significant import shocks and had high home-ownership rates – areas like Cleveland, Detroit, Toledo, and Pittsburgh.

The local labor market effects of international trade have been explored in many recent papers, for instance Topalova (2010), Acemoglu et al. (2016), Autor et al. (2013), and Hakobyan and McLaren (2016). These papers tend to focus exclusively on the effects of import competition, driven either by foreign shocks or changes in trade policy. Kovak (2013) is similar and focuses on a trade liberalization period, though does not separate import from export effects. Feenstra et al. (2019) and Feenstra and Sasahara (2018) are examples of work that incorporate both export and import exposure due to Chinese and global economic growth, with both papers focusing on employment outcomes in the short run. Also similar to our paper, Monte (2015) focuses on the impact of trade shocks on standards of living across local labor markets. He also finds rapid equilibration across markets, finding that there is little relationship between local import exposure and the real wage due to the fact that changes in local prices and commuting patterns offset changes in nominal income. Adao et al. (2019a) estimate the aggregate (direct and indirect) effects of labor market exposure to a different set of shocks. More recently, Autor et al. (2021) explore the long-run persistence of the China shock, finding significant and sustained declines in the employment-population ratio over nearly two decades. Other recent work has explored the role of new port technologies during this era. For instance, Bernhofen et al. (2016) estimate the contribution of new port technologies to the rise in global trade over the containerization period, while Ducruet et al. (2020) and Brooks et al. (2018) consider port development as a shock to the local economy that is hosting the port.

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<sup>5</sup>Recent related work that exploits heterogeneity in housing supply elasticities includes Hornbeck and Moretti (2018), Monte et al. (2018), and Monte (2015).

With respect to the housing market, Notowidigdo (2020) finds evidence for a concave housing supply function in the face of local labor demand shocks. Our context allows for a direct test of the shape of the housing supply function around the current level of supply due to the fact that we simultaneously observe both positive (export) and negative (import) demand shocks as well as local housing supply.

The paper is organized as follows. We outline our conceptual framework in Section 2. In Section 3 we describe our research design, including the dataset and identification strategy. In Section 4 we report our estimates of the effects of import and export exposure on local labor markets, including heterogeneity in these effects due to differential housing supply elasticities and robustness tests. Section 5 concludes.

## 2 Conceptual Framework

Here we describe the intuition of a standard Rosen-Roback model with two notable features: first, an elastic labor supply function and, second, a kinked housing supply curve as in Glaeser and Gyourko (2005). We focus narrowly on the impact of a labor demand shock on changes in the employment rate.

For a given labor market, when labor supply is perfectly inelastic a labor demand shock cannot alter employment and is entirely absorbed by a change in income. To get variation in the employment rate therefore requires elasticity in the labor supply curve. Amior and Manning (2018) show that an elastic labor supply curve in the standard model leads to a tradeoff between the response of real income and the response of the employment rate to a labor demand shock. Specifically, when the labor supply elasticity is high (low) the employment rate response to the shock will be large (small) relative to the real income response. Stated differently, the change in the employment rate due to a labor demand shock is approximately proportional to the change in welfare, where the proportionality is mediated by the labor supply elasticity. This margin of adjustment represents the partial equilibrium effect, in which incumbent workers shift into and out of employment in response to the labor demand shock.

In the general equilibrium individuals will also move across markets in response to a labor demand shock. Consider two outcomes, one in which the net (export minus import) effect on income in a market is positive and the other in which it is negative. Figure 1 depicts these cases, showing that equivalently-sized increases or decreases in income ( $\Delta w^+$ ,  $\Delta w^-$ ) must be perfectly offset by equivalent changes in rental prices ( $\Delta p^+$ ,  $\Delta p^-$ ) in order to maintain constant real income across markets. A positive shock thus leads workers to migrate in from surrounding labor markets.<sup>6</sup> This increases the local demand for housing leading to new home construction ( $Q_0$  to  $Q_E$ ) that mitigates the upward pressure on rental prices (where  $Q_E$  ensures that  $\Delta w^+ = \Delta p^+$ ). In contrast, a trade shock that is balanced toward the import effect will reduce the demand for labor, leading to

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<sup>6</sup>Although it is well established that workers with relatively little education are less geographically mobile than more educated workers, in this paper we are focused on median outcomes and set aside distributional impacts.

a net decline in the demand for housing and worker out-migration. However, in this case, the housing supply falls only by the slow rate of depreciation of the housing stock in future periods ( $Q_0$  to  $Q_I^j$  in period  $j$ ) such that minimal out-migration is required to reduce rents enough to offset the initial decline in income (so that  $\Delta w^- = \Delta p^-$ ). Thus, the kinked housing supply curve leads to an asymmetry in the migration response to export versus import shocks.<sup>7</sup> In the empirical section we test both directly and indirectly for evidence of a kinked supply curve.

We highlight two implications of the kinked supply curve and its impact on migration for our context. First, migration across markets may alter employment rates, and hence welfare. When in-migrants are more likely to work and out-migrants are less likely to work relative to the incumbent populations, then migration raises the employment rate in an area. Whether this is true is difficult to answer without detailed longitudinal workforce data and we leave that for future work. Perhaps unsurprisingly, there is an overall positive correlation across labor markets between the working-age population and employment rates, which is supportive of this pattern, though it is far from definitive. We note that to the extent that migration raises employment rates both in the destination and origin markets (as unemployed leave to seek employment elsewhere), this implies that the constraints on out-migration caused by an inelastic housing supply curve exacerbate the welfare losses due to negative shocks.

The second implication is that the incidence of import competition is, on average, borne by property owners (land) relative to workers (labor), as we note in the Introduction. Given the wide variation in home ownership rates across U.S. labor markets (Figure 7) the relatively large, negative impact on property owners will also lead to large *regional* variation in welfare losses due to import competition. In contrast, the gains from export shocks accrue to property owners relative to renters, though the gains will be mediated by differential local housing supply elasticities above the current level of supply (Figure 1). We explore this empirically in Sections 4.8 and 4.9.

### 3 Research Design

We explore the impact of the rapid expansion in U.S. trade beginning in the late 1960s on the ratio of employment to working-age population (employment rate), home prices and rental prices, and nominal income. To do this,

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<sup>7</sup>Notowidigdo (2020) introduces a cost associated with out-migration (but not in-migration) to the model and shows that this could lead to an identical, asymmetric migration response to a positive versus negative labor demand shock, even with a symmetric housing supply curve. (The reason there is no cost of in-migration is that it is assumed that there are infinite regions with marginal workers available to migrate in to a region that experiences a positive labor demand shock. In other words, it is a small economy model.) However, in that case the model also implies an asymmetry in the rental price response. In short, the migration cost creates a wedge between the decline in income due to the import shock and the decline in rental prices that is required to compensate for it. The addition of a migration cost to the model means there are now two channels through which labor demand shocks impact housing markets: via a kinked supply curve and via a migration cost. Both of these channels lead to asymmetry in the migration response, however only the migration cost channel implies asymmetry in the rental price response. Since both Notowidigdo (2020) and our paper find nearly symmetric rental price responses to local labor demand shocks, we rule out a role for migration costs as a mechanism and focus solely on asymmetry in the housing supply curve.

we estimate three separate specifications capturing the local projection of the shock on outcomes across 722 U.S. Commuting Zones (labor markets),  $l$ , over the short, medium and long run.<sup>8</sup> These impulse-response specifications are given by the following:

$$Y_{lt} - Y_{l,1970} = \beta_t^x \Delta E_{l,66-80}^X + \beta_t^m \Delta E_{l,66-80}^M + \gamma_t MS_{l,1959} + \omega_t (y_{l,1970} - y_{l,1960}) + \alpha_s + \varepsilon_{lt} \quad (1)$$

where  $Y_{lt}$  is a local outcome and  $\{\beta_t^x, \beta_t^m\}$  are the effects of export and import exposure, respectively, for  $t \in \{1980, 1990, 2000\}$ . The variables  $\Delta E^X$  and  $\Delta E^M$  represent the change in export and import exposure in a labor market over the containerization period, 1966 to 1980;  $\alpha_s$  are state fixed effects to control for state-specific policy variation; and  $(y_{l,1970} - y_{l,1960})$  are pre-period decadal changes in the outcome variables. We also control for the output share of manufacturing in 1959,  $MS_{l,1959}$ , in order to focus on variation due to differences in the industry mix *within* the manufacturing sector across labor markets. We weight observations by the start-of-period (1959) working-age population. We note that the outcomes vary across specifications – reflecting contemporaneous, medium-run, and long-run changes – but the treatment variables do not. As a result, the estimated effects can be interpreted as the contemporaneous-, medium-, and long-run impulse-responses to the common trade shock, where the impulse is sudden and large and effectively over by 1980.

### 3.1 Data and Variable Construction

Our measures of export and import exposure are the commonly used measures from Autor et al. (2013) and are given by:<sup>9</sup>

$$\Delta E_{l,66-80}^X = \sum_j \frac{L_{lj,1959}}{L_{l,1959}} \frac{\Delta X_{j,66-80}}{Y_{j,1959}} \quad (2)$$

$$\Delta E_{l,66-80}^M = \sum_j \frac{L_{lj,1959}}{L_{l,1959}} \frac{\Delta M_{j,66-80}}{(Y_{j,1959} - X_{j,1959} + M_{j,1959})} \quad (3)$$

where  $L_{lj}$  is employment in labor market  $l$  and four-digit Standard Industrial Classification (SIC) industry  $j$  and  $Y_j$  is total shipments in industry  $j$ . The denominator in (3) is therefore industry absorption. In words, the national-level change in export share of industry output, or industry import penetration, over the period 1966 to 1980 is allocated to local labor markets according to the relative importance of each industry in the local market in 1959. These industry values are then summed up to the local labor market level (with employment weights that sum to 1).

<sup>8</sup>Jordà (2005) describes advantages of the local projections approach to estimating impulse-responses.

<sup>9</sup>In practice, we use the related measures described in Acemoglu et al. (2016).

We obtain values for employment in a four-digit SIC industry and county ( $L_{lj,1959}$ ) from the County Business Patterns (CBP) for 1959,<sup>10</sup> 1960, 1970, 1980, 1990, and 2000.<sup>11</sup> National industrial output data for 1959 ( $Y_{j,1959}$ ) come from the National Bureau of Economic Research, Center for Economic Studies (NBER-CES) Manufacturing Industry Database. Our use of 1959 shares, before the start of the sample period, follows the best practice for shift-share estimators outlined in Goldsmith-Pinkham et al. (2018). Values for U.S. imports and exports by origin and destination across four-digit SIC industries over the period 1966 to 1980 come from Feenstra et al. (2005) and are deflated using the Personal Consumption Expenditure (PCE) price index to 2012 values.<sup>12</sup> Figures 5a and 5b plot the distribution of the measures (2) and (3) across U.S. labor markets. One key fact highlighted by the Figures is the very different geographic distributions of export versus import exposure, which will be useful for identifying their relative impacts.

Our outcome variables of interest are at the commuting zone (labor market) level, which is aggregated from the underlying county-level data as in Autor et al. (2013).<sup>13</sup> These variables are decadal total employment, drawn from the CBP with missing values interpolated via the fixed point algorithm used by Autor et al. (2013); decadal working-age population, median home and rental prices, drawn from the Census of Housing and Population (CHP) in each decade from 1960 to 2000; and decadal median income from the CHP, again over the period 1960 to 2000. Values are deflated using the 2012 PCE.

In the construction of our instrumental variables, described in the next section, we exploit data from several additional sources. Our main variation comes from the sequence of international port and rail expansions over what we consider to be the “containerization period”, 1966 to 1980.<sup>14</sup> Over this period countries around the world progressively upgraded their port and transportation infrastructure to varying degrees in order to efficiently handle shipping containers. The year in which each country became capable of handling containers is obtained from Bernhofen et al. (2016), who compiled these data from the *Containerization International Yearbook*. Figure 6 documents the sequence of major port openings along with total (imports plus exports) U.S. trade with each country in the year in which the container port opened. This containerization indicator – denoted  $Port_{ct}$ , where  $c$  is country of origin or destination – is set to 1 in the year in which either the country’s port or rail infrastructure is able to handle shipping containers (and is 1 in all subsequent years). By including rail capability the indicator allows for variation due to rail traffic that may be linked to container-ready ports in other countries, such as Rotterdam in Europe (a major hub of container traffic); however, the results are almost entirely invariant to the use of a “port-only” (no rail) indicator. Finally, we drop Canada and Mexico from the sample since trade with these countries clearly relies on a large number of land border crossings, which

<sup>10</sup>We obtained the 1959 data from the Hathi Trust as pdfs, which we digitized.

<sup>11</sup>The 2000 and 2010 CBP data are converted to U.S. SIC industries using a concordance from Pierce and Schott (2012).

<sup>12</sup>One nice feature of the data is that both the CBP and trade data are reported at the SIC 4-digit level, so the match is very clean, minimizing measurement error. When matching to 1959 data we do have to concord the CBP data to the 1972 SIC classification, which requires relatively minor adjustments.

<sup>13</sup>The county-to-labor market concordances are from David Dorn: <http://www.ddorn.net/data.htm>

<sup>14</sup>Globally the containerization period was 1966 to 1983, but U.S. trade flows were 97 percent containerizable by 1980.

mitigates the impact of ports. Trade with these countries is also more likely to be endogenous to economic conditions in U.S. local labor markets.

When constructing our instrumental variables, we sometimes include interactions of the containerization indicators with distance to the foreign country, bilateral tariffs, and other standard bilateral gravity measures, which we obtain from Fouquin et al. (2016). We also include interactions with an indicator for whether a product is able to be containerized or not, again obtained from Bernhofen et al. (2016). Non-containerizable products include, for example, finished autos and certain steel products and constitute 20 percent of total U.S. trade, on average, over the period. Importantly, this indicator is drawn from a 1968 analysis by the German Engineer’s Society and so pre-dates the subsequent rapid growth in container traffic. In Section 3.2.2 we further exploit the non-containerizability of some products as a placebo test of our research design.

Table 1 presents summary statistics for the main trade exposure variables along with the main dependent variables, each of which is multiplied by 100 throughout for ease of interpretation. We note that the distribution of both trade exposure variables across labor markets is such that a 5 percentage point difference in either import or export exposure is approximately equal to the difference in exposure between the labor market at the 90th percentile and the labor market at the 10th percentile. In an absolute sense, the change in trade exposure over the period 1966 to 1980 was large, with U.S. imports rising by a factor of 10 and exports by a factor of 8; by comparison, over the 1991 to 2007 (“China shock”) period imports from China rose by a similar factor of 11.5 (see Autor et al. (2013)). On average, labor markets saw a change in export and import exposure over the 1966-1980 period of 2.02 and 2.24 percentage points, respectively. There is significant skewness to the distribution as evidenced by the much smaller median values. The 1970s also saw rapid growth in all of the outcome variables, particularly home prices and rental prices, with later years seeing more moderated growth (or declines in the case of manufacturing employment).

## 3.2 Identification

Our outcomes of interest are at the U.S. local labor market level. As a result, in specification (1) the exclusion restriction will be violated if shocks to local labor markets within a state and labor market are systematically correlated with both the extent of local exposure to imports and exports as well as with the error term (and not absorbed by the pre-trend controls or the manufacturing share in 1959). For instance, increasing efficiency gains due to automation in some industry may generate new U.S. exports in labor markets in which those industries are active, while also directly affecting labor market outcomes in those labor markets.

Motivated by a model of bilateral trade, we address these threats to identification by exploiting the plausibly exogenous opening of foreign container ports around the world over the period 1966 to 1980. Due to the large fixed costs associated with building container-ready port and transportation infrastructure, most countries were

reluctant to make these investments until there were sufficient container-friendly shipping routes already in place. As a result, early U.S. investments in container infrastructure along the Eastern seaboard and, later, investments by Western European countries were critical to developing the shipping routes that would spur subsequent investments by other countries. This led to a progressive opening of container-ready ports around the world over the period, as documented in Figure 6. As Table 6 documents, the main U.S. trading partners were early adopters so that by 1972 80 percent of U.S. trade went via container-friendly ports. This, of course, limits the temporal variation available due to the timing of port openings. At the same time, we show in Section 3.2.3 that port openings had very different impacts *across* countries due to differences in the distance to the U.S. and the level of bilateral trade policy barriers in place. Furthermore, as noted, some products were not containerizable, which meant that products were differentially affected by new container ports, leading to shifts in the composition of foreign trade with the U.S. Overall, these sources of heterogeneity generated substantial variation in labor market exposure to container-port driven trade (e.g., see Figures 5a and 5b).

The impact of the opening of a container port on trade flows was large and immediate. We see this in Figures 3a and 3b where we plot log bilateral exports and imports between the U.S. and its trading partners as a function of the time since the foreign partner adopted container infrastructure, where  $t = 0$  is the year of adoption. Clearly there is a marked increase in both exports and imports (larger for exports) in the year in which the foreign port began handling containers. This discontinuity is the key variation that we exploit in our empirical strategy.

In Section 3.2.2 below and later in Section 4.7 we explore in greater detail potential violations of the exclusion restriction that are not addressed by approach described in the next section.

### 3.2.1 Instrumental Variable Strategy

Our approach is to instrument for observed local exposure to imports and exports over this period with *predicted* exposure.<sup>15</sup> To do this, we first note that in (2) and (3) the potentially endogenous components are the values  $\Delta X_{j,66-80} = \sum_c \sum_{t=67}^{80} \Delta X_{jc,t:t-1}$  and  $\Delta M_{j,66-80} = \sum_c \sum_{t=67}^{80} \Delta M_{jc,t:t-1}$ , respectively, where we have simply written the change in total exports over the period as the sum over the annual changes across individual export destinations ( $c$ ), and similarly for imports. We generate predicted bilateral exports and imports between the U.S. and its trading partners in each year,  $\hat{X}_{jct}$  and  $\hat{M}_{jct}$ , by isolating variation that is exogenous to U.S. local labor market conditions, in part by controlling for potentially endogenous structural variables in our prediction specification. This variation then allows us to construct the predicted values  $\widehat{\Delta X}_{j,66-80}$  and  $\widehat{\Delta M}_{j,66-80}$ , which will be used to construct new versions of (2) and (3) that will serve as instruments for the original measures.

We note that neither our exposure measures, (2) and (3), nor the IVs vary over time, though in this section

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<sup>15</sup>One advantage of this approach is that the use of predicted exposure mitigates possible bias due to the use of the shift-share instruments (see Borusyak et al. (2018))

we exploit panel variation in trade flows and the timing of foreign port containerization in constructing the IVs. In short, in this section we are constructing predicted annual variation in industry trade flows that arise from the sequence of containerization decisions over time. We then aggregate the predicted industry flows to a single cross-section period, which then gets allocated to CZs according to the pre-period industry compositions.

Next, we derive our structural specification for the predicted trade flows that will be used in constructing the IVs. We note that in Section 4.7.2 we present an alternative, non-structural approach using the double-LASSO method (Belloni et al. (2012)). We start with the symmetric Constant Elasticity of Substitution (CES) equilibrium condition for exports from the U.S. to country  $c$  relative to those from some third country  $i$  to  $c$ , similar to Romalis (2007) and Feenstra et al. (2019). A related condition holds for *imports* into the U.S. from country  $c$  and is also presented below. The CES export ratio is given by:

$$\frac{X_{jvt}^{US,c}}{X_{jvt}^{i,c}} = \left( \frac{c_{jt}^{US} t_{jt}^{US,c}}{c_{jt}^i t_{jt}^{i,c}} \right)^{1-\sigma} \quad (4)$$

where  $X_{jvt}^{US,c}$  and  $X_{jvt}^{i,c}$  are exports from the U.S. or country  $i$  to  $c$  of product variety  $v$  in industry  $j$  and year  $t$ ;  $c_{jt}^i$  is the industry-specific marginal costs of production in country  $i$ ;  $t_{jt}^{i,c}$  are industry-specific, bilateral iceberg trade costs between  $i$  and  $c$ ; and  $\sigma$  is the elasticity of substitution. Assuming that there are  $N_{jt}^{US}$  and  $N_{jt}^i$  symmetric varieties produced in each industry in each country and year, so that  $X_{jt}^{US,c} = N_{jt}^{US} X_{jvt}^{US,c}$  and  $X_{jt}^{i,c} = N_{jt}^i X_{jvt}^{i,c}$ , we can rearrange (4) to get:

$$X_{jt}^{US,c} = \frac{N_{jt}^{US} (c_{jt}^{US} t_{jt}^{US,c})^{1-\sigma}}{\sum_{k \neq US} N_{jt}^k (c_{jt}^k t_{jt}^{k,j})^{1-\sigma}} \sum_{i \neq US} X_{jt}^{i,c}$$

Taking logs we get:

$$\ln X_{jt}^{US,c} = \alpha_{jt}^{US} + \ln \left( t_{jt}^{US,c} (P_t^c) \right)^{1-\sigma} + \ln \left( \sum_{i \neq US} X_{jt}^{i,c} \right) - \ln \left( \sum_{i \neq US} N_{jt}^i (c_{jt}^i t_{jt}^{i,c})^{1-\sigma} \right) + \varepsilon_{jt}^c. \quad (5)$$

where  $\alpha_{jt}^{US} = \ln \left( N_{jt}^{US} (c_{jt}^{US})^{1-\sigma} \right)$  are U.S. industry-specific shocks. We now also write trade costs,  $t_{jt}^{US,c} (P_t^c)$ , as a function of whether a foreign port is containerized, whereby  $P_t^c = \{0, 1\}$  is an indicator for the existence of a container port in country  $c$ .

The third term in (5),  $\sum_{i \neq US} X_{jt}^{i,c}$ , reflects third-country trade flows with  $c$  that we can directly control for. Finally, the last term,  $-\ln \left( \sum_{i \neq US} N_{jt}^i (c_{jt}^i t_{jt}^{i,c})^{1-\sigma} \right)$ , reflects third-country productivity or variety shocks (i.e., shocks to the trading partners of U.S. trading partners) as well as bilateral trade costs between those countries and  $j$ . In this sense, the model clarifies the identification issue: to the extent that these third-country variables end up in the error term and are correlated with both exports from the U.S. to country  $c$  and the timing of

a container port opening in  $c$ , they will introduce omitted variable bias to our estimate of the impact of the container port opening on U.S. exports. However, it is important to note that our final specification will require only that this potentially endogenous variation is uncorrelated with U.S. local labor market outcomes. In other words, the relevant exclusion restriction will be violated to the extent that shocks to U.S. local labor markets during the containerization era were correlated with trade between U.S. trading partners and third countries in a way that also affected the timing of U.S. trading partner port infrastructure investments. Violations of the exclusion restriction would therefore occur only via several chains of influence.

Nevertheless, we attempt to control for the final term in (5) by adding controls for variety, productivity, and trade cost effects in third countries (and implement the IV strategy discussed above as well). To do this, we first construct a single trade-weighted measure of aggregate TFP for country  $j$ 's trading partners in year  $t$ , where we use pre-period (1962) trade weights from  $i$  to  $c$ .<sup>16</sup> We also control for the log trade-weighted average tariff faced by country  $c$  when exporting to its trading partners  $i$ , which we denote  $\bar{\tau}_t^c$ . Ideally, we would also like to control for port openings in third countries, however these are highly (or perfectly in some cases) co-linear with the port opening variable of interest (for country  $c$ ). In lieu of this, in a robustness check we focus only on the early container port openings, whose timing should be less correlated with container port openings in third countries, an issue that we explore in greater detail in the context of pre-trends in Section 3.2.2.

Following (5), we generate predicted bilateral exports from the coefficients on the port dummy and its interaction with a range of bilateral trade costs. Specifically, we estimate:

$$\ln X_{jt}^{US,c} = \delta_j + \gamma_t + \beta_1 P_t^c + \beta_2 \ln \mathbf{T}_{jt}^{US,c} + \beta_3 \left( P_t^c \times \ln \mathbf{T}_{jt}^{US,c} \right) + \beta_4 \ln \left( \sum_{i \neq US} X_{jt}^{i,c} \right) + \ln \overline{TFP}_t^c + \ln \bar{\tau}_t^c + \varepsilon_{jt}^c. \quad (6)$$

where  $\mathbf{T}_{jt}^{US,c}$  is now a vector of bilateral trade costs between the U.S. and  $c$  and  $\overline{TFP}_t^c$  is trade-weighted average TFP in country  $c$ 's trading partners in each year, where trade-weights are constructed using 1962 trade flows.<sup>17</sup> Similarly  $\bar{\tau}_t^c$  is the trade-weighted average tariff faced by country  $c$  when exporting to its trading partners.

We then calculate the predicted value  $\hat{X}_{jct} = \beta_1 \overline{P}_t^c + \beta_3 \overline{\left( P_t^c \times \ln \mathbf{T}_{jt}^{US,c} \right)}$  which we use to construct (2), which serves as our IV for export exposure. By controlling for a range of potentially endogenous structural variables and given the plausibly exogenous nature of containerization decisions across foreign ports, this IV should serve as a good source of exogenous variation in local exposure to the trade shock.

Finally, we note that the *import* equilibrium is symmetric to the export equilibrium (5), and is formally given by:

<sup>16</sup>Data on TFP come from the Penn World Tables.

<sup>17</sup>As discussed in the next section, the bilateral trade costs that we include are the distance to  $c$ , tariff barriers, a common language indicator, and a former colony indicator.

$$\ln M_{jt}^{j,US} = \alpha_{jt}^c + \ln \left( t_{jt}^{c,US} \right)^{1-\sigma} + \ln \left( \sum_{i \neq j} M_{jt}^{i,US} \right) - \ln \left( \sum_{i \neq j} N_{jt}^i \left( c_{jt}^i t_{jt}^{i,US} \right)^{1-\sigma} \right) + \varepsilon_{jt}^j. \quad (7)$$

where  $\alpha_{jt}^c = \ln \left( N_{jt}^c \left( c_{jt}^j \right)^{1-\sigma} \right)$  are country  $c$ -specific shocks;  $t_{jt}^{c,US}$  are symmetric bilateral trade costs;  $\sum_{i \neq j} M_{jt}^{i,US}$  are third-country imports to the U.S.; and  $-\ln \left( \sum_{i \neq c} N_{jt}^i \left( c_{jt}^i t_{jt}^{i,US} \right)^{1-\sigma} \right)$  are third-country shocks as before. We generate predicted imports using (7) and use these values to construct measure (3), which serves as our IV for import exposure.

### 3.2.2 Further Threats to Identification

A potential concern is that there remains variation in the error term in (6) that is both correlated with the timing of container port openings as well as with U.S. labor-market-level outcomes.<sup>18</sup> Our structural approach to generating predicted trade flows should go a long way toward eliminating this variation, as will the fact that in most cases U.S. labor market output is small relative to the volume of container traffic through any foreign port. Nevertheless, a good place to start in looking for additional problematic variation is in the relationship between U.S. bilateral trade and the timing of container port openings.

With this in mind, we ask whether pre-period bilateral trade flows between the U.S. and its partners can, on average, predict the timing of foreign container-port openings. Ideally, we would like to know whether port openings are as good as randomly assigned with respect to *counterfactual* changes in bilateral trade flows, but since we do not observe counterfactual outcomes we instead focus on pre-trends in outcomes, as is standard. We also split the sample in two ways. First, by early and late adopters of container-port technologies. This addresses the possibility that late adopters responded endogenously to the additional global trade generated by early adopters. Second, we split the sample by the share of U.S. trade in total trade in the destination or origin country, since countries with high U.S. trade shares are more likely to be responsive to U.S. labor market specific shocks, which is the primary threat to the validity of the exclusion restriction. As we see in Table 1 columns (1) and (2), conditional on controls there is no statistically significant relationship between the timing of port openings and the volume of bilateral trade with the U.S. in the 5 years preceding the opening, suggesting (though not proving) that container port openings are indeed as good as randomly assigned with respect to counterfactual changes in bilateral trade flows. In columns (3)-(10) we see that this result is robust to each of the samples. Nevertheless, in a robustness check in Section 4.7.1 we also estimate versions that exclude variation due to late adopters.

Finally, we note that we can exploit the fact that some products cannot be placed in containers in order to partially test the validity of our research design. Figures 4a and 4b are similar to Figures 3a and 3b except that

<sup>18</sup>Specification (1) also includes pre-trends in outcomes and state fixed effects, which may absorb a portion of this variation.

they focus narrowly on trade in products that are not containerizable, presenting a placebo scenario in which trade should be unaffected. The Figures show that as expected the opening of foreign container ports did not raise the observable flow of non-containerizable trade.<sup>19</sup>

In Section 4.7 below we explore the robustness of our results to two additional concerns regarding identification. The first is that foreign port containerization induced U.S. ports to invest in their own infrastructure and our observed effects reflect labor market outcomes from this endogenous investment rather than induced trade flows. The second is that countries that adopted containerization later in the period did so as an endogenous response to prior countries' investments – in effect that the network effects of port investments took hold such that future investments were no longer as-good-as-randomly assigned. In neither case do our results suggest cause for concern.

### 3.2.3 First Stage

We begin by presenting first-stage estimates of the impact of container port openings on our measures of U.S. local labor market exposure to imports and exports. As discussed in detail in Section 3.2.1, we first generate *predicted* bilateral imports and exports using exogenous variation from port openings. These predicted trade flows are then combined with pre-period employment across U.S. local labor markets to construct predicted labor market exposure measures based on (2) and (3). These measures are then used as instruments for *actual* labor market exposure to imports and exports.

First, Table 2 presents estimates from specification (6) and its counterpart for imports – i.e., the regressions that generate predicted trade flows. The contemporaneous impact of container port openings on trade flows was economically large and statistically significant, indicating that port openings increased exports by between 200 and 300 percent over the period 1966 to 1980 (columns (2) and (3)) and increased imports by around 200 percent (columns (7) and (8)). This is consistent with the findings from Bernhofen et al. (2016) who find that container ports increased world trade by 350 percent over a 20 year period. The interactions with cross-country features indicate that the effect was increasing in the distance to the foreign port and decreasing in the level of foreign tariffs, while shared language had little differential impact. Being a former U.S. colony was associated with a relatively smaller impact. The strictest specification explains around 40 percent of the variation in log exports and imports.

We then generate predicted exposure to exports and imports by using the predicted flows to construct measures (2) and (3). Table 4 presents the first stage results, which indicate that the first stage is strong with F-stats of 18 and 24.

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<sup>19</sup>We note that there is some evidence of a partial crowding out of non-containerizable exports in the short-term as seen by the small drop in the treatment period in Figure 4a.

## 4 Effects of the Container Shock

In this section we report our estimates of the short-, medium-, and long-run impact of container-driven import and export exposure over the period 1966-1980 on U.S. local labor markets and we evaluate the findings in the context of the model outlined in Section 2. We focus on the employment-to-population ratio, median income, median rental prices and median home prices.<sup>20</sup> In Section 4.8 we explore the consequences of a durable housing stock for outcomes, both in the short and long run, in part by exploiting heterogeneity in housing supply elasticities across markets. In Section 4.7 we explore robustness specifications that include a focus on early port technology adopters as well as an alternative IV strategy exploiting LASSO-based predicted trade exposures. Throughout, we multiply the trade exposure measures and outcomes by 100 for ease of interpretation.

An additional consideration when interpreting the coefficients is the extent to which the medium- and long-run estimates reflect direct impacts on the outcomes or, rather, impacts arising from persistence in the treatment over time. In Appendix Section A we show that the treatment persistence channel is likely to be small so that the estimates are effectively direct effects.

### 4.1 Employment to Working-Age Population Ratio

Table 5 presents the OLS and 2SLS results for the change in the local employment rate. The initial decade estimates in columns (1) and (4) indicate a clear contemporaneous impact: export exposure raises the employment rate and import exposure reduces it. In the medium-run (1970-1990) both the OLS and 2SLS estimates in columns (2) and (5) suggest some degree of persistent, but declining, effects due to the initial import and export exposure, while columns (3) and (6) indicate no statistically significant impact on the employment rate after three decades.

The 2SLS estimates in column (4) indicate that, on average, a one percentage point increase in export exposure led to a 1.83 percentage point relative increase in the employment rate in the initial decade. At the same time, a one percentage point increase in import exposure reduced the relative employment rate by 1.24 percentage points. Table 6 shows that this effect was concentrated in the manufacturing sector, with no short-run spillovers to the non-manufacturing sector. In fact, there is some evidence that the net impact on the non-manufacturing sector turns positive, though statistically insignificant, in the medium run (see column (5)), suggesting possible mitigating effects of the shock due to labor mobility across sectors within labor markets. Taking the mean export and import exposures over the period 1966-1980 (2.02 and 2.24, respectively, see Table 1) we find that the net effect of the trade shock was to increase the employment rate by 0.91  $((1.83 \times 2.02 - 1.24 \times 2.24))$  percentage points over a period in which it fell overall by -1.99 percentage points.

Table 7 reports estimates of the log population response to the trade shocks, where we see that in-migration

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<sup>20</sup>We note that the estimates in this sub-section represent relative impacts across labor markets, rather than national-level effects.

due to export exposure greatly exceeded out-migration due to import exposure during the 1970s. The 2SLS estimates in column (5) indicate a 4.15 percentage point increase in population from export-induced in-migration and a -1.64 percentage point decrease due to import-induced out-migration. There is also evidence of continued out-migration into the medium run due to import exposure, consistent with slow depreciation of the housing stock and accompanying out-migration over time.

## 4.2 Housing Supply

In estimating the separate response of housing units to the export and import shocks we can directly test whether the housing supply function indeed exhibits a kink at current supply, as depicted in Figure 1 and discussed in our conceptual framework. Table 8 presents the OLS and 2SLS results for the change in local log housing units due to the trade shock. The OLS estimates for the short-, medium-, and long-run are presented in columns (1)-(3). Columns (4)-(6) report the 2SLS estimates for each period. All specifications include state fixed effects with standard errors clustered at the labor market level.<sup>21</sup>

Table 8 presents clear evidence of this asymmetry: the export shock generates a large contemporaneous rise in the supply of homes with continued, but smaller and statistically insignificant, increases in future periods; in contrast, the import shock has little impact on the supply of homes in any period.<sup>22</sup> Below we combine these estimates with estimates of the home and rental price response in order to calculate the implied average housing supply elasticities due to the export and import shocks.

## 4.3 Income

Table 9 presents the OLS and 2SLS results where the dependent variable is the change in log median income. The results indicate a positive impact on income due to export exposure and a negative impact due to import exposure in the contemporaneous period. The contemporaneous 2SLS estimates indicate that a one percentage point increase in labor market export exposure led to a 4.16 percentage point relative increase in income, while a one percentage point increase in import exposure led to a -1.73 percentage point relative decline in income. Converting this to a dollar value using the initial-period (1970) median U.S. income, we find that the net impact of the trade shock was to raise median income over the period by \$2,692 (in 2012 \$). This accounts for around nine percent of the overall rise in median income over the period.

<sup>21</sup>A regression of export exposure, or import exposure, on state fixed effects produces an  $R^2$  of 0.06 and 0.25, respectively. So the bulk of the variation being exploited is within state and across labor markets.

<sup>22</sup>Interestingly, these findings contrast with Feyrer (2009) who finds that the positive effect on GDP due to the opening of the Suez Canal was equal in magnitude to the negative effect due to the closing of the Canal. Donaldson (2015) points out that while this result is consistent with standard static models of trade, the Feyrer (2009) result is inconsistent with a dynamic model in which physical or human capital investments respond positively to increased trade, but do not immediately decline when trade ceases – i.e., a model with asymmetric factor adjustment costs. Here we are focused on export versus import competition, rather than levels of trade openness as in Feyrer (2009), but we indeed find evidence that (housing) capital adjustment costs are asymmetric.

The fact that the relative income effects are concentrated in the initial period, while diminishing in later periods (Table 9), suggests that markets equilibrated over time in response to the shock. This is also supported by the fact that the shock impacts relative employment growth very little beyond the short run.

#### 4.4 Home Prices and Rents

The impact on home prices is reported in Table 10 and the impact on rental prices is reported in Table 11. We find that the estimates for export exposure are similar for home prices and rents, with both rising in the contemporaneous period only. In contrast, the impact due to import exposure is negative and significant over the first two decades. The contemporaneous 2SLS estimates indicate that a one percentage point increase in export exposure produced a 4.24 percentage point relative increase in home prices and a 3.79 percentage point relative increase in rental prices. For import exposure, a one percentage point rise led to a -4.78 percentage point relative decline in home prices and a -4.22 percentage point relative decline in rental prices. The medium-run estimates of import exposure on home values and rents suggest some persistence in outcomes and are equal to -5.02 and -4.45, respectively. This persistence is consistent with a slow depreciation in the housing stock following a negative labor demand shock that generates continued out-migration over time.<sup>23</sup>

Overall, the estimates of the export and import effects are not statistically distinguishable, suggesting near symmetry in the housing response to the shocks. As noted in Section 2, this is consistent with the findings of Notowidigdo (2020) and provides evidence against a role for migration costs to explain the asymmetry in the migration response to the shocks.

#### 4.5 Consequences for Real Income

The consequences for real income will differ between homeowners and renters. For renters, the change in purchasing power due to the trade shock can be calculated as the difference between the change in log income and the weighted change in log rental prices and log prices of local non-tradable, non-housing goods; i.e.,  $\Delta \ln w - \beta_H \Delta \ln p_H - \beta_{NT} \Delta \ln p_{NT}$  where the  $\beta$ 's are weights and  $p_H$  and  $p_{NT}$  are the prices of housing and local non-tradable, non-housing goods, respectively. To calculate this, we adopt the weights used in construction of the Consumer Price Index (CPI), which are the average shares of local expenditure on housing (0.33) and non-housing goods (0.66). However, we are missing estimates of the trade shock on the price of local non-housing goods, for which data are scarce. In order to account for variation in these prices we therefore adopt the approach described in Hornbeck and Moretti (2018) and Moretti (2013). In short, Moretti (2013) estimates

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<sup>23</sup>In Section 4.8 below we also find persistence in outcomes due to the *export* shock for CZs with low housing supply elasticities. This is consistent with the model and evidence presented thus far as it indicates that the housing supply elasticity is an important determinant of the extent of persistence in outcomes. In other words, much like the durability of the housing stock constrains housing supply on the downside, unusually high building costs will constrain supply on the upside (e.g., due to an export shock) over the short run, but less so over the longer run.

the relationship between changes in the price of local non-housing goods and changes in rental prices across a sample of U.S cities for which data are available, and then uses data on rental prices across all cities to impute the missing non-housing prices. On average, he finds that a one percent increase in rental prices is associated with a 0.35 percent increase in local non-housing goods. We use this elasticity along with our estimates of the response of rental prices to the trade shock to proxy for the change in local non-housing goods. The end result is that changes in real income due to the trade shock are given by the difference between the change in log income and 0.56 times the change in log rental prices.<sup>24</sup> Over the short run, our estimates in Tables 9 and 11 imply an overall rise in real income for renters due to the net (exports - imports) impact of the trade shock equal to 2.7 percent, which increases to 3.5 percent when we use the medium-run estimates for the effect of the import shock on rental prices.

For homeowners the calculation is more subtle since changes in home values are only relevant to the extent that the rise or fall in value passes through to changes in real income. At one extreme, a homeowner could be fully insulated from a shock if they hold on to the home indefinitely and extract no equity, in which case any changes in value will have no impact on real income. At the other extreme, homeowner real income may be maximally impacted by the change in value, increasing or decreasing in perpetuity by an amount equal to the annual change in rent times the share of housing in expenditure – for instance, if the homeowner rents out the home immediately following the shock and moves to another city whose home prices did not change. In either case, the annual change in rent is the relevant measure of housing value when considering impacts on purchasing power. In the former case (fully insulated homeowners), we can ignore changing home and rental prices and account only for the impact of the shock on the price of local non-housing goods, which implies a weight on log rental prices of 0.23 and an overall rise in real income for homeowners due to the net impact of the trade shock equal to 2.5 percent,<sup>25</sup> which increases to 2.9 percent accounting for the medium-run persistence. In the latter case (fully liquidated homeowners) the weight on log rental prices falls to 0.10 and the overall rise in purchasing power is equal to 2.4 percent,<sup>26</sup> which increases to 2.6 percent over the medium run.

We revisit the role of relative home ownership rates across labor markets in Section 4.9 below. There we discuss the implications of the fact that home ownership rates are correlated with both local housing supply elasticities and relative exposure to the trade shock, a force for concentration of the effects of the trade shock.

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<sup>24</sup>With Cobb-Douglas utility over a traded good, a non-traded good, and housing, where the price of the traded good is fixed, indirect utility (real income) is given by  $\Delta \ln V = \Delta \ln w - \beta_H \Delta \ln p_H - \beta_{NT} \Delta \ln p_{NT}$ , where the weights are the expenditure shares. With an expenditure share of 0.33 for housing and a non-traded good price elasticity with respect to rental prices of 0.35, this can be re-written as  $\Delta \ln V = \Delta \ln w - 0.35 \times 0.66 \times \Delta \ln p_H = \Delta \ln w - 0.56 \times \Delta \ln p_H$ .

<sup>25</sup>The value 0.23 is the rental price elasticity with respect to non-tradable goods (0.35) times the non-housing consumption share (0.66).

<sup>26</sup>The value 0.10 is the housing consumption share (0.33) gain in real income from rising rents minus the real income loss due to the rise in non-tradable goods prices (as proxied by the weight on rental price changes of 0.23).

## 4.6 Implied Elasticities

We can use the estimates in Tables 8, 10, and 11 to calculate the average implied, short-run housing supply elasticities for output levels beyond current supply – i.e., to the right of the kink in Figure 1. To do this, we exploit the fact that for some outcome  $y = \ln Y$ , specification (1) implies that:<sup>27</sup>

$$\Delta Y_t = \sum_l \left[ Y_{lt} \left( e^{(\hat{\beta}_t^x \Delta E_{l,66-80}^X + \hat{\beta}_t^m \Delta E_{l,66-80}^M)} - 1 \right) \right] \quad (8)$$

where  $\hat{\beta}_t^x \Delta E_{l,66-80}^X + \hat{\beta}_t^m \Delta E_{l,66-80}^M$  is the sum of the estimated export and import effects on the outcome over the period 1970 to  $t$ , given observed changes in export and import exposure in each labor market. This implies that the percent change in an outcome over the period 1970 to  $t$  in labor market  $l$  – i.e.,  $\frac{\Delta Y_{lt}}{Y_{lt}}$  – due to the export shock is given by  $e^{(\hat{\beta}_t^x \Delta E_{l,66-80}^X)} - 1$ . Evaluating this at the mean value of export exposure,  $\overline{\Delta E^X}_{66-80}$ , we can calculate the average housing supply elasticity induced by the positive export shock (i.e., along the housing supply curve *above* current supply):

$$\varepsilon_t^{HS} \equiv \frac{\% \Delta Q_t^H}{\% \Delta P_t^H} = \frac{e^{(\hat{\beta}_t^{Qx} \overline{\Delta E^X}_{66-80})} - 1}{e^{(\hat{\beta}_t^{Px} \overline{\Delta E^X}_{66-80})} - 1} \quad (9)$$

where  $\hat{\beta}_t^{Qx}, \hat{\beta}_t^{Px}$  are the estimates of the impact of the shock on housing quantities,  $Q_t^H$ , and home prices,  $P_t^H$ , respectively. A similar elasticity can be obtained for rental prices. These calculations give export-induced average housing supply elasticities with respect to home prices and rental prices over the period 1970-1980 of 1.31 and 1.80, respectively, such that each 1 percent rise in the number of households in a labor market due to the export shock increased the average price of homes by 0.82 percent and the average price of rental units by 0.57 percent (applying the inverse elasticities). These estimates are in line with the existing literature – for instance, Saiz (2010) reports a similar average housing supply elasticity of 1.54 at the MSA level while Gyourko (2009) reports estimates from the literature ranging from 1 to 3.<sup>28</sup> We further note that the implied supply elasticities due to the *import* shock (i.e., along the housing supply curve *below* current supply) are much smaller and mostly near zero, though the coefficients ( $\hat{\beta}_t^{Qm}, \hat{\beta}_t^{Pm}$ ) are not precisely estimated.

## 4.7 Robustness

### 4.7.1 Focusing on Early Adopters and Endogenous U.S. Port Investment

Here we present estimates from specification (1) except that the IVs are now constructed using only variation from foreign-country port openings during the 1966-1973 (early) period. As noted in section 3.2.2, the invest-

<sup>27</sup>Acemoglu et al. (2016) interpret this as the difference between the actual and counterfactual outcome in the case when there was no trade shock.

<sup>28</sup>This is also consistent with other findings in the literature showing that rental prices are less responsive than home prices to shocks.

ments in port technologies made by late adopters were more likely to be motivated by prior port openings around the world and the increasing global trade flows that followed. These port openings may therefore be endogenous to local U.S. outcomes to the extent that these outcomes were also driven by prior port openings. Appendix Tables B.1 and B.2 reproduce our main 2SLS specifications but using this early period variation only, where we see a local average treatment effect that is similar in magnitude to the estimates in Tables 5 through 11, indicating that late adopters did not differentially affect outcomes in an economically important way.

Another potential concern is that foreign port containerization induced U.S. ports to invest in their own infrastructure. In that case, the observed average labor market impacts may be unrelated to changes in trade flows but, rather, a response by port regions in the U.S. to anticipated future flows from upgraded foreign ports. This endogenous investment hypothesis can be tested by removing CZs that host U.S. ports from the sample. Appendix Tables B.3 and B.4 report the results for the employment rate where we see somewhat less precise but similarly sized effects compared to the main estimates.

#### 4.7.2 LASSO-based IVs

We also applied a double-lasso approach (Belloni et al. (2012)) to generate predicted exports and imports in the construction of the instrumental variables, rather than using the structural approach described in Section 3.2.1. The idea is to begin with a large set of regressors and find the “best” predictors of bilateral trade flows without over-selecting potentially spurious covariates. We include the port opening indicator and a set of typical “gravity” variables (bilateral distance, bilateral tariffs, common language, former colony), along with interactions between each one of them. We then use the best predictors to generate predicted imports and exports and use these to construct instruments for (2) and (3). The first stage F-Stat in this case is 49, quite a bit stronger than when using the structural IVs. Appendix Tables B.5 and B.6 reproduce the main 2SLS specifications using these new IVs, where we see that this local average treatment effect is somewhat larger than the baseline estimates. The similarity of the estimates is important confirmation of the size of the effects, given the potential bias that is highlighted in the recent literature on shift-share research designs (e.g., Borusyak et al. (2018), Goldsmith-Pinkham et al. (2018), and Adao et al. (2019b)).

### 4.8 Heterogeneity in Outcomes

In this section we explore the role of heterogeneity in the local housing supply elasticity. We focus on two model predictions (see Figure 1). First, that in the face of an *export* shock the housing stock adjustments will be relatively quick, and home and rental price effects relatively mitigated, in areas with relatively large housing supply elasticities. Second, we also expect the home and rental price response due to an *import* shock to be invariant to differences in local housing supply elasticities since contraction occurs only via the slow process

of depreciation, whose rate should be unrelated to the local housing supply elasticity. In Figure 1 this implies that the supply curve to the left of the equilibrium point is fixed across labor markets in the short run, whereas there may be significant heterogeneity in the slope of the supply curve to the right of the equilibrium.

We also CZs into two subsamples, high building cost CZs (low elasticity) and low building cost CZs (high elasticity). Specifically, we use a measure of the share of local land that is unavailable for development due to the steepness of the slope or other natural impediments such as oceans, rivers, lakes, etc., which serves as a proxy for building costs. This measure is drawn from Lutz and Sand (2017) and expands on the popular measure developed by Saiz (2010), in part by providing more detailed geographic variation. Importantly, Lutz and Sand (2017) show that the measure is uncorrelated with housing demand factors and so represents a reliable proxy for supply constraints in the housing market. We exploit county-level values that we aggregate up to the local labor market level. Generally speaking, the literature has found that total land unavailability is an important determinant of growth in home prices and rental prices – e.g., see Glaeser et al. (2008) or Mian and Sufi (2011). In our case, regressing home price growth (each period stacked, 1970-2000) on total land unavailability (which is time invariant and assumed to be pre-determined) and applying the coefficient, we calculate that labor markets at the 90th percentile of total land unavailability experienced growth in home prices over the period that was 14 percent greater, on average, than the 10th percentile, and 16 percent greater in the case of rental price growth.

Table 12 presents estimates for the housing supply, price, and rent versions of specification (1) with each set of estimates split into the two subsamples. Formally, we define low housing supply elasticity CZs as those above the median land unavailability, and high elasticity CZs as those below the median. The estimates indicate that export exposure raises the supply of homes along with home prices and rents in the contemporaneous period, in both high- and low-elasticity areas. The effect size on housing supply is statistically smaller for low-elasticity CZs, consistent with less mitigating expansion in housing supply in response to the shock. At the same time, the effect persists into the medium-run in the low-elasticity case suggesting that the equilibration of the housing market is slower in locations in which home building is more costly. Home values and rental prices also respond consistent with the model, with smaller export effects in relatively high-elasticity areas. Taking the mean export exposure over the contemporaneous period, a CZ at the 90th percentile of land availability experienced a 23 percent smaller rise in home prices and a 19 percent smaller rise in rents relative to a CZ at the 10th percentile of land availability.

Import exposure, on the other hand, produced persistent outcomes of similar effect size in both cases – i.e., the effect was mostly invariant to the magnitude of the housing supply elasticity. Along with the direct evidence from Table 8, the constancy of import effects across labor markets facing very different housing supply elasticities offers strong support for the hypothesis that asymmetry in the housing supply response to positive versus negative shocks drives the asymmetry in key labor market outcomes. We do note that the import

exposure effects may not be totally invariant to the housing supply elasticity: whereas our model predicts no difference in the effect of an import shock across CZs with differing housing supply elasticities, we instead see that high-elasticity CZs may have experienced a somewhat more negative price response to the import shock, though the estimates are not statistically different.

Similar to the calculation of the average export-induced housing supply elasticities above, the estimates from Table 12 can be used to construct labor-market-specific housing supply elasticities. To do this, we follow the same approach as above and combine the estimates from Table 12 with the observed changes in export and import exposure. This local housing supply elasticity (now indexed by  $l$ ) is given by:

$$\varepsilon_{lt}^{HS} = \frac{e^{\left(\hat{\beta}_{1t}^Q \overline{\Delta E^X}_{66-80} \Lambda_l + \hat{\beta}_{3t}^Q \overline{\Delta E^X}_{66-80}\right)} - 1}{e^{\left(\hat{\beta}_{1t}^P \overline{\Delta E^X}_{66-80} \Lambda_l + \hat{\beta}_{3t}^P \overline{\Delta E^X}_{66-80}\right)} - 1} \quad (10)$$

where again  $\hat{\beta}_t^Q, \hat{\beta}_t^P$  are the estimates of the export impacts on housing quantities and prices, respectively, and we perform a similar calculation for rental prices. The resulting elasticities display significant heterogeneity within reasonable bounds: the 90th percentile elasticity with respect to home prices is 3.81 while the 10th percentile is 1.13. For rental prices the 90-10 values are 3.02 and 0.80.

## 4.9 Discussion

Following the discussion in Section 4.5, while a local rise in home or rental prices represents a *gain* for incumbent home and property owners, it represents a *loss* for non-incumbent home buyers or renters. As a result, high (low) home-ownership rates in a local labor market will lead to on-average gains (losses) due to export exposure and on-average losses (gains) due to import exposure. Figure 7 maps home-ownership rates at the beginning of the container shock in 1970 across U.S. counties, where we see that there was indeed wide variation in the prevalence of home ownership. For instance, only 14 percent of homes in the Bronx were owner occupied in 1970, whereas many Michigan counties were above 80 percent. We calculate the aggregate impact on each labor market as the weighted average of outcomes for home owners and renters, where the weights are the rates of home ownership and renting in 1970 (see Figure 7). The outcomes for home owners that we present are calculated for the case in which home owners completely liquidate their gains (Section 4.5).

To summarize our approach thus far, the total incidence of the trade shock will vary across labor markets for three primary reasons: 1) the magnitude of exposure to the export and import shocks will vary; 2) the local housing supply elasticity will vary; and 3) the share of incumbent home owners versus non-incumbent home owners and renters will vary. These factors will independently generate concentration of the effects in certain markets, but this concentration will be further exacerbated due to systematic correlation in these factors across markets. In fact, both export and import exposure are strongly, positively correlated with home ownership

rates, a byproduct of the fact that manufacturing was relatively concentrated in the Midwest. Additionally, home ownership is generally more prevalent in areas that have more available land – i.e., a larger housing supply elasticity. Taken together, these correlations have important implications for the geography of the response of housing markets to shocks. For instance, in places with relatively large housing supply elasticities and high home ownership (e.g., the Great Lakes region) an export shock will lead to relatively large average gains due to high home ownership, but these gains will dissipate relatively quickly due to the large local supply elasticity (as indicated by the estimates in Table 12). Thus, in the long run these two features work in opposite directions in their influence on the local incidence of the trade shock. At the other extreme, in places with small housing supply elasticities and low home ownership (e.g., San Francisco) an export shock will lead to relatively large average losses in the housing market since most people are renters, and this effect is more likely to persist due to the small local supply elasticity (again see Table 12). This leads to an exacerbated, negative long-run welfare impact via the housing market – though it is important to note that positive income effects may offset this loss to some extent. Finally, since the impact of import exposure is largely invariant to the local housing supply elasticity (Table 12), the prevalence of home ownership and the magnitude of the trade shock solely determine the geography of import effects.

Table 13 lists the CZs with the largest dollar value rise in real income (top panel) and those with the largest fall in real income (bottom panel). We denote the CZ by its largest MSA. We also list the percentile of each labor market in the distribution of trade shock magnitudes, housing supply elasticities, and home ownership rates in columns (2)-(5). The broad picture that emerges in the top panel is that the largest gains accrued to CZs that experienced relatively large export shocks, had relatively low housing supply elasticities, and had relatively high home ownership rates. In these areas labor demand rose due to high export exposure, but the relatively low housing supply elasticities limited the amount of new home building which led to relatively large increases in home and rental prices. High home ownership rates then ensured these gains accrued, on average, to the majority of residents. A contrasting story is evident in the bottom panel: high import exposure combined with relatively high home ownership rates meant that property value declines accrued to the majority of residents. Note that in this case the housing supply elasticities are in some cases quite high, and in other cases quite low, consistent with our model and findings in which the effects of import competition are invariant to local supply elasticities since the supply elasticity is uniformly near zero across markets.

Overall, we find that changes in real income due to the containerization-induced trade shock varied widely across labor markets though consistent with other parts of the literature we find that the Midwest was most negatively impacted.

## 5 Concluding Remarks

We exploit variation in container port openings to measure the impact of the second wave of globalization on U.S. welfare. There are three main contributions of this work. First, we carefully construct measures of exposure to growing import and export markets and identify their differential effects on income, the employment-to-population ratio, and home and rental prices. Second, we present the cumulative effects of the trade shock across three decades. Previous work has mostly focused more narrowly on short-run impacts, typically with a focus on import shocks. Lastly, we explore the housing market response to a trade shock that incorporates asymmetry in the housing supply function. This allows us to focus on heterogeneity in the effects of trade shocks across locations highlighting important disparities. For example, areas such as the rust belt used to be centers of well-paying blue-collar jobs. Import competition from the 1970s onwards, along with high homeownership rates that had previously served as symbols of prosperity, led to persistent declines in home values that eroded average standards of living. The findings highlight the importance of accounting for the housing market in evaluating the welfare consequences of trade at the local level.

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Figure 1: Asymmetric Housing Supply and Labor Demand Shocks

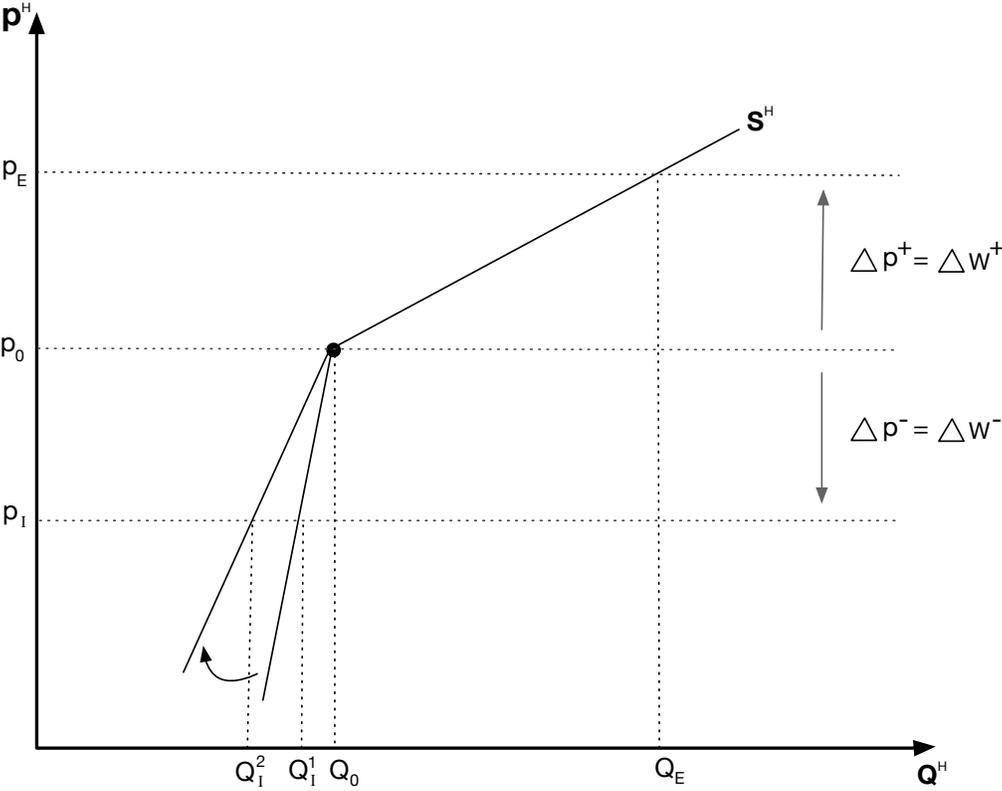


Figure 2: U.S. Merchandise Trade as a Share of GDP

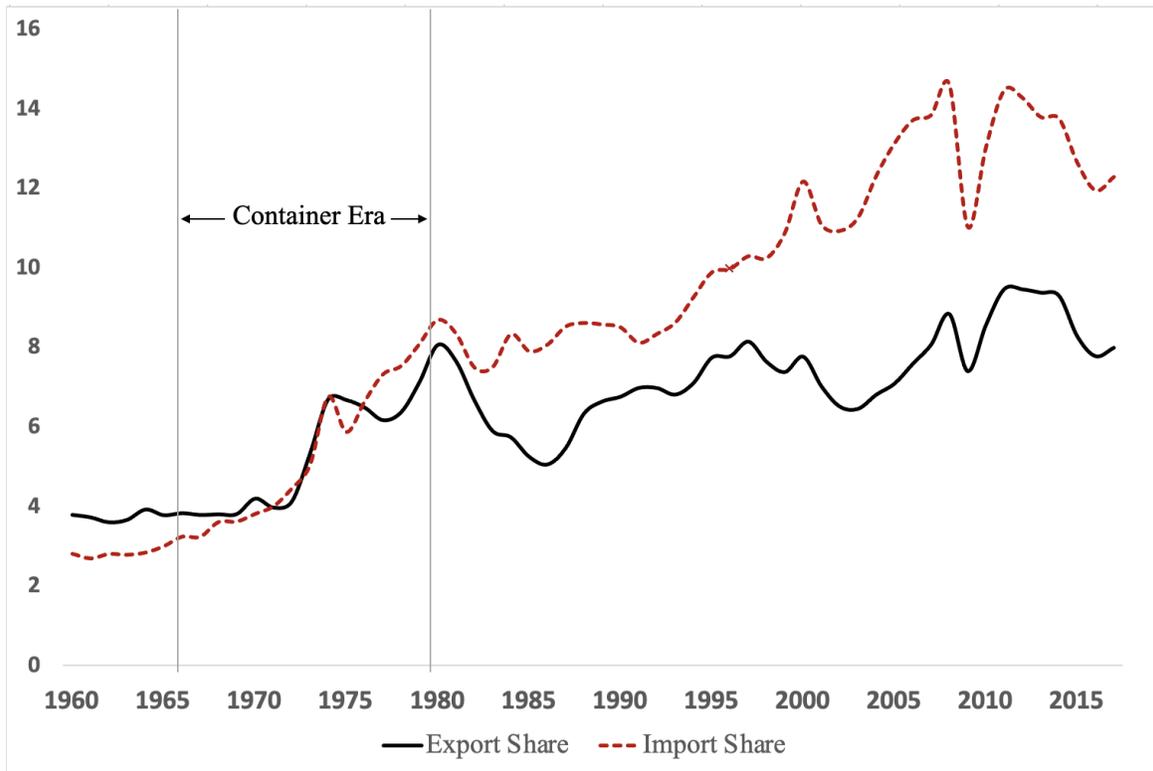
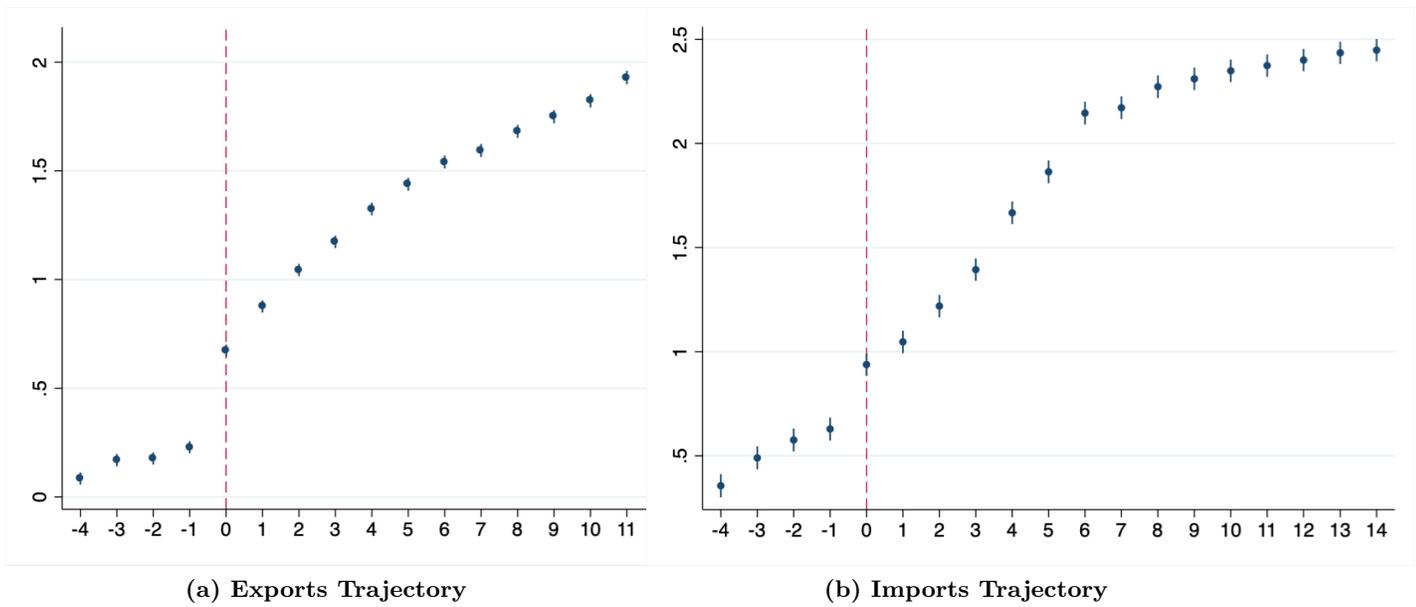
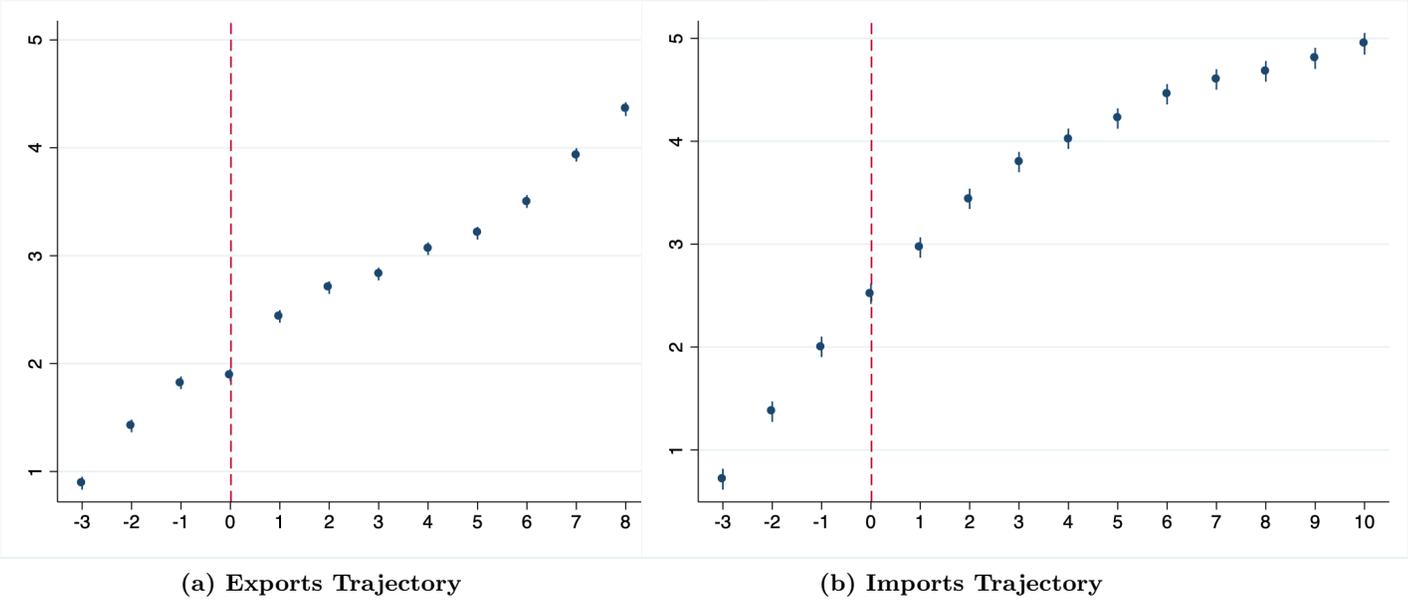


Figure 3: Port Adoption Treatment Effects on Log Bilateral Exports and Imports



**Note:** The figure plots the coefficients of a regression of log *containerizable* exports or imports on an indicator (0,1) for whether a country adopted container-friendly port technologies in a given year.

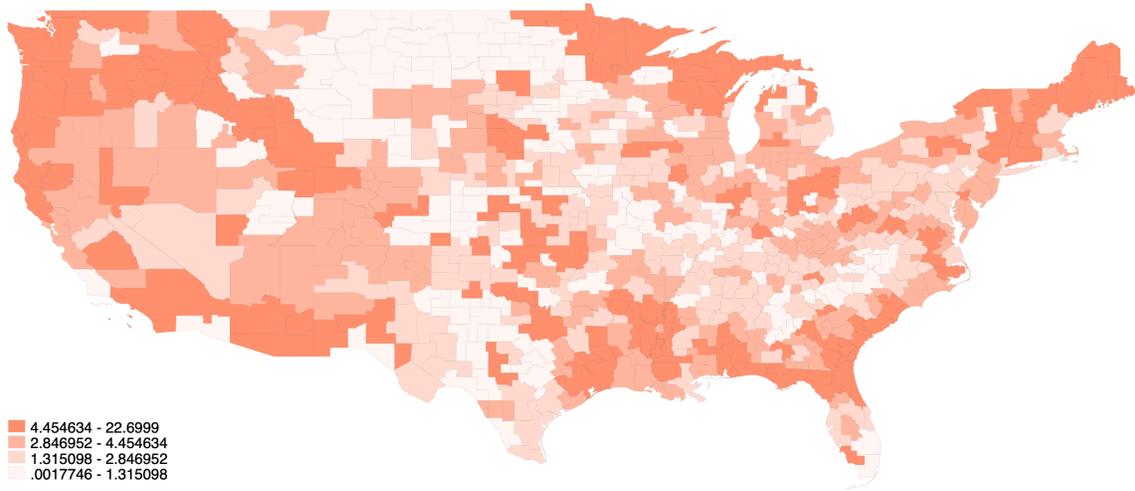
Figure 4: Placebo Treatment Effects on Log Bilateral Exports and Imports



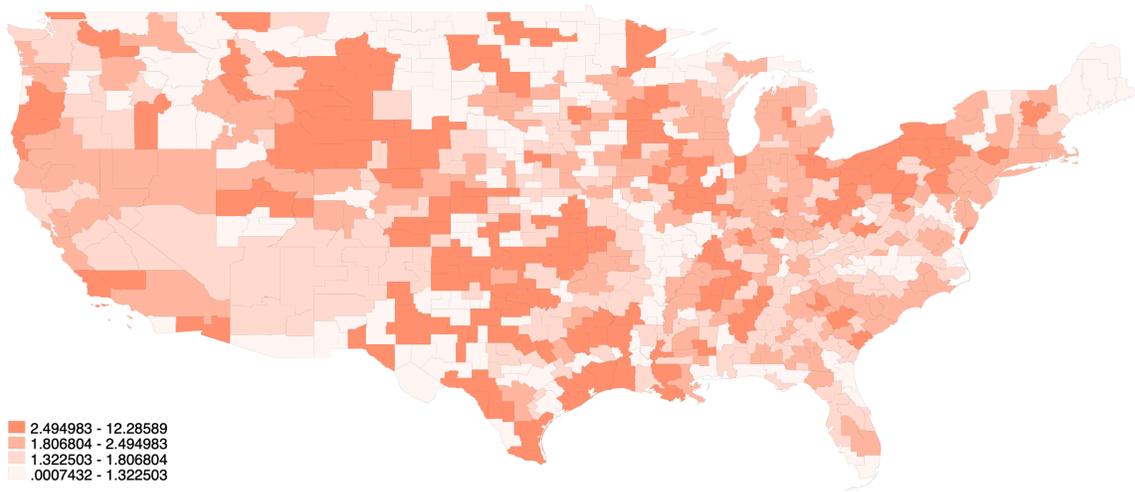
**Note:** The figure plots the coefficients of a regression of log *non-containerizable* exports or imports on an indicator (0,1) for whether a country adopted container-friendly port technologies in a given year.

Figure 5: Distribution of Export and Import Exposure Over the Period 1966 to 1980

(a) Export Exposure



(b) Import Exposure



**Note:** The figures map the values of the export and import exposure measures covering 1966-1980 across U.S. Commuting Zones, as defined by (2) and (3).

Figure 6: Foreign Container Port Openings and U.S. Bilateral Trade with Partner Countries

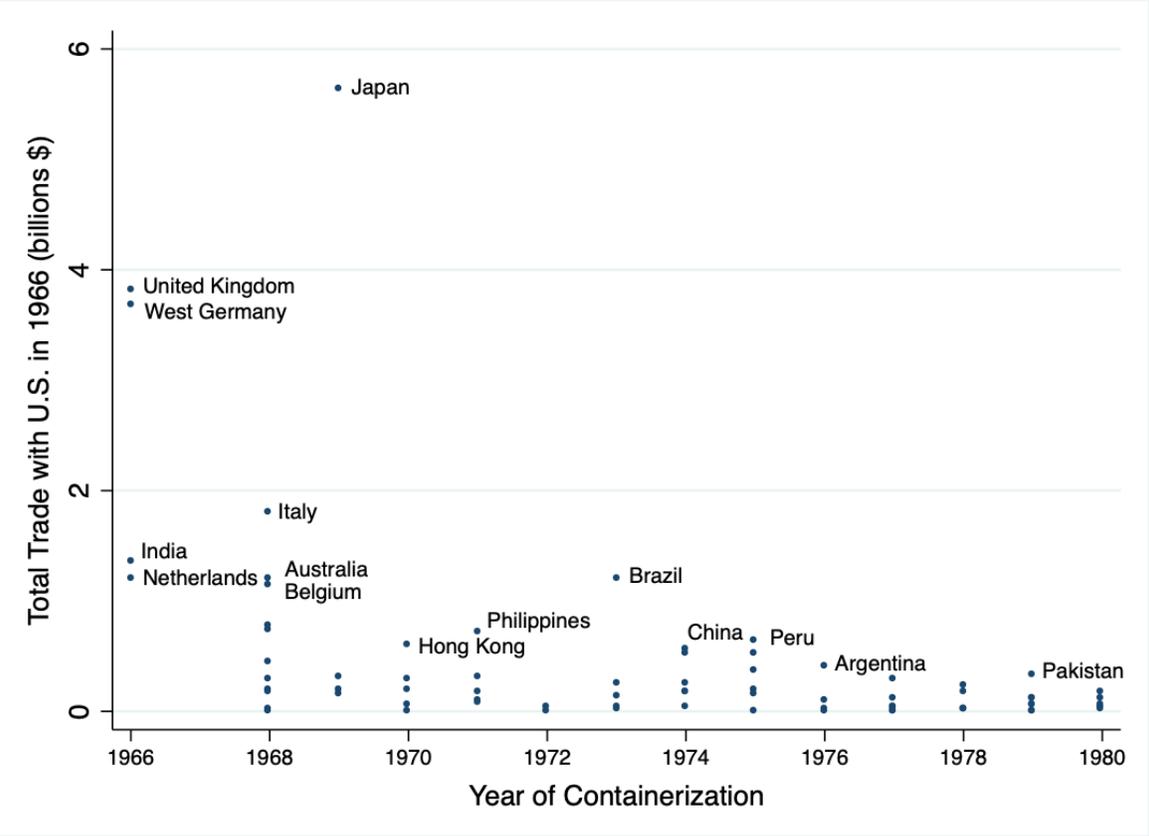
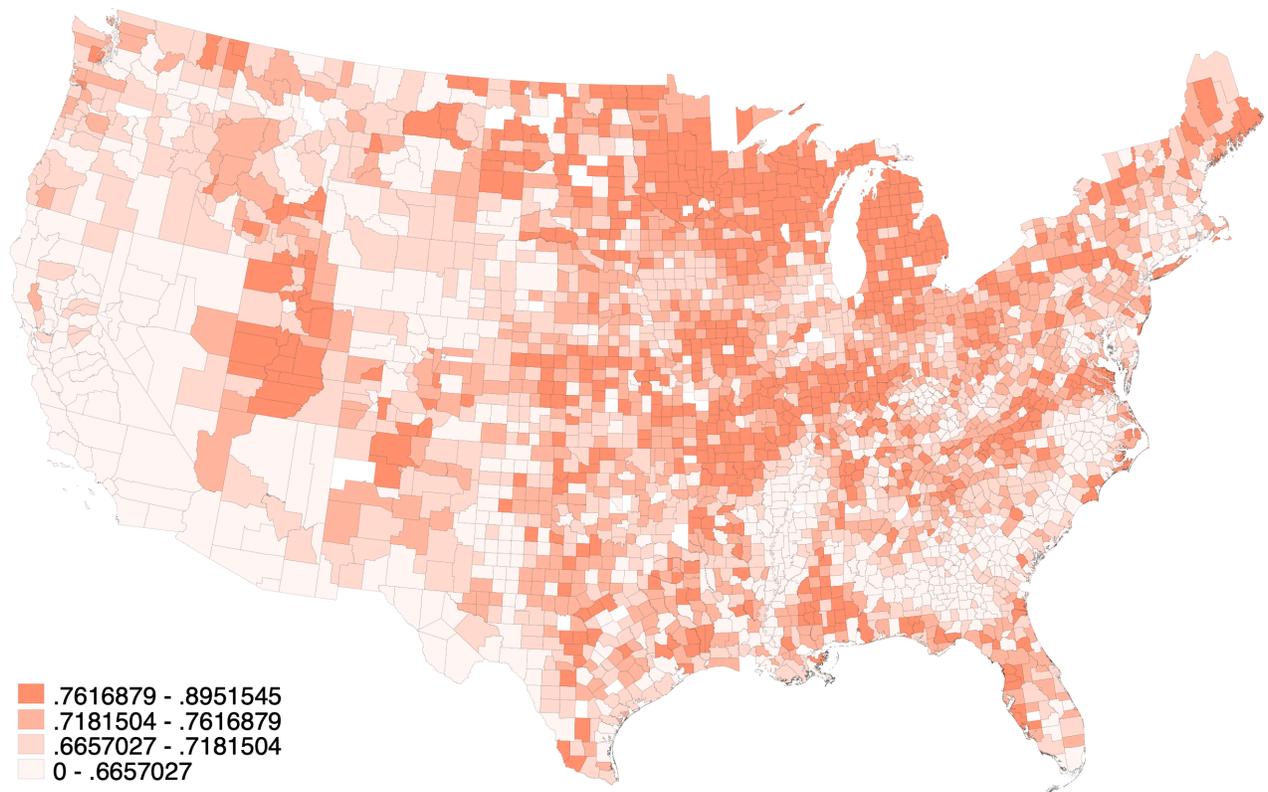


Figure 7: Home Ownership Rates Across U.S. Counties, 1970



**Table 1: Summary Statistics at the Commuting Zone Level**

	Observations Per Decade	1966-1980 Mean/S.D.	1966-1980 Median	1970-1980 Mean/S.D.	1980-1990 Mean/S.D.	1990-2000 Mean/S.D.
$100 \times \Delta$ in Export Exposure	722	2.02 (2.89)	1.19			
$100 \times \Delta$ in Import Exposure	722	2.24 (3.13)	1.26			
$100 \times \text{Log } \Delta$ in Total Employment	722			24.43 (14.04)	18.12 (12.16)	18.54 (13.28)
$100 \times \text{Log } \Delta$ in Mfg Employment	722			11.86 (8.85)	-6.91 (6.82)	-3.52 (5.07)
$100 \times \text{Log } \Delta$ in Non-Mfg Employment	722			24.37 (13.32)	19.02 (11.05)	19.34 (12.97)
$100 \times \text{Log } \Delta$ in Home Prices (2012 \$)	722			27.30 (23.32)	16.54 (16.05)	6.23 (15.57)
$100 \times \text{Log } \Delta$ in Rental Prices (2012 \$)	722			22.04 (31.09)	20.76 (27.82)	4.92 (14.76)
$100 \times \text{Log } \Delta$ in Income (2012 \$)	722			6.88 (9.03)	7.70 (11.21)	11.59 (14.81)

**Notes:** The table reports summary statistics for the main independent variables over the period of the shock (1966-1980) and for the main dependent variables for each decade individually. Total employment is total non-farm employment.

**Table 2: Predicted Exports and Imports**

	Log Exports				Log Imports			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Port-Rail Indicator	0.122*** (0.0138)	1.387*** (0.0310)	2.764*** (0.207)	2.477*** (0.189)	2.261*** (0.0730)	1.753*** (0.0642)	1.977*** (0.555)	2.278*** (0.500)
Log Distance		-0.641*** (0.0299)	-0.920*** (0.0320)	-1.063*** (0.0278)		-0.143*** (0.0507)	-0.356*** (0.0617)	-0.197*** (0.0536)
Log Tariff		0.113*** (0.0332)	0.429*** (0.0421)	0.440*** (0.0390)		-0.0690 (0.0496)	-0.0185 (0.0807)	0.113 (0.0755)
Colonized		0.404*** (0.0321)	2.047*** (0.0620)	2.085*** (0.0535)		0.333*** (0.0476)	1.361*** (0.102)	1.568*** (0.0916)
Common Language		0.505*** (0.0193)	0.447*** (0.0222)	0.568*** (0.0192)		-0.123*** (0.0361)	-0.298*** (0.0454)	-0.307*** (0.0379)
Third-Country Exports to $j$		5.22e-08*** (1.23e-09)	5.18e-08*** (1.15e-09)	5.59e-08*** (1.11e-09)				
Third-Country Exports to $U.S.$						2.01e-08*** (9.02e-10)	2.94e-08*** (9.51e-10)	2.62e-08*** (9.72e-10)
Third-Country TFP		0.181*** (0.0276)	0.245*** (0.0276)	0.326*** (0.0275)		-0.623*** (0.0710)	-0.555*** (0.0708)	-0.487*** (0.0634)
Port-Rail x Distance			0.974*** (0.0248)	1.071*** (0.0220)			0.420*** (0.0600)	0.416*** (0.0526)
Port-Rail x Tariff			-0.500*** (0.0292)	-0.475*** (0.0273)			-0.123* (0.0677)	-0.0402 (0.0655)
Port-Rail x Language			0.0253 (0.0275)	-0.0327 (0.0252)			0.281*** (0.0442)	-0.0660* (0.0387)
Port-Rail x Colonized			-1.930*** (0.0501)	-1.985*** (0.0445)			-1.221*** (0.0879)	-0.838*** (0.0831)
Observations	439707	439707	439707	439707	145350	142205	142205	142205
Product and Year FE	no	no	no	yes	no	no	no	yes
Adjusted $R^2$	.147	.221	.232	.429	.175	.245	.248	.402

**Notes:** The table reports the results from specification (6) along with a symmetric version for imports. The coefficients on variables involving the Port-Rail indicator are then used to generate predicted imports and exports, which are then used to construct the IVs.

**Table 3: Pre-Period Trends in Trade and the Timing of Port Containerization**

	MAIN SPECS		EARLY ADOPTER		LATE ADOPTER		RELIANT ON U.S.		NOT RELIANT ON U.S.	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Import Growth	-0.00458 (0.00454)		-0.00368 (0.0288)		-0.00414 (0.00428)		0.0000377 (0.00963)		-0.00724 (0.00452)	
Export Growth		0.00374 (0.00459)		-0.00545 (0.0126)		0.00313 (0.00416)		-0.00314 (0.0108)		0.00547 (0.00400)
N	3933	4342	1104	1102	2829	3240	2325	2358	1608	1984
Country FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

**Notes:** The dependent variable is an indicator for the opening of a foreign container port. The regressors are import and export growth in the 5-year period prior to the port opening.

**Table 4: First Stage**

	Export Exposure	Import Exposure
Predicted Export Exposure	0.535*** (0.005)	-0.003 (0.007)
Predicted Import Exposure	-0.005* (0.003)	0.826*** (0.003)
Manufacturing Share	-0.002*** (0.000)	-0.003*** (0.000)
Employment Pre-Trends	-0.001 (0.000)	0.001 (0.000)
Observations	721	721
K-P Wald F-Statistic	17.94	24.65

**Notes:** The table reports first stage results of export and import exposure on their predicted exposures and controls. Predicted exposure is constructed as described in Section 2.2.1.

**Table 5: Trade Exposure and the Employment-to-Population Ratio**

	1970-1980	1970-1990	1970-2000	1970-1980	1970-1990	1970-2000
	(1)	(2)	(3)	(4)	(5)	(6)
	<b>OLS</b>			<b>2SLS</b>		
Export Exposure	1.309** (0.731)	1.073* (0.576)	1.229 (2.198)	1.831*** (1.002)	1.212* (0.737)	1.030 (1.732)
Import Exposure	-1.016** (0.455)	-0.740* (0.414)	-0.379 (1.199)	-1.244** (0.461)	-0.722 (1.748)	-0.047 (0.767)
Manufacturing Share	-0.004 (0.005)	0.005 (0.003)	0.005 (0.004)	0.002 (0.003)	0.002 (0.003)	0.002 (0.003)
Pre-Trend in Employment	0.610 (0.663)	0.402 (0.394)	0.412* (0.228)	0.663 (0.384)	0.419 (0.385)	0.352 (0.302)
Observations	722	722	722	722	722	722
State FE	✓	✓	✓	✓	✓	✓

**Notes:** The table reports estimates of the cumulative effects from specification (1). The dependent variable is  $100 \times$  the change in the employment-to-population ratio in a commuting zone (labor market) over the period noted (1970-1980, 1970-1990, 1970-2000). The regressors include  $100 \times$  import and export exposure as defined in equations (2) and (3) in the text. We control for pre-trends in the outcome variable and the manufacturing share of employment. Standard errors are clustered at the labor market level. \*\*\* Significant at the 1 percent, \*\* 5 percent, \* 10 percent level.

**Table 6: Trade Exposure and the Employment-to-Population Ratio by Sector, 2SLS Only**

	<u>1970-1980</u>	<u>1970-1990</u>	<u>1970-2000</u>	<u>1970-1980</u>	<u>1970-1990</u>	<u>1970-2000</u>
	(1)	(2)	(3)	(4)	(5)	(6)
	<b>Manufacturing, 2SLS</b>			<b>Non-Manufacturing, 2SLS</b>		
Export Exposure	1.903*** (0.273)	0.638* (0.312)	0.814 (0.922)	0.270 (0.239)	0.347** (0.182)	0.524 (1.140)
Import Exposure	-1.374*** (0.459)	-0.748 (1.353)	-0.385 (1.039)	-0.383 (0.779)	-0.125 (1.853)	-0.161 (4.208)
Manufacturing Share	-0.003 (0.003)	0.004 (0.003)	0.005 (0.004)	-0.006 (0.003)	0.003 (0.003)	0.002 (0.003)
Pre-Trend in Employment	0.471 (0.477)	0.429 (0.538)	0.512 (0.409)	0.338** (0.110)	0.291 (0.447)	0.117 (0.206)
Observations	722	722	722	722	722	722
State FE	✓	✓	✓	✓	✓	✓

**Notes:** The table reports 2SLS estimates of the cumulative effects from specification (1), separately for the Manufacturing sector (left) and the Non-manufacturing sector (right). The dependent variable is  $100 \times$  the change in the employment-to-population ratio in a commuting zone (labor market) over the period noted (1970-1980, 1970-1990, 1970-2000). The regressors include  $100 \times$  import and export exposure as defined in equations (2) and (3) in the text. We control for pre-trends in the outcome variable and the manufacturing share of employment. Standard errors are clustered at the labor market level. \*\*\* Significant at the 1 percent, \*\* 5 percent, \* 10 percent level.

**Table 7: Trade Exposure and Population**

	<u>1970-1980</u>	<u>1970-1990</u>	<u>1970-2000</u>	<u>1970-1980</u>	<u>1970-1990</u>	<u>1970-2000</u>
	(1)	(2)	(3)	(4)	(5)	(6)
	<b>OLS</b>			<b>2SLS</b>		
Export Exposure	3.309** (1.731)	3.173 (2.506)	2.229 (3.198)	4.150** (2.802)	5.030 (4.737)	5.751 (4.732)
Import Exposure	-1.316** (0.655)	-1.740* (0.914)	-2.379 (2.199)	-1.644** (0.861)	-2.122** (0.848)	-3.047 (3.767)
Manufacturing Share	-0.002 (0.005)	0.003 (0.003)	0.005 (0.004)	-0.001 (0.003)	0.002 (0.003)	0.002 (0.003)
Pre-Trend in Employment	0.593 (0.602)	0.501 (0.482)	0.464* (0.449)	0.391 (0.600)	0.339 (0.526)	0.513 (0.553)
Observations	722	722	722	722	722	722
State FE	✓	✓	✓	✓	✓	✓

**Notes:** The table reports estimates of the cumulative effects from specification (1). The dependent variable is  $100 \times$  the change in log population in a commuting zone (labor market) over the period noted (1970-1980, 1970-1990, 1970-2000). The regressors include  $100 \times$  import and export exposure as defined in equations (2) and (3) in the text. We control for pre-trends in the outcome variable and the manufacturing share of employment. Standard errors are clustered at the labor market level. \*\*\* Significant at the 1 percent, \*\* 5 percent, \* 10 percent level.

**Table 8: Trade Exposure and Housing Supply**

	<b>1970-1980</b>	<b>1970-1990</b>	<b>1970-2000</b>	<b>1970-1980</b>	<b>1970-1990</b>	<b>1970-2000</b>
	(1)	(2)	(3)	(4)	(5)	(6)
	<b>OLS</b>			<b>2SLS</b>		
Export Exposure	5.048** (2.430)	6.194 (5.733)	6.576 (11.803)	7.491** (3.938)	7.290 (10.338)	9.311 (13.536)
Import Exposure	-1.080 (4.520)	-1.694 (4.603)	0.344 (1.767)	-2.310 (2.853)	-1.567 (1.294)	-1.307 (1.993)
Manufacturing Share	-0.003* (0.002)	-0.001* (0.001)	-0.000 (0.001)	0.001 (0.001)	0.001 (0.001)	0.002 (0.001)
Pre-Trend in Housing Supply	0.428 (0.618)	0.215 (0.433)	0.197 (0.328)	0.401 (0.315)	0.388 (0.506)	0.210 (0.200)
Observations	722	722	722	722	722	722
State FE	✓	✓	✓	✓	✓	✓

**Notes:** The table reports estimates of the cumulative effects from specification (1). The dependent variable is  $100 \times$  the change in log total housing units in a commuting zone (labor market) over the period noted (1970-1980, 1970-1990, 1970-2000). The regressors include  $100 \times$  import and export exposure as defined in equations (2) and (3) in the text. We control for pre-trends in the outcome variable and the manufacturing share of employment. Standard errors are clustered at the labor market level. \*\*\* Significant at the 1 percent, \*\* 5 percent, \* 10 percent level.

**Table 9: Trade Exposure and Income Growth**

	<b>1970-1980</b>	<b>1970-1990</b>	<b>1970-2000</b>	<b>1970-1980</b>	<b>1970-1990</b>	<b>1970-2000</b>
	(1)	(2)	(3)	(4)	(5)	(6)
	<b>OLS</b>			<b>2SLS</b>		
Export Exposure	3.727*** (1.084)	2.382 (2.441)	2.022 (2.606)	4.663** (2.642)	3.601 (3.062)	3.321 (3.235)
Import Exposure	-1.534*** (0.892)	-0.948 (0.991)	-0.576 (1.001)	-1.925** (1.161)	-1.263 (1.748)	-0.893 (3.767)
Manufacturing Share	-0.004* (0.002)	-0.001 (0.001)	-0.000 (0.001)	0.002 (0.003)	0.002 (0.003)	0.002 (0.003)
Pre-Trend in Income	0.209 (0.213)	0.199 (0.305)	0.173 (0.207)	0.334 (0.392)	0.251 (0.282)	0.211 (0.301)
Observations	722	722	722	722	722	722
State FE	✓	✓	✓	✓	✓	✓

**Notes:** The table reports estimates of the cumulative effects from specification (1). The dependent variable is  $100 \times$  the change in log median income in a commuting zone (labor market) over the period noted (1970-1980, 1970-1990, 1970-2000). Values are in 2012 \$. The regressors include  $100 \times$  import and export exposure as defined in equations (2) and (3) in the text. We control for pre-trends in the outcome variable and the manufacturing share of employment. Standard errors are clustered at the labor market level. \*\*\* Significant at the 1 percent, \*\* 5 percent, \* 10 percent level.

**Table 10: Trade Exposure and Home Price Growth**

	1970-1980	1970-1990	1970-2000	1970-1980	1970-1990	1970-2000
	(1)	(2)	(3)	(4)	(5)	(6)
	<b>OLS</b>			<b>2SLS</b>		
Export Exposure	2.928*** (1.078)	4.359 (4.285)	4.023 (5.338)	4.243*** (2.603)	5.531 (3.991)	4.692 (5.700)
Import Exposure	-2.245*** (0.679)	-4.246** (2.535)	-4.105 (4.095)	-5.201*** (2.003)	-5.912** (2.991)	-6.889 (7.804)
Manufacturing Share	0.003 (0.002)	0.002* (0.001)	0.000** (0.000)	0.002 (0.003)	0.002 (0.003)	0.001 (0.003)
Pre-Trend in Home Prices	0.522 (0.442)	0.419 (0.491)	0.400 (0.504)	0.691 (0.551)	0.406* (0.293)	0.381* (0.185)
Observations	722	722	722	722	722	722
State FE	✓	✓	✓	✓	✓	✓

**Notes:** The table reports estimates of the cumulative effects from specification (1). The dependent variable is  $100 \times$  the change in log median home price in a commuting zone (labor market) over the period noted (1970-1980, 1970-1990, 1970-2000). Values are in 2012 \$. The regressors include  $100 \times$  import and export exposure as defined in equations (2) and (3) in the text. We control for pre-trends in the outcome variable and the manufacturing share of employment. Standard errors are clustered at the labor market level. \*\*\* Significant at the 1 percent, \*\* 5 percent, \* 10 percent level.

**Table 11: Trade Exposure and Rental Price Growth**

	1970-1980	1970-1990	1970-2000	1970-1980	1970-1990	1970-2000
	(1)	(2)	(3)	(4)	(5)	(6)
	<b>OLS</b>			<b>2SLS</b>		
Export Exposure	2.235** (1.214)	2.413* (1.405)	3.807 (3.424)	3.778** (2.038)	4.259 (3.438)	4.025 (5.536)
Import Exposure	-3.080*** (1.366)	-3.694** (2.319)	-4.444 (3.664)	-4.216** (2.515)	-6.211** (3.388)	-5.307 (4.558)
Manufacturing Share	0.002** (0.001)	0.002 (0.001)	0.002 (0.002)	0.002 (0.003)	0.002 (0.003)	0.002 (0.003)
Pre-Trend in Rents	0.491 (0.454)	0.303 (0.398)	0.217 (0.333)	0.552 (0.485)	0.462* (0.302)	0.280 (0.199)
Observations	722	722	722	722	722	722
State FE	✓	✓	✓	✓	✓	✓

**Notes:** The table reports estimates of the cumulative effects from specification (1). The dependent variable is  $100 \times$  the change in log median rental price in a commuting zone (labor market) over the period noted (1970-1980, 1970-1990, 1970-2000). Values are in 2012 \$. The regressors include  $100 \times$  import and export exposure as defined in equations (2) and (3) in the text. We control for pre-trends in the outcome variable and the manufacturing share of employment. Standard errors are clustered at the labor market level. \*\*\* Significant at the 1 percent, \*\* 5 percent, \* 10 percent level.

Table 12: Trade Exposure and Outcomes, By Land Unavailability (2SLS Only)

	1970-1980	1970-1990	1970-2000	1970-1980	1970-1990	1970-2000
	(1)	(2)	(3)	(4)	(5)	(6)
<b>PANEL A Dep Var: Log <math>\Delta</math> Housing Supply</b>			<b>High Availability</b>		<b>Low Availability</b>	
Export Exposure	8.183** (4.038)	8.859** (5.238)	8.025 (7.536)	2.008 (2.510)	1.631 (3.370)	2.291 (4.091)
Import Exposure	-0.824 (1.166)	-1.225 (1.519)	-1.047 (2.664)	-2.723 (2.515)	-2.916 (2.388)	-2.992 (2.558)
Manufacturing Share	0.002 (0.002)	0.001 (0.001)	-0.001 (0.001)	0.002 (0.002)	0.002 (0.002)	0.002 (0.004)
Pre-Trend in Housing Supply	0.658** (0.320)	0.639* (0.421)	0.585 (0.481)	0.511 (0.496)	0.492 (0.548)	0.442 (0.580)
<b>PANEL B Dep Var: Log <math>\Delta</math> Home Prices</b>			<b>High Availability</b>		<b>Low Availability</b>	
Export Exposure	2.074** (1.139)	3.293 (2.629)	4.718 (4.062)	4.005** (2.283)	4.833* (2.915)	5.519 (5.552)
Import Exposure	-4.285*** (2.010)	-4.791 (3.862)	-6.623 (5.792)	-6.027** (3.577)	-6.311* (4.239)	-7.048 (9.451)
Manufacturing Share	0.002 (0.002)	0.002 (0.001)	0.001 (0.001)	0.002 (0.003)	0.003 (0.003)	0.003 (0.003)
Pre-Trend in Home Prices	0.500 (0.621)	0.432 (0.305)	0.308 (0.207)	0.441 (0.392)	0.372 (0.282)	0.351 (0.301)
<b>PANEL C Dep Var: Log <math>\Delta</math> Housing Rent</b>			<b>High Availability</b>		<b>Low Availability</b>	
Export Exposure	4.109** (2.184)	4.449 (3.651)	6.027 (4.629)	5.113** (2.480)	5.736* (3.172)	5.725 (5.728)
Import Exposure	-3.201*** (1.003)	-4.415 (3.361)	-5.021 (4.107)	-4.620*** (1.660)	-4.309** (2.076)	-6.912 (8.824)
Manufacturing Share	0.001 (0.002)	0.001 (0.001)	0.001 (0.001)	0.002 (0.003)	0.002 (0.003)	0.003 (0.003)
Pre-Trend in Rents	0.620* (0.447)	0.492 (0.426)	0.441 (0.422)	0.591 (0.529)	0.558 (0.561)	0.414 (0.587)
Observations	361	361	361	361	361	361
State FE	✓	✓	✓	✓	✓	✓

**Notes:** The table reports 2SLS estimates from three separate specifications given by (1), where the outcomes are listed at the top of each panel and the estimates are reported for high availability (below median land unavailability) and low availability (above median land unavailability). The land unavailability measure is described in Section 4.8. The dependent variable is  $100 \times$  the change in log outcome in a commuting zone (labor market) over the period noted (1970-1980, 1970-1990, 1970-2000). The regressors include  $100 \times$  import and export exposure as defined in equations (2) and (3) in the text. We control for pre-trends in the outcome variable and the manufacturing share of employment in all specifications. Standard errors are clustered at the labor market level. \*\*\* Significant at the 1 percent, \*\* 5 percent, \* 10 percent level.

**Table 13: Largest Real Income Gains and Losses by Commuting Zone**

Commuting Zone (Largest MSA)	$\Delta$ Real Income (\$)	Pctile Export Exposure	Pctile Import Exposure	Pctile Supply Elasticity	Pctile Home Own. Rate
	(1)	(2)	(3)	(4)	(5)
<b>Largest Real Income Gains</b>					
Charlotte-Gastonia-Rock Hill NC-SC	8811	82	50	17	68
Houston TX PMSA	8105	91	38	34	81
Mobile AL MSA	7004	85	71	48	73
Hartford CT NECMA	6914	69	62	5	82
Pittsfield MA NECMA	6259	98	49	51	91
Los Angeles-Long Beach CA PMSA	6251	94	16	62	58
Atlanta GA MSA	4926	90	90	28	64
Phoenix-Mesa AZ MSA	4751	73	36	43	93
Beaumont-Port Arthur TX MSA	4662	65	58	57	91
Rochester MN MSA	4410	88	82	59	98
<b>Largest Real Income Losses</b>					
Cleveland-Lorain-Elyria OH PMSA	-6061	47	92	25	59
Toledo OH MSA	-5801	61	94	34	68
Fort Smith AR-OK MSA	-5763	24	74	68	58
Dayton-Springfield OH MSA	-5691	21	89	45	72
Grand Rapids-Muskegon-Holland MI	-5602	48	72	60	80
Detroit MI PMSA	-5225	62	65	85	67
Cincinnati OH-KY-IN PMSA	-4337	33	79	34	59
Birmingham-Hoover, AL MSA	-3912	25	63	81	87
Pittsburgh PA MSA	-3904	52	68	41	70
Columbus OH MSA	-3770	70	94	39	72

**Notes:** The table reports values for twenty Commuting Zones (CZs), where the CZs are named according to the largest MSA in the CZ. We calculate real income for home owners for the scenario in which they fully liquidate their gains or losses. The total effect for a CZ is the weighted combination of real income outcomes for home owners and renters, using home ownership and rental rates as weights. The top panel reports values for the CZs experiencing the largest gains in real income and the bottom panel for those experiencing the largest declines in real income. Real income is in 2012 dollars.

## A Persistence in Outcomes and Treatment

In the model described in Section 2, both positive and negative shocks have contemporaneous effects on outcomes, while negative shocks may also generate effects that persist into future periods (Corollaries ?? and ??). We refer to this latter channel of impact as “outcome persistence” and specification (1) captures this via the local projection. At the same time, there is a potentially confounding impact on outcomes due to the fact that the shocks themselves may persist into future periods, which we will refer to as “treatment persistence”. Typically this channel is not the effect of interest in long-run studies and, in that sense, biases the “true” effect – i.e., the effect due to outcome persistence only. We estimate the importance of the treatment persistence channel in our data in this subsection, finding only a small contribution to the total effect.

To be more specific, Figures 3a and 3b indicate that foreign container port openings generated a discontinuous, one-time rise in the level of U.S. trade flows. However, this one-time shock may have generated an increase in future trade flows as well (a persistence in treatment), perhaps due to increasing efficiency in the use of port infrastructure or due to spillovers from the growing global network of container ports.<sup>29</sup> These intervening treatments in future periods can be thought of as omitted variables in (1), such that the medium- and long-run estimates that we obtain  $\{\beta_{1990}^x, \beta_{1990}^m, \beta_{2000}^x, \beta_{2000}^m\}$  reflect the sum of the two effects:

$$\beta_{1990}^k = \underbrace{\theta_{1980}^k}_{\text{Outcome Persistence}} + \underbrace{\gamma^k \theta_{1990}^k}_{\text{Treatment Persistence}} \quad \text{and} \quad \beta_{2000}^k = \underbrace{\theta_{1980}^k}_{\text{Outcome Persistence}} + \underbrace{\gamma^k \theta_{2000}^k + \delta^k \theta_{1990}^k}_{\text{Treatment Persistence}}$$

for  $k \in \{X, M\}$  and where  $\theta_{1980}^k$  in each equation reflects the outcome persistence channel – i.e., it is the direct effect of the initial period container shock on outcomes over the 1980-1990 period and the 1990-2000 periods. The parameters  $\{\gamma^k, \delta^k\}$  then reflect the reduced form effects of treatment persistence – i.e., they are the effects of the initial period trade exposure due to the container shock on future trade exposure, conditional on the set of controls in (1).

In fact, we can estimate these parameters in our data. First,  $\gamma$  is the OLS-estimated impact of initial period (1966-1980) trade exposure on trade exposure in the subsequent period (1980-1990) and is positive for both exports and imports (0.03 and 0.10, respectively, and significant at the one percent level). This indicates that without controlling for medium-run treatment persistence the estimated  $\beta$ 's will *overstate* the true impact of the initial shock on outcomes, though we note that the magnitude of this channel is not large.<sup>30</sup> In contrast, we find that  $\delta$  is negative for exports and imports (-0.004 and -0.02, respectively, and significant at the one percent level) such that without controlling for long-run treatment persistence the estimates will *understate* the true long-run impact of the initial shock, again likely by only a relatively small amount.<sup>31</sup> The estimated coefficients

<sup>29</sup>This scenario is similar to Cellini et al. (2010) who explore the dynamic effects of the passage of school bonds, where the outcomes depend not only on passage of a particular bond measure but also on the entire history of bond proposals.

<sup>30</sup>For example, the effect of export treatment persistence on outcomes in 1990 will be  $0.03 \times \theta_{1990}^x$ .

<sup>31</sup>We note that the medium-run treatment persistence dominates the long-run for both exports and imports ( $\delta^k > \gamma^k$ ), so that

in our medium- and long-run regressions can therefore be thought of as reflecting outcome persistence (the “true” effect) plus a small omitted variable bias due to treatment persistence into future periods.

Note that, in principle, the outcome persistence channel can be fully recovered by conditioning on intervening treatments. However, in practice these controls will be endogenous to the extent that they are correlated with unobservables and so we do not report specifications that include these controls.<sup>32</sup>

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<sup>32</sup> $\beta_{2000}^k$  will slightly overstate the true impact of the initial shock.

<sup>32</sup>We did produce tables of these estimates and the results are not qualitatively different, as expected given the exercise described here. These tables are available upon request.

## B For Online Publication

**Table B.1: Early Port Adopters: Trade Exposure Impact on Housing Supply and Employment-to-Population Ratio, 2SLS**

	<u>1970-1980</u>	<u>1970-1990</u>	<u>1970-2000</u>	<u>1970-1980</u>	<u>1970-1990</u>	<u>1970-2000</u>
	(1)	(2)	(3)	(4)	(5)	(6)
	<b>Housing Supply, 2SLS</b>			<b>Employment Rate, 2SLS</b>		
Export Exposure	6.893** (3.141)	7.022 (5.890)	9.241 (8.552)	2.032** (1.012)	0.813 (4.069)	0.227 (5.092)
Import Exposure	-2.053 (2.220)	-1.936 (2.159)	-2.885 (3.262)	-1.802** (0.873)	-3.152 (2.972)	-4.446 (3.250)
Manufacturing Share	0.004 (0.003)	0.003 (0.003)	0.005 (0.004)	0.003 (0.002)	0.004 (0.001)	0.002 (0.002)
Pre-Trend in Employment	0.558* (0.341)	0.418 (0.409)	0.405 (0.351)	0.309 (0.225)	0.300 (0.284)	0.215 (0.309)
Observations	722	722	722	722	722	722
State FE	✓	✓	✓	✓	✓	✓

**Notes:** The table reports estimates of the effects from specification (1). The dependent variable is  $100 \times$  the change in log number of housing units or employment-to-population ratio in a commuting zone over the period noted. The regressors include  $100 \times$  import and export exposure as defined in equations (2) and (3) in the text. We control for pre-trends in the outcome variable and the manufacturing share of employment. Standard errors are clustered at the labor market level. \*\*\* Significant at the 1 percent, \*\* 5 percent, \* 10 percent level.

**Table B.2: Early Port Adopters: Trade Exposure Impact on Home Price and Rental Price Growth, 2SLS**

	<u>1970-1980</u>	<u>1970-1990</u>	<u>1970-2000</u>	<u>1970-1980</u>	<u>1970-1990</u>	<u>1970-2000</u>
	(1)	(2)	(3)	(4)	(5)	(6)
	<b>Home Prices</b>			<b>Rental Prices</b>		
Export Exposure	2.994*** (1.302)	3.545 (2.851)	4.807 (4.913)	2.791** (1.352)	4.091 (3.762)	4.882 (4.815)
Import Exposure	-3.292*** (1.214)	-3.580* (2.276)	-3.881 (3.508)	-4.219*** (2.005)	-4.993** (2.713)	-5.428 (5.558)
Manufacturing Share	0.002 (0.002)	0.001* (0.000)	0.001 (0.000)	0.003 (0.003)	0.002 (0.003)	0.003 (0.003)
Pre-Trend in Home Prices	0.481 (0.453)	0.336 (0.381)	0.218 (0.311)	0.557 (0.436)	0.601* (0.380)	0.482 (0.451)
Observations	722	722	722	722	722	722
State FE	✓	✓	✓	✓	✓	✓

**Notes:** The table reports estimates of the effects from specification (1). The dependent variable is  $100 \times$  the change in log median home price in a commuting zone over the period noted. Values are in 2012 \$. The regressors include  $100 \times$  import and export exposure as defined in equations (2) and (3) in the text. We control for pre-trends in the outcome variable and the manufacturing share of employment. Standard errors are clustered at the labor market level. \*\*\* Significant at the 1 percent, \*\* 5 percent, \* 10 percent level.

**Table B.3: Remove U.S. Port CZs: Trade Exposure Impact on Housing Supply and Employment-to-Population Ratio, 2SLS**

	<u>1970-1980</u>	<u>1970-1990</u>	<u>1970-2000</u>	<u>1970-1980</u>	<u>1970-1990</u>	<u>1970-2000</u>
	(1)	(2)	(3)	(4)	(5)	(6)
	<b>Housing Supply, 2SLS</b>			<b>Employment Rate, 2SLS</b>		
Export Exposure	6.405* (4.011)	7.186 (5.715)	6.092 (6.884)	1.859** (0.951)	0.710 (1.991)	0.441 (1.254)
Import Exposure	-2.116 (2.715)	-1.814 (2.491)	-3.298 (3.224)	-1.731** (0.914)	-3.113 (2.902)	-4.152 (3.542)
Manufacturing Share	0.001 (0.003)	0.002 (0.003)	0.001 (0.004)	0.003 (0.002)	0.002 (0.001)	-0.003 (0.002)
Pre-Trend in Employment	0.415* (0.512)	0.391 (0.445)	0.422 (0.392)	0.395 (0.347)	0.311 (0.302)	0.354 (0.440)
Observations	722	722	722	722	722	722
State FE	✓	✓	✓	✓	✓	✓

**Notes:** The table reports estimates of the effects from specification (1). The dependent variable is  $100 \times$  the change in log number of housing units or employment-to-population ratio in a commuting zone over the period noted. The regressors include  $100 \times$  import and export exposure as defined in equations (2) and (3) in the text. We control for pre-trends in the outcome variable and the manufacturing share of employment. Standard errors are clustered at the labor market level. \*\*\* Significant at the 1 percent, \*\* 5 percent, \* 10 percent level.

**Table B.4: Remove U.S. Port CZs: Trade Exposure Impact on Home Price and Rental Price Growth, 2SLS**

	<u>1970-1980</u>	<u>1970-1990</u>	<u>1970-2000</u>	<u>1970-1980</u>	<u>1970-1990</u>	<u>1970-2000</u>
	(1)	(2)	(3)	(4)	(5)	(6)
	<b>Home Prices</b>			<b>Rental Prices</b>		
Export Exposure	2.813*** (1.222)	4.143 (2.797)	4.245 (5.255)	2.901** (1.352)	3.476 (3.762)	4.524 (4.815)
Import Exposure	-3.912*** (1.497)	-3.024* (2.148)	-2.447 (3.524)	-4.842*** (2.116)	-4.112* (3.104)	-4.712 (4.882)
Manufacturing Share	0.003 (0.002)	0.001* (0.000)	0.002 (0.000)	0.001* (0.003)	0.001 (0.003)	-0.004 (0.003)
Pre-Trend in Home Prices	0.405 (0.447)	0.449 (0.395)	0.501 (0.341)	0.298 (0.308)	0.440* (0.626)	0.382 (0.309)
Observations	722	722	722	722	722	722
State FE	✓	✓	✓	✓	✓	✓

**Notes:** The table reports estimates of the effects from specification (1). The dependent variable is  $100 \times$  the change in log median home price in a commuting zone over the period noted. Values are in 2012 \$. The regressors include  $100 \times$  import and export exposure as defined in equations (2) and (3) in the text. We control for pre-trends in the outcome variable and the manufacturing share of employment. Standard errors are clustered at the labor market level. \*\*\* Significant at the 1 percent, \*\* 5 percent, \* 10 percent level.

**Table B.5: Lasso-IVs: Trade Exposure Impact on Housing Supply and Employment-to-Population Ratio, 2SLS**

	<u>1970-1980</u>	<u>1970-1990</u>	<u>1970-2000</u>	<u>1970-1980</u>	<u>1970-1990</u>	<u>1970-2000</u>
	(1)	(2)	(3)	(4)	(5)	(6)
	<b>Housing Supply</b>			<b>Employment Rate</b>		
Export Exposure	8.205*** (2.697)	9.243* (5.913)	9.337 (7.470)	1.53** (0.741)	1.214 (1.126)	0.711 (2.392)
Import Exposure	-3.277 (4.138)	-4.192 (4.509)	-4.504 (5.331)	-0.908** (0.481)	-1.018 (1.761)	-0.648 (1.809)
Manufacturing Share	0.002 (0.003)	0.001 (0.003)	0.002 (0.003)	0.003 (0.003)	0.004 (0.003)	0.002 (0.004)
Pre-Trend in Employment	0.448* (0.294)	0.325 (0.307)	0.318* (0.339)	0.562 (0.183)	0.493 (0.524)	0.374 (0.416)
Observations	722	722	722	722	722	722
State FE	✓	✓	✓	✓	✓	✓

**Notes:** The table reports estimates of the effects from specification (1). The dependent variable is  $100 \times$  the change in the employment-to-population ratio in a commuting zone over the period noted. The regressors include  $100 \times$  import and export exposure as defined in equations (2) and (3) in the text. We control for pre-trends in the outcome variable and the manufacturing share of employment. Standard errors are clustered at the labor market level. \*\*\* Significant at the 1 percent, \*\* 5 percent, \* 10 percent level.

**Table B.6: Lasso IVs: Trade Exposure Impact on Home Price and Rental Price Growth, 2SLS**

	<u>1970-1980</u>	<u>1970-1990</u>	<u>1970-2000</u>	<u>1970-1980</u>	<u>1970-1990</u>	<u>1970-2000</u>
	(1)	(2)	(3)	(4)	(5)	(6)
	<b>Home Prices, 2SLS</b>			<b>Rental Prices, 2SLS</b>		
Export Exposure	5.349*** (2.201)	7.293 (6.982)	8.444 (9.419)	4.582*** (2.242)	6.091 (5.447)	6.992 (7.514)
Import Exposure	-7.352*** (0.679)	-8.114** (2.535)	-8.230 (4.095)	-4.914*** (1.639)	-7.254*** (8.144)	-7.833 (10.413)
Manufacturing Share	0.003 (0.002)	0.002* (0.001)	0.000** (0.000)	0.002 (0.003)	0.002 (0.003)	0.001 (0.003)
Pre-Trend in Home Prices	0.522 (0.442)	0.419 (0.491)	0.400 (0.504)	0.691 (0.551)	0.406* (0.293)	0.381* (0.185)
Observations	722	722	722	722	722	722
State FE	✓	✓	✓	✓	✓	✓

**Notes:** The table reports estimates of the effects from specification (1). The dependent variable is  $100 \times$  the change in log median home price in a commuting zone over the period noted. Values are in 2012 \$. The regressors include  $100 \times$  import and export exposure as defined in equations (2) and (3) in the text. We control for pre-trends in the outcome variable and the manufacturing share of employment. Standard errors are clustered at the labor market level. \*\*\* Significant at the 1 percent, \*\* 5 percent, \* 10 percent level.