The Economic Consequences of TradeProtection: Evidence from the Smoot-Hawley Tariff Act *

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Abstract

This paper examines the effect of tariff increases on regional economies after the passage of the Smoot-Hawley Tariff Act of 1930, which raised tariff rates on approximately one-third of all dutiable items. We construct a Bartik-style measure of the Average Tariff Changes (ATC) for each local labor market, a measure of how exposed the labor market is to the tariff policy. By employing a continuous difference-in-differences strategy, we find local labor markets with a larger exposure to the tariff policy experienced a significant increase in the labor force participation rate. While the Smooth-Hawley Tariff Act was originally proposed to help the struggling agricultural sector, the rise in labor force participation was concentrated among the urban labor markets, particularly among the urban, school-going age workers (age 16-24). This may imply that workers decided to work instead of continuing education, decreasing investment in the human capital of the local population, which has ambiguous implications for the long-run regional economic development. There is no significant effect on rural, agricultural-heavy local labor markets. The tariff policy had no significant effect on the value of agricultural lands or the use of agricultural machinery in rural labor markets.

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1 Introduction

The Smoot-Hawley Tariff Act of 1930 is one of the most controversial and important trade policies in U.S. history. It increased tariff rates on roughly one-third of all dutiable items and raised the average tariff rate to be its second-highest point in US history (Irwin and Kroszner 1996). The tariff act affected many industries in both the agricultural and industrial sectors and has long been blamed for exacerbating or even causing the Great Depression (Eichengreen 1986). Economists have examined the effect the tariff act had on the Great Depression (Meltzer 1976; Eichengreen 1986; Irwin 1996), its impact on the productivity of domestic industries (Bond et al. 2013), and the political process during the passage of the act (Irwin and Kroszner 1996; Eichengreen 1986). However, we seem to know little about the effect the policy had on workers of domestic industries and regional economies, even though one of the main purposes of a protective tariff is to help domestic industries and workers.[1] We examine what effect, if any, the tariff policy had on regional economies and labor market outcomes of workers in the U.S.

Since the establishment of the General Agreement on Tariffs and Trade (GATT) during the post-WWII period, countries have worked on removing trade barriers, which allowed the global economy to move towards trade liberalization. Protective trade policies, including raising tariffs, thus received less attention from both politicians and economists. Goldberg and Pavcnik (2016) argue that "economists have shifted the focus of international trade research from trade policies to other forms of trade frictions," such as transportation costs. However, recently, governments and politicians have actively reconsidered trade protection as a means of supporting domestic industries and workers. For instance, the Trump administration in 2018 imposed import tariffs on steel, aluminum, and solar panels, as well as a list of other Chinese imports that will face a 25 percent tariff rate. In the report investigating the impact of imports of aluminum on national security, the administration claims that increasing the tariffs may be "a means to ensure US producers' investment, research and development, and jobs." (U.S. Department of Commerce 2018)

Can an increase in tariffs protect domestic industries and workers? The effect of increased tariffs on domestic industries is ambiguous because tariffs affect the demand for domestic goods and labor through multiple channels. First, under the Heckscher-Ohlin framework, the increased tariff on a foreign product raises the price of the product's domestic counterpart and thus increases labor demand. This could raise the wages of workers in the industry. On the other hand, a tariff imposed on input products could increase the input cost. This could reduce the domestic supply of the final products and the domestic labor demand. Also, raising tariffs may lead to strategic trade and tariff retaliations from other countries. The trade retaliation could decrease the foreign demand for domestic products and thus reduce the domestic labor demand. Thus, the impact of tariffs on domestic labor could depend on the set of products the tariffs were imposed on and how strong each of the forces is compared to one another.

[1] In the early 1900s, tariffs also served as a significant source of government revenues. Irwin (2017)

In order to formally examine the effect of the Smoot-Hawley Tariff Act on regional economies, we employ a continuous difference-in-differences strategy, where the treatment intensity variable is the regional exposure to the tariff policies. We construct the exposure variable by defining the Average Tariff Changes (ATC) in each local labor market, which is an average of national industry-level tariff changes, weighted by the employment share of each industry in the local labor market. We use the 467 State Economic Areas (SEA), which is a set of neighboring counties with similar economic characteristics, as the unit of analysis. We examine whether the tariff policy significantly impacted labor force participation, occupational composition, and working-age population of the SEAs using the Population Census data between 1880 and 1950.

We find that the ATC measure is heavily driven by the agricultural employment share, and we use the tariff line-item data created by Bond et al. (2013) and the U.S. Census of Agriculture to construct the ATC that takes detailed crop-level tariff changes and regional crop mix into account. This measure allows me to explore the variation within the agricultural sector and further control for the agriculture employment share. Using this measure, we conclude that controlling for the initial agricultural share, the tariff policy may have had a positive and significant impact on regional labor force participation rates: a 10 percentage point increase in the ATC measure may be associated with a 2.5 percentage point increase in labor force participation rate. Also, we attempt to examine the effect of tariff policy exposure on the regional value of agricultural land, which may serve as a direct test of the effect of protective tariff on production factor costs, and the effect of tariff policy on the regional value of agricultural machinery, which may be an alternate margin of regional adjustment in the agricultural sector other than increasing labor or land demand. We do not find a significant effect of the tariff changes on both outcomes.

The tariff act was originally targeted to help the agricultural sector that suffered throughout the 1920s. However, we find that there was no significant impact of the tariff increase on rural local labor markets. Later in this paper we show some suggestive evidence that most of the crops that experienced high tariff increase did not face much import competition. This finding is consistent with the insignificant impact on rural SEAs.

The increased labor force participation is concentrated in urban SEAs. The demographic group that responds significantly to the increased tariff seems to be the school-going age population, who often face a decision between education and employment. This has a different interpretation from increased labor participation of older workers, who are likely to increase labor force participation when they come out of long-term unemployment. The increased labor force participation in the younger workers may imply a decreased level of education and human capital in the SEAs, which has a potentially ambiguous impact on the long-term development of the local labor markets.

This project comprehensively assesses the long-run regional and individual economic outcomes of one of the major protective tariff policies enacted in the United States. The literature on trade protection used to focus on industry-level changes in prices or outputs (Crandall 1987; Bond et al. 2013) and changes in trading patterns (de Bromhead et al. 2018). The recent literature on the Trump Tariffs finds that the tariff increases imposed by the Trump administration may have reduced the real income in the US, and the combined effect of the US import tariffs and retaliatory tariffs from trading partners would have hurt local labor markets that received the favorable import tariffs (Fajgelbaum et al. 2020; Amiti et al. 2019). This paper contributes to the literature by examining the long-run regional outcome of a major trade protection policy.

This paper is related to the literature on local labor markets. Studying the impact on regional economies is important in several ways. First, workers' labor market outcome may depend more on the smaller geographic unit or local labor markets, which means that the analysis will be more relevant in the margins of worker adjustments. Also, compared to studying the industry outcomes at the national level, studying regional economies allows for exploiting the heterogeneous regional industry composition as a source of variation. This Bartik-style measure of tariff policy exposure has been used in several papers in the trade literature, including Topalova (2007), which examines the effect of Indian trade liberalization on poverty and inequality, as well as in Kovak (2013) and Dix-Carneiro and Kovak (2017), which empirically estimate the effect of reducing tariffs on regional economies and workers' labor market outcomes from the setting of Brazilian trade liberalization.[2]

The rest of the paper is organized as follows. Section 2 describes the historical background of the Smoot-Hawley tariff act of 1930. Section 3 describes the data sources. Section 4 presents the empirical strategy. Section 5 presents the results for the regional analysis that uses the census data. Section 6 goes through the potential mechanisms and economic interpretation of the findings. Section 7 concludes with the ongoing steps to be updated in the future draft.

2 Historical backgrounds: The Smoot-Hawley Tariff Act of 1930

The U.S. significantly increased its industrial production during the First World War (Rockoff 2004). During the 1920s, after the war, many European industries recovered from the effects of WWI and quickly regained their competitive edge against U.S. industries, affecting the agricultural sector the most due to the added effects of overproduction by U.S. farmers (Winders 2009).

During this time, the U.S. government increased import duties several times to protect the interests of the nation's businesses and farmers. The 1922 Fordney-McCumber Tariff Act was enacted by Congress, which raised the average tariff rates to nearly 35 percent (Irwin 1998)[3]. In 1928, President Herbert Hoover and many Republican senators supported another bill to increase tariff rates, but this bill failed due to opposition from centrist Senate Republicans and the fact that U.S. producers faced very little competition. Views changed with the stock market crash,

[2] There is a debate on whether looking at the local labor markets as a closed unit of the economy is a reasonable approach or not. For instance, Monte, Redding, and Rossi-Hansberg (2018) highlight the role of commuting flows in determining local employment elasticities.

[3] In the current version of the paper, we do not include the data on the tariff rates before and after the Fordney-McCumber Act.

and protectionism regained traction (Eichengreen 1986). The Smoot-Hawley Tariff Act, which had already been presented to the House of Representatives in March of 1929, gained support.

The Smoot-Hawley Tariff Act raised the tariff rates from the 1922 Tariff Act by roughly 8 percentage points (Irwin 1998). The act was originally intended to protect the U.S. agricultural sector but soon included increasing tariffs on many industries due to pressure from congressmen representing regions with large shares of non-agricultural industries. Vote sharing, a common practice at the time, contributed to expanding the scope of the act (Eichengreen 1986). The act was eventually signed into law by President Hoover in June of 1930, over a year after it was first introduced.

In the decade following the passing of the Smoot-Hawley Tariff Act, the United States faced several hardships – the Great Depression and the Dust Bowl. The Great Depression started with the stock market crash of 1929 and continued until the late 1930s. During this time, prices of goods fell, interest rates declined, the value of the U.S. dollar deflated, and unemployment rose to an average of 25 percent (Frank and Bernanke 2007). The Dust Bowl in the Great Plains lasted from the early 1930s to nearly 1940. A severe drought hit the region, causing huge dust storms and caused crop failures in local grain farms (Hornbeck 2012).

To combat the declining U.S. economy, President Roosevelt and Congress created the Agricultural Adjustment Act (AAA) in 1933 to help farmers, reduced import duties in 1934 to promote global trade, and enacted the New Deal in 1935 to provide relief to struggling citizens and businesses. The AAA was designed to provide subsidies to the struggling agricultural sector and reduce crop surpluses responsible for the plummet of U.S. crop prices (Hurt 2002). The New Deal consisted of various public work programs and financial reforms targeted to provide relief to workers and to reverse the deflation of the U.S. dollar (Berkin et al. 2011).

These factors in the 1940s could be potential sources of confounders. In this paper, we try to control for the local measure of Great Depression severity, the amount of the AAA relief and New Deal expenditures, and exposure to the Dust Bowl.

Due to the Reciprocal Trade Agreements Act of 1934, which allowed the president to negotiate tariffs with countries bilaterally, the tariff act became the last tariff legislation determined by Congress. The tariff structure that was largely influenced by the act remained important after WWII when the GATT and WTO were established and countries started to move towards free trade. The tariff rates for countries with non-Normal-Trade-Relations (non-NTR) are still the rates established by the Smoot-Hawley tariff. (Pierce and Schott 2018). Thus, the tariff structure may have played an important role in the US's economic structure in the long run.

3 Data

3.1 Tariff and Industry-level IO linkage/cost data

The tariff bill involved changes in both ad-valorem tariffs and specific duties that depended on the nominal U.S. currency units per physical quantity of imports. We use panel data of tariff line items from Bond et al. (2013) to compute industry-level average tariff rates. Bond et al. (2013) digitized and used the complete line item data from the Foreign Trade and Navigation of the United States (FTNUS) to construct panel data of tariff rates for around 500 line items, which is roughly 10 percent of the total line items. The publicly available data do not contain the exact product name for each line. Instead, they have the Leontief industry code for each line item. We use this information to first compute the unweighted average change in ad-valorem equivalent tariff rate for 39 Leontief industries. Then, we aggregate the industries into 19 final industries by taking the average change in tariff rate, weighted by the industry's total value of output.[4] The aggregated industry definitions are benchmarked from Dix-Carneiro and Kovak (2017), and they are modified to fit the Census and Leontief industry categorizations. The crosswalk is available in Table 1.

Figure 1 presents the average percentage point change in tariff rate by industry. The Leontief industries with the highest increase in tariff rate are mining, coal, food processing, and agricultural industries. When aggregated, the industries with the highest tariff rate are mining, leather, and agricultural sectors due to the weighting by total industry output. The coal and refined petroleum industries are part of the gas and coal mining industry, whose weighted average becomes net negative. Table 2 compares the average tariff rate change estimates to the estimates from Irwin (1996) for 12 industries (expressed in percentage points.) In his estimation, the most affected industries are agriculture, food and tobacco, chemicals, textiles, and leather. The order and magnitude do not differ much – the discrepancy may come from the fact that the matched line-item panel data we use contains only 10 percent of the total line-item data.

We further exploit variation within the agricultural sector by measuring the changes in tariff by different crops. Line item names from Bond et al. (2013) are used to construct the crop-level tariff changes. Figure 2 shows the tariff changes by major crops and livestock. The crops with the highest tariff changes are soybeans, peas, potatoes, cotton. The crops with the lowest tariff changes include wheat, with a net negative change in average tariff rate, followed by animals (livestocks), rice, and flax.

3.2 Census of Agriculture 1920 - 1945

The within-agriculture employment share of each crop, composition of crops, and value of agricultural land and machinery at the regional level are obtained from U.S. Census of Agriculture data spanning 1920 to 1945 (Haines, Fishback, and Rhode 2018). If we assume that each crop

[4]The gross output of Leontief industries are available in Leontief's Input-Output table for the US economy in 1929 (Leontief 1949).

has a constant labor-land ratio for production, the share of acreage used for a crop among all farmland acreage in the region will be equivalent to the regional employment share of the crop within agricultural employment. We first compute the acreage share of major crops by dividing the acreage used for crops in a county by the total farmland acreage of the county. Then, we define the acreage share of each SEAs to be the average acreage share of each crop in counties that belong to the SEA. Livestock acreage share is excluded from the analysis because the census data do not have information on acreage used to raise livestock.

4 Empirical strategy

4.1 Local labor market measure of tariff changes and theoretical foundations

The local labor market exposure to the tariff policy is defined by the average of national industry-level tariff changes, weighted by the employment composition of each local labor market. In the main continuous difference-in-differences specification (see section 4.2), the unit of analysis will be State Economic Areas (SEAs), which are sets of neighboring counties with similar economic characteristics. There are 467 SEAs in the U.S. The measure captures two intuitions on how different regions are affected by the national tariff policy. First, industries with higher tariff changes may have bigger economic consequences from the Smoot-Hawley tariff. Second, SEAs whose important industries are affected by the tariff will have a larger exposure to the tariff policy (Topalova 2007). We define the Average Tariff Change (ATC) of a SEA as below :

$$\begin{aligned} \text{ATC}_{\text{SEA}} &= \sum_{j \in T} \lambda_{\text{SEA},j} \Delta t_j \\ \lambda_{\text{SEA},j} &= \frac{L_{\text{SEA},j}}{\sum_{j \in T} L_{\text{SEA}j}} \\ \Delta t_j &= log(1 + tariff_{j,post}) - log(1 + tariff_{j,pre}) \end{aligned} \tag{1}$$

where Δt_j is change in the tariff rate for industry j in percentage points and $\lambda_{\text{SEA},j}$ is the fraction of SEA's labor allocated to industry j. T refers to the set of tradable industries. The labor allocation is computed based on the 1920 census, which is the labor allocation prior to the tariff policy.[5]

However, the ATC defined above may be heavily driven by a small set of industries that take up a large share of employment. In particular, in the early 20th century, agriculture was an important U.S. industry that took a large share of employment in many regions. We decompose the share of the regional population working in the agricultural industries, and the correlation between the agricultural employment share and the ATC is roughly 0.85. This means that the geographic distribution of agricultural employment share alone may be the most important source of variation in the ATC. This finding is consistent with the recent literature investigating different identifying

[5] Alternatively, we can define $\text{ATC}_{\text{SEA}} = \sum_{j \in T} \beta_{\text{SEA},j} \Delta t_j$, where $\beta_{\text{SEA},j} = \frac{L_{\text{SEA},j}/\theta_j}{\sum_{j \in T} L_{\text{SEA}j}/\theta_j}$ which divides the labor count by the non-labor share of production cost, following Kovak (2013).

assumptions of Bartik instruments, including Pinksmith-Goldham, Sorkin, and Swift (2018), which present examples that a small set of industries can often explain a large share of the identifying variation (McKenzie 2018).

When the aggregated agricultural employment share of SEAs can explain most of the variation in the regional tariff exposure measure, taking into account different levels of tariff changes by crop and by crop mix of SEAs will help exploit within-agriculture variation in tariff policy exposure. Thus, we attempt to construct an ATC measure that incorporates agricultural tariff changes by SEAs. With the line-item data shared by the authors of Bond et al. (2013), we are able to obtain the level of tariff changes by major crop. The challenge in constructing the agricultural tariff changes is to obtain the employment share within agriculture, which is not available in the Census of Agriculture. To resolve this issue, we use the amount of acreage allocated to different crop productions divided by the total amount of farmland in each SEA as a proxy for the within-agriculture employment share. This is based on the assumption that the labor share or labor-land ratio in crop production is constant across different crops. These agricultural tariff changes by region will interact with the overall agricultural employment share among the total working-age population in the SEA and are incorporated in the ATC measure we developed earlier. In particular :

$$\begin{aligned} \text{ATC}_{\text{SEA}} &= \sum_{j} \lambda_{\text{SEA},j} \Delta t_j \\ &= \lambda_{\text{SEA,Agric.}} \Delta t_{\text{SEA,Agric.}} + \sum_{j' \neq \text{Agric.}, j' \in T} \lambda_{\text{SEA},j'} \Delta t_{j'} \\ \Delta t_{\text{SEA,Agric.}} &= \sum_{i \in \text{Agric.}} \theta_{\text{SEA},i} \Delta t_i \end{aligned} \tag{2}$$

and $\theta_{\text{SEA},i}$ are defined as :

$$\theta_{\text{SEA},i} = \frac{\text{Acreage used for crop } i \text{ in the SEA}}{\text{Total farm acreage for major crops}_{\text{SEA}}} \tag{3}$$

Figure 3 plots the geographic distribution of the regional changes in agricultural tariffs $\Delta t_{\text{SEA,Agric.}}$. The SEAs with the highest exposure to the changes in agricultural tariffs are the Corn Belt region and the Southern states with higher acreage share of cotton, followed by tobacco. Figure 4 and 5 compare the previous ATC measure defined as equation (1) with the ATC accounting for the finer level of agricultural sectors defined in equation (2). The plots highlight the fact that the previous measure counted all sub-sectors in agriculture equally, but there is much more variation in regional exposure to the tariff policy when considering the within-agriculture variations in tariffs and employment shares.

The Bartik-style instrument measuring regional exposure to the trade policy has connections to literature on trade liberalization. Topalova (2007) uses a similar Bartik-style measure to estimate the impact of Indian trade liberalization on poverty and inequality. Kovak (2013) studies the effect of Brazilian trade liberalization on regional wages and offers a theoretical foundation of Bartik-style measures of regional tariff changes. He develops a specific-factor model, where each industry uses labor and an industry-specific factor in Cobb-Douglas production. In general equilibrium, two opposite effects determine wage changes : (i) Increases in product prices drive up the labor demand and wages, where the effect of each product price is proportional to the regional employment share, and (ii) increases in wages draw in labor from other regions and suppress regional wages. Kovak (2013) assumes labor to be mobile across industries but immobile across regions, which establishes a one-to-one relationship between the change in wages and the average tariff changes weighted by the regional employment share of each industry.

Dix-Carneiro and Kovak (2017) examine the long-run impact of Brazilian trade liberalization on regional employment and migration. They generalize the model by allowing for labor mobility and perfectly mobile capital in the nested Cobb-Douglas production function, where there is substitution between labor and joint inputs of industry-specific factor and capital, and substitution between the specific factor and capital. Changes in total labor used in each region-industry pair depend on (i) overall regional exposure to the tariff policy, which is captured by the measure developed in Kovak (2013), (ii) the tariff change that varies by industry, and (iii) changes in national-level capital adjustment in the long run. When the region-industry pairs are aggregated to calculate total regional labor, the variation in regional labor changes is still captured by the regional tariff change measure used in Kovak (2013). The main empirical difference between the regional tariff change measure from Kovak (2013) and the measure used in this paper is the assumptions on labor share in each industry.[6]

4.2 Main specification

The SEA-level outcome variables are constructed from the Population Census spanning 1880 - 1950. Our main specification is as below :

$$\begin{aligned} Y_{\mathrm{SEA},t} \;=\; & \alpha_{\mathrm{SEA}} + \theta_t + \omega_{\mathrm{state},t} + X_{\mathrm{SEA},t} \\ & + \sum_{t \neq 1930} \gamma_t \times (\text{Average Tariff Change}_{\mathrm{SEA}} \times \mathbb{1}(\text{year} = t)) + \varepsilon_{\mathrm{SEA},t} \end{aligned} \quad (4)$$

where $Y_{\mathrm{SEA},t}$ are outcome variables at the SEA level in year t, α_{SEA} are SEA-fixed effects, and θ_t are year-fixed effects. $\omega_{\mathrm{state},t}$ are state indicators interacted with year indicators. $X_{\mathrm{SEA},t}$ are SEA-specific controls, including SEA-level measures of Great Depression severity and a binary variable for whether the SEA was affected by the Dust Bowl, interacted with year dummies. For each year t except for the base year (1930), (Average Tariff Change$_{\mathrm{SEA}} \times \mathbb{1}(\text{year} = t)$) is the interaction between the regional ATC and the Census year dummy.

SEAs that received more government relief could have different recovery patterns from the

[6] Using data on the US industry labor shares in 1929 and 1939 (Leontief 1949), an alternative specification takes into consideration industry labor share. The results are robust to the specification.

Great Depression. To control for such patterns in local labor markets, we use the Great Depression severity measures from Fishback, Horrace, and Kantor (2005). The severity measure is defined as the growth rate of retail sales per capita from 1929 to 1933. The measure captures SEA-level depression severity under the assumption that regions with severe depression would have experienced a larger decline in retail sales than other regions. We also obtain the total amount of the Agricultural Adjustment Act (AAA) relief and New Deal spending per capita from the dataset.

The ideal outcome variables for the analysis are regional employment rate, wages, and working-age population. If the net effect of tariff changes on labor demand is positive, SEAs with higher exposure to the tariff policy (higher ATC) could experience higher employment and higher wages compared to the SEAs with lower exposure to the tariff policy. SEAs with higher ATC are also more likely to experience an in-flow of population from other regions. However, the Census provides no employment variable prior to 1930. Thus, instead of SEA-level employment rate, we construct a proxy of labor force participation rate by dividing number of individuals having gainful occupations by the total number of working-age male population in the SEAs.

Wage information is not available until 1940, so instead, we consider how occupational composition changed after the tariff policy. Occupational composition of local labor markets can be measured by taking the average of individuals' Duncan socioeconomic index. The Duncan socioeconomic index is an index that maps each Census occupation into a score from 0 to 96, where a higher-scoring occupation implies a higher socioeconomic status. Note that the average Duncan SEI is not a perfect measure of wage changes in a region: an increase in the average Duncan SEI in a SEA could imply that there is potentially an increase in regional average wage, but a SEA with unchanged average Duncan SEI could still have an increase in the average wage. Finally, the log of working-age male population is used as a proxy for population in SEAs.

5 Results

5.1 Long-term effect of the tariff increase on LFPR

Table 3 presents continuous difference-in-differences results using the estimation equation (4). The outcome variables are labor force participation rate, average SEI in SEAs, and log of working-age population. As the measure captures the variations of tariff policy exposure within the agricultural sector, it is possible to control for the initial share of agriculture in the analysis. Panel A presents the estimated effect of the Smoot-Hawley tariff on labor force participation rate of the SEAs. The coefficients on the interaction variables between the ATC and year binary variables are also plotted in figure 6 panel A. Panel B presents the effect on the average SEI, and panel C presents the effect on the working-age population. In each panel, column (6) shows the regression result that includes the share of agriculture of SEAs in 1880 interacted with year binary variables, and column (7) presents results that control for the interaction between share of agriculture of SEAs in 1920 and year binary variables in the regression.

For each panel, column (1) allows for only flexible state time trend, and column (2) - (5) include different combinations of the flexible controls of regional Great Depression severity, the AAA relief amount, and the Dust Bowl indicator. In all three panels, the column (1) - (6) do not differ much in qualitative interpretation. In column (6), the results do change significantly from the previous columns when controlling for the 1880 agricultural shares. In column (7), when controlling for the 1920 agricultural shares, the results change more drastically.

To illustrate the point, in figure 6 we plot the coefficients of column (5) in table 3, which includes all controls other than initial agricultural share, and overlay the graph with the coefficients of column (7), which includes all controls and 1920 initial agricultural shares. Controlling for the initial agricultural share of 1920 interacted with year binary variables, the regions with higher ATC are likely to experience a larger increase in labor force participation rate. The coefficient of interest, the interaction between ATC and the year 1940 binary variable is insignificant, but the interaction between ATC and the year 1950 binary variable become significant in 10 percent level. Since all the employment share is based on 1920 census, we consider column (7) to be the more relevant control for the agricultural employment share of each region, and column (7) to be the main specification throughout the analysis. In this case, the interpretation will be that a 10 percentage point increase in the ATC is associated with a 2.5 percentage point larger increase in labor force participation rate.

For the average SEI or log working-age population of the SEAs, when not controlling for the agricultural employment share, there seem to be positive pre-trends in the analysis, which go away in column (7). Both the average SEI and the log working-age population of regions are not significantly associated with the changes in ATC based on the preferred specification.[7]

The finding that the ATC is associated with an increase in LFPR is entirely driven from the urban regions where the dominant industries are not agriculture. I define urban SEAs to be the SEAs with more than 30 percent of the population living in an urban area, which is the median value of the share of SEA population living in an urban area. Using the definition, we divide the sample into two, one with urban SEAs and the other with rural SEAs. Figure 7 shows the geographic distribution of urban and rural SEAs. The southern states do not seem to have many urban SEAs, and they seem to be very dispersed. Figure 8 shows the analysis based on the urban SEA sample and the rural SEA sample, which shows that the association between the ATC and the increase in

[7]Controlling for the initial share of agriculture of 1920s allows for exploiting the variation "within" the agricultural sector. This rationale is similar to the approach used in Autor, Dorn, and Hanson (2013) who examine the effect of Chinese import exposure to the U.S. local labor markets during 1990 - 2007. In the setting of this paper, controlling for the initial share of agriculture of 1920s will compare the regions with the same agricultural share, which means that the results are driven by the differences in regional crop mix and the crops' heterogeneous level of tariff changes. One important distinction between the approach in Autor, Dorn, and Hanson (2013) and the one used in this paper, however, is that when controlling for initial share of agriculture, the ATC measure will still have variations from non-agricultural sectors. The import exposure measure used in Autor, Dorn, and Hanson (2013) use the import information and employment share among manufacturing industries. This is equivalent to assuming for zero import exposure changes or zero treatments in non-manufacturing industries, while our measure of ATC still allows for non-zero tariff changes for non-agricultural industries.

LFPR mostly comes from the urban SEAs. In the next section, we argue that rural SEAs may have not experienced any significant impact from the tariff act since many crops did not face any import competition, which made the crops to be out of the cone of diversification where the assumption of the Heckscher-Ohlin theorem will not hold.

5.2 Inconclusive impact on the value of farm lands and the value of machinery

If the tariff has overall positive effect on the demand of domestic agricultural products, the value of agricultural land, which is one of the major factors for agricultural products, could go up as the demand for agricultural lands increases. Thus, testing the effect of the Smoot-Hawley tariff on the value of farm lands could serve as a test for the impact of the policy on factor costs. This information is contained in the variable "Value of farm : land and buildings in dollars" in the agricultural census.

Also, if the tariff has an overall positive effect on the domestic demand, producers may also choose to increase mechanization in the production process to increase their capacity. This is an adjustment channel that could be caused by changes in demand other than significantly increasing labor or land usage. Especially, the U.S. agricultural sector experienced an increase in technological progress and biological innovations, which improved both land and labor productivity (Olmstead and Rhode 2008). This historical background makes the changes in the value of machinery an important mechanism to further test on. The variable "Value of farm : implements and machinery in dollars" will be used as a proxy for the total value of mechanizations.

The formal test of above mechanisms will follow the estimation strategy as in equation (4), where the outcome variables will be log of the value of farm lands and log of the value of machinery. The treatment intensity variable will be the ATC that captures the with-in agricultural variation in tariff changes and employment shares. The unit of analysis will be SEAs, where the county-level information will be aggregated by taking the weighted average of the county-level variables weighted by the county population. The analysis uses the sample period of 1920 - 1945, as the earlier census has slightly different definitions of farm land values.

In table 4 and 5, we present the difference-in-differences estimates for the value of farm lands and log value of machinery. In each table, columns (1) - (5) show the specifications all including the ATC and state by year fixed effects; and each of (2) to (5) includes the Great Depression severity by year fixed effects; the AAA relief and New deal spending interacted with year binary variables; both severity and spending measures; all spending measures and the Dust Bowl SEA by year fixed effects, respectively. Column (6) includes all aforementioned controls and the control of 1880 regional agricultural share by time fixed effect, and column (7) uses initial agricultural share to be those of 1920s. Figure 9 and 10 show the corresponding coefficient plots. The tariff policy does not have a significant effect on neither the value of farm lands nor value of machineries. Controlling for the initial agricultural share does not change the results significantly. Especially, the coefficient of the exposure variable interacted with binary variables of pre-period years (1920, 1925) indicates that the parallel pre-trend assumption has been violated in the analysis for both outcome variables.

6 Potential mechanisms

6.1 Insignificant impact on the rural SEAs and agricultural outcome variables : Low import competition faced by agricultural crops

A potential mechanism for the insignificant impact in the rural SEAs and the insignificant impact on the agricultural sector may be that the crops which experienced high tariff increase were not facing much import competition. When there is no import competition, the crop may be out of the cone of diversification, which means that the tariff may not affect the domestic price or domestic producer decisions. We compute the import share of each crop that experienced high tariff increase, where the import share is defined as the total value of import divided by the value of domestic production of the crop. The import share by crop is plotted against the tariff rate increase and presented in figure 11. While the tariff changes seem to be positively correlated to the import share, most of the crops have low import share except for buckwheat, potatoes, and soybeans. Anecdotally, cotton, the crop that experienced one of the highest tariff increases, also was a major crop that the US exported to the rest of the world, which makes it plausible that the increase in tariff would have not affected the domestic price. Coupled with the deflationary forces during the Great Depression that is known to drop crop prices, the low import competition seems to suggest that the effect of the tariff act on the rural regions or agricultural sector may have been minimal.

6.2 Economic interpretation of the increase in LFPR : Increased labor force participation among the school-going age population

The increased LFPR may have different implications on regional economies: the labor participation may have increased among the school-going age young population whose decision is made between going to school or working, or the labor participation may have increased in middle-aged workers who were initially unemployed, or the labor participation may have delayed the retirement of the older workers. In order to understand which population increased their labor force participation, I split the working-age population sample by age groups and conduct the same analysis on labor force participation: 16 - 24 years old (school-going age), 25 - 34 years old (young), 35 - 54 years old (middle-age), and 55 - 65 years old workers (older workers).

The result is shown in table 6. All columns include the controls used in the preferred specification. Column (1) uses the sample of all SEAs, column (2) uses the sample of rural SEAs, and column (3) uses the sample of urban SEAs. In column (3), the labor force participation rate seems to have increased among the school-going age workers only, with a potential pre-existing trend of increased labor force participation in the 1920s. This increased labor force participation may be suggestive of young male population drawn into the labor force, instead of the tariff act lowered the unemployment among the workers who were already in the labor force.

7 Conclusion

In this paper, we employ a continuous difference-in-differences strategy to measure the effect of the Smoot-Hawley tariff on regional economies. We construct a Bartik-style treatment intensity variable, defining the Average Tariff Changes (ATC) in each local labor market. Using the SEAs as the unit of analysis, we examine whether the tariff policy had a significant impact on labor force participation, occupational composition, and working-age population of the regions using the census data in the period of 1880 - 1950.

Controlling for the initial agricultural share of the region may matter in the analysis, and using the ATC measure that allows capturing the within-agriculture variation, we find that the tariff policy may have had a positive and significant impact on regional labor force participation rates: a ten percentage point increase in the ATC measure may be associated with a 2.5 percentage point increase in labor force participation rate, while we find an insignificant impact on the worker composition and working-age population of the SEAs. Also, we attempt to examine the effect of tariff policy exposure on the regional value of agricultural land, which may serve as a direct test of the effect of protective tariff on production factor costs, and the effect of tariff policy on the regional value of agricultural machinery, which may be an alternate margin of regional adjustment in the agricultural sector other than increasing labor or land demand. We do not find a significant effect of the tariff changes on both outcomes.

The increased labor force participation is concentrated in urban SEAs. This is consistent with the finding that agricultural crops, while they experienced relatively high increase in tariff, had low import competition. Thus the tariff act is expected to have minimal impact on the domestic agricultural market. Given that the tariff act had a purpose of supporting the agricultural sector, the act did not seem to boost the rural economy or agricultural prices.

The school-going age population who face the decision between education and employment seem to have increased the labor force participation. This has different economic implication from increased labor force participation among older workers, who might be potentially coming out of their long-term unemployment. The increased labor force participation from the forgone education may have ambiguous impact on the long-run development of the regions, due to the potential decrease in human capital investment of the population.

Table 1: Industry aggregation and crosswalk

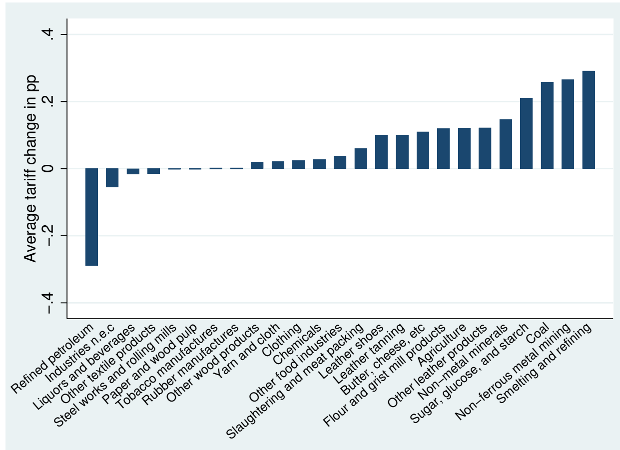
Industry (DCK)	Industry name (DCK)	Leontief industry name	Census industry code
1	Agriculture	Agriculture	105, 116, 126
2	Mineral mining	Non-metal minerals	236, 239
3	Petroleum and gas extraction and coal mining	Petroleum and natural gas; Refined petroleum; Coal; Coke	216, 226
4	Nonmetallic mineral goods manufacturing	Removed as this only accounts for one 3-digit 1950 census industry code. Replaced with miscellaneous manufacturing	--
5	Iron, steel, nonferrous, and other metal production and processing, electric manufacture	Iron mining; Blast furnaces; Steel works and rolling mills; Other iron and steel and electric manufactures; Non-ferrous metal mining; Smelting and refining; Brass, bronze, copper, etc. manufactures	206, 336-338, 346-348, 356, 357, 367, 386
6	Machinery, equipment, commercial installation manufacturing, and tractor manufacturing	Moved to 5 based on Leontief's industry definitions: electric manufactures are included in iron, steel, metal manufacturing	--
7	Communication equipment and components manufacturing	Moved to 5 based on Leontief's industry definitions (Not many exists in 1950 industry either)	--
8	Automobile and transportation, and vehicle parts manufacturing	Automobiles	376-379, 506, 516
9	Wood products, furniture manufactuing	Lumber and timber products; Other wood products	306-309
10	Paper manufacturing, publishing, and printing	Paper and wood pulp; Other paper products; Printing and publishing	456-459, 466
11	Rubber product manufacturing	Rubber manufactures	478
12	Chemical product manufacturing	Chemicals	467-469
13	Petroleum refining	Manufactured gas	476, 477
14	Pharmaceutical products	Moved to 12	--
15	Plastics products manufacturing	Removed since both Leontief's and the Census' definition of industries does not have plastic products manufacture	--
16	Textiles manufacturing	Yarn and cloth; Other textile products	436-439, 446, 449
17	Apparel and apparel accessories manufacturing	Clothing	448
18	Footwear and leather manufacturing	Leather tanning; Leather shoes; Other leather products	487-489
19	Food processing	Flour and grist mill products; Canning and preserving; Bread and bakery products; Sugar, glucose, and starch; Liquors and beverages; Tobacco manufactures; Slaughtering and meat packing; Butter, cheese, etc; Other food industries	406-409, 416-419, 426, 429
20	Miscellaneous other products manufacturing	Industries n.e.c.	316-319, 326, 358, 387-399, 499
21	Nontraded goods and services	Electric utilities; Construction; Transportation	246, 526, 527, 536, 546, 556, 567, 568, 578, 579, 586-588, 596-598, 606-609, 616-619, 626, 627, 636, 637, 646, 647, 656-659, 667-669, 679, 686-689, 696-699, 716, 726, 736, 746, 756, 806-808, 816, 817, 826, 836, 846-849, 856-859, 868, 869, 879, 888, 896-899, 906, 916, 926, 936, 946

Table 2: Comparison of average tariff rates to estimates in Irwin (1996)

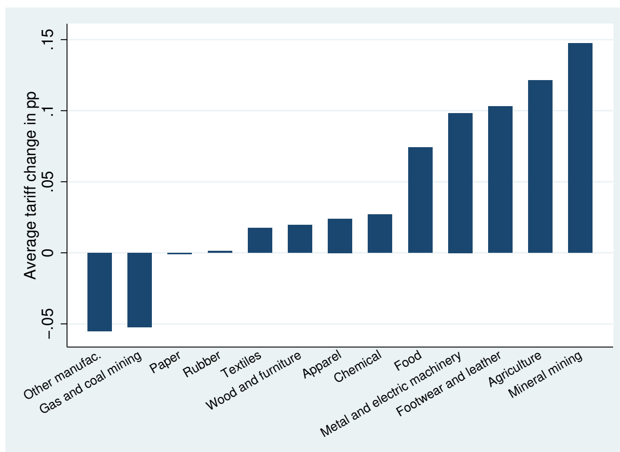
Sector	Pre-SH tariff (Irwin)	Post-SH tariff (Irwin)	Change (in pp)	Pre-SH tariff	Post-SH tariff	Change (in pp)
Agriculture	0.22	0.36	0.14	0.27	0.39	0.12
Food & Tobacco	0.56	0.66	0.10	0.28	0.35	0.07
Iron & Steel	0.44	0.49	0.05	0.36	0.45	0.09
Automobiles*	0.29	0.26	-0.03	–	–	–
Mining & Metals*	0.34	0.36	0.02	0.40	0.55	0.15
Energy	0.10	0.10	0.00	0.23	0.18	-0.05
Chemicals	0.30	0.40	0.10	0.31	0.34	0.03
Wood	0.25	0.22	-0.03	0.38	0.40	0.02
Textiles	0.40	0.50	0.10	0.33	0.35	0.02
Apparel	–	–	–	0.56	0.59	0.02
Leather	0.40	0.48	0.08	0.09	0.19	0.10
Paper	–	–	–	0.29	0.29	-0.00
Rubber	–	–	–	0.09	0.09	0.00
Other	0.40	0.46	0.06	0.23	0.17	-.06

Note : *The tariff line item panel data did not include any products categorized in Automobiles.
**In our industry crosswalk, Minings & Metals in the analysis only includes mining, and Iron & Steel includes other metal production and manufacturing.
Energy is not part of the industry crosswalk for the analysis but we inputted results for "Petroleum and gas extraction and coal mining."

Figure 1: Average change in tariff rate by industry



(a) Average change in tariff rate by Leontief industry



(b) Average change in tariff rate by industry

Figure 2: Average change in tariff rate by major crops

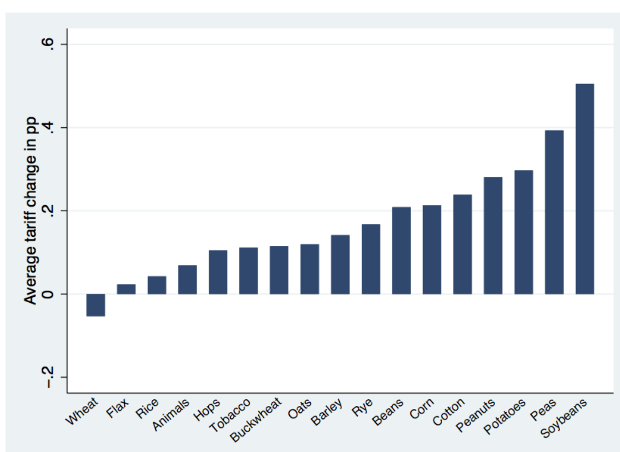


Figure 3: Average changes in agricultural tariffs by SEAs

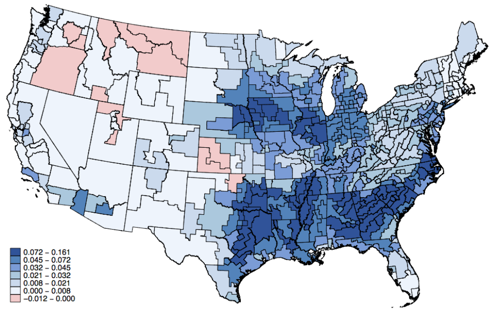


Figure 4: Average Tariff Change (ATC) using the aggregated industry employment share

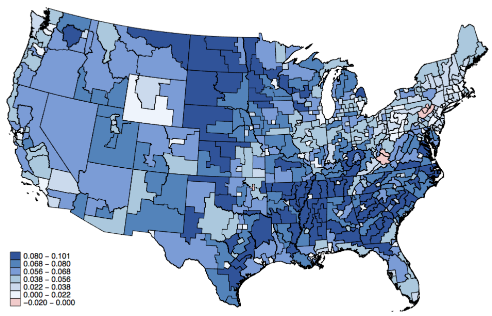
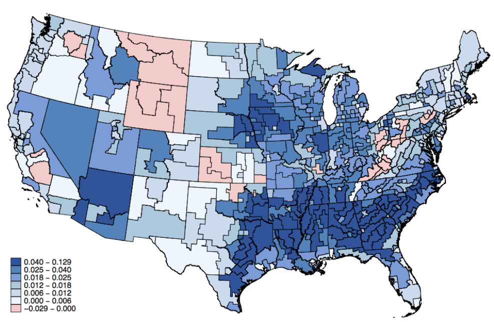


Figure 5: Average Tariff Change (ATC) using the detailed agricultural tariff / acreage info. : Acreage share denominator : total farm land acreage



	25%	50%	75%	Mean	SD
Average changes in agricultural tariffs	0.015	0.032	0.055	0.038	0.030
Average Tariff Change (Agg. industry)	0.030	0.056	0.074	0.052	0.026
Average Tariff Change (Using detailed agricultural info.)	0.009	0.018	0.031	0.022	0.019

Table 3: Regression results using the ATC with detailed agric. info. as treatment intensity (Base year : 1930)

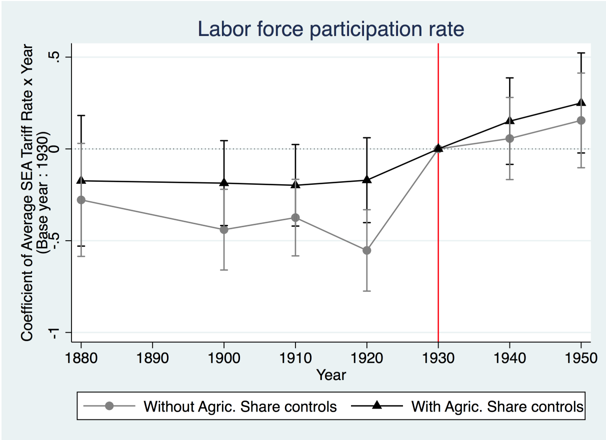
Change in outcomes:	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A: Labor force participation rate							
Avg. Tariff Change x 1880	-0.291***	-0.349***	-0.295***	-0.295**	-0.278**	-0.275**	-0.174
	(0.107)	(0.112)	(0.111)	(0.119)	(0.119)	(0.125)	(0.136)
Avg. Tariff Change x 1900	-0.376***	-0.400***	-0.392***	-0.442***	-0.440***	-0.374***	-0.186
	(0.107)	(0.112)	(0.111)	(0.119)	(0.119)	(0.125)	(0.136)
Avg. Tariff Change x 1910	-0.340***	-0.396***	-0.348***	-0.383***	-0.374***	-0.299**	-0.198
	(0.107)	(0.112)	(0.111)	(0.119)	(0.119)	(0.125)	(0.136)
Avg. Tariff Change x 1920	-0.506***	-0.524***	-0.527***	-0.559***	-0.553***	-0.340***	-0.170
	(0.107)	(0.112)	(0.111)	(0.119)	(0.119)	(0.125)	(0.136)
Avg. Tariff Change x 1940	0.040	0.029	0.045	0.040	0.057	0.078	0.151
	(0.107)	(0.112)	(0.111)	(0.119)	(0.119)	(0.125)	(0.136)
Avg. Tariff Change x 1950	0.118	0.085	0.145	0.132	0.155	0.197	0.250*
	(0.107)	(0.112)	(0.111)	(0.119)	(0.119)	(0.125)	(0.136)
State	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Great Depression Severity	No	Yes	No	Yes	Yes	Yes	Yes
AAA + Relief Amount	No	No	Yes	Yes	Yes	Yes	Yes
Dust Bowl SEAs	No	No	No	No	Yes	Yes	Yes
Agri. Share (1880)	No	No	No	No	No	Yes	No
Agri. Share (1920)	No	No	No	No	No	No	Yes
Dep. Var. Mean	0.904	0.904	0.904	0.904	0.904	0.904	0.904
Dep. Var. SD	0.04	0.04	0.04	0.04	0.04	0.04	0.04
R-squared	0.72	0.76	0.76	0.79	0.79	0.80	0.80
Observations	3164	3143	3143	3143	3143	3143	3143
Panel B: Average SEI							
Avg. Tariff Change x 1880	32.123***	30.159***	33.451***	36.767***	37.673***	39.834***	-1.069
	(7.509)	(7.819)	(7.731)	(8.289)	(8.338)	(8.785)	(9.298)
Avg. Tariff Change x 1900	9.808	12.714	13.512*	19.232**	19.874**	16.578*	12.653
	(7.509)	(7.819)	(7.731)	(8.289)	(8.338)	(8.785)	(9.298)
Avg. Tariff Change x 1910	5.405	2.842	7.566	7.705	8.389	2.972	-6.261
	(7.509)	(7.819)	(7.731)	(8.289)	(8.338)	(8.785)	(9.298)
Avg. Tariff Change x 1920	4.463	4.595	5.805	5.979	6.180	12.069	12.521
	(7.509)	(7.819)	(7.731)	(8.289)	(8.338)	(8.785)	(9.298)
Avg. Tariff Change x 1940	10.231	14.438*	11.027	14.942*	15.169*	10.224	4.015
	(7.509)	(7.819)	(7.731)	(8.289)	(8.338)	(8.785)	(9.298)
Avg. Tariff Change x 1950	16.091**	18.520**	16.575**	20.241**	21.289**	18.042**	14.744
	(7.509)	(7.819)	(7.731)	(8.289)	(8.338)	(8.785)	(9.298)
State	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Great Depression Severity	No	Yes	No	Yes	Yes	Yes	Yes
AAA + Relief Amount	No	No	Yes	Yes	Yes	Yes	Yes
Dust Bowl SEAs	No	No	No	No	Yes	Yes	Yes
Agri. Share (1880)	No	No	No	No	No	Yes	No
Agri. Share (1920)	No	No	No	No	No	No	Yes
Dep. Var. Mean	20.996	20.957	20.957	20.957	20.957	20.957	20.957
Dep. Var. SD	4.75	4.72	4.72	4.72	4.72	4.72	4.72
R-squared	0.90	0.92	0.92	0.93	0.93	0.93	0.93
Observations	3164	3143	3143	3143	3143	3143	3143
Panel C: Log of working-age population							
Avg. Tariff Change x 1880	14.009***	14.178***	13.291***	13.745***	13.164***	8.208***	1.191
	(1.397)	(1.471)	(1.474)	(1.589)	(1.592)	(1.620)	(1.661)
Avg. Tariff Change x 1900	9.030***	8.827***	8.917***	9.114***	8.804***	5.837***	1.179
	(1.397)	(1.471)	(1.474)	(1.589)	(1.592)	(1.620)	(1.661)
Avg. Tariff Change x 1910	4.763***	4.398***	4.863***	4.844***	4.813***	3.346**	0.586
	(1.397)	(1.471)	(1.474)	(1.589)	(1.592)	(1.620)	(1.661)
Avg. Tariff Change x 1920	2.170	2.193	2.179	2.147	2.023	1.419	0.222
	(1.397)	(1.471)	(1.474)	(1.589)	(1.592)	(1.620)	(1.661)
Avg. Tariff Change x 1940	-0.493	-0.416	-0.558	-0.427	-0.625	-0.748	-1.182
	(1.397)	(1.471)	(1.474)	(1.589)	(1.592)	(1.620)	(1.661)
Avg. Tariff Change x 1950	-2.321*	-2.169	-2.444*	-2.318	-2.505	-2.253	-1.825
	(1.397)	(1.471)	(1.474)	(1.589)	(1.592)	(1.620)	(1.661)
State	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Great Depression Severity	No	Yes	No	Yes	Yes	Yes	Yes
AAA + Relief Amount	No	No	Yes	Yes	Yes	Yes	Yes
Dust Bowl SEAs	No	No	No	No	Yes	Yes	Yes
Agri. Share (1880)	No	No	No	No	No	Yes	No
Agri. Share (1920)	No	No	No	No	No	No	Yes
Dep. Var. Mean	6.138	6.140	6.140	6.140	6.140	6.140	6.140
Dep. Var. SD	0.92	0.91	0.91	0.91	0.91	0.91	0.91
R-squared	0.91	0.92	0.92	0.93	0.93	0.94	0.94
Observations	3164	3143	3143	3143	3143	3143	3143

Standard errors in parentheses

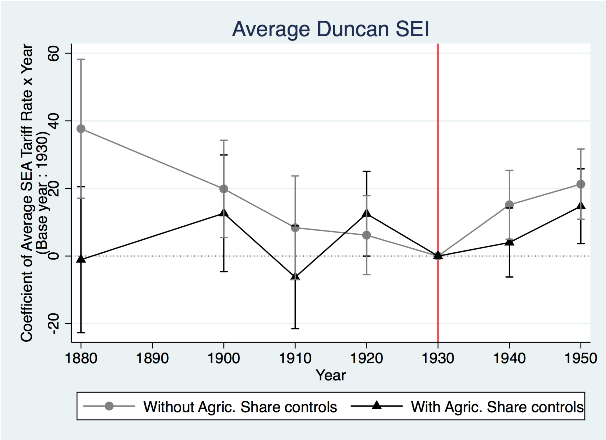
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note : The table contains the regression result of the estimating equation (4) in the text. The sample is the working-age male population of age 16 - 64. The outcome variable in Panel A-C is labor participation rate, average Duncan socioeconomic index, and log working-age population. The treatment year for the Smoot-Hawley Tariff is 1930, and the unit of analysis is the State Economic Areas (SEAs). The treatment intensity variable is the ATC which incorporates the detailed agricultural information on crop-level tariff changes and regional crop mix. In this table the base year is set to be 1930 and the interaction between the ATC and the base year is omitted from the regression.

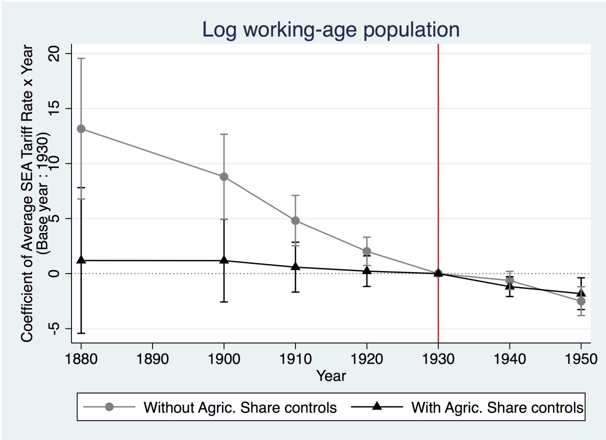
Figure 6: Regression results using the ATC with detailed agric. info. as treatment intensity



(a) Labor force participation rate



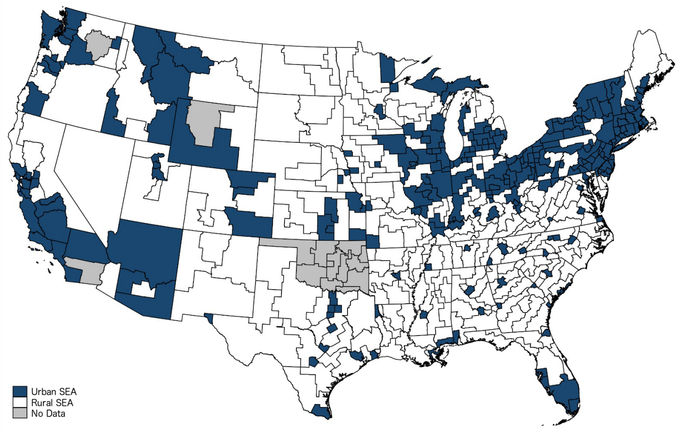
(b) Average Duncain SEI



(c) Log working-age population

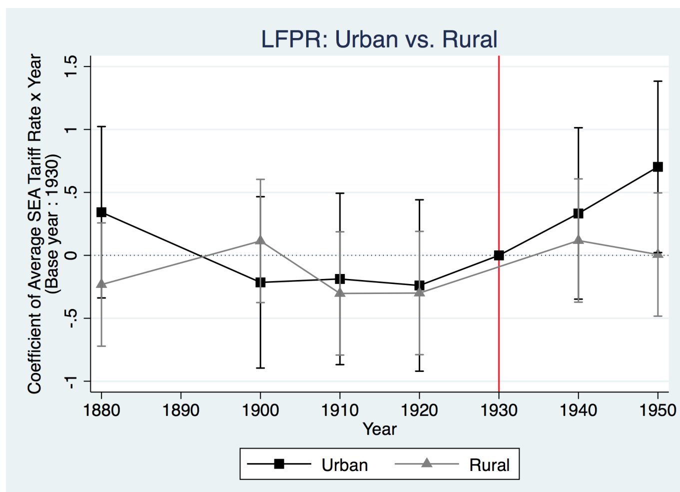
Note : The figures are plotting the coefficient of ATC interacted with year variable, columns 5 and 7 in table 3.

Figure 7: Geographic distribution of the urban SEAs



Note : The urban SEAs are SEAs with more than thirty percent of their population residing in urban areas.

Figure 8: Labor force participation rate by urban vs. rural SEAs



Note : The SEAs are split into two samples : urban and rural SEAs. The urban SEAs are SEAs with more than thirty percent of their population residing in urban areas. The analysis uses the estimating equation (4).

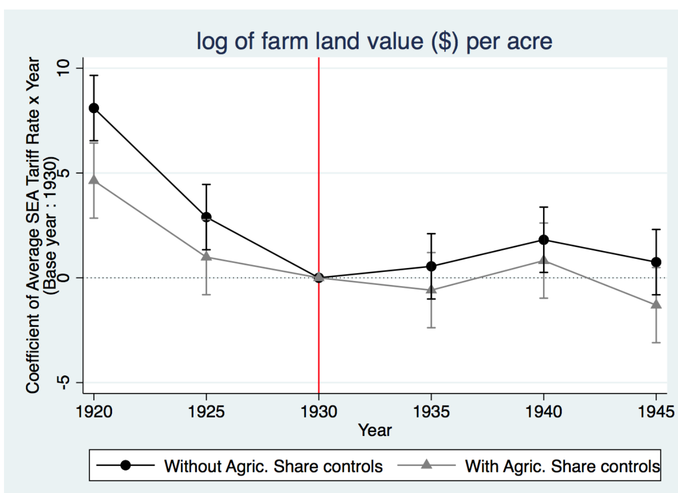
Table 4: Regression results of log farm land values on the ATC with detailed agric. info.
(Base year : 1930)

Change in outcomes:	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Log value of land / acre							
Avg. Tariff Change x 1920	8.606***	7.474***	9.052***	7.950***	8.099***	5.996***	4.638***
	(0.751)	(0.748)	(0.733)	(0.785)	(0.790)	(0.838)	(0.909)
Avg. Tariff Change x 1925	3.624***	2.808***	3.315***	2.808***	2.896***	1.734**	0.987
	(0.751)	(0.748)	(0.733)	(0.785)	(0.790)	(0.838)	(0.909)
Avg. Tariff Change x 1935	0.916	0.425	0.667	0.499	0.547	-0.031	-0.589
	(0.751)	(0.748)	(0.733)	(0.785)	(0.790)	(0.838)	(0.909)
Avg. Tariff Change x 1940	2.052***	1.667**	1.833**	1.875**	1.815**	1.236	0.821
	(0.751)	(0.748)	(0.733)	(0.785)	(0.790)	(0.838)	(0.909)
Avg. Tariff Change x 1945	0.997	0.395	0.742	0.652	0.749	-0.317	-1.303
	(0.751)	(0.748)	(0.733)	(0.785)	(0.790)	(0.838)	(0.909)
State	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Great Depression Severity	No	Yes	No	Yes	Yes	Yes	Yes
AAA + Relief Amount	No	No	Yes	Yes	Yes	Yes	Yes
Dust Bowl SEAs	No	No	No	No	Yes	Yes	Yes
Agri. Share (1880)	No	No	No	No	No	Yes	No
Agri. Share (1920)	No	No	No	No	No	No	Yes
Dep. Var. Mean	4.033	4.021	4.021	4.021	4.021	4.038	4.038
Dep. Var. SD	0.88	0.86	0.86	0.86	0.86	0.86	0.86
R-squared	0.97	0.98	0.98	0.98	0.98	0.98	0.98
Observations	2801	2784	2784	2784	2784	2694	2694

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note : The table contains the regression result of the estimating equation (4) in the text. The outcome variable is the log of values of agricultural land, and the treatment intensity variable is the ATC with detailed agricultural information. The sample period is 1920 to 1945, every five years.

Figure 9: Regression results on Log of farm land values per acre,
using the ATC with detailed agric. info



Note : The figures are plotting the coefficient of ATC interacted with year variable, columns 5 and 7 in table 4.

Table 5: Regression results of log value of machinery on the ATC with detailed agric. info. (Base year : 1930)

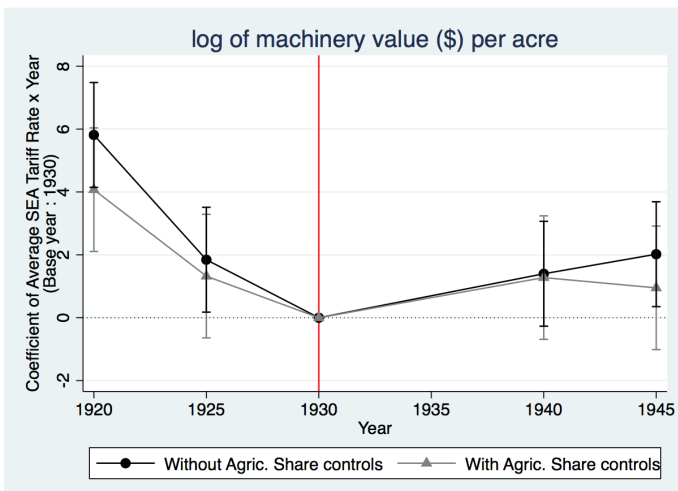
Change in outcomes:	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Log value of machinery / acre							
Avg. Tariff Change x 1920	6.221***	5.557***	6.343***	5.899***	5.814***	4.390***	4.073***
	(0.785)	(0.793)	(0.782)	(0.840)	(0.846)	(0.917)	(0.996)
Avg. Tariff Change x 1925	2.844***	2.121***	2.411***	1.862**	1.846**	1.115	1.323
	(0.785)	(0.793)	(0.782)	(0.840)	(0.846)	(0.917)	(0.996)
Avg. Tariff Change x 1940	1.996**	1.463*	1.662**	1.514*	1.399*	1.215	1.277
	(0.785)	(0.793)	(0.782)	(0.840)	(0.846)	(0.917)	(0.996)
Avg. Tariff Change x 1945	2.398***	1.844**	2.092***	2.072**	2.021**	1.599*	0.950
	(0.785)	(0.793)	(0.782)	(0.840)	(0.846)	(0.917)	(0.996)
State	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Great Depression Severity	No	Yes	No	Yes	Yes	Yes	Yes
AAA + Relief Amount	No	No	Yes	Yes	Yes	Yes	Yes
Dust Bowl SEAs	No	No	No	No	Yes	Yes	Yes
Agri. Share (1880)	No	No	No	No	No	Yes	No
Agri. Share (1920)	No	No	No	No	No	No	Yes
Dep. Var. Mean	1.503	1.495	1.495	1.495	1.495	1.514	1.514
Dep. Var. SD	0.84	0.83	0.83	0.83	0.83	0.84	0.84
R-squared	0.97	0.97	0.97	0.98	0.98	0.98	0.98
Observations	2335	2320	2320	2320	2320	2245	2245

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

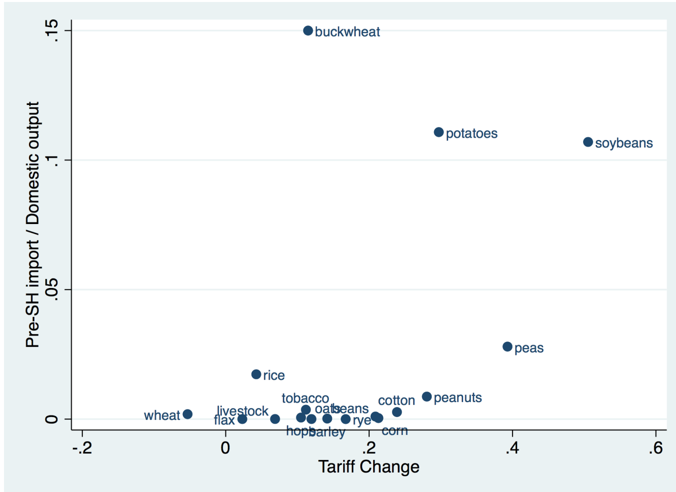
Note : The table contains the regression result of the estimating equation (4) in the text. The outcome variable is the log of values of machinery, and the treatment intensity variable is the ATC with detailed agricultural information. The sample period is 1920 to 1945, every five years except for 1935. The variable is not available in the 1935 census.

Figure 10: Regression results on Log value of machinery per acre, using the ATC with detailed agric. info



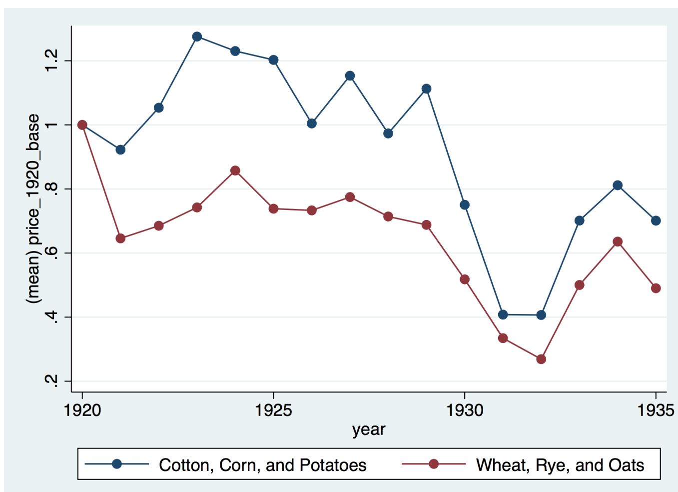
Note : The figures are plotting the coefficient of ATC interacted with year variable, columns 5 and 7 in table 5.

Figure 11: Import share by crops



Note : Each dot corresponds to a crop, where the pre-SH import value divided by the total domestic output value is plotted against the tariff rate change.

Figure 12: Price response by crops



Note : The crop series is plotted from the 1936 Statistical Abstract of the United States, which contained the longest time period of crop price series that has consistent definition. The crops are divided into two groups where cotton, corn, potatoes experienced higher tariffs.

Table 6: Labor force participation rate by age group 1880-1950

Samples :	All SEAs	Rural	Urban
	(1)	(2)	(3)
School-going age workers			
Avg. Tariff Change x 1880	-0.079	0.062	2.399
	(0.323)	(0.430)	(2.732)
Avg. Tariff Change x 1900	-0.137	-0.052	4.959*
	(0.323)	(0.430)	(2.732)
Avg. Tariff Change x 1910	-0.281	-0.508	3.069
	(0.323)	(0.430)	(2.732)
Avg. Tariff Change x 1920	-0.215	-0.293	5.264*
	(0.323)	(0.430)	(2.732)
Avg. Tariff Change x 1940	0.148	0.504	5.539**
	(0.323)	(0.430)	(2.732)
Avg. Tariff Change x 1950	0.242	0.176	4.670*
	(0.323)	(0.430)	(2.732)
Dep. Var. Mean	0.770	0.771	0.770
Dep. Var. SD	0.10	0.09	0.11
R-squared	0.83	0.86	0.99
Observations	3031	2065	966
Young workers			
Avg. Tariff Change x 1880	0.149	0.173	2.039
	(0.189)	(0.283)	(1.315)
Avg. Tariff Change x 1900	-0.190	-0.085	-0.297
	(0.189)	(0.283)	(1.315)
Avg. Tariff Change x 1910	-0.084	-0.007	0.608
	(0.189)	(0.283)	(1.315)
Avg. Tariff Change x 1920	-0.136	-0.150	0.809
	(0.189)	(0.283)	(1.315)
Avg. Tariff Change x 1940	0.069	0.191	0.442
	(0.189)	(0.283)	(1.315)
Avg. Tariff Change x 1950	0.103	0.176	1.338
	(0.189)	(0.283)	(1.315)
Dep. Var. Mean	0.959	0.960	0.959
Dep. Var. SD	0.04	0.04	0.03
R-squared	0.55	0.62	0.97
Observations	3031	2065	966

Samples :	All SEAs (1)	Rural (2)	Urban (3)
Middle age workers			
Avg. Tariff Change x 1880	-0.371***	-0.439***	0.568
	(0.127)	(0.169)	(1.534)
Avg. Tariff Change x 1900	-0.236*	-0.041	-0.901
	(0.127)	(0.169)	(1.534)
Avg. Tariff Change x 1910	-0.198	-0.147	-0.580
	(0.127)	(0.169)	(1.534)
Avg. Tariff Change x 1920	-0.248*	-0.121	-0.238
	(0.127)	(0.169)	(1.534)
Avg. Tariff Change x 1940	0.053	-0.030	1.342
	(0.127)	(0.169)	(1.534)
Avg. Tariff Change x 1950	0.087	-0.050	0.609
	(0.127)	(0.169)	(1.534)
Dep. Var. Mean	0.962	0.963	0.958
Dep. Var. SD	0.03	0.03	0.03
R-squared	0.67	0.75	0.94
Observations	3031	2065	966
Old workers			
Avg. Tariff Change x 1880	-0.567*	-0.370	-6.566**
	(0.299)	(0.396)	(3.042)
Avg. Tariff Change x 1900	-0.060	-0.124	-2.818
	(0.299)	(0.396)	(3.042)
Avg. Tariff Change x 1910	-0.195	-0.290	0.085
	(0.299)	(0.396)	(3.042)
Avg. Tariff Change x 1920	0.001	-0.031	-2.023
	(0.299)	(0.396)	(3.042)
Avg. Tariff Change x 1940	0.004	-0.022	1.083
	(0.299)	(0.396)	(3.042)
Avg. Tariff Change x 1950	0.742**	0.577	1.521
	(0.299)	(0.396)	(3.042)
Dep. Var. Mean	0.900	0.904	0.891
Dep. Var. SD	0.07	0.07	0.07
R-squared	0.70	0.79	0.95
Observations	3031	2065	966

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note : The table contains the regression result of the estimating equation (4) in the text. The outcome variable is the labor force participation of different age groups : the first panel is for school-going age workers (age 16 - 24), the second for young workers of age 25 - 34, the third for middle-aged workers of age 35 - 54, and the last for workers of age 55 - 65.

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