THE EFFECT OF FURNITURE IMPORTS FROM CHINA ON EMPLOYMENT IN U.S. REGIONS

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ECONOMICS WORKING PAPER SERIES

Working Paper 2017-08-A

U.S. INTERNATIONAL TRADE COMMISSION

500 E Street SW

Washington, DC 20436

August 2017

The author is grateful to Andre Barbe and Ross Hallren for helpful comments and suggestions.

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ABSTRACT

We develop an industry-specific model of subnational and international trade. We use the model to simulate the impact of hypothetical changes in the tariff on U.S. imports of furniture from China on industry employment in different regions of the United States. We find that eliminating the current tariff would reduce industry employment by less than 0.1 percent, while imposing an additional 20 percent tariff would increase industry employment by about 4.4 percent. In either scenario, the effects on employment in the industry are unevenly distributed across regions of the United States: the effects are more than one and a half times larger in the West than in the East. This pattern reflects the locations of import entry and export production, as well as the flow of furniture shipments between the regions. The model contributes to the broader literature on the local labor market effects of trade from China by incorporating data on subnational trade.

Keywords: subnational, trade and labor, trade policy, furniture

JEL Codes: F13, F15, F16

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1. Introduction

In this paper, we develop an industry-specific model of subnational and international trade, and then we use the model to quantify the impact of trade policy on employment in different regions of the United States. The model illustrates how changes in industry-specific tariffs can have employment effects that are unevenly distributed across regions of the country whenever transport costs segment U.S. product markets.

The model is motivated by the recent literature on the economic impact of international trade on local labor markets in the United States. This literature includes studies by Autor, Dorn, and Hanson (2013a, 2013b, 2016), Acemoglu, Autor, Dorn, Hanson, and Price (2016), Hakobyan and McLaren (2016), and Monte (2016). These authors recognize that labor markets in the United States are geographically segmented and that differences in an industry's share of employment across locations will result in differences in workers' exposure to international trade and, ultimately, in regional differences in the effects of trade on labor market outcomes.

While these studies focus attention on the geographic segmentation of labor markets within the United States, they assume that there is no segmentation of product market and that the country comprises a single, perfectly integrated product market. For example, Autor, Dorn, and Hanson (2013a, 2013b, 2016), Acemoglu, Autor, Dorn, Hanson, and Price (2016), and Monte (2016) calculate the exposure of local labor markets to imports from China based on industry shares of local employment and total U.S. imports in each industry, regardless of where the imports from China enter the United States. Following this approach, if local labor markets in California and Massachusetts had the same industry composition of local employment, then the two local labor markets would be equally exposed to imports from China, even though most imports from China arrive on the West Coast and are costly to ship to the East Coast. Similarly, the measure of the exposure of local labor markets to NAFTA tariff reductions in Hakobyan and McLaren (2016) combines industry-level measures of trade exposure with data on the industry composition of local employment to measure trade exposure: the authors assign imports to local labor markets based on the location's share of national employment in the industry without regard to where the imports enter the United States.[1]

[1] The econometric model of wages in Hakobyan and McLaren (2016) includes a dummy variable for locations that are close to the U.S.-Mexican border, but the measure of distance to the border is not part of the authors' measure of each location's exposure to the NAFTA tariff reductions.

However, analysis of the effects of trade on labor markets should take into account where the imports enter the country and where they are ultimately consumed, because it is costly to ship goods within the United States. Hillberry and Hummels (2008) provides evidence on the cost of intra-national shipments. They estimate that manufacturers' shipments within the United States are extremely localized: shipments within zip codes are three times larger than shipments outside of the zip code. Hummels and Schaur (2012) estimate that one day in transit is equivalent to a 0.6 to 2.1 percent ad valorem trade cost.[2]

In this paper, we relax the assumption of a perfectly integrated national product market. We examine how subnational trade between regions of the United States determines the geographic distribution of the labor market effects of changes in U.S. trade policy. We develop an industry-specific partial equilibrium model that utilizes microdata from the 2012 Commodity Flow Survey on domestic shipments between regions and information about where U.S. imports entered the country to estimate the labor market effects specific to each region. Our simulation model differs from the econometric analyses in the literature, in part because it focuses on a single industry. But its main contribution to the broader literature on the local labor market effects of trade from China is that it incorporates data on subnational trade.

We use the model to simulate the impact of eliminating the small remaining tariff on U.S. imports of furniture from China on employment in the competing U.S. industry. We focus on furniture imports from China for several reasons. First, the U.S. furniture industry is fairly geographically concentrated in the Southeast region of the United States. Second, furniture imports from China account for a significant share of the total U.S. market. Third, the entry of imports from China is geographically concentrated on the West Coast. The combination of these three factors make furniture imports from China an interesting application of the model.

We find that eliminating the tariff shifts demand toward furniture imports from China, reduces the demand for labor in the United States, and reduces employment in the U.S. furniture manufacturing industry. The employment effects are very small and unevenly distributed across regions. According to the model, U.S. employment in the industry would decline by 0.039 percent in the New England region and by 0.064 percent in the Far West region, for example. The inter-regional differences in employment effects reflect the locations of import entry and export production, as

[2] In addition, Ramondo, Rodríguez-Clare, and Saborío-Rodríguez (2016) find that it is important to account for domestic trade costs when reconciling theories of international trade with scale economies with the available data.

well as the flow of furniture shipments between the regions. In a comparable model without subnational divisions, employment in the U.S. industry would decline by 0.046 percent nationwide.

A second policy simulation imposes an additional 20 percent tariff on U.S. furniture imports from China. In this scenario, the employment effects in the United States are positive rather than negative and much larger in absolute value, but their geographic distribution is the same as the first policy simulation: the percentage change in employment in the U.S. industry is more than one and a half times larger in the Far West region than in the New England region. According to the model, U.S. employment in the industry would increase by 3.66 in the New England region and by 6.09 percent in the Far West region.

The rest of the paper is organized into six sections. Section 2 specifies the equations of the model. Section 3 provides an overview of trade and employment in the U.S. furniture industry. Section 4 discusses the construction of the regional dataset used in the model. Section 5 discusses econometric estimation of a key elasticity parameter of the model. Section 6 reports simulations of the employment effects of eliminating the remaining tariff on U.S. imports of furniture from China, and then the employment effects of imposing a new 20 percent tariff on these imports. Section 7 offers concluding remarks.

2. Equations of the Model

2.1. Subnational Model

The model represents the links between international trade, subnational trade, and labor market outcomes in the U.S. furniture manufacturing industry. We assume that there are CES demands for the differentiated products of the industry. Each domestic region and foreign country produces a distinct variety, similar to the Armington assumption in models of international trade. The countries and subnational regions are consumer markets as well as production locations. We assume that consumer preferences are identical across the subnational regions.[3]

[3] This assumption implies that two subnational regions with the same delivered prices will devote the same share of their total expenditures to the products of each country and subnational region. On the other hand, when shipping costs lead to differences in delivered prices, this is reflected in differences in expenditure shares across the regions.

Equation (1) represents the percentage change in the value of industry shipments from country or region i to country or region j, as a function of income and delivered prices. The variable k indexes all of the countries and subnational regions that supply the products of the industry.

$$\hat{E}_{ij} = \hat{Y}_j + (\sigma - 1)\sum_k v_{kj}\, \hat{p}_{kj} + (1-\sigma)\, \hat{p}_{ij} \qquad (1)$$

E_{ij} is expenditure in country or region j on furniture from country or region i, and $\hat{E}_{ij}$ is the percentage change in this variable, dE_{ij} / E_{ij}. Y_j is income in j, and we assume that a constant share of this income is devoted to the products of the furniture industry.[4] p_{kj} is the price of furniture from country or region k delivered to j. The parameter σ is the elasticity of substitution among varieties in the industry, and v_{kj} represents the share of expenditures in j on furniture from k. According to the CES production function in equation (1), the value of shipments from i to j increases in proportion to income in j, and it decreases with the ratio of the delivered price of varieties from i to an expenditure share-weighted average of the delivered prices of all varieties available in j.

We assume that there are constant returns to scale in labor inputs. Based on this assumption, industry employment in each region varies in proportion to the quantity of industry output in the region. Equation (2) represents the percentage change in employment that is associated with industry shipments from i to j, based on the product demands in equation (1) and assuming that each unit of output in region or country i requires a_i workers.

$$\hat{L}_{ij} = \hat{a}_i + \hat{Y}_j + (\sigma - 1)\sum_k v_{kj}\, \hat{p}_{kj} - \sigma\, \hat{p}_{ij} \qquad (2)$$

We assume that there is perfect competition in product markets, so the delivered price in j of a product from k is equal to the product of wage of the workers in k (w_k), the unit labor requirement (a_k), and a trade cost factor ($\tau_{kj} > 1$).

$$p_{kj} = \tau_{kj}\, a_k\, w_k \qquad (3)$$

[4] Specifically, we assume that consumers have Cobb-Douglas preferences across the industries, so total expenditures on the products of each industry are a constant share of aggregate expenditures, which are determined by income levels.

When i and j are both subnational regions in the United States, the trade cost factor is equal to one plus the ad valorem rate of domestic shipping costs. When i or j is a foreign country and the other is a region of the United States, then τ_{kj} includes tariffs and international shipping costs.

Equation (4) translates equation (3) into percentage changes.[5]

$$\hat{p}_{kj} = \hat{\tau}_{kj} + \hat{a}_k + \hat{w}_k \qquad (4)$$

The labor market for workers with industry-specific skills is also perfectly competitive and clears within each country or region i with a constant labor supply elasticity β_i. This labor supply elasticity parameter is a simple way to represent the mobility of workers across industries and possibly across regions: the labor supply elasticity for the industry in a specific region will be higher if the workers are more mobile across regions and if their skills are less industry-specific. Equation (5) is the labor market clearing condition for i.

$$\hat{L}_i = \sum_j s_{ij}\, \hat{L}_{ij} = \beta_i\, \hat{w}_i \qquad (5)$$

The variable s_{ij} is the share of the industry's production in i that is shipped to j. Equations (2), (4) and (5) jointly determine the change in industry employment in i in response to the change in tariffs on imports. Equation (6) translates the percentage change in industry employment in the region into a count of job losses or gains.

$$\Delta L_i = L_{0i}\ \hat{L}_i \qquad (6)$$

L_{0i} is industry employment in region i before the change in trade policy.

2.2. Exposure Index

Next, we define a simple measure of each region's exposure to changes in tariffs on U.S. imports from China. We focus on the simplified case in which labor supply is perfectly elastic in each region. In this case, wages and prices are exogenous, and equation (7) is the employment effect in region i.

[5] Wages and prices are endogenously determined in the model. This is less restrictive than the partial equilibrium U.S. regional model in Hallren and Riker (2017), which assumes that that the labor supply elasticity is infinite and wages are not affected by industry-specific changes in trade policy.

$$\hat{L}_i = \hat{\tau}_c \left(\sigma - 1\right)\left(\sum_r s_{ir}\, v_{cr}\right) \qquad (7)$$

The variable r indexes all of the subnational regions within the United States, and the subscript c represents China. The last term on the right-hand side of equation (7) is an average of the regions' penetration ratios for imports from China in each region, weighted by the share of the shipments of region i that are sent to the region. We call this weighted average the exposure index. It is smaller if the region exports a larger share of its total shipments and if the region ships mostly to regions with relatively low import penetration ratios.[6] As we will show below, this exposure index predicts most of the differences in regional employment effects in the model simulations.

2.3. National Model

Finally, for the sake of comparison, we also calculate employment changes using a national model that assumes a perfectly integrated product market across the United States. Equation (8) is the employment effect of the tariff change, based on the simpler national model.

$$\hat{L}_u = \left(\frac{\beta_u \; s_{uu}\left(\sigma - 1\right)v_{cu}}{\beta_u + \sigma - \left(\sigma - 1\right)v_{uu}}\right)\hat{\tau}_c \qquad (8)$$

The subscript u represents the United States, and again the subscript c represents China. v_{ij} is the share of the products of i in the consumer expenditures of j.

3. The U.S. Furniture Manufacturing Industry

We apply the model in Section 2 to the U.S. furniture and related products manufacturing industry (NAICS 337). Table 1 reports the U.S. industry's total employment and value of shipments in 2012.[7] The table also reports U.S. exports of the industry to all countries, landed duty-paid value of U.S. imports from all countries, U.S. imports from China, the average U.S. tariff rate on imports from

[6] If all of a region's shipments did not leave the region, then its exposure would be simply the import penetration ratio in the region. At the other extreme, if a region exports all of its shipments, then it would have no exposure.

[7] The source of the employment and shipments data is the Census Bureau's 2012 Economic Census. We focus on 2012 because this is the year of the Commodity Flow Survey and Economic Census.

China, and the average U.S. tariff rate on imports from all other countries.[8] The final row of the table reports our estimate of nationwide apparent consumption of furniture.[9]

According to these national statistics, the U.S. industry supplied 67 percent of total consumption in the U.S. market for furniture, and imports from China supplied 19 percent of the market. U.S. tariff rates on imports from China averaged 0.21 percent, a very low rate but still higher than the average rate on imports from all other countries (0.04 percent).

Table 1: Nationwide Statistics for Furniture Manufacturing (NAICS 337)

Economic Measure	Value in 2012	Source
Number of Employees	340,552	Econ. Census
Total Value of Shipments by U.S. Producers	$66.6 billion	Econ. Census
U.S. Imports from All Countries	$30.4 billion	Trade Dataweb
U.S. Imports from China	$17.9 billion	Trade Dataweb
U.S. Exports	$4.4 billion	Trade Dataweb
Industry Average Tariff on Imports from China	0.21 percent	Trade Dataweb
Industry Average Tariff on All Other Countries	0.04 percent	Trade Dataweb
U.S. Consumption	$92.5 billion	Both Sources

Note: Not including producers in Alaska and Hawaii or for imports or exports of those states.

The 2012 Economic Census reports that employment in the U.S. furniture manufacturing industry is concentrated in a few states. The top five states are California (9.58 percent of U.S. employment in 2012), North Carolina (9.50 percent), Texas (6.11 percent), Michigan (5.53 percent) and Indiana (5.43 percent).

4. Data Sources

Next, we describe the data sources that we use in the simulation model and the steps that we take to transform the data. The first step is to calculate the value of shipments originating from each BEA region. The 2012 Economic Census discloses the value of industry shipments originating in each of 42 states (technically 41 states plus the District of Columbia). These 42 states collectively account for 97 percent of the national total value of shipments of the industry. For the remaining states, the values of industry shipments of the individual states are not publicly disclosed. We allocate the national total value of shipments that are not linked to a specific state among the remaining states in proportion to the states' shares of employment in NAICS 337. Then we sum these estimates of the value of shipments originating in each state to construct the value of shipments originating in

[8] The source of the trade and tariff data is the USITC's Trade Dataweb.
[9] Apparent consumption is defined as the difference between the total value of shipments of the industry and its net exports.

each BEA region, using the concordance in Table 2. Table 3 reports the value of shipments by region.

Table 2: BEA Regions and Assigned U.S. Customs Districts

BEA Region	States and DC	Customs Districts
Far West *	CA, NV, OR, WA	Columbia-Snake OR, Los Angeles CA, San Diego CA, San Francisco CA, Seattle WA
Southwest	AZ, NM, OK, TX	Dallas TX, El Paso TX, Houston TX, Laredo TX, Nogales AZ
Rocky Mountain	CO, ID, MT, UT, WY	Great Falls MT
Plains	IA, KS, MN, MO, ND, NE, SD	Duluth MN, Minneapolis MN, Pembina ND, St. Louis MO
Great Lakes	IL, IN, MI, OH, WI	Chicago IL, Cleveland OH, Detroit MI, Milwaukee WI
Southeast	AL, AR, FL, GA, KY, LA, MS, NC, SC, TN, VA, WV	Charleston SC, Charlotte NC, Miami FL, Mobile AL, New Orleans LA, Norfolk VA, Savannah GA, Tampa FL
Mideast	DE, DC, MD, NJ, NY, PA	Baltimore MD, Buffalo NY, New York NY, Ogdensburg NY, Philadelphia PA, Washington DC
New England	CT, ME, MA, NH, RI, VT	Boston MA, Portland ME, Providence RI, St. Albans VT

*Note: Alaska and Hawaii are included in BEA's Far West region but are not included in our analysis.

Table 3: Total Shipments and Exports by Region, 2012

Region	Total Value of Shipments ($ Million)	U.S. Exports ($ Million)	Export Share (Percent)
Far West	7,778.7	365.0	4.7
Southwest	4,717.9	93.3	2.0
Rocky Mountain	2,317.5	57.2	2.5
Plains	4,763.6	48.9	1.0
Great Lakes	18,001.1	1,984.3	11.0
Southeast	19.733.5	1,364.7	6.9
Mideast	7,287.9	304.3	4.2
New England	2,031.5	192.8	9.5

The second step is to calculate the value of U.S. exports of furniture originating in each BEA region. We use the public microdata sample of the 2012 Commodity Flow Survey (CFS) to calculate the share of the total value of U.S. exports that originates in each region. Then we multiply these region shares by the total value of U.S. exports of the industry. The second column in Table 3 reports the resulting values of exports originating in each region. The third column reports the region's export share, defined as a ratio of exports to total shipments. By this measure, the Great Lakes region is the most export-intensive.

The third step is to calculate the value of shipments between the U.S. regions, using data on domestic shipments from the CFS microdata. The inter-regional shipment shares of manufacturers in NAICS 337 in the CFS microdata are reported in Table 4. The rows of the table indicate the region of manufacture (the origin), and the columns of the table indicate the destination of the manufacturers' domestic shipments. The shares of value in each row sum to 100 percent.[10] The microdata indicate the destination state of the CFS shipments, which may not be the final destination of the shipments. Still, these data on gross shipments between the regions are at least suggestive of the magnitude of *net* shipments between the regions. For example, a shipment from Region 1 to Region 2 is probably not going to be shipped back to Region 1. The shipment to Region 2 might be consumed in that region or might be shipped to a third region. However, further shipments out of the region are less likely when the analysis involves broad BEA regions, as in our model, rather than smaller areas.

Table 4: Subnational Trade between the BEA Regions, Percentage of Value, 2012

Origin in Rows	F.West	So.West	R.Mtn	Plns	G.Lks	So.East	M.East	N.Eng
Far West	65.0	10.2	5.6	1.1	11.0	2.8	3.2	0.8
Southwest	13.8	47.8	4.7	4.0	5.1	16.7	5.3	2.4
Rocky Mtn	9.0	10.5	41.7	4.8	16.7	7.3	8.5	1.5
Plains	9.9	6.4	5.7	38.8	13.1	9.9	13.8	2.4
Great Lakes	5.6	8.8	1.6	13.0	34.6	15.3	17.9	3.1
Southeast	5.1	11.4	1.3	3.4	11.8	47.9	15.0	4.1
Mideast	4.2	4.3	1.5	2.4	6.9	15.0	53.7	12.1
New England	4.9	2.6	0.4	1.5	5.1	13.8	26.8	44.4

*Note: Alaska and Hawaii are not included in our model, because only a very small share of the furniture production of these states is shipped to the other states.

The fourth step in constructing the dataset is to estimate the value of U.S. imports of furniture consumed in each of the BEA regions. These calculations utilize disaggregated trade data that

[10] The numbers in the table are rounded.

identify the point of entry of the U.S. imports, specifically the customs district. A district is a collection of neighboring U.S. ports (land and air ports, as well as sea ports).[11] The district-level trade data report transit points where the imports enter the United States and where the exports leave the country. They do not specifically identify where the imports are consumed.

We start with data on the value of imports that enter each of the customs districts, and sum this to calculate the value of imports that enter each of the BEA regions, using the concordance between customs districts and BEA regions in Table 2. Then we distribute these imports from the region of entry to the estimated region of consumption by assuming that the imports are shipped between regions according to the same region shares as the domestic shipments of furniture in Table 4. Table 5 reports the resulting value of imports consumed in each region.

According to these calculations, the Far West region had the largest share of imports from China, when measured by the region of import entry (40.4 percent) and to a lesser extent when measured by the location of consumption (30.0 percent). The Southeast region had the second largest share of imports from China, again to a lesser extent when measured by the location of consumption (19.5 and 16.2 percent).

Table 5: Imports by Region, 2012, Shares of Value

Region	Imports from China (Entered)	Imports from China (Consumed)	Imports from All Other Countries (Entered)	Imports from All Other Countries (Consumed)
Far West	40.4	30.0	26.5	13.4
Southwest	5.5	11.3	13.6	11.8
Rocky Mountain	1.4	4.0	1.4	3.9
Plains	4.8	5.0	3.4	8.2
Great Lakes	9.3	12.6	13.2	16.6
Southeast	23.5	17.6	16.7	22.8
Mideast	14.4	15.5	24.0	18.0
New England	0.7	3.9	1.3	5.2

Finally, table 6 reports apparent consumption, which we calculate as the sum of domestic shipments to the region from the same region and from all other subnational regions, as well as U.S. imports that are consumed in the region. The table also reports each region's estimated penetration ratio for imports from China.

[11] Table 2 includes a concordance between the customs districts and the BEA regions.

Table 6: Regional Import Penetration and Export Shares, 2012

Region	Apparent Consumption ($ Billion)	Import Penetration Ratio China (Percent)	Exposure Index from Equation 7* (Percent)*
Far West	16.5	32.6	25.9
Southwest	11.1	18.3	19.1
Rocky Mountain	3.1	20.0	18.9
Plains	6.6	13.4	16.9
Great Lakes	14.2	16.0	15.1
Southeast	19.5	16.2	16.1
Mideast	16.5	16.8	16.5
New England	4.6	15.3	15.1

*Note: This index is an average of the penetration ratio for imports from China in each regional market, weighted by the share of the producing region's shipments that are sent to the regional market.

The penetration ratio for imports from China is highest in the Far West region (32.6 percent of the region's market) and lowest in the Plains region (13.4 percent).[12] The national average is 19.4 percent. Table 6 is arranged by proximity to China, with regions in the West at the top of the table and regions in the East on the bottom. The import penetration ratios are mostly declining as the regions become more distant from China, with a few exceptions. The import penetration ratio in the Plains region and Great Lakes are lower than expected based on proximity to China alone, and the ratio in the Mideast region is higher than expected.

The final column in Table 6 reports the index of exposure to changes in tariffs on U.S. furniture imports from China based on equation (7). It is a shipments-weighted average of the regions' China import penetration ratios. Again, exposure generally falls as the distance of the region from China increases. There are a few important exceptions. The exposure index is Great Lakes region is lower than expected based on geography alone, reflecting the region's relatively high export share. The exposure index for the Mideast region is higher than expected, reflecting the region's relatively high China import penetration ratio.

5. Estimating the Elasticity of Substitution

We use panel econometric techniques to estimate the elasticity of substitution between different varieties of furniture. The model relates the industry's import values to international trade costs

[12] There is less geographic dispersion in the penetration ratio for imports from the rest of the world: the regions' ratios range from 9.5 percent to 16.8 percent, with an average of 13.4 percent.

and a set of fixed effects. The specification in the econometric analysis is based on a gravity model of trade.[13]

$$ln\left(M_{fdt}\right) = \gamma_{dt} + \delta_{ft} + \left(1-\sigma\right) ln\left(X_{fdt}\right) + \epsilon_{fdt} \qquad (9)$$

The econometric estimation uses a panel dataset that includes U.S. imports between 2010 and 2014 in the HTS codes associated with NAICS 337. The data are disaggregated by source country, district and year.[14] M_{fdt} is the landed duty-paid value of industry imports from country f into district d in year t, and γ_{dt} and δ_{ft} are district-year and country-year fixed effects. X_{fdt} is a trade cost factor associated with importing the production from country f through district d in year t. We consider two alternative measures of X_{fdt}. One includes freight costs and tariffs. It is the ratio of the difference between landed duty-paid value of the imports and their customs value to their customs value. The other alternative only includes international freight costs. It is the difference between the cost-in-freight value of the imports and their customs value over their customs value. ϵ_{fdt} is the error term of the econometric model.

The fixed effects control for many relevant explanatory factors. The country-year fixed effects δ_{ft} control for producer prices in the industry in exporting country f in year t. The district-year fixed effects γ_{dt} control for the industry price index and aggregate expenditure levels in all of the markets served by imports into district d in year t.[15]

Table 7 reports the econometric estimates of σ for the two alternative measures of X_{fdt}. In both specifications, the estimate of σ for NAICS 337 is positive and statistically significant. The second specification, with a point estimate of 2.387, has a slightly better overall fit, but the two estimates are almost identical.

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[13] Anderson and van Wincoop (2003, 2004) and Head and Mayer (2014) discuss fixed effects estimation of gravity models. Our approach to estimating the elasticity of substitution is similar in many ways to the approach in Hertel, Hummels, Ivanic, and Keeney (2007).

[14] The data on import values, international freight costs, and tariffs are from the USITC's *Trade Dataweb*.

[15] These markets include local consumers and also more distant consumers, with different incomes and possibilities different sets of available varieties. The assumption is simply that all imports into the district face the same combined set of consumers.

Table 7: Econometric Estimates for Furniture Manufacturing

	Trade Costs Includes Duties	**Trade Costs Excludes Duties**
Elasticity of Substitution σ	2.385	2.387
(95 percent confidence interval)	(2.055 – 2.716)	(2.057 - 2.717)
Country Fixed Effects	Included	Included
District Fixed Effects	Included	Included
Number of Observations in the 2010-2014 Sample	10,451	10,451
R Squared	0.6711	0.6712

6. Simulation Results

6.1. Eliminating Tariffs on Imports of Furniture from China

In this section, we use the model and the dataset that we have constructed to estimate the regional employment effects of eliminating the tariff on imports of furniture from China ($\hat{\tau}_{cj} = -0.0021$ in all subnational regions j).[16] Assuming that the industry's labor supply elasticity in each region is equal to ten, the estimated declines in employment range from a low of 0.039 percent in the New England region to a high of 0.064 percent in the Far West region. Table 8 reports point estimates and confidence intervals for different assumptions about the industry's labor supply elasticity.[17] The middle column of estimates assumes that all of the regional labor supply elasticities are ten.

[16] We adopt the simplifying partial equilibrium assumption that consumer incomes remain constant as the tariff is eliminated. We also assume that unit labor requirements are not affected by the change in trade policy.

[17] The uncertainty reflected in these confidence intervals is the variance of the econometric estimate of the elasticity of substitution in Table 7. Other model inputs are not known with certainty, but the uncertainty about them is not quantified in the reported confidence intervals. The reported intervals indicate the sensitivity of the estimates as we vary the elasticity of substitution from 2.057 to 2.717.

Table 8: Regional Employment Effects of Eliminating Tariffs on U.S. Imports from China (Estimated Percentage Change in Total Employment)

Region	Labor Supply Elasticity = 1	Labor Supply Elasticity = 10	Labor Supply Elasticity = 20
Far West	-0.0273	-0.0640	-0.0693
	(-0.0318 to -0.0223)	(-0.0780 to -0.0496)	(-0.0850 to -0.0532)
Southwest	-0.0219	-0.0482	-0.0517
	(-0.0260 to -0.0177)	(-0.0590 to -0.0372)	(-0.0636 to -0.0396)
Rocky Mountain	-0.0219	-0.0477	-0.0511
	(-0.0258 to -0.0175)	(-0.0585 to -0.0368)	(-0.0629 to -0.0392)
Plains	-0.0203	-0.0432	-0.0461
	(-0.0241 to -0.0162)	(-0.0531 to -0.0333)	(-0.0568 to -0.0353)
Great Lakes	-0.0180	-0.0386	-0.0411
	(-0.0214 to -0.0144)	(-0.0473 to -0.0297)	(-0.0507 to -0.0315)
Southeast	-0.0191	-0.0409	-0.0437
	(-0.0226 to -0.0152)	(-0.0502 to -0.0315)	(-0.0538 to -0.0334)
Mideast	-0.194	-0.0418	-0.0447
	(–0.0230 to -0.0155)	(–0.0513 to -0.0322)	(–0.0550 to -0.0342)
New England	-0.0180	-0.0385	-0.0411
	(-0.0213 to -0.0144)	(-0.0472 to -0.0296)	(-0.0506 to -0.0315)
Ratio of Max to Min	1.52	1.66	1.69

Note: The table reports 95 percent confidence intervals in parentheses.

According to the model, the employment effect in each region depends on the market share of the imports from China in the region, the export intensity of the region, and the pattern of shipments between the regions, as well as the size of the tariff that is removed and the elasticity of substitution.

Based on the point estimates for each region, the combined reduction in industry employment is 151 employees, which is very small in an industry with 340,552 employees in 2012. This is because the industry average tariff rate is very small (0.21 percent) and the regional market shares of imports of furniture from China are less than one-third in all of the regions.

The largest percentage changes in employment are in the Far West and Southwest regions, and the smallest percentage changes are in the New England and Great Lakes regions. Although the magnitudes of the employment effects are small in all of the regions, there are still significant differences across the regions. The reduction in industry employment in the Far West region (0.064 percent) is more than one and a half times larger than the reduction in the New England region (0.039 percent).

The inter-regional differences in the employment effects are predictable. The relative magnitudes of the regions' employment effects reflect the differences in the regions' penetration ratios for imports from China in Table 6, differences in their export shares in Table 3, and differences in their inter-regional shipments in Table 4. The exposure index in Table 6 combines all of these factors and is a very close predictor of the relative magnitude of the regions' employment effects in Table 8.

As a sensitivity analysis, we reran the model using alternative assumptions about the labor supply elasticity in each region. As we noted in Section 2, the labor supply elasticity parameter is a simple way to represent the mobility of workers across industries and possibly across regions: the industry's labor supply elasticity in a specific region is higher when workers are more mobile across regions and industries. The results for these alternative elasticities are also reported in Table 8.

When the labor supply elasticity is larger, the inter-regional differences in employment effects are magnified. When it is twice as larger, the ratio of the largest regional effect to the smallest regional effect increases from 1.66 to 1.69.

When the labor supply elasticity is smaller, the inter-regional differences in employment effects are attenuated. When the labor supply elasticity is only one, the ratio of the largest effect to the smallest effect declines from 1.66 to 1.52.

Finally, using the simpler national model described in equation (8), the estimated percentage reduction in employment is 0.046 percent nationwide when the national labor supply elasticity is equal to ten. In this model, the relevant import penetration ratio is the national average rate, 19.4 percent.

6.2. Imposing an Additional 20 Percent Tariff

We also use the model to simulate the regional employment effects of imposing an additional 20 percent tariff on U.S. imports of furniture from China ($\hat{\tau}_{cj} = 0.1996$ for all subnational regions j). The point estimates and confidence intervals for the employment effects are reported in Table 9.

Table 9: Regional Employment Effects of Imposing an Additional 20 Percent Tariff on U.S. Imports from China (Estimated Percentage Change in Industry Employment)

Region	Labor Supply Elasticity = 1	Labor Supply Elasticity = 10	Labor Supply Elasticity = 20
Far West	2.5984	6.0867	6.5852
	(2.1157 to 3.0252)	(4.7132, 7.4178)	(5.0623, 8.0823)
Southwest	2.0845	4.5837	4.9118
	(1.6726 to 2.4572)	(3.5327, 5.6114)	(3.7658, 6.0441)
Rocky Mountain	2.0771	4.5370	4.8561
	(1.6642 to 2.4517)	(3.4946, 5.5575)	(3.7218, 5.9776)
Plains	1.9425	4.1106	4.3831
	(1.5369 to 2.2881)	(3.1603, 5.0442)	(3.3558, 5.4009)
Great Lakes	1.7188	3.6659	3.9097
	(1.3696 to 2.0381)	(2.8187, 4.4979)	(2.9935, 4.8172)
Southeast	1.8135	3.8870	4.1491
	(1.4465 to 2.1488)	(2.9900, 4.7674)	(3.1776, 5.1110)
Mideast	1.8440	3.9736	4.2457
	(1.4723 to 2.1832)	(3.0580, 4.8716)	(3.2524, 5.2287)
New England	1.7113	3.6589	3.9043
	(1.3646 to 2.0282)	(2.8143, 4.4880)	(2.9900, 4.8097)
Ratio of Max to Min	1.52	1.66	1.69

Note: The table reports 95 percent confidence intervals in parentheses.

In this case, there are relatively large, positive employment effects in all regions, but the ranking of regions in terms of the absolute magnitude of the employment effects is identical to Table 8. The increase in industry employment in the Far West region (6.09 percent) is more than one and a half times greater than the increase in the New England region (3.66 percent). The similarity in the ratios of the maximum to the minimum regional employment effects and the ranking of the absolute magnitudes of these effects reflects the fact that the underlying model and data on the location of import entry, exports, and the shipments between the regions are the same in both sets of policy simulations. According to the point estimates in Table 9, the combined effect of the additional 20 percent tariff on U.S. industry employment is 14,366 workers.[18]

[18] Table 9 also reports simulation results for alternative values of the labor supply elasticity in each region.

In the simpler national model based on equation (8), the percentage increase in industry employment from the additional 20 percent tariff is 4.37 percent nationwide, again assuming a national labor supply elasticity equal to ten.

7. Conclusions

The employment effects of tariff changes are more than one and a half times larger in the West than the East. The differences in magnitude across U.S. regions reflect several features of the data for the furniture industry, including the high China import penetration ratios in the West, the surprisingly high import penetration ratio in the Mideast region, and the high export share in the Great Lakes region.

One limitation of the model is that the regional distribution of the consumption of imports is estimated based on CFS data on inter-regional domestic shipments. Improving the estimates of the regional distribution of imports could be a useful direction for future research. A second limitation is that we have not estimated the industry labor supply elasticity parameters for each region. We have simply performed a sensitivity analysis with regard to alternative parameter values. Providing estimates of this elasticity, and in particular estimates of the variation in this elasticity across U.S. regions, could also be a useful direction for future research.

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