Wage Rigidity during the Great Depression: Plant-level Evidence

Changkeun Lee[1]

June 10, 2018

Very Early-stage and Preliminary Work – Please Do Not Cite

Abstract

Conventional wisdom says that sticky wages play a crucial role in deepening and extending the downturn. It is also claimed that the leaders of big businesses wanted to delay or minimize wage reduction, hoping to maintain the purchasing power of workers. However, these arguments have never been tested against micro-level data. This paper explores the wage-setting behaviors of individual employers during the Great Depression using the plant-level microdata from the biennial Census of Manufactures, 1929-1935. I find that wages were rigid in both nominal and real terms during the first two years. However, wages fell more than consumer and wholesale price indices between 1931 and 1933. But greater reduction of hourly wages came with less reduction or increase of work hours. This would have helped workers maintain their labor income. This paper also suggests that measuring rigidity from aggregate data can lead to overestimation. Plants that closed between 1929 and 1931 paid significantly lower wages, which causes a composition bias that is prevalent in individual-level studies.

JEL Codes: E24, N12, N32, N62

[1] Korea Development Institute (e-mail: leechk@kdi.re.kr).

1. Introduction

To many macroeconomists, sticky wages play a crucial role in explaining why the Great Depression was so deep and prolonged. A sentence from Bernanke and Carey (1996), one of the most influential papers with the argument, summarizes the idea well:

> "…nominal wages adjusted quite slowly to falling prices, and that the resulting increases in real wages depressed output."

The common approach of the scholars in this discussion is to set up a neoclassical general equilibrium model and fit macro-level time series data. Good examples include Bordo, Erceg, and Evans (2000) and Cole and Ohanian (2004). These studies conclude that wages were not as flexible as prices and it caused the "labor wedge." As a result, the economy deviates from the equilibrium, and the natural adjustment for recovery was delayed. Studies that take different approaches, such as and Ebel and Ritschl (2008), reach a similar conclusion.[2] On the empirical side, Dighe (1997) support the argument by carefully examining the high-frequency aggregate data published by the Conference Board and the Bureau of Labor Statistics.

Taking the same position with this conventional view, some scholars seek the source of wage rigidity. O'Brien (1989) is one of the most well-known studies in this line. He examines qualitative sources to shed light on the behavioral motives of firms to maintain wages facing an extraordinary downturn. He points that cutting wages during the 1920-1922 downturn left unsatisfactory consequences to firm managers. As a result, he indicates, business leaders believe in the idea of maintaining the purchasing power of workers. This motivation is evident in large firms. A monograph from the National Industrial Conference Board, one of the primary historical sources, also confirms that this idea was widespread and strong (National Industrial Conference Board 1932).

Some recent studies take more micro-level approaches and cast doubts on the conventional view. For example, Hanes and James (2012) claim that nominal wages were not

[2] Bernanke and Carey argue that "nominal wages adjusted quite slowly to falling prices, and that the resulting increases in real wages depressed output"

"unusually rigid" during the downturn of 1929 to 1933 as they were on the predicted path from the Phillips Curve. More micro-oriented also studies present results that are either contrary to the conventional wisdom or ambiguous. Simon (2001) examines the wages asked in job postings and finds that wages asked for female clerical workers fell by more than a half between 1929 and 1933. Because the decline is not explained by the changes in labor quality, he concludes that labor supply was inelastic. Rose (2010) uses news information to test whether the conferences of President Hoover and business leaders had any impact on the timing of wage cut. From a cross-sectional analysis, he finds no evidence supporting the evidence.

The conflicting arguments raise the need for further research. This paper contributes to the literature by analyzing the wage-setting behaviors of individual employers during the Great Depression. Specifically, I examine the plant-level microdata from the Census of Manufactures which was conducted every two years between 1929 and 1935. While the data are certainly of low frequency, they contain rich information about all individual plants above the size threshold. Most importantly, because the data track the same plant over the period, it offers all the advantages of the panel data. Considering that previous studies have used industry-level data and there exist no individual-level data, direct observations of manufacturing plants' adjustment provides a significant advantage for tackling important questions regarding wage rigidity during the Depression. One can measure the degree of wage adjustment of individual plants, find where the adjustment was large, and figure what the aggregate implications of such heterogeneity.

Although this paper studies a historical event, it is closely connected to the recent development of the literature in many ways. First, it takes the employer's perspective. Swanson (2004) pointed that most studies on wage rigidities focus on individuals, while it is the employers who set the wages and they have different considerations in making decisions. For example, while the worker would want the real consumption wage (wage divided by consumer price index) not to fall too much during a recession, the employer would want the real product wage (wage divided by price index) not to rise too much. Second, the investigation of wage rigidity during the Great Depression is parallel to that of the Great Recession. Recent findings, such as Elsby, Shin, and Solon (2016), find that real wages were

pro-cyclical and "downward wage rigidity may be less binding… than is often supposed" during the Great Recession. They indicate composition bias as one of the reasons; low-wage and low-skilled workers are more likely to exit from the sample during the Recession and it leads to the overestimation of aggregate wages (Solon, Barsky, and Parker 1994). This paper addresses both issues with the microdata of manufacturing plants.

The rest of this paper is organized as follows. In Section 2, I introduce the data and measurement of key variables. In Section 3, I observe the changing distribution of wages. Section 4 associates the size of wage reduction with various plant characteristics. I pay special attention to plant size because the existing literature has emphasized that large employers were more reluctant to cut wages. In Section 5, I discuss the macro implications of the micro-level observations made in this paper. Section 6 concludes.

2. Data and Measurement

The main data source is the original schedules for the biennial Census of Manufactures from 1929 and 1935. While Raff and Bresnahan (1991) collected the original data of individual plants for several industries, the dataset remained incomplete for a long time. I filled the missing information with the visit to the National Archives. While the dataset includes other industries, such as cotton goods, sugar refining, glass, rubber tires, aircraft, and glass, this paper analyzes four manufacturing industries that have been cleaned and passed quality check: petroleum refining, blast furnace, and motor vehicles. Table 1 provides basic information of the four industries during the Great Depression. Others will be added shortly.

Most wage rigidity studies observe gross earnings and hours worked over a period to calculate average hourly wages. I take the same approach to the plants instead of the individuals. Table 2 summarizes what information can be obtained from each year's census.[3] The census form has parts "Wage Earners Employed, by Months" and "Wages, Cost of

[3] For the full schedule of the census, see Appendix.

Materials, etc." for every census year (Figure 1). Because these part include the total number of production workers by month (g in Table 1) and the total wages paid to them (i in Table 1), I can calculate average monthly earnings (AME) of a plant for a year by dividing total wage payment by the total number of production workers.[4]

$$\text{AME}_t = \frac{\text{total wage payment}_t}{\text{total wage earner-months}_t}$$

To obtain the hourly wage, one needs to know hours worked. The census form also has a part "Time in Operation and Hours of Labor." For our purposes, the best information from the census would be the "normal number of hours per week for the individual wage earner" (e in Table 1). However, as shown in Table 1 and Figure 1, this information is not available for 1933 and 1935. An alternative the "number of hours plant was operated (day shift only) during the week including December 15" (c in Table 1). Both the census of 1933 and 1935 ask the same question. Now the problem is whether this can be a good alternative, and it depends on whether a plant operates multiple shifts.[5] Fortunately, the 1929 census allows us to test the possibility because it asks all the required information; the number of plant operation, the number of shifts, and the number of hours for the individual worker. Examining the motor vehicle data, I find that the "hours operation = normal hours for the individual wage earner× number of shifts" relationship is stable across plants.[6] Because the 1933 and 1935 ask the hours of operation for the day shift only, the hours of operation can serve as the proxy for the individual wage earner's working hours per week.[7]

---

[4] Wage earners refer to production workers, and salaried workers refer to nonproduction workers.

[5] One may point that the census form did not ask working hours per week as of December 15 in 1929 and 1931. But see the "5. Persons Engaged" part of the census 1929. It asks the number of salaried workers and wage earners as of December 14, 1929. The next part asks the number of wage earners of the 15th day. It can be seen that the census sets the week of December 15th as the base week..

[6] For example, a Ford plant in Cleveland, Ohio was operated 48 hours per week and it ran only one shift. The normal hours of work for the individual wage earner was also 48 hours. In contrast, a Ford plant in Chester, Pennsylvania was operated 80 hours per week, running two shifts. The census schedule recorded that the normal hours of work for the individual wage earner was 40 hours.

[7] On can consider another alternative – using man-hours by month of 1933 and 1935 (k in Table 1). The appearance of these questions seems to be related to the National Recovery Administration's "Share-the-work" initiative that limited working hours. But I find that the number of man-hours are extremely noisy and cannot be

Now that I have the average working hours per week, I calculate the average hourly earnings (AHE) as follows.

$$\mathrm{AHE}_t = \frac{\mathrm{AMEt}_t}{4.35 \times \text{weekly working hours}_t}$$

4.35 indicates that an average month includes 4.35 weeks.

Like other historical statistics, not all numbers are reliable. There were cases where plant managers misunderstood the question. For example, many plant managers answered that they operated "168 hours" during the day shift when the number cannot exceed 84 hours technically. It is obvious that they counted over more than one shifts. I corrected such cases for 1935 because that year's census also asked the normal number of shifts per day. However, it is not available in the 1933 census. The 1935 census also shows that "168 hours" can be associated with two, three, or even four shifts. In this case, any correction would be inappropriate. Therefore, I excluded the observations with more than 84 hours in the 1933 data as well as extreme answers such as "2920 hours" from the analysis.

Given the definitions of earnings and hours, the percentage changes in AHE can be computed as follows.

$$(\%\Delta)\mathrm{AHE}_t = (\%\Delta)\mathrm{AME}_t - (\%\Delta)\text{weekly working hours}_t$$

Like the most wage rigidity studies, this analysis focuses on the changes in AHE, the factor price of labor. However, AME still has an important economic meaning because it measures the labor income of the average worker. Past literature suggested that both the government and business leaders had the idea that wage reduction should be avoided to maintain the purchasing power of workers. In this regard, AME would measure workers' purchasing power better than AHE. AME can also be used to the comparison between the experience of compensation adjustment wage earners (production workers) and that of salaried workers (nonproduction workers). Most salaried workers are paid not based on hours worked. Instead, they receive the annual amounts over the pay period (usually a year).

---

used for the analysis before extensive cleaning.

Therefore, adjusting hours is not an option when a firm needs to reduce its labor costs for salaried workers. It is either lay off them or reduce the total amount of salaries.

3. Distribution of Wage Changes: How Rigid, by What Standards?

I first describe notable wage change patterns in the selected industries. Figure 2 illustrates the distribution of changes in average nominal hourly wages over each two-year period using estimated kernel density functions for each industry. Note that only continuing plants in each period are included. Vertical lines indicate the change in consumer price index (solid line) and wholesale price indices (various dashed lines). They serve as reference points for the judgment of real rigidity. From the worker's perspective, there is real wage rigidity if the change in nominal wage exceeds the change in consumer price index (CPI). From the firm's viewpoint, real rigidity means that nominal wages do not fall as much as the wholesale price index (WPI).

Panel A of Figure 2 shows that nominal wages barely fell during the first two years of downturn, from 1929 to 1931. In the same period, CPI fell 12.9 percent, and WPIs of the selected industries fell even more. Hourly wages were also rigid in the real term. Wage distribution's peaks are on the right of the respective WPI changes, except the motor vehicle industry. This is consistent with the observations of previous studies that wages did not fall much before the fall of 1931. However, the figure also shows that many plants, especially auto and blast furnace ones, cut their wages more than WPIs did. Table 3 shows the shares of these "flexible" plants in employment. About 20 percent of production workers at petroleum refining plants and more than 60 percent of production workers at auto plants experienced wage cuts greater than output price decline. The observed dispersion in the magnitude of wage reduction naturally leads to a new question which is addressed in the next section – who cut wages more?

Panel B illustrates the distribution of wage changes during the next two years, between 1931 and 1933. It shows that employers overreacted this time. Nominal wages fell more than

CPI and WPIs did. According to Table 3, more than 60% of petroleum refining workers and about half of blast furnace and auto workers experienced excessive wage cuts. However, hourly wages rebounded quickly once the recovery started in 1933. This was when Roosevelt took office, the NRA started, and various measures to keep wages and shorten hours were in effect. Panel C of Figure 3 shows that the peaks of hourly wages lie on the right of the CPI and WPI lines. Hourly wages rose more than output, and consumer prices recovered. Table 3 shows that 80 percent and more workers were affected by this unusually large pay increase.

Observations made so far suggest that hourly wages were certainly rigid in the first two years of the Great Depression, in both nominal and real terms. However, it was considerably flexible over the next two years. The degree of wage adjustment, both downward and upward, was greater than the change in consumer and product prices. Blast furnace plants appear to have been particularly sensitive, whereas auto plants were relatively stable in adjusting wages.

How about average monthly earnings? Figure 3 presents the distribution of nominal AME changes. A conspicuous characteristic is that wage changes are distributed around the CPI changes. While Panel A looks similar to Panel A of Figure 2, other panels show clear differences from their comparisons in Figure 2. Where are the reasons for these differences? Figure 4 suggests that change in AHE and change in hours were negatively correlated throughout the Great Depression period. When a plant cut its hourly wage rate more than the average, it "compensated" with more working hours. This would have helped maintain production workers' labor income. Figure 2 and 3 suggest that the behavioral motive to maintain workers' purchasing power, which past literature has emphasized, was working.

4. Plant Characteristics and the Size of Wage Reduction

This paper draws on the plant-level information from the Census of Manufactures. Its greatest advantage would be that it allows us to explore heterogeneity and find who were more reluctant to cut wages during the downturn. Scholars have indicated that large firms tried to avoid or delay wage reduction. They also suggest possible reasons. Besides the

purchasing power motive of O'Brien (1989), Cole and Ohanion (2004) emphasize the motivation of business to buy industrial peace and the role of public policies. Temin (1990) suggest that the organized labor at large workplaces, "insiders," put their interest before that of outsiders. In a similar spirit, Jacoby (1985) highlights the role of the internal labor market development in the 1920s. Dighe (1997) offers an explanation that managers were worried that workers could feel that their wages were reduced disproportionately and unfairly and be demoralized. While all these arguments imply that large employers had more incentives to maintain wages, they are not supported by strong empirical evidence. My plant-level data are suitable for testing the hypotheses.

To explore the association of plant characteristics and the size of wage reduction, I regress the change in AHE and AME on the wage level and size of the plant in the beginning year of each period. Table 4 reports the results. It shows that the initial wage level was the most crucial factor of the subsequent wage change. According to Column (1)-(3), a plant that paid hourly wages 10% higher than the industry average in 1929 would have cut wages 4-5 percent point more between 1929-31. This pattern persists over the periods of 1931-33 and 1933-35. In contrast to the importance of the initial wage level, plant size, measured by the employment of production workers, does not have significant effects on wage changes. Considering that large employers usually pay high wages, the results suggest that wage reduction would have been more intense at large plants.

Columns (10)-(18) report the results for AME instead of AHE. While they present the same patterns, the coefficients for the initial AME level are consistently smaller than the coefficients for the initial AHE level. This is well explained by the patterns shown in Figure 4 that a large reduction in AHE was likely to be accompanied by a less reduction in hours. But it is still hard to find any evidence that large plants maintained hourly or monthly wages compared to small plants.

5. Bringing Micro Findings to the Macro Level

I have explored the wage-setting behaviors of manufacturing plants to this point. I have found that wages were rigid in both nominal and real terms during the first two years, but since then wages were adjusted more than CPI and WPI changes. However, plants cutting wages a lot compensated with less reduced or increased hours between 1931 and 1933. This helped workers maintain their labor income and purchasing power. During the early recovery, hourly and monthly wages rose faster than CPI and WPIs, which is likely to be affected by the New Deal policies of the new administration. However, I did not find that wage reduction was smaller at large employers.

Now the question is what aggregate implications these micro-level findings have. This question requires one to think how the behaviors of individual employers add up to overall outcomes. Composition plays a crucial role. Previous sections have found considerable heterogeneity in the magnitude of wage reduction. Then wage rigidity observed at the industry level depends on the weights of the plants with rigid wage structure and the plants with flexible wage structure. Section 4 found that wage reduction at large employers was not small, unlike many qualitative studies have suggested. Once the effect of the initial wages is isolated, initial size does not the predictive power of the subsequent wage changes. Thus there is less likely to be serious composition bias toward more or less rigidity from the set of continuing plants.

Therefore, I investigate whether composition bias may emerge from the differences between exiting and continuing plants, which is an analogy to the critiques by Solon, Barsky, and Parker (1994). They examined the PSID data to show that the weights to low-skill, thus low-wage, workers increase during recessions because they exit the labor force. Elsby, Shin, and Solon (2016) pointed that a similar problem is found during the Great Recession. I conduct a similar analysis at the plant level. Specifically, I test whether low-wage plants were more likely to exit, resulting in upward bias in the aggregate wages. Firm dynamics literature has also indicated that smaller plants tend to pay lower wages and they are more likely to close and exit during recessions. I do a diagnostic regression of log wages on the indicator of survival to the next census year, and year and industry dummies.

Table 5 shows the regression results. On average, plants that survive to the next census

year paid 9 percent higher hourly wages and 4.5 percent higher monthly wages. Looking at each period indicates that this difference appears only in the first two years, 1929-1931. Surviving plants paid 14 percent higher hourly wages and 9.5 percent higher monthly wages. Recall that Figure 2 and 3 showed that wages were sticky at continuing plants. Combined with the rigidity among continuing plants, the exit of low-wage plants would make the aggregate wages look more rigid than the actual. Micro-level findings of this paper suggest that macroeconomic arguments based on aggregate data may overstate the degree of wage rigidity of this time.

6. Conclusion

To be added later

References

Bernanke, Ben S., and Kevin Carey. 1996. "Nominal Wage Stickiness and Aggregate Supply in the Great Depression." *Quarterly Journal of Economics* 111 (3): 853–83. doi:10.2307/2946674.

Bordo, Michael D., Christopher J. Erceg, and Charles L. Evans. 2000. "Money, Sticky Wages, and the Great Depression." *American Economic Review* 90 (5): 1447–63. doi:10.1257/aer.90.5.1447.

Bresnahan, Timothy F., and Daniel M. G. Raff. 1991. "Intra-Industry Heterogeneity and the Great Depression: The American Motor Vehicles Industry, 1929–1935." *Journal of Economic History*. doi:10.1017/S0022050700038961.

Cole, Harold L., and Lee E. Ohanian. 2004. "New Deal Policies and the Persistence of the Great Depression: A General Equilibrium Analysis." *Journal of Political Economy* 112 (4): 779–816. doi:10.1086/421169.

Dighe, Ranjit S. 1997. "Wage Rigidity in the Great Depression: Truth? Consequences?" *Research in Economic History* 17: 85–134.

Ebel, Monique, and Albrecht Ritschl. 2008. "Real Origins of the Great Depression: Monopoly Power, Union and the American Business Cycle in the 1920s." CEPR Discussion Paper 876.

Hanes, Christopher, and John A. James. 2012. "Wage Rigidity in the Great Depression."

Jacoby, Sanford M. 1985. *Employing Bureaucracy: Managers, Unions, and the Transformation of Work in the 20th Century*. Psychology Press.

National Industrial Conference Board. 1932. "Salary and Wage Policy in the Depression."

O'Brien, Anthony Patrick. 1989. "A Behavioral Explanation for Nominal Wage Rigidity during the Great Depression." *Quarterly Journal of Economics* 104 (4): 719–35.

Ohanian, Lee E., and Harold L. Cole. 2004. "New Deal Policies and the Persistence of the Great Depression: A General Equilibrium Analysis." *Journal of Political Economy* 112 (4): 779–816.

Rose, Jonathan D. 2010. "Hoover's Truce: Wage Rigidity in the Onse of the Great Depression." *Journal of Economic History* 70 (4): 843–70.

Shin, Donggyun, Michael W. L. Elsby, and Gary Solon. 2016. "Wage Adjustment in the Great Recession and Other Downturns: Evidence from the United States and Great Britain." *Journal of Labor Economics* 34 (S1): S249–91.

Simon, Curtis J. 2001. "The Supply Price of Labor during the Great Depression." *The*

Journal of Economic History 61 (4): 877–903. doi:10.1017/S0022050701042012.

Solon, Gary, Robert Barsky, and Jonathan A. Parker. 1994. "Measuring The Cyclicality Of Real Wages: How Important Is Composition Bias?" *Quarterly Journal of Economics* 109 (1): 1–25. doi:10.2307/2118426.

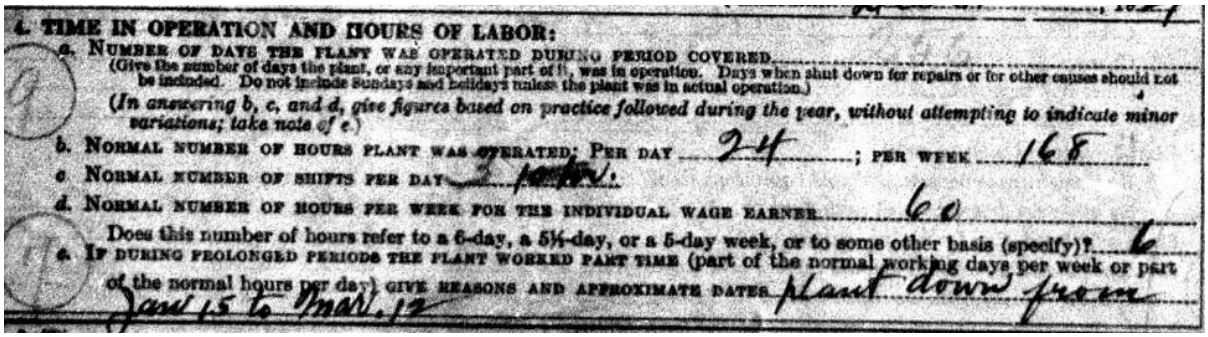
Swanson, Eric T. 2004. "Measuring the Cyclicality of Real Wages: How Important Is the Firm's Point of View?" *Review of Economics and Statistics* 86 (1): 362–77.

Temin, Peter. 1990. "Socialism and Wages in the Recovery from the Great Depression in the United States and Germany." *Journal of Economic History*. doi:10.1017/S0022050700036445.

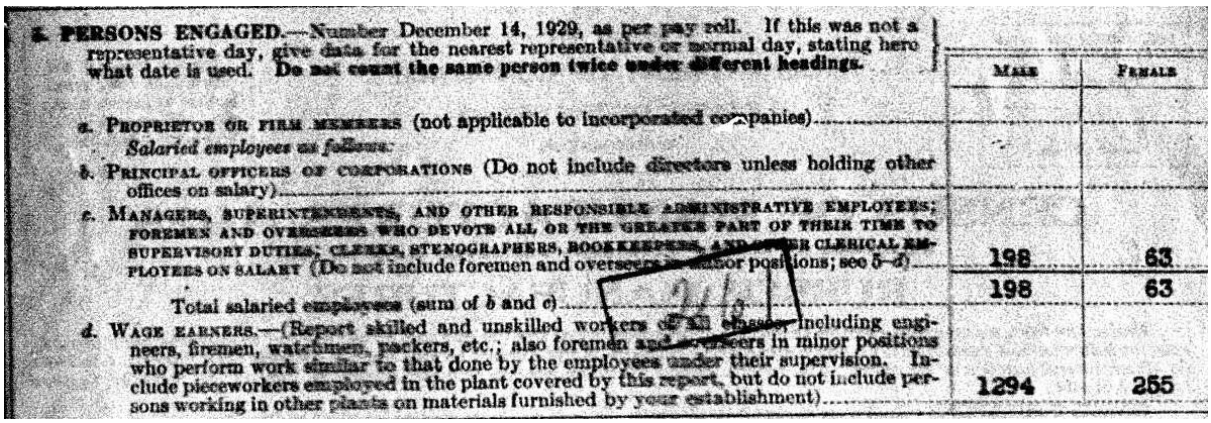
Figures and Tables

Figure 1 – Employment and Hours-related Questions in Census Schedule of Each Year

1929

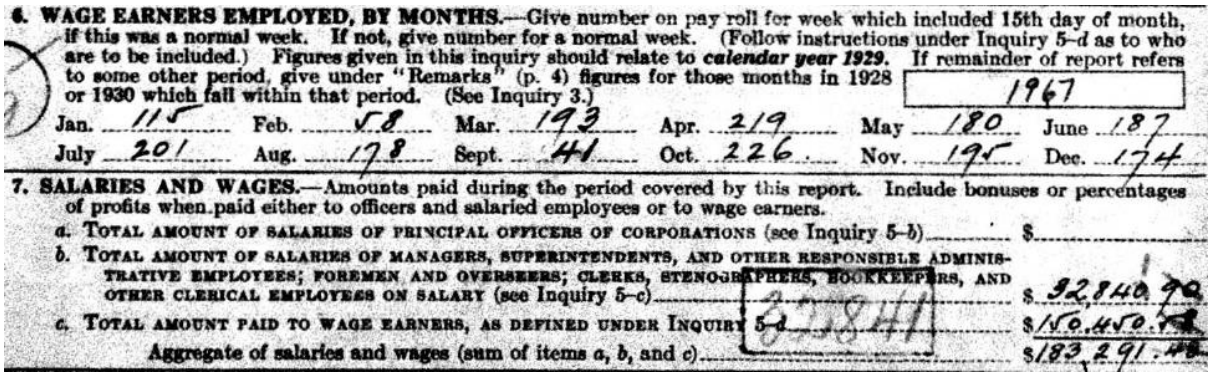


4. TIME IN OPERATION AND HOURS OF LABOR:
a. NUMBER OF DAYS THE PLANT WAS OPERATED DURING PERIOD COVERED
(Give the number of days the plant, or any important part of it, was in operation. Days when shut down for repairs or for other causes should not be included. Do not include Sundays and holidays unless the plant was in actual operation.)
(*In answering b, c, and d, give figures based on practice followed during the year, without attempting to indicate minor variations; take note of e.*)
b. NORMAL NUMBER OF HOURS PLANT WAS OPERATED: PER DAY 24; PER WEEK 168
c. NORMAL NUMBER OF SHIFTS PER DAY 3 (one)
d. NORMAL NUMBER OF HOURS PER WEEK FOR THE INDIVIDUAL WAGE EARNER 60
Does this number of hours refer to a 6-day, a 5½-day, or a 5-day week, or to some other basis (specify)? 6
e. IF DURING PROLONGED PERIODS THE PLANT WORKED PART TIME (part of the normal working days per week or part of the normal hours per day) GIVE REASONS AND APPROXIMATE DATES. Plant down from Jan. 15 to Mar. 12



5. PERSONS ENGAGED.—Number December 14, 1929, as per pay roll. If this was not a representative day, give data for the nearest representative or normal day, stating here what date is used. **Do not count the same person twice under different headings.**

	MALE	FEMALE
a. PROPRIETOR OR FIRM MEMBERS (not applicable to incorporated companies)		
Salaried employees as follows:		
b. PRINCIPAL OFFICERS OF CORPORATIONS (Do not include directors unless holding other offices on salary)		
c. MANAGERS, SUPERINTENDENTS, AND OTHER RESPONSIBLE ADMINISTRATIVE EMPLOYEES; FOREMEN AND OVERSEERS WHO DEVOTE ALL OR THE GREATER PART OF THEIR TIME TO SUPERVISORY DUTIES; CLERKS, STENOGRAPHERS, BOOKKEEPERS, AND OTHER CLERICAL EMPLOYEES ON SALARY (Do not include foremen and overseers in minor positions; see 5–d)	198	63
Total salaried employees (sum of *b* and *c*)	198	63
d. WAGE EARNERS.—(Report skilled and unskilled workers of all classes, including engineers, firemen, watchmen, packers, etc.; also foremen and overseers in minor positions who perform work similar to that done by the employees under their supervision. Include pieceworkers employed in the plant covered by this report, but do not include persons working in other plants on materials furnished by your establishment)	1294	255



6. WAGE EARNERS EMPLOYED, BY MONTHS.—Give number on pay roll for week which included 15th day of month, if this was a normal week. If not, give number for a normal week. (Follow instructions under Inquiry 5–*d* as to who are to be included.) Figures given in this inquiry should relate to ***calendar year 1929.*** If remainder of report refers to some other period, give under "Remarks" (p. 4) figures for those months in 1928 or 1930 which fall within that period. (See Inquiry 3.) 1967

Jan. 115 Feb. 58 Mar. 193 Apr. 219 May 180 June 187
July 201 Aug. 178 Sept. 41 Oct. 226 Nov. 195 Dec. 174

7. SALARIES AND WAGES.—Amounts paid during the period covered by this report. Include bonuses or percentages of profits when paid either to officers and salaried employees or to wage earners.

a. TOTAL AMOUNT OF SALARIES OF PRINCIPAL OFFICERS OF CORPORATIONS (see Inquiry 5–*b*)	$
b. TOTAL AMOUNT OF SALARIES OF MANAGERS, SUPERINTENDENTS, AND OTHER RESPONSIBLE ADMINISTRATIVE EMPLOYEES; FOREMEN AND OVERSEERS; CLERKS, STENOGRAPHERS, BOOKKEEPERS, AND OTHER CLERICAL EMPLOYEES ON SALARY (see Inquiry 5–*c*)	$ 92,840.90
c. TOTAL AMOUNT PAID TO WAGE EARNERS, AS DEFINED UNDER INQUIRY 5–*d*	$ 150,450.58
Aggregate of salaries and wages (sum of items *a*, *b*, and *c*)	$ 183,291.48

1931

4. TIME IN OPERATION AND HOURS OF LABOR:

a. NUMBER OF DAYS PLANT WAS OPERATED DURING PERIOD COVERED: 143
(Give the number of days the plant, or any important part of it, was actually in operation. Do not include Sundays and holidays unless the plant was actually in operation, and do not include days when only the office was open.)

b. NORMAL NUMBER OF HOURS PER WEEK FOR THE INDIVIDUAL WAGE EARNER: 72

c. DOES NUMBER OF HOURS (*b*) REFER TO A 6-DAY, A 5½-DAY, OR A 5-DAY WEEK, OR TO SOME OTHER BASIS (specify)? 7

5. WAGE EARNERS EMPLOYED, BY MONTHS.—Report skilled and unskilled workers of all classes, including engineers, firemen, watchmen, repairmen, etc.; also foremen and overseers in minor positions who perform work similar to that done by the employees under their supervision, but NOT overseers, superintendents, etc., engaged solely in supervisory work. Include pieceworkers employed in the plant covered by this report, **but do not include persons working in other plants on materials furnished by your establishment.** DO NOT INCLUDE OFFICERS NOR OFFICE EMPLOYEES.

Give below for each month number of wage earners on pay roll for week which included 15th day of month, if this was a normal week. If not, give number for a normal week. 252

Jan.	51	Feb.	45	Mar.	45	Apr.	45	May	33	June	33
July		Aug.		Sept.		Oct.		Nov.		Dec.	

6. WAGES, COST OF MATERIALS, ETC.—Report the total amounts paid during the period covered by this report for wages, cost of materials, etc., and for contract work. DO NOT INCLUDE ANY OVERHEAD OR MISCELLANEOUS EXPENSES, NOR SALARIES OF OFFICERS AND OFFICE EMPLOYEES.

a. WAGES.—(Report the total wages paid to wage earners, as defined under Inquiry 5) $ 24,038

b. COST OF MATERIALS, FUEL, AND ELECTRIC ENERGY.—(Report the cost of all materials—not including supplies called for under item *c*, below—which were purchased or were transferred from other plants under the same ownership or control, together with the cost of fuel and purchased or transferred electric energy, actually used in the manufacture of products reported under Inquiry 7, during the period covered by this report $ 704,480

c. Report the total cost of furnace supplies—limestone, refractories, etc.—which were purchased or were transferred from other plants under the same ownership, and used during the year. Do NOT include this cost in the cost of materials given above (6–*b*) $ 49,151

1933

3. TIME IN OPERATION AND HOURS OF LABOR:

(*a*) Number of days plant (not merely office) was operated in 1933: 245

(*b*) Number of hours plant was operated (day shift only) during the week including December 15: 56

5. WAGE EARNERS EMPLOYED, BY MONTHS.—Give number on pay roll for week which included 15th day of month, if this was a normal week. If not, give number for a normal week. (Follow instructions under Inquiry 4-*e* as to who are to be included.)

4-1162

Jan.	0	Feb.	0	Mar.	0	Apr.	0	May	64	June	69
July	121	Aug.	161	Sept.	183	Oct.	200	Nov.	189	Dec.	175

6. SALARIES AND WAGES.—Amounts paid in 1933. Include bonuses or percentages of profits when paid either to officers and salaried employees or to wage earners.

(*a*) TOTAL AMOUNT OF SALARIES OF OFFICERS OF THE CORPORATION (see Inquiry 4-*b*) $ None

(*b*) TOTAL AMOUNT OF SALARIES OF MANAGERS, SUPERINTENDENTS, AND OTHER RESPONSIBLE ADMINISTRATIVE EMPLOYEES (see Inquiry 4-*c*) $ 27,614.21

(*c*) TOTAL AMOUNT OF SALARIES OF CLERKS, STENOGRAPHERS, BOOKKEEPERS, AND OTHER CLERICAL EMPLOYEES ON SALARY (see Inquiry 4-*d*) $ 15,290.54

(*d*) TOTAL AMOUNT PAID TO WAGE EARNERS, AS DEFINED UNDER INQUIRY 4-*e* $ 82,920.48

Aggregate of salaries and wages (sum of items *a*, *b*, *c*, and *d*) $ 125,825.23

11. MAN-HOURS (A man-hour is one hour of work by one person).—Report, from the pay roll, the total number of man-hours actually worked during each month by all the wage earners reported under Inquiry 5, above. The figure for each month should be an aggregate for the *entire* month (not for any one week), but should cover only the time actually employed on the job. (To illustrate: 10 wage earners employed 100 hours worked 1,000 man-hours.)

Jan.	0	Feb.	0	Mar.	0	Apr.	0	May	21,576	June	22,080
July	30,752	Aug.	45,632	Sept.	49,440	Oct.	55,304	Nov.	50,880	Dec.	49,104

1935

INQUIRY 3. TIME IN OPERATION AND HOURS OF LABOR.

(*a*) Number of days plant was actually engaged in production during period covered 236 (Do not include Sundays and holidays unless the plant was in operation, and do not include days when only the office or the ***shipping department*** was open.)

(*b*) Normal number of hours per week (day shift only) 40 (*c*) Normal number of shifts per day 1

(*d*) Does number of hours (*b*) refer to a 6-day, a 5½-day, or a 5-day week, or to some other basis (specify)? 5-day week

INQUIRY 5. WAGE EARNERS EMPLOYED, BY MONTHS, AND WAGES PAID.—Report here all time and piece workers employed in the plant (including the power plant and the maintenance, shipping, warehousing, and other departments) covered by this report, NOT INCLUDING employees reported above under Inquiry 4. Include here working foremen and gang and straw bosses, but not foremen whose duties are primarily supervisory. (See Inquiry 4-c, above.) ***Clerical*** employees in the factory should not be included here but should be reported under Inquiry 4-*e*, above. Do not include employees in cafeterias, nor persons working in other plants or in their homes on materials supplied by your establishment.

(*a*) Number of wage earners who worked during any part of a week of normal activity in each month, preferably the week ended nearest the 15th day of the month.

		Key			Key			Key
Jan.	2250	C-1	May	1870	C-5	Sept.	810	C-9
Feb.	2310	C-2	June	1010	C-6	Oct.	1110	C-10
Mar.	2280	C-3	July	870	C-7	Nov.	1550	C-11
Apr.	2290	C-4	Aug.	910	C-8	Dec.	1590	C-12

(Specify year, if other than 1935. See General Instructions, section (f))

Code	Key	Total W. E. M.	Key
	A-3	18850	A-4

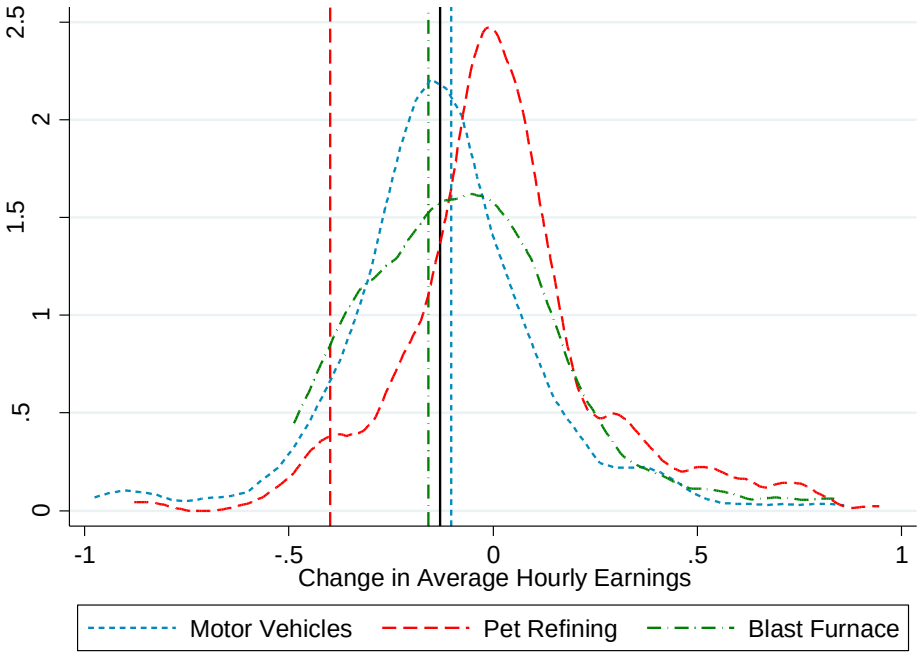
(*b*) Total amount paid to wage earners, as defined above, during the year (DO NOT include salaries of persons reported under Inquiry 4) $ 2,176,643. — A-5 / D-1

INQUIRY 5a. MAN-HOURS (**a man-hour is one hour of work by one person.**—Report, ***from the pay roll,*** the total number of man-hours actually worked during each month of the year covered by this report by all the wage earners as defined in Inquiry 5, page 2. The figure for each month should be an aggregate for the ***entire*** month. Where the pay-roll period extends from one month into the next, the man-hours of this pay period should be allocated between the two months.

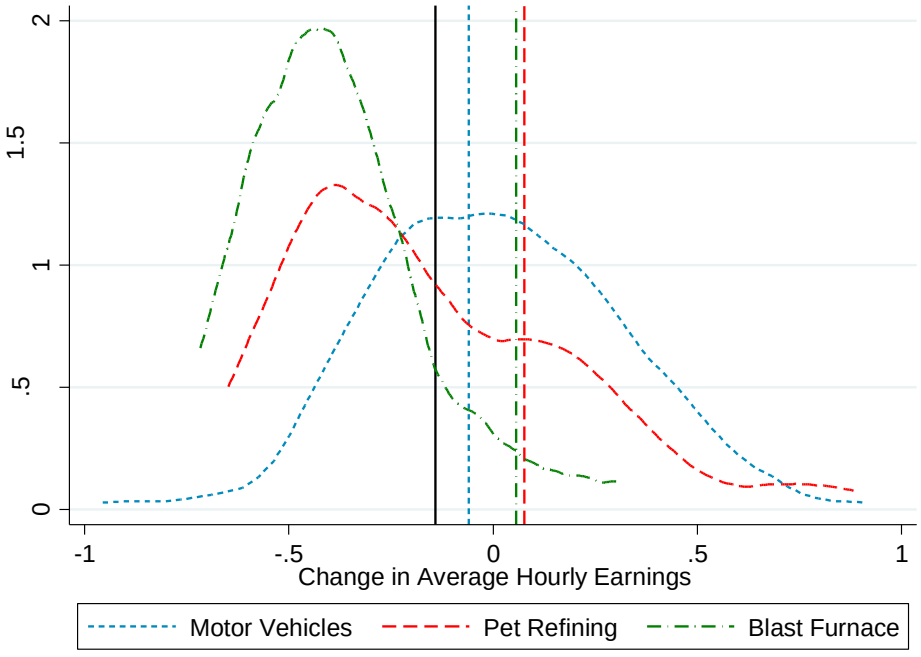
Jan.	464,120	Feb.	431,850	Mar.	460,270	Apr.	433,340	May	252,840	June	157,670
July	129,220	Aug.	118,620	Sept.	77,070	Oct.	190,830	Nov.	250,660	Dec.	221,360

TOTAL FOR THE YEAR 3,187,850

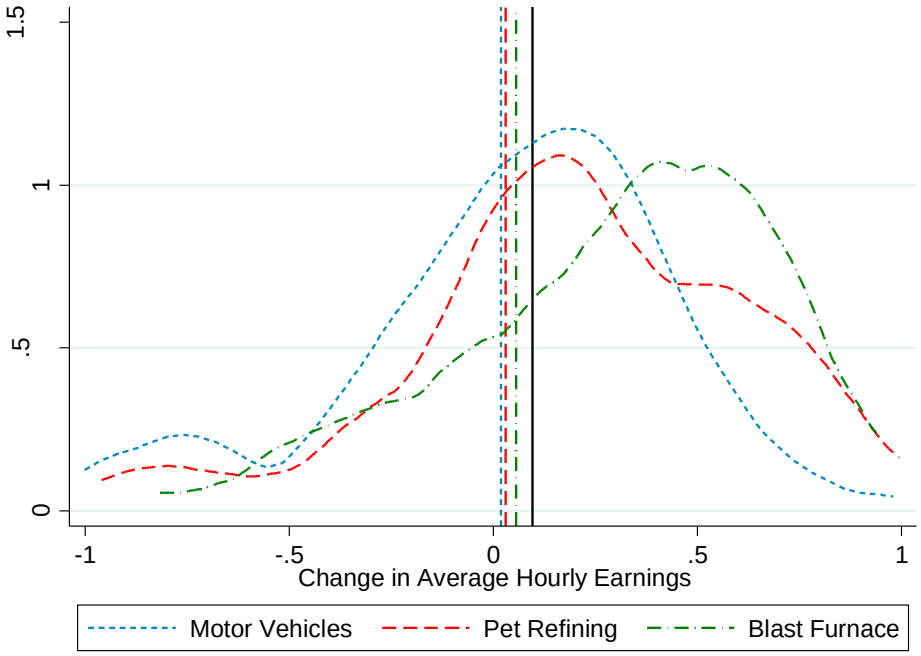
Figure 2 – Distribution of Nominal Hourly Wage Changes



A. 1929-31

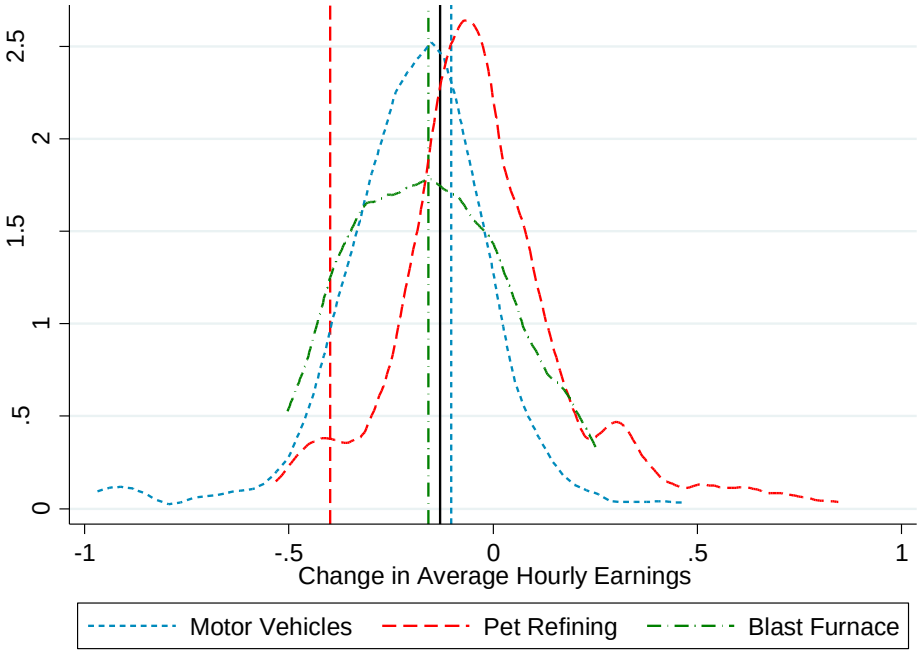


B. 1931-33

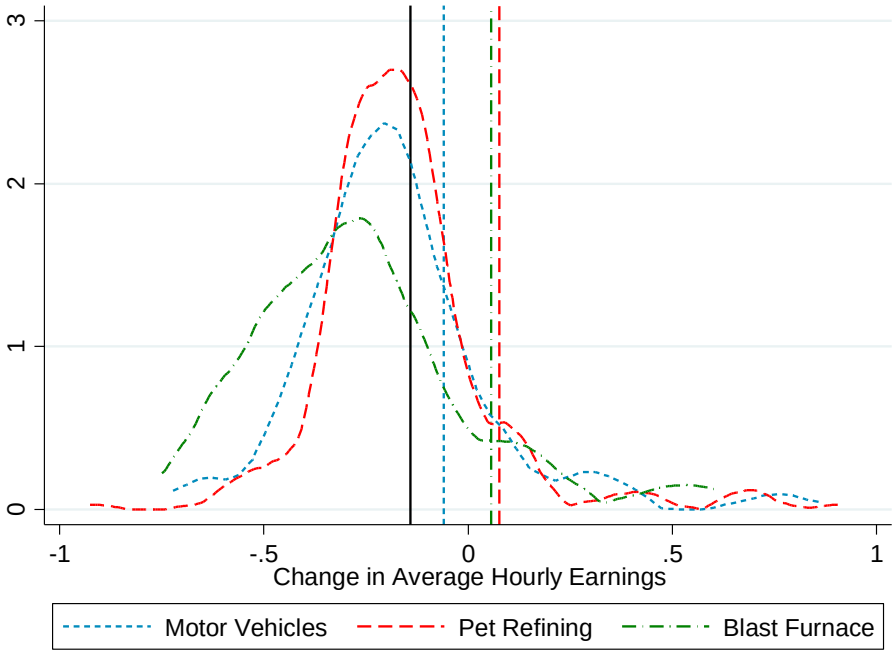

1.5
1
.5
0
-1
-.5
0
.5
1
Change in Average Hourly Earnings
Motor Vehicles
Pet Refining
Blast Furnace

C. 1933-35

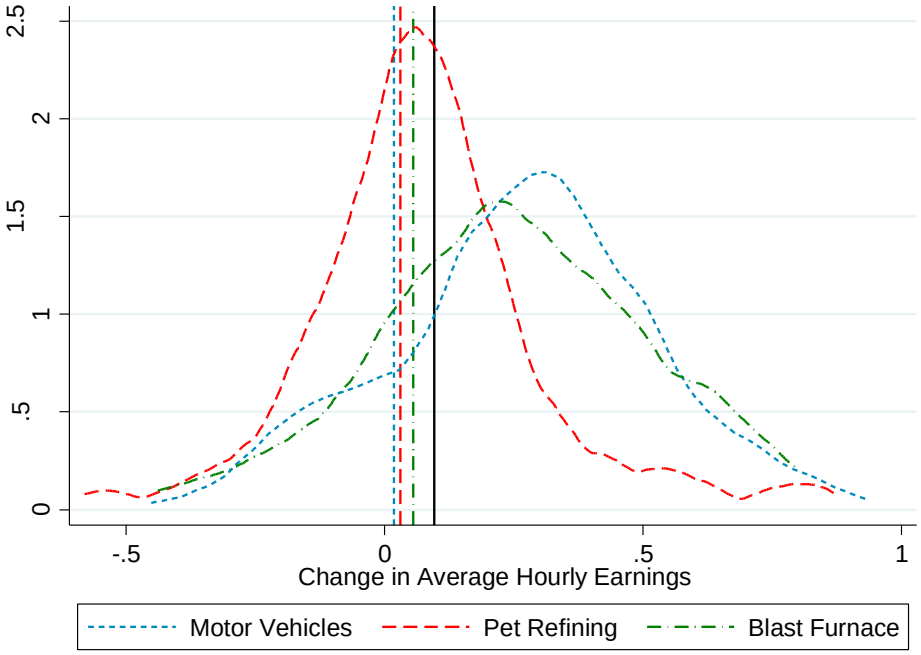
Figure 3 – Distribution of Nominal Monthly Wage Changes



A. 1929-31

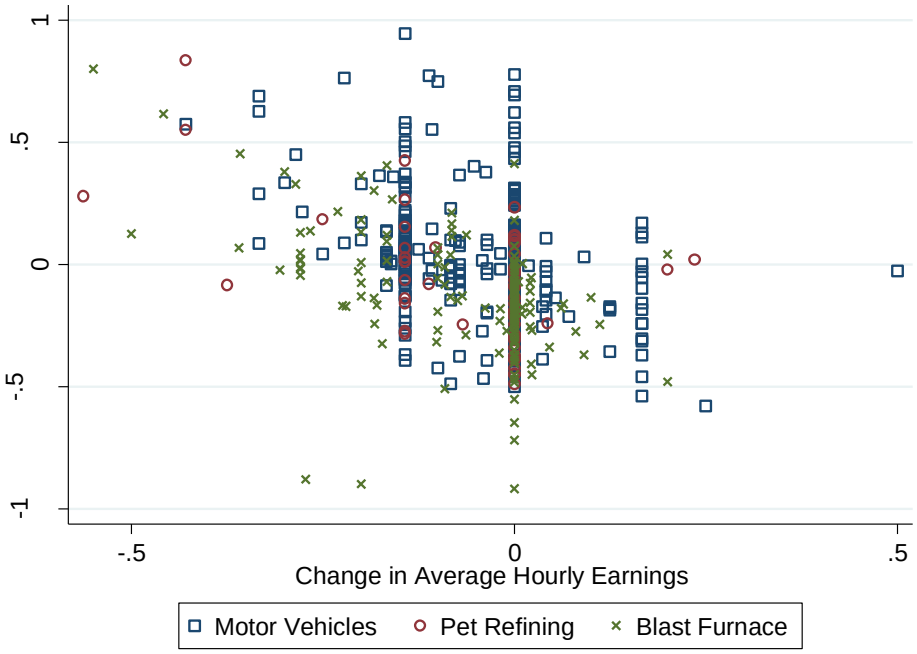


B. 1931-33

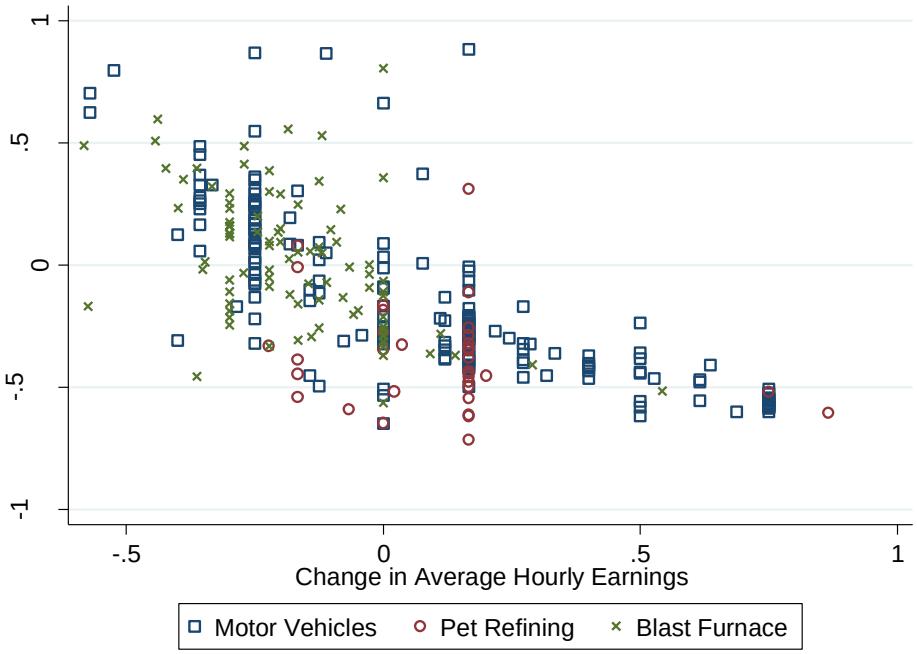

2.5
2
1.5
1
.5
0
-.5
0
.5
1
Change in Average Hourly Earnings
Motor Vehicles
Pet Refining
Blast Furnace

C. 1933-35

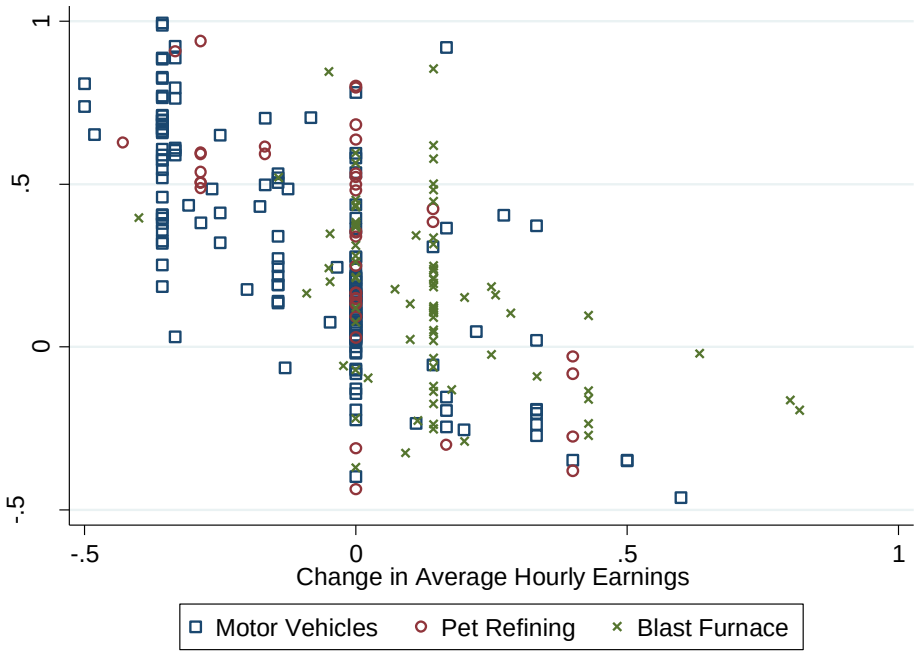
Figure 4 –Channels of Adjustment: Hours and Hourly Wage



A. 1929-31



B. 1931-33


1
.5
0
-.5
-.5
0
.5
1
Change in Average Hourly Earnings
Motor Vehicles
Pet Refining
Blast Furnace

C. 1933-35

Tables

Table 1 – Summary of Selected Industries

Industry	Number of Establishments				Number of Production Workers (in 000s)				Share in Manufacturing Total (%)			
	1929	**1931**	**1933**	**1935**	**1929**	**1931**	**1933**	**1935**	**1929**	**1931**	**1933**	**1935**
Petroleum Refining	390	376	389	393	80.6	68.8	69.0	77.4	0.91	1.06	1.14	1.00
Blast Furnace Prod.	105	80	72	72	25.0	13.6	12.1	15.2	0.28	0.21	0.20	0.20
Motor Vehicles	210	178	122	121	224.7	134.9	97.9	147.0	2.55	2.07	1.62	1.90
Sum	705	634	583	586	837.4	607.0	616.1	687.2	9.49	9.33	10.17	8.88
Manufacturing Total	209,862	174,255	141,769	169,111	8,821.8	6,506.7	6,055.7	7,738.8				

Source: Census of Manufactures, 1935

Table 2 - Availability of Wage and Salary Information from the Census

Census Question	was asked in the census of year			
	1929	1931	1933	1935
a. Number of days plant operation	O	O	O	O
b. Normal number hours of plant operation per day	O		O	
c. Normal number hours of plant operation per week	O			
d. Normal number shifts per day	O			O
e. Normal number hours per week for the individual wage earner	O	O		O
f. Number days per week	O	O		O
g. Number of wage earners by month	O	O	O	O
h. Number of salaried workers	O		O	O
i. Total wage payment	O	O	O	O
j. Total salary payment	O		O	O
k. Man-hours by month			O	O

Table 3 - Share of "Flexible" Plants in Production Workers (%)

A. Plants with Wage Cut more than CPI Change

Industry	1929-31	1931-33	1933-35
Petroleum Refining	13.9	54.4	17.7
Blast Furnace Products	22.9	44.7	13.9
Motor Vehicles	61.5	25.9	23.3

B. Plants with Wage Cut more than WPI Change

Industry	1929-31	1931-33	1933-35
Petroleum Refining	0.9	60.3	7.8
Blast Furnace Products	19.9	47.3	10.7
Motor Vehicles	63.8	45.2	21.9

Table 4- Plant Characteristics and Wage Changes

Dependent Variable:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Change in AHE		1929-31			1931-33			1933-35	
	Pet Ref.	Blast Fur.	Auto	Pet Ref.	Blast Fur.	Auto	Pet Ref.	Blast Fur.	Auto
ln(AHE)	-0.529**	-0.415*	-0.424**	-0.975**	0.0405	-0.741**	-1.178**	-0.691**	-0.547**
	(0.0648)	(0.180)	(0.0975)	(0.163)	(0.100)	(0.178)	(0.108)	(0.175)	(0.109)
ln(Wage Earner-Months)	-0.00375	0.123*	-0.00488	-0.00338	-0.00359	0.00648	0.0409*	0.178	0.0584**
	(0.00759)	(0.0524)	(0.00857)	(0.0146)	(0.0333)	(0.0117)	(0.0194)	(0.0960)	(0.0100)
Constant	-0.252**	-1.248*	-0.256**	-0.636**	-0.254	-0.457**	-0.751**	-1.692*	-0.640**
	(0.0691)	(0.473)	(0.0820)	(0.123)	(0.288)	(0.119)	(0.171)	(0.658)	(0.101)
Observations	321	58	157	178	26	94	173	33	79
R-squared	0.254	0.170	0.095	0.305	0.005	0.273	0.516	0.340	0.469

Dependent Variable:	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
Change in AME		1929-31			1931-33			1933-35	
	Pet Ref.	Blast Fur.	Auto	Pet Ref.	Blast Fur.	Auto	Pet Ref.	Blast Fur.	Auto
ln(AME)	-0.630**	-0.405**	-0.328**	-0.456**	0.0592	-0.298**	-0.482**	-0.470**	-0.493**
	(0.0639)	(0.127)	(0.0783)	(0.0895)	(0.120)	(0.0795)	(0.0768)	(0.0838)	(0.105)
ln(Wage Earner-Months)	-0.0101	0.0502	-0.0203**	0.00707	0.00839	0.00153	0.0121	0.140**	0.0446**
	(0.00623)	(0.0343)	(0.00557)	(0.00621)	(0.0318)	(0.00772)	(0.00831)	(0.0476)	(0.0105)
Constant	3.111**	1.455*	1.580**	1.994**	-0.594	1.212**	2.254**	1.256*	2.116**
	(0.324)	(0.616)	(0.389)	(0.459)	(0.637)	(0.380)	(0.358)	(0.580)	(0.490)
Observations	321	58	157	178	26	94	173	33	79
R-squared	0.336	0.116	0.193	0.270	0.006	0.123	0.234	0.493	0.382

Robust standard errors in parentheses. *: significant at 5%, **: significant at 5%

Table 5 -Wage Differentials Between Continuing and Exiting Plants

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	1929-33		1929-31		1931-33		1933-35	
Dependent Variable: log of	AHE	AME	AHE	AME	AHE	AME	AHE	AME
Continuing Plants	0.0929**	0.0454**	0.140**	0.0946**	0.0373	0.0119	0.112	0.0368
	(0.0245)	(0.0157)	(0.0318)	(0.0239)	(0.0320)	(0.0271)	(0.0883)	(0.0301)
Observations	1694	1914	701	704	611	629	382	581
R-squared	0.050	0.221	0.063	0.023	0.020	0.113	0.100	0.145

Coefficients for Industry and year dummies are not reported. Standard errors in parentheses. *: significant at 5%, **: significant at 5%