Misallocation and Productivity Effects of the Hawley-Smoot Tariff of 1930*

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Abstract

Using a newly created microeconomic archive of U.S. imports at the tariff-line level, we investigate the role of the Hawley-Smoot Tariff in generating consumption and production inefficiencies.

Keywords: Hawley-Smoot Tariff, Great Depression, commercial policy, productivity, misallocation, macroeconomic inefficiency.

JEL Codes:

1. Introduction

The Hawley-Smoot Tariff Act of 1930 (HS) when combined with tariff increases in other industrialized countries represents the high-water mark of recorded tariff history. While early research claimed the downward spiral of world trade and output was largely due to commercial policy, recent investigations have discounted their role in the trade collapse. Viewpoints have shifted toward the causal channel running from a collapse of output caused by factors other than commercial policy with trade responding passively through income

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effects on the demand for traded goods and away from the opposite causal chain of events from commercial policy to trade and output. Any yet the decline in trade relative to output is just as puzzling in the context of the Great Depression as it is in the context of the more recent Great Recession.

By studying this period of history we hope also to learn about the potential for distortions in relatively small segments of the national economy to propagate a banking or financial crisis leading to large declines in output and possibly a disintegration of trade. In a sense the apparent larger fall in trade relative to world output in the Great Recession is more puzzling precisely because it was not accompanied by large protectionist actions. Of course there were numerous other structural differences: i) less round-tripping of trade in the earlier period; ii) a system of fixed exchange rates rather than floating rates (within Europe, however the EMU is an interesting point of comparison); iii) a much larger share of manufacturing in terms of aggregate employment and value added in the earlier period; iv) fewer built-in stabilizer and experience with discretionary monetary and fiscal policy in the 1930s; and v) a collapse of a major segment of the U.S. banking system contrasting with significant bailouts and liquidity provision in the more recent recession.

This paper revisits the role of commercial policy during the interwar period with a special focus on the Hawley-Smoot Tariff Act. It extends the analysis of Crucini and Kahn (2007) who examined the macroeconomic effects of the Hawley-Smoot tariffs and foreign retaliation using a three-sector, two-country SDGE model of trade. Here we drill down to the line item level of the Foreign Trade and Navigation of the United States (FTNUS) which records legislated rates of duty and value and quantity of imports for more than 5,000 individual items. To date we have developed three cross-sections.[1] These microeconomic trade data are supplemented with a large panel of individual stock price data for publicly listed companies. The pre-1929 stock price data collected by Jovanovic-Rousseau is spliced to the CRSP data from 1930 to 1940. To the extent possible, the companies in the stock price panel have been reconciled with product lines in the tariff schedules using Moody's[2]. We also utilize

[1]The massive cross-sections are supplemented with a more limited set of goods for which a complete panel of data is avaialble; namely, the 1903 to 1940 panel of 32 individual imports compiled by Crucini (1994).

[2]Tristan Potter (2010) developed the cross-walk between stock prices and product lines in the trade data

Leontief's input-output tables to consider the different effects of tariffs on final goods and intermediate inputs.

Our goal is to link tariffs and macroeconomic wedges as previously study in the context of the Great Depression by Crucini and Kahn (1996, 2007), but at a much more aggregated level than what is done here. The disaggregation is important for at least two reasons. First, the impact of tariffs is different if the tariff changes are uniform across goods as opposed to specific to the good.[3] Second, tariffs on consumption goods, material inputs and capital goods have different qualitative and quantitative impacts on aggregate and sectoral economic activity. Thus, an important empirical task is to construct separate price and tariff indices for consumption goods, material and capital goods. These trade wedges will be related to the labor, capital and efficiency wedges of the Chari, Kehoe and McGrattan (2008) one-sector neoclassical growth model.

2. Data

This papers uses microeconomic data on trade flows and stock prices along with Leontief's input-output tables for the United States. The trade data consists of three extensive cross-sections of U.S. import values, volume and tariffs at the line item from the FTNUS. The first two cross-sections span the passage of the HS tariff legislation, which went into effect on June 30, 1930. That is, they provide data on imports and duties at the line item from January 1, 1930 to June 30, 1930 and from July 1, 1930 to December 31, 1930. The third cross-section is for 1933, the trough year of the U.S. depression.

The duties on imports into the United States took one of three forms: i) pure ad-valorem duties such that the duty is assessed as a percentage of the imported value; ii) specific duties such that the duty is assessed in nominal currency per physical unit imported (e.g., cents per pound) and iii) mixed duties which combined ad-valorem and specific rates.[4] Figures 1

to study stock-price reactions to the SH tariff changes.

[3] Anderson and Neary (2005) develop a trade restrictiveness index in which the weights reflect the structure of the balance of trade function. This approach extends the typical approach of an import-weighted price index to capture (static) general equilibrium effects of tariff changes. Our approach allows us to incorporate dynamic effects of tariff changes as well.

[4] Quotas were rarely used as an instrument of U.S. commercial policy during the period of our study.

through 3 from Potter (2010) show the distribution of tariffs by product and type of tariff assessed.

The median ad-valorem rate rose from 35% to 40%, while the median mixed duty rose from 47% to 56% and the median specific duty was almost unchanged at 27%. As the distribution of ad-valorem-equivalent rates seems to suggest, there were a large number of small reductions and a small number of very large increases in the case of ad-valorem and specific duties. The items with combined duties tended to see increases throughout the distribution. It should also be kept in mind that the ad-valorem equivalent of the specific duties increased substantially from 1930 to 1933 due to the impact of price level deflation on the real value of specific duties. Thus the 1933 distribution of tariffs for these categories will be a function of how U.S. dollar prices of individual imports changed relative to each other. Furthermore, the tariff schedules expanded to include items which were not subject to duties previously (note that the red line extend to higher product numbers than the blue lines).

3. The model

The starting point of our analysis is a very disaggregated version of the model of Crucini and Kahn (1996, 2007). The reader is referred to the two earlier papers for details of the macroeconomic model structure and macroeconomic findings. Here we strip the presentation down to the key equations and first-order conditions to focus on the mapping from tariffs to aggregate distortions. In later sections the focus is on the implications of the cross-sectional levels and changes in tariffs for labor and capital misallocation and reallocation as well as the income redistribution effects that may have followed.

To map microeconomic tariffs into macroeconomic wedges we use the CKM framework which maps a variety of underlying shocks and taxes into three macroeconomic wedges in the one-sector neoclassical model: an efficiency wedge, a labor wedge and an investment wedge. Each is discussed in abstract terms below and then connected to U.S. trade patterns and commercial policy in the data section. The choices made below are driven by a desire

Their use is more prevalent in other countries.

to begin with three key price indices, one for final consumption goods, one for materials and one for capital goods. The motivation for doing so is to get a better sense of both the tariff data and the macroeconomic implications before adding a great deal of heterogeneity across sectors and complex trade interactions.

3.1. Preferences

The utility function is additively separable over time and between aggregate consumption and leisure:

$$E_o \sum_{t=0}^{\infty} \beta^t log C_t + v(1 - N_t)$$

where $1 - N_t$ is leisure (total time is normalized to 1) and β^t is the discount factor. C_t is a CES aggregator,

$$C_t = \left(\sum_j b_j {C_{jt}}^{-\gamma} \right)^{-\frac{1}{\gamma}} . \tag{3.1}$$

Due to data limitations, CK considered only three goods in the aggreagtor: a non-traded domestically produced good, an export good and an import good. The elasticity of substitution was calibrated using trade elasticities estimated from the recent trade literature along with extensive sensitivity analysis. The weight on non-traded goods was set at 0.98 to generate a historical average trade share of about 7%. The first point of departure here is an attempt to endogenize as much of the home bias in consumption as possible from the tariffs schedules themselves through substitution effects rather than rely on taste biases. In what follows we abstract from the time dimension and focus on steady-state implications.

Value added is produced with capital and labor with gross output requiring aggregate material inputs which enter in a constant proportion:

$$\begin{aligned} Y_j &= K_j^{\alpha} N_j^{1-\alpha} \\ M_j &= aY_j \end{aligned}$$

This is much more restrictive than how Potter (2010) incorporated materials into calculations of effective protection as he used the actual Leontief input-output tables where sectors differ significantly on their material bundles. The assumption comes at the benefit of being able

to model materials as a CES function of the individual goods:

$$M = \left(\sum_m b_m {M_m}^{-\mu} \right)^{-\frac{1}{\mu}} . \tag{3.2}$$

Moreover, since all domestic firms are assumed to also face the same set of prices, they will choose the same input mix up and we just scale their demands by their production scale.[5] The physical resource constraints are:

$$\begin{aligned} M &= \sum_j M_j \\ C &= \sum_j p_j^* \tau_j C_j \end{aligned}$$

$\tau_j - 1$ is the ad-valorem tariff or in the case of a specific duty, the ad-valorem equivalent tariff.

3.2. Tariffs on final goods

Consider the choice of any two goods, taking foreign prices (denoted by '$*$') as given for the time being, the intratemporal condition is given by:

$$\frac{b_j}{b_k} \left(\frac{C_j}{C_k} \right)^{-(1+\gamma)} = \frac{p_j^* \tau_j}{p_k^* \tau_k}$$

Substituting this and similar first-order conditions involving pairs of goods into the definition of C, one can show that up to a scalar normalization, consumption is:

$$C = \left[\sum_j b_j^{\frac{1}{1+\gamma}} (p_j^* \tau_j)^{\frac{\gamma}{1+\gamma}} \right]^{-\frac{1+\gamma}{\gamma}} .$$

The first-order condition for C_t and N_t in the CKM prototype one-sector model is

$$\frac{1/C}{\Lambda v'(1-N)} = \frac{1}{w(1-\tau_N)}.$$

And thus to establish equivalence between the tariff distortions and the labor wedge we set

$$1 - \tau_N = \left[\frac{\sum_j b_j^{\frac{1}{1+\gamma}} (p_j^* \tau_j)^{\frac{\gamma}{1+\gamma}}}{\sum_j b_j^{\frac{1}{1+\gamma}} (p_j^*)^{\frac{\gamma}{1+\gamma}}} \right]^{-\frac{1+\gamma}{\gamma}} .$$

[5] An extension considers firm-specific effects a_j.

which of course equals one if $\tau_j = 1$, ∇j, indicating an absence of a labor wedge if there are no tariffs. The wedge is decreasing in τ_j for $\gamma > -1$. This reflects the fact that the tariff in effect reduces real wages by making the preferred consumption bundle more expensive. It will not, however, result in an observable labor wedge in the macroeconomic data in the sense of CKM. It will simply lower the real wage, and the marginal rate of substitution between consumption and leisure will equal the new marginal rate of transformation.[6] The implications of this are dealt with in the empirical section.

CK found a labor wedge of less than 0.2% of GDP and an efficiency wedge of about 1% of GDP associated with tariff changes from peak to trough (1929 to 1933). There are reasons to expect their estimates to understate the impact. Beginning with the labor wedge, non-traded consumption was assigned the role of the first good in the CES aggregate and calibrated with a weight of 98% of the aggregate using the taste parameter. This assumption limits the aggregate impact of tariffs by implicitly assuming that most of the home bias in consumption is due to tastes rather than as a consequence of the tariff distortions. The approach also limits the size of the wedge because of the level of aggregation used in the analysis. As is well-known unless the tariff is uniform across items in the CES aggregator, a single tariff value underestimates the true value of the wedge. Given the variance of tariffs across items and over time, the true wedge is likely to be higher and more variable over time than CK found.

In the case of a uniform tariff on all final goods, the expression simplifies to:

$$1 - \tau_N = {\tau_t}^{-1}.$$

To place this number in perspective consider an admittedly biased estimate of tariff levels, the ratio of customs revenue to dutiable imports. This measure of the ad-valorem equivalent rate rose from about 40% to 60% from the 1920s to the 1930s. If tariffs applied equally to all goods, this would be equivalent to a proportional labor income tax change from 28% to 37.5%. This is a substantial distortion, the impact of which will depend on a number of factors, even in this simplified partial-equilibrium framework.

[6] Later we consider the role of rigidities and public policy inventions in the labor market of various forms and add an extensive margin of adjustment in employment.

After determining the size of the wedge the goal is to assess its quantitative impact. In the absence of capital accumulation and general equilibrium considerations (i.e. using the small open economy assumption) the analysis boils down to a simple comparatives exercise. The labor wedge has a wealth effect and a substitution effect which is fully born within the period. The wealth effect depends on what the government does with the tariff revenue. In the benchmark case the revenue is rebated lump sum back to individuals in which case the labor supply response will compensated and we will need a compensated labor supply elasticity estimate. In contrast if preferences are Cobb-Douglas and the revenue is discarded, labor supply (and leisure) will be unchanged and consumption will fall in proportion to the labor wedge about 10% in the stylized case above.

3.3. Tariffs on intermediate inputs and capital goods

The firm the produces good j solves the following problem:

$$\max \ \Pi_j = p_j^* \tau_j Y_j - w_j N_j - p_m M_j$$

Substituting in the functional forms for the production function, we have:

$$\max \ \Pi_j = p_j^* \tau_j K_j^\alpha N_j^{1-\alpha} - p_j^k K_j - w_j N_j - p_m a K_j^\alpha N_j^{1-\alpha}$$

The first-order conditions and Leontief input requires are:

$$\begin{aligned} (p_j^* \tau_j - a p_m)(1-\alpha) Y_j &= w_j N_j \\ (p_j^* \tau_j - a p_m)\alpha Y_j &= p_k K_j \\ p_m a Y_j &= p_m M_j \end{aligned}$$

Effectively, if the prices are taken as given the tariffs on final goods and their impact on marginal products is isomorphic to a sector-specific productivity shock, $(p_j^* \tau_j - a p_m) = A_j$. Later we exploit this to discuss sector productivity variation implied by these tariffs and the implication for distributive effects and so forth. For the time being it is more convenient to consider the aggregate model as having a proportional tax on the aggregated materials, denoted $(1 + \tau_m)$.

The effect of the tariffs on individual materials that make up the material inputs into each sectors production requires us to solve the sub-problem of minimizing material costs using the CES aggregator for material inputs. This is analogous to the consumer problem up to a point. Consider the choice of any two material inputs, taking foreign prices (denoted by '$*$') as given for the time being, the intratemporal condition is given by:

$$\frac{b_l}{b_k}\left(\frac{M_{jkt}}{M_{jlt}}\right)^{-(1+\mu)} = \frac{q_{kt}\tau^m_{kt}}{q_{lt}\tau^m_{lt}}$$

Using the same basic approach as how the labor wedge was defined, effectively we use the ideal price index for materials, given costs have been minimized and compare the tariff and non-tariff-ridden levels to define an equivalent proportional materials tax that leads to the same change in the materials price index. Thus the comparable tariff wedge in the prototype model, even with multiple sectors is:

$$(1+\tau_m)p_m = \left[\frac{\sum_m b_m^{\frac{1}{1+\mu}}(q_m\tau_m)^{\frac{\mu}{1+\mu}}}{\sum_m b_m^{\frac{1}{1+\mu}}(q_m)^{\frac{\mu}{1+\mu}}}\right]^{\frac{1+\mu}{\mu}}.$$

It is important to emphasize at this stage that by treating all firms as using the same material aggregate, we are restricting all heterogeneity in "efficiency" to originate with the tariffs on final goods. We plan to extend the model to consider the actual input-output relationships measured by Leontief. For now we keep this facet of the model tractable.

The same analytical results led to an impact capital costs if we assume another CES function aggregating capital inputs. The tax on capital purchases is thus:

$$(1+\tau_k)p_k = \left[\frac{\sum_k b_k^{\frac{1}{1+\mu}}(q_k\tau_k)^{\frac{\mu}{1+\mu}}}{\sum_k b_k^{\frac{1}{1+\mu}}(q_k)^{\frac{\mu}{1+\mu}}}\right]^{\frac{1+\mu}{\mu}}.$$

Aside from providing a mapping from the micro-data and sectoral effects, the definitions of the wedges help us organize the trade data into three categories, final goods, material and capital goods and construct three tariff series and associated price indices. Moreover, we will estimate separate elasticities for each of the three aggregators.[7]

[7] One aspect glossed over at this point is the treatment of capital, which was treated as fully depreciating in the setup so far.

4. Quantitative Approach

To determine the size of the wedge and its quantitative impact we begin by using our data along with standard values for the import demand elasticity to compute tariff wedges for consumption, intermediate inputs and capital.[8] Using tariff data before and after the legislated tariff changes allows us to identify the impact of highly disaggregated tariff changes on size of the wedges and their evolution over time. Moreover, simulating our model allows us to compute the impact of the tariff changes on disaggregated factor prices and welfare in our benchmark economy.

We note, however, that our model will also allow us to provide new estimates of the import demand elasticity parameter across highly disaggregated groups of products. Although numerous studies have examined differences in import elasticities across countries we are among the few that are able to identify and estimate differences across different types of highly disaggregated goods. To see this clearly consider the firm's first order condition for profit maximization. For any two goods k and l the first order condition implies

$$\frac{M_k}{M_l} = \left(\frac{b_k}{b_l}\frac{p_k^\tau}{p_l^\tau}\right)^{-\frac{1}{1+\mu}}$$

where p_k^τ and p_l^τ are the prices of goods k and l inclusive of the tariff. Similar expressions can be derived from numerous modern trade models including Melitz (2003), Eaton and Kortum (2003) and Chaney (2008). The elasticity parameter has been shown to be key to evaluating welfare gains across a large class of models (c.f. Arkolakis, Costinot, and Rodriguez-Clare, 2011) and has proven difficult to estimate (c.f. Simonovska and Waugh, 2011). We proceed by providing new estimates of this key parameter using a novel source of variation unavailable to other studies: legislated tariff reform.[9]

[8] Estimates of the import elasticity of demand can be found in Kee, Nicita, and Olarreaga (2008), for example, and the citations therein.

[9] In order to identify the price elasticity we would ideally want to observe different price and quantity combinations along the *same* demand curve. We proceed in two ways here. First, under the assumption that the legislated tariff changes were exogenous to import flows we can instrument endogenous prices with the tariff changes and estimate the import elasticity within consumption, capital and intermediate inputs directly. Second, in the event that our assumption that tariff changes were not exogenous is violated we can also use simulation-based estimation methods to identify the import elasticity parameters.

5. Results and Conclusions

TBA

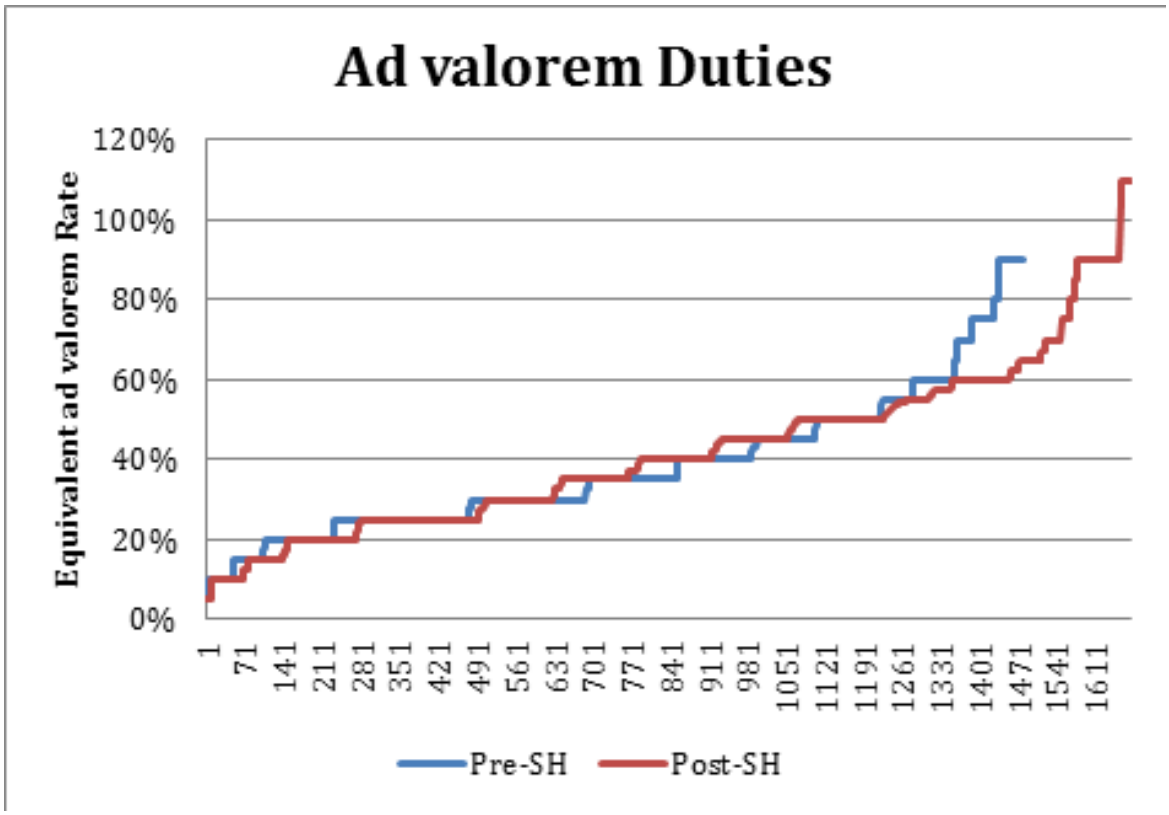

Figure 1. Pre- and Post- Smoot Hawley Ad-valorem Duties Across Goods

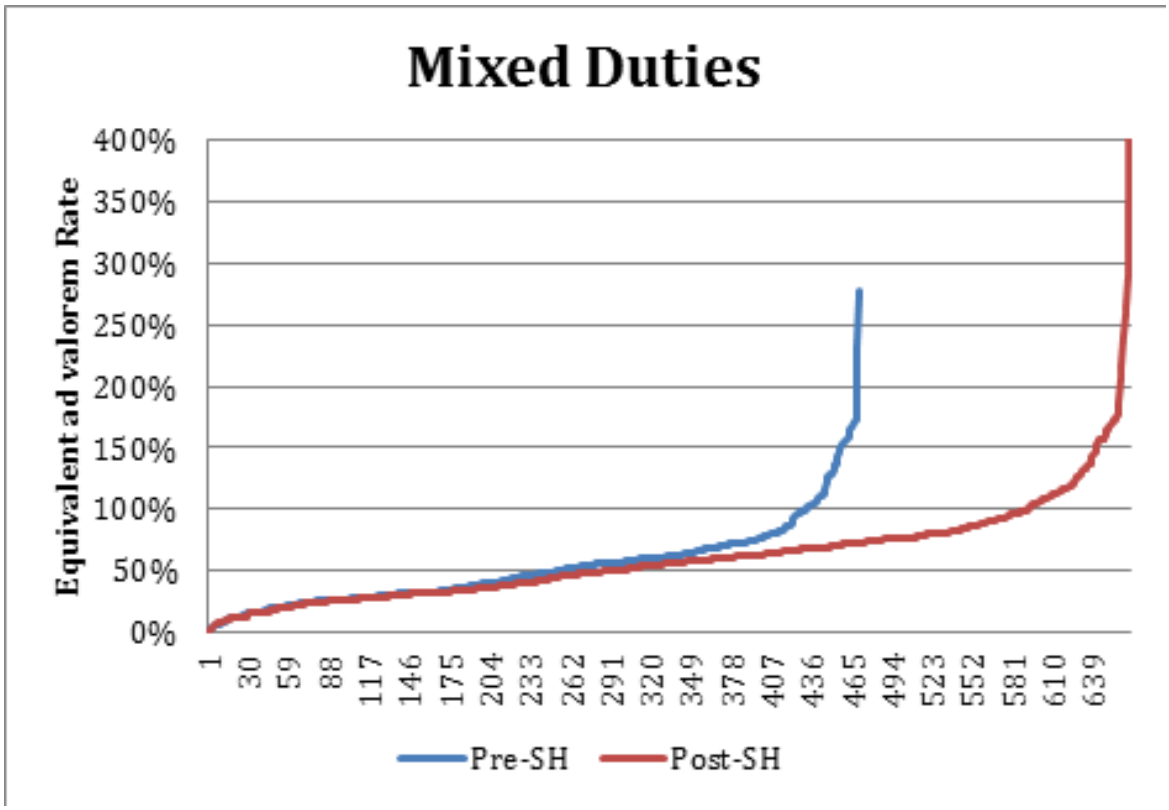

Figure 2. Pre- and Post Smoot-Hawley Mixed Duties Across Goods

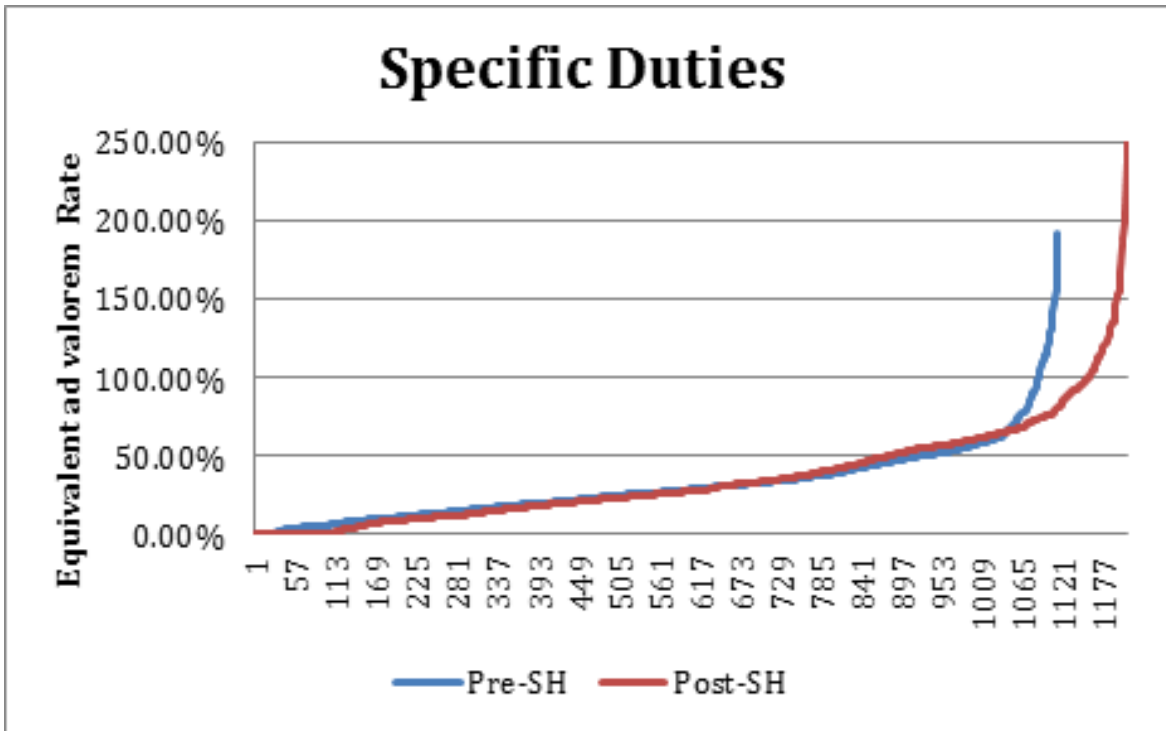

Figure 3. Pre- and Post- Smoot Hawley Specific Duties by Good