What was Bad for GM was Bad for America: The Automobile Industry and the 1937-38 Recession

Joshua K. Hausman*

May 26, 2015

VERSION 1.6

Abstract

The 1937-38 recession was one of the largest in U.S. history. Industrial production fell 32 percent and the nonfarm unemployment rate rose 6.6 percentage points. This paper shows that there were timing, geographic, and sectoral anomalies in the recession, none of which are easily explained by aggregate macro shocks. I argue that a supply shock in the auto industry contributed both to the recession's anomalies and to its severity. Labor-strife-induced wage increases and an increase in raw material costs led auto manufacturers to raise prices in the fall of 1937. Equally important, higher costs combined with nominal rigidity to make the price increase predictable. Expectations of price increases brought auto sales forward and thus sustained sales during the summer and early fall of 1937, despite negative monetary and fiscal factors. When auto prices did rise in October and November, auto sales and production plummeted. A forecasting exercise suggests that this shock reduced 1938 auto sales by 600,000 units and 1938 GDP growth by as much as one percentage point.

*Ford School of Public Policy, University of Michigan. 735 S. State St. #3309, Ann Arbor, MI 48109. Email: `hausmanj@umich.edu`. Phone: (734) 763-3479. I thank J. Bradford De Long, Barry Eichengreen, and Christina Romer for exceptional advising and Robert Barksy for providing valuable comments as my discussant at the 2015 American Economic Association meetings. I also thank Martha Bailey, David Berger, John Bound, Gabriel Chodorow-Reich, Robert Gordon, Yuriy Gorodnichenko, Catherine Hausman, Daniel Hausman, David Hausman, Maurice Obstfeld, Martha Olney, Daniel Raff, Michael Reich, Paul Rhode, David Romer, Ugo Troiano, Johannes Wieland, and conference and seminar participants at the 2015 American Economic Association meetings, Harvard University, Northwestern University, Rutgers University, UC Berkeley, the University of Arizona, the University of Houston, the University of Michigan, and the All-UC Group Conference on Transport, Institutions, and Economic Performance at UC Irvine for thoughtful suggestions. I am grateful to Warren Whatley for providing me with payroll records from the Ford River Rouge plant and to Martin Kohli for providing me with the 1939 input-output table. Walid Badawi, Chris Boehm, and Matthew Haarer provided superb research assistance.

1 Introduction

The 1937-38 recession is prominent in economists' accounts of the interwar period and in current macro policy debates. After growing rapidly between 1933 and 1937, the U.S. economy plunged back into recession. From 1937 to 1938, real GDP fell 3.2 percent and the nonfarm unemployment rate rose 6.6 percentage points.[1] Because the recession was brief, annual numbers disguise the downturn's severity. Industrial production fell 32 percent between May 1937 and May 1938. This contrasts with a peak to trough industrial production decline in the 2007-09 U.S. recession of 17 percent.[2]

Economists often take the 1937-38 recession as a lesson in the perils of reversing expansionary monetary and fiscal policy too soon. In June 2009, Christina Romer wrote a column for *The Economist* on "The Lessons of 1937."[3] In January 2010, Paul Krugman wrote a *New York Times* column entitled "That 1937 Feeling."[4] Both Romer and Krugman cautioned that a decline in government spending or shrinking of the Federal Reserve's balance sheet could push the economy back into recession. Their arguments reflect a near-consensus in the academic literature that the 1937-38 recession was caused by contractionary monetary policy, fiscal policy, or both (Eggertsson and Pugsley 2006, Eichengreen 1992, Friedman and Schwartz 1963, Romer 1992, Velde 2009, Irwin 2012).[5] Both the monetary and fiscal shock had multiple sources. The Federal Reserve raised reserve requirements in August 1936 and again in March and May 1937. At the same time, the Treasury began to sterilize gold inflows rather than passively allow the money supply to expand as gold flowed to the U.S. from Europe (Friedman and Schwartz 1963, Irwin 2012). Contemporaneously, a decline in outlays and an increase in revenues caused the federal budget deficit as a percent of GDP

[1] Real GDP data are from National Income and Product Accounts (NIPA) table 1.1.6a. The nonfarm unemployment rate is from Lebergott (1964) table A-3. Including the entire labor force, the unemployment rate rose from 14.3 to 19.1 percent, or, if federal work-relief workers are counted as employed, from 9.2 to 12.5 percent (Darby 1976, table 3).

[2] Industrial production data are from FRED series INDPRO.

[3] See http://www.economist.com/node/13856176.

[4] See http://www.nytimes.com/2010/01/04/opinion/04krugman.html.

[5] A prominent exception is Cole and Ohanian (2001). See section 2.2.

to fall 5.4 percentage points.[6] Outlays decreased after the payment of the veterans' bonus (Hausman 2014). Much of the revenue increase came from social security taxes, which were first collected in January 1937.

Relative to its importance for the interwar U.S. economy and contemporary policy debates, there is little research asking whether existing explanations of the recession are consistent with the timing, geographic, and sectoral patterns of output and employment in 1937-38. The first half of this paper shows that there are in fact timing, geographic, and sectoral anomalies in the recession. Specifically: (1) The decline in industrial production from September to December 1937 is the largest three-month decline in the history of the Federal Reserve and Miron-Romer series going back to 1884. (2) Manufacturing employment rises in 8 states despite a 12 percent decline nationwide. (3) There is a lack of comovement between components of GDP. Durables consumption falls over 17 percent while nondurables consumption rises. The 1937-38 recession is the only time since 1929 in which nondurables spending rises in a recession in which annual real GDP falls more than 2 percent. These facts are anomalous both in the sense of being unusual relative to other severe recessions and in the sense of not being easily explained by monetary or fiscal policy.

What could explain these facts? The analysis points strongly to a role for the auto industry in explaining the anomalous behavior of the economy: manufacturing employment falls most in Michigan, and auto sales and production fall more than 40 percent. Furthermore, auto prices *rise* at the same time as the overall price level falls. In the second half of the paper, I ask what explains the peculiar behavior of the auto industry, and how exogenous developments in this industry affected the rest of the economy. I argue that a cost shock in the auto industry and consequent auto price increases explain the industry's extraordinary behavior. The unionization of General Motors and Chrysler and an increase in raw material costs led auto manufacturers to raise prices in fall 1937. Equally important, the increase in costs combined with nominal rigidity to make the price increase predictable. Expectations

[6] Office of Management and Budget, Historical Table 1.2.

of price increases brought auto sales forward and thus sustained sales during the summer and early fall of 1937, despite negative monetary and fiscal factors. When auto prices did increase in fall 1937, sales plummeted. Narrative evidence confirms this explanation.

The auto industry was a significant part of the U.S. economy, so this large shock to auto sales almost certainly had large effects on the economy as a whole. Table 1 compares the macroeconomic importance of the U.S. auto industry in 1937 to its importance in 2012. Along most dimensions, the industry was more important in 1937 than it is today. Sales were a larger share of GDP, and auto industry employment was a much larger share of total employment. Furthermore, in 1937, most inputs to car production were supplied domestically, so accounting for linkages to other sectors would increase the discrepancy between the industry's importance then and its importance now.

Table 1: The auto industry in 1937 and 2012

	1937	2012
Motor veh. sales / GDP (%)	3.5	2.8
Motor veh. consump. / consump. (%)	3.7	3.6
Motor veh. produced domestically (1000s of units)	4,807	10,333
MV prodn. workers (% of nonfarm emp.)	1.53	0.44

Sources: Rows 1 and 2: NIPA tables 2.3.5 and 1.1.5; row 3: 1937-NBER macrohistory series m01107a and m01144a, 2012-Bureau of Transportation, National Transportation Statistics, Table 1-23; row 4: 1937-Federal Trade Commission (1939), p. 27 and NBER macrohistory series a08172, 2012-Bureau of Labor Statistics, establishment survey.

To quantify the impact on auto sales and aggregate output of the fall 1937 price shock, I perform a forecasting exercise. I construct a statistical model that fits the monthly pre-recession behavior of auto sales given fiscal and monetary factors and overall economic conditions. As expected, the model underpredicts sales in the summer of 1937, when consumers expected auto prices soon to increase, and overpredicts sales in 1938. I interpret the difference between predicted and actual sales as the effect of the auto sector supply shock. This implies that without the auto shock, the fall in auto sales between 1937 and 1938 would have been 0.8 million rather than the actual 1.6 million. Using data on the price of cars sold and

an estimate of the multiplier, I find that positive price expectations added 0.1 to 0.2 percent to GDP in 1937, while the subsequent drop-off in sales subtracted 0.4 to 0.8 percent from GDP in 1938: absent the shock, the output decline in 1938 would have been as much as a third smaller.

In the final section of the paper I explore how the auto shock contributed to the recession's anomalies. I use an unpublished 38x38 input-output table for the 1939 U.S. economy to quantify the links between the motor vehicle industry and other sectors. Using this information, I provide suggestive evidence that the auto industry shock contributed to the rapid decline in industrial production in fall 1937 and to the long left tail of negative state employment growth. I also suggest that the auto shock may resolve much of the mysterious lack of comovement in the recession. Without this shock, durables consumption would have fallen 12 rather than 18 percent. More speculatively, absent the relative price impact of the auto shock, nondurables spending may not have risen, and there may have been fewer states with positive employment growth.

This paper contributes to our understanding of the 1937-38 recession by proposing an additional explanation of the recession and by refining our understanding of existing explanations. It also relates to a long-standing theoretical literature on the importance of sectoral and firm level shocks for explaining aggregate fluctuations. It provides support for Gabaix's (2011) hypothesis that shocks to large firms may account for a significant portion of aggregate fluctuations. And this paper provides an example of how the auto industry played a significant role in aggregate fluctuations before World War II, just as it did after the war (Ramey and Vine 2006).

I proceed in the next section by reviewing the literature on the 1937-38 recession. Section 3 documents anomalies in the timing, sectoral, and geographic incidence of the recession. This motivates section 4, which discusses and explains the auto price increase. Section 5 quantifies the impact on auto sales of the supply shock by constructing a forecast for the path of auto sales had sales only been affected by monetary policy, fiscal policy, and the business

cycle. Section 6 explores the link between the auto shock and the recession's anomalies. Section 7 concludes and suggests that acknowledging the effect of the auto shock makes monetary and fiscal policy explanations of the remainder of the recession more plausible.

2 Previous literature and policy developments

2.1 Fiscal Policy

Many authors have placed full or partial blame for the 1937 recession on increasing taxes and decreasing transfers.[7] After peaking at 5.5 percent of GDP in fiscal year 1936 (7/1/35-6/30/36), the federal government's budget deficit shrank to 2.5 percent of GDP in fiscal 1937 and 0.1 percent of GDP in fiscal 1938.[8] This large swing was divided equally between an increase in receipts and a decrease in outlays. Much of the revenue increase came from social security taxes, which began to be collected in January 1937.[9] Both workers and firms paid a one percent payroll tax on the first $3,000 of earnings (Barro and Sahasakul 1986). The effect was contractionary since regular social security benefits were not paid until 1940.[10] Corporate tax rates also rose with the enactment of the undistributed profits tax in June 1936. Federal government transfers fell after the payment of the veterans' bonus in the summer of 1936.

Figure 1(a) shows the monthly federal budget deficit between 1936 and 1939.[11] It makes clear the significance of the veterans' bonus. In June 1936, the federal government paid veterans cash and bonds worth roughly 2 percent of GDP. Not only was this payment to

[7] See, for example, Lewis (1949), Roose (1954), and, more recently, Eichengreen (1992), Romer (1992), and Velde (2009).

[8] Office of Management and Budget, Historical Table 1.2.

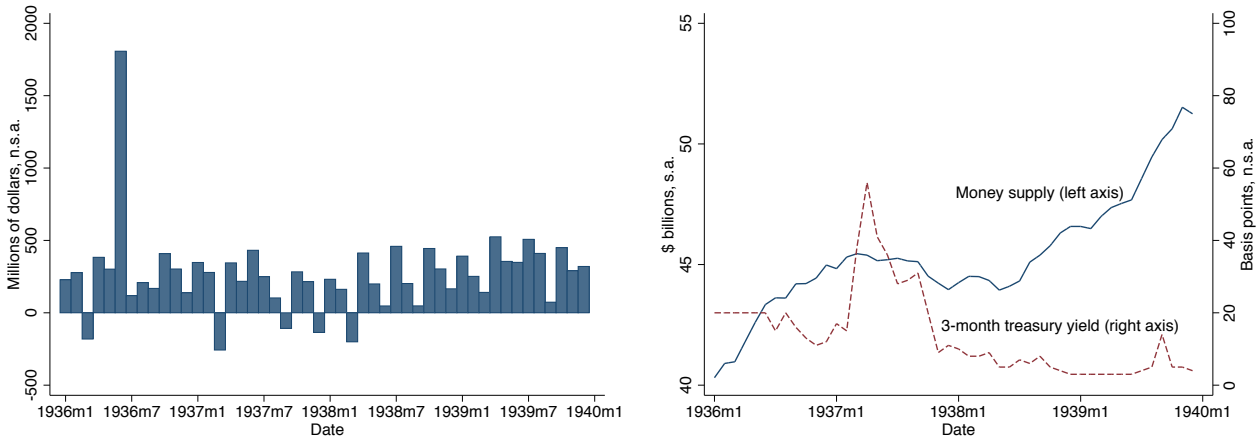
[9] Total federal government receipts rose from 3.923 billion in fiscal 1936 to 6.751 billion in fiscal 1938. 53 percent of this revenue increase is accounted for by social insurance taxes, a category that included both social security taxes and railroad retirement receipts. See Office of Management and Budget, Historical Tables 2.1 and 2.4.

[10] See `http://www.ssa.gov/history/hfaq.html`. Of course, the effect was contractionary only insofar as this forced savings for retirement was not offset by declines in other saving.

[11] Monthly budget deficit figures are derived from daily treasury statements and reported in NBER macrohistory series m15025c.

veterans enormous, Hausman (2014) argues that it was mostly spent in 1936.

Figure 1: The budget deficit and the money supply



(a) The Federal budget deficit

(b) The money supply and 3-month treasury yield

Source: (a) NBER macrohistory series m15025c. Underlying data are from the U.S. Treasury Department, daily treasury statements. (b) The money supply is currency held by the public + demand and time deposits of commercial banks. Sources: NBER macrohistory series 1444a; FRED series TB3MS.

2.2 Monetary Policy

Along with fiscal policy, the most popular explanation for the 1937-38 recession is restrictive monetary policy.[12] The Federal Reserve raised reserve requirements in August 1936 and again in March and May 1937. In December 1936, the Treasury began sterilizing gold inflows. Friedman and Schwartz argue (1963, pp. 544-545):

> The combined impact of the rise in reserve requirements and—no less important—the Treasury gold-sterilization program first sharply reduced the rate of increase in the money stock and then converted it into a decline. . . . The sharp retardation in the rate of growth of the money stock must surely have been a factor curbing expansion, and the absolute decline, a factor intensifying contraction.

[12] See, for example, Roose (1954), Friedman and Schwartz (1963), Eichengreen (1992), Romer (1992), Velde (2009), and Irwin (2012).

Figure 1(b) shows the behavior of the money supply (currency held by the public plus demand and time deposits of commercial banks) from 1936 to 1939. The money stock plateaus in the spring and summer of 1937 and then declines in the fall. There is an emerging consensus that the key shock was gold sterilization rather than the increase in reserve requirements. Calomiris, Mason, and Wheelock (2011) use individual bank data to investigate how tighter reserve requirements affected bank behavior. They find no evidence that the changes in reserve requirements affected bank reserve demand in 1936 and 1937. Irwin (2012) examines the time series of the deposit-reserve ratio and also cannot detect an effect of the reserve requirement changes. Finally, Park and Van Horn (2013) examine loan supply and find no effect of the reserve requirement increase.

Unlike the changes to reserve requirements, Irwin (2012) argues that gold sterilization had quantitatively large impacts on the monetary base and thus on the money supply. He estimates that absent gold sterilization, the 1937 monetary base would have been as much as 10 percent larger. However, the channel through which money supply declines affected real activity is unclear. There was relatively little impact on interest rates. Figure 1(b) shows the path of the yield on three-month treasury bills. Although yields briefly spike by 10 to 40 basis points in the spring and summer of 1937, they remain close to zero over the period. Other interest rates rose only slightly. For example, in 1937 the prime commercial paper rate rose from 0.75 to 1 percent (Irwin 2012).

Of course when interest rates are near zero, monetary policy may still change inflation expectations and thus affect the real interest rate. This is the channel through which Romer (1992) argues that money supply growth led to economic recovery after 1933. Eggertsson and Pugsley (2006) argue that policymakers' actions in the spring of 1937 lowered inflation expectations and through this channel caused the 1937-1938 recession. This provides one way of explaining how monetary actions, despite little impact on interest rates, may have had large real effects.

2.3 Unionization

Cole and Ohanian (2001, 2004, 2009) argue that New Deal policies and unionization led to high manufacturing wages and a slow recovery of output and employment after 1933. In their working paper (Cole and Ohanian 2001), they briefly suggest that a spike in wages due to the upholding by the Supreme Court of the National Labor Relations Act (the Wagner Act) in April 1937 contributed to the 1937-38 recession. Since this is not the focus of their work, they do not provide quantitative evidence—beyond the documentation of wage increases—for this effect. My work supports their argument insofar as it shows how unionization in the automobile industry did substantially contribute to the recession. The transmission mechanism in my paper is, however, different from that in Cole and Ohanian. I argue that unionization had large impacts in the auto industry because it affected expectations of the future price of automobiles, leading to substantial intertemporal substitution of auto purchases. Furthermore, whereas Cole and Ohanian suggest that wage increases induced by unionization were the primary cause of the recession, I argue that understanding the auto industry shock still leaves much of the recession to be explained by monetary and fiscal policy.

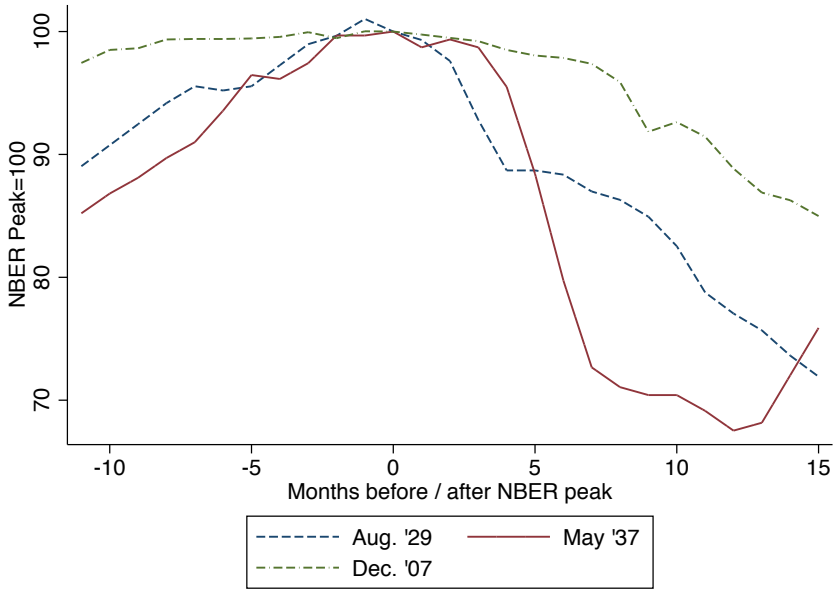
3 Anomalies

3.1 Timing

The NBER dates the business cycle peak as May 1937. During the summer, however, production and employment declined only slightly. Indeed, Romer's (1994) business cycle dating algorithm selects August as the peak. The period between May and August was marked by a decoupling of nondurable and durable goods manufacturing. Nondurables peaked in May, with production falling by 6.1 percent over the ensuing three months. Durables production rose 3.7 percent over the same period, peaking in August.[13]

[13]Seasonally adjusted data are from the *Federal Reserve Bulletin*, August 1940, p. 765.

Figure 2: Seasonally adjusted industrial production around 3 business cycle peaks



Source: Industrial production is the seasonally adjusted Fed index, FRED series INDPRO.

In early fall, the character of the recession changed entirely. Seasonally adjusted industrial production fell 24 percent from September to December 1937. Non-seasonally adjusted production fell 27 percent.[14] The decline in output was accompanied by large declines in employment. From September 1937 to January 1938, 22 percent of durable goods employment disappeared.[15] These job losses were reflected in a rapidly rising unemployment rate. The monthly, seasonally-adjusted, series from the National Industrial Conference Board shows the unemployment rate rising from 11.6 percent in September 1937 to 16.9 percent in January 1938.[16]

Figure 2 shows the path of industrial production around the business cycle peak in 1937, and, for comparison, in 1929 and 2007. It makes clear how extraordinarily rapid the contraction was in 1937. Indeed, the decline in industrial production from September to December 1937 is the largest three-month decline in the history of the Federal Reserve Board series

[14]Seasonally adjusted and non-seasonally adjusted data are from FRED series INDPRO and IPB50001N.

[15]Seasonally adjusted factory employment data are from the *Federal Reserve Bulletin*, October 1939, p. 880.

[16]NBER macrohistory series m08292a.

(which begins in 1919), and is larger than any three-month decline in the Miron-Romer series that goes back to 1884.

I am unaware of existing work that emphasizes or offers explanations for the speed of the economy's collapse in fall 1937. Existing theories of the recession are unpromising in this regard. The timing of the decrease in transfers (the second half of 1936) or the increase in taxes (the beginning of 1937) fits poorly with the rapid economic decline in the fall of 1937. Theory and evidence suggest that changes in taxes and transfers should have immediate impacts. Parker, Souleles, Johnson and McClelland (2013), for instance, find that the largest effect of the 2008 stimulus payments was in the quarter of payment. And Hausman (2014) finds that veterans spent much of their 1936 bonus within six months.[17] The decline in the money supply in 1937 was also small compared to that in the Great Depression and is thus ill-suited to explain a much more rapid decline in industrial production. Finally, the collapse in production occurred 6 months after April 1937, the key date in Cole and Ohanian's (2001) unionization story.

3.2 Geography

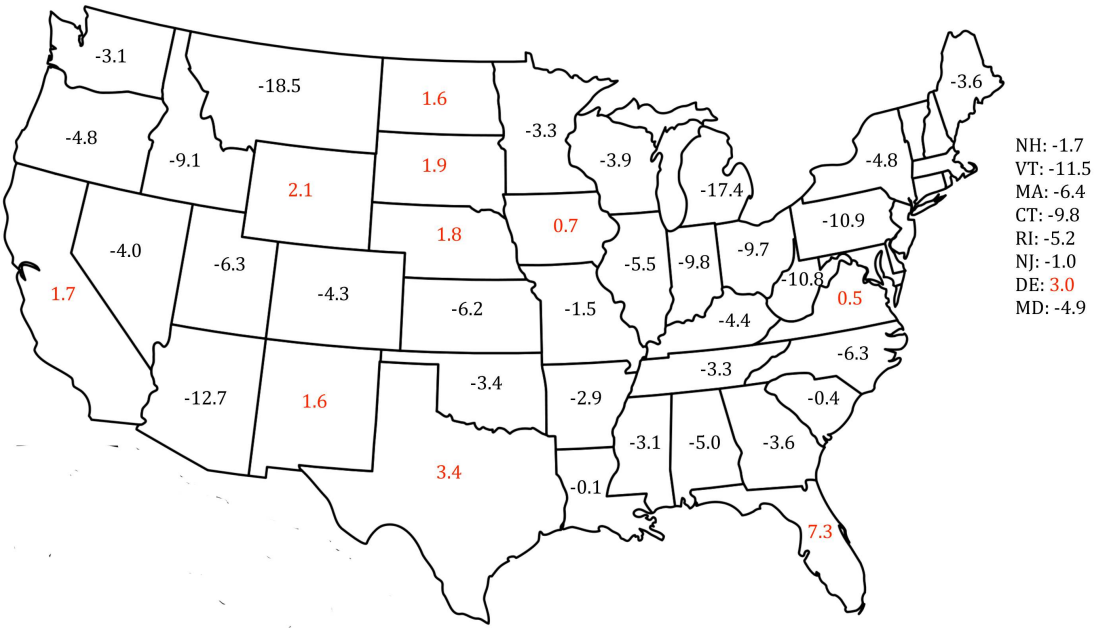
A generally unappreciated aspect of the 1937-38 recession was its varying impact across states.[18] Figures 3 and 4 show the percent change in private nonfarm and manufacturing employment between 1937 and 1938. Despite a 5 percent decline in the country as a whole, total private employment rose in 11 states. Perhaps more remarkably, while manufacturing employment fell 12 percent nationwide, it rose in 8 states.[19] Of course, recessions always affect some states more than others. States have different concentrations of cyclically sensitive industries and different pre-recession employment trends. But it is unclear how these factors can explain actual increases in employment in some states during a severe recession.

[17] Using a structural VAR, Blanchard and Perotti (2002) also find that output declines in the quarter in which taxes rise, however, they find that the peak effect on output occurs 5-7 quarters after a tax shock, a result more consistent with the 1937-38 experience.

[18] An exception is Wallis (1989, p. 61) who notes the "markedly differential regional impact" of the 1937-38 recession but does not compare the geographic variation to that in other interwar downturns.

[19] State employment data are from Wallis (1989).

Figure 3: Change in private nonfarm payroll employment, 1937-38 (%).



Source: Wallis (1989).

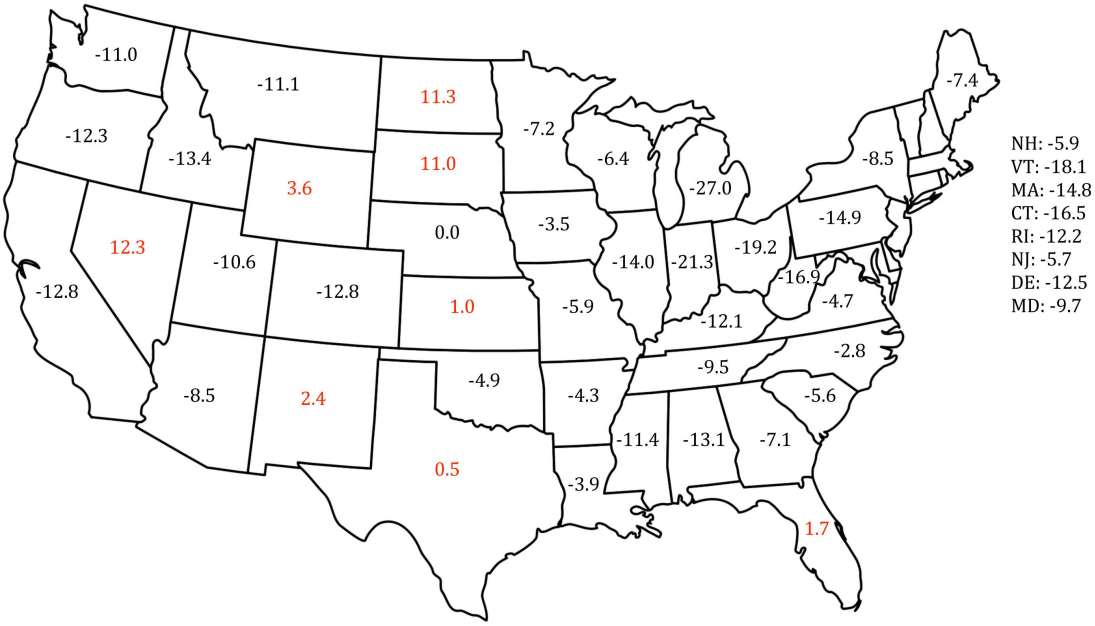
And there is strong evidence that the degree of geographic dispersion in 1937-38 was unusual relative to that in other interwar downturns.

Tables 2 and 3 compare the variation in the change in private and manufacturing employment between 1937 and 1938 with that between 1929 and 1932. In the case of manufacturing, it is also possible to extend the comparison to 1919-21. The comparison is done across regions rather than across states, since the BLS did not regularly publish state employment data before 1931.[20] The tables show a remarkably consistent story: regardless of whether one focuses on total employment or manufacturing employment, the coefficient of variation in 1937-38 is roughly double its value during any year of the Depression itself.

To understand to what extent this geographic variation reflects the interaction of state

[20]Despite this, Wallis (1989) is able to estimate state employment in 1930. So it is possible to construct tables analogous to tables 2 and 3 for variation across states. These are available upon request. They also support the conclusion that there was an unusual level of geographic variation in employment outcomes in 1937-38.

Figure 4: Change in manufacturing employment, 1937-38 (%).



Source: Wallis (1989).

Table 2: Variation in employment outcomes across 9 regions.

Downturn	U.S. employment decline (%)	Mean of region employment changes (%)	Standard deviation of region employment changes (%)	Coefficent of variation
1929-32	-21.7	-24.6	7.3	-0.30
1929-30	-5.1	-6.9	3.4	-0.48
1930-31	-8.2	-8.9	3.8	-0.42
1931-32	-10.1	-11.2	2.8	-0.25
1937-38	-4.9	-4.1	3.6	-0.88

Source: Wallis (1989).

Table 3: Variation in manufacturing employment outcomes across 9 regions.

Downturn	U.S. manufacturing employment decline (%)	Mean of region employment changes (%)	Standard deviation of region employment changes (%)	Coefficent of variation
1919-21	-23.2	-22.3	3.0	-0.13
1929-32	-35.2	-37.5	6.3	-0.17
1929-30	-10.4	-14.1	3.9	-0.28
1930-31	-14.2	-14.1	3.6	-0.25
1931-32	-15.8	-15.5	2.4	-0.15
1937-38	-11.9	-9.7	5.3	-0.54

Note: Data for 1919-21 are for wage earner employment only.
Sources: Wallis (1989) for 1929-38, the 1947 *Census of Manufactures* for 1919-21.

industry structure with industry-specific outcomes, I estimate the following regression:

$$\Delta E_j = \beta_0 + \beta_1 CEI_j + \beta_1 Trend_j + \epsilon_j. \tag{1}$$

ΔE_j is the percent change in total manufacturing employment in state j;[21] $Trend_j$ is the average annual growth rate of employment in state j from 1933 to 1937; $CEI_j = \sum_i S_{ij} \Delta E_i$, where S_{ij} is the share of wage earner employment in industry i in state j in 1937 and ΔE_i is the percent change in wage earner employment in industry i nationwide from 1937 to 1938.[22] Thus CEI_j shows how employment in state j would have changed had employment changes in each industry in the state exactly matched the nationwide changes in employment by industry.[23] Put differently, variation in CEI_j across states reflects only differences in industry structure across states. To compute state shares of employment by industry, I collected data on employment in every industry by state from the 1937 *Census of Manufactures*. Data on

[21] I focus on manufacturing employment for two reasons. (1) The manufacturing employment data are likely to have significantly less measurement error than the total employment numbers (Wallis 1989), and (2) the 1937 sectoral composition of employment in each state is available only for manufacturing.

[22] CEI_j is similar to the composite employment index calculated by Wallis (1989). Wallis (1989) investigates the impact of industry structure on state outcomes in the 1930s but not specifically in the 1937-1938 recession.

[23] This statement is approximate, since the left hand side variable of the regression is total manufacturing employment, while data limitations force me to compute CEI_j using data on wage earner employment only.

Table 4

Dependent variable is percent change in state manufacturing employment 1937-38 (average decline is 7.8%)

CEI		1.721***	1.295***		1.576***	1.668***
		(0.192)	(0.279)		(0.211)	(0.318)
Impact of 1 standard deviation increase (percentage points)		*6.5*	*4.9*		*5.1*	*5.4*
33-37 growth	-1.318***		-0.488**	-1.167***		0.132
	(0.191)		(0.239)	(0.312)		(0.335)
Impact of 1 standard deviation increase (percentage points)	*-5.8*		*-2.1*	*-3.6*		*0.4*
Constant	3.194*	17.66***	15.44***	0.658	15.40***	15.69***
	(1.799)	(2.924)	(3.030)	(3.005)	(3.470)	(3.597)
Sample		All States		States with > 50,000 wage earners in manufacturing		
Observations	48	48	48	31	31	31
R-squared	0.509	0.637	0.668	0.325	0.658	0.659

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

nationwide changes in employment by industry were taken from the October 1939 *Federal Reserve Bulletin*.

Table 4 shows results both for all states and for the 31 states with more than 50,000 wage earners in manufacturing in 1937.[24] The measure of industry structure, CEI, and to a lesser extent, trend employment growth in the state from 1933 to 1937 are robustly statistically and economically significant. A one standard deviation decline in CEI is associated with more than 5 percentage points lower manufacturing employment growth. Measured by the R^2, CEI alone explains nearly 2/3 of the variation in state employment changes. The negative coefficient on 1933-37 growth means that on average states that grew faster after 1933 did worse in the 1937-38 recession. In the 31 state sample, however, this result disappears when the measure of industry structure is included.

Industry structure's overwhelming importance suggests that the geographic anomalies in 1937-38 are primarily a manifestation of an unusual pattern of output movements across industries.[25] To understand why state outcomes were so different in 1937-38, one must

[24]Data on the number of manufacturing wage earners in each state come from the 1937 *Census of Manufactures*.

[25]Existing explanations of the recession also suggest possible factors that could have directly caused unusual

understand sectoral output patterns in the recession. The next section turns to this topic.

3.3 Sectoral

Macroeconomists view comovement as a common element of recessions. There is widespread disagreement about the causes of particular recessions, but there is a widespread agreement that recessions are not simply the result of dramatic declines in output in one sector of the economy. Rather they are events in which nearly all sectors decline, albeit to different degrees. Long and Plosser (1987) summarize this conventional view, stating: "Comovement among a wide variety of economic activities is an essential empirical characteristic of business cycles" (p. 333). This view of business cycles has shaped nearly all macroeconomic models. Models ranging from old Keynesian to real business cycle are constructed so that negative shocks lead to declines in output and employment across all forms of consumption and investment.

To a surprising degree, the 1937-38 recession does not fit this accepted wisdom. The following describes movements in components of consumption and investment in 1937-38 versus in other recession years.

3.3.1 Consumption

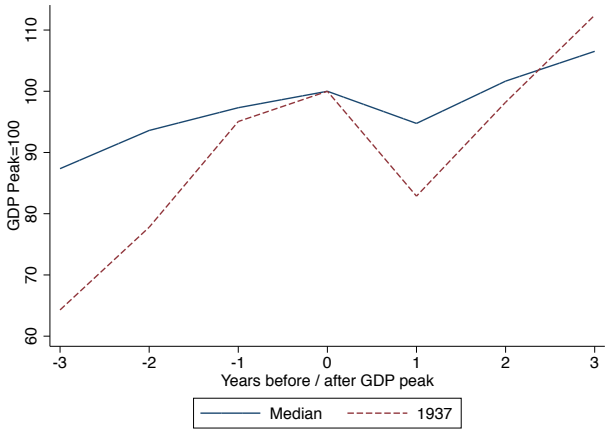
Between 1937 and 1938 real durables consumption fell 17.1 percent. New motor vehicles consumption fell 42 percent.[26] This decline in durables, and particularly motor vehicles, consumption was extraordinarily unusual given the behavior of GDP.

geographic dispersion in the recession. Insofar as the fiscal shock was due to the beginning of social security tax collection, states with more workers subject to social security taxes may have fared worse in the recession (Wallis 1989). Insofar as the monetary shock took the form of a reserve requirement increase, states with a larger percent of bank deposits in Federal Reserve member banks may have suffered more. And insofar as general, rather than sector specific, unionization induced wage increases mattered, states with more workers unionized may have performed worse (Wallis 1989).

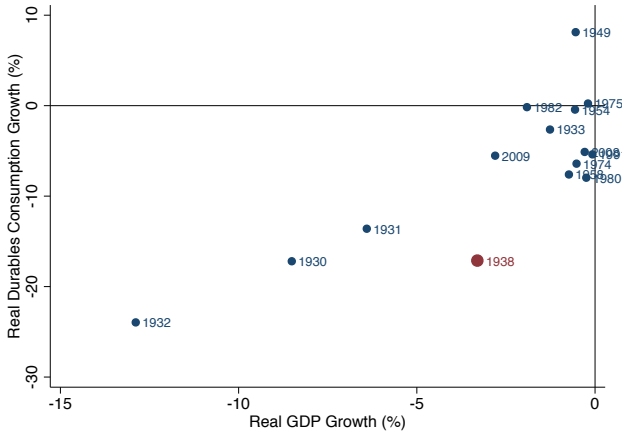
To test for the importance of each of these factors, I added proxies for the percent of workers covered by social security, the share of bank deposits in Federal Reserve member banks, and the union membership rate to specification (1). None of these variables are robustly economically or statistically significant with the possible exception of social security coverage. Full results are available on request. See also Wallis (1989).

[26] NIPA table 2.4.3.

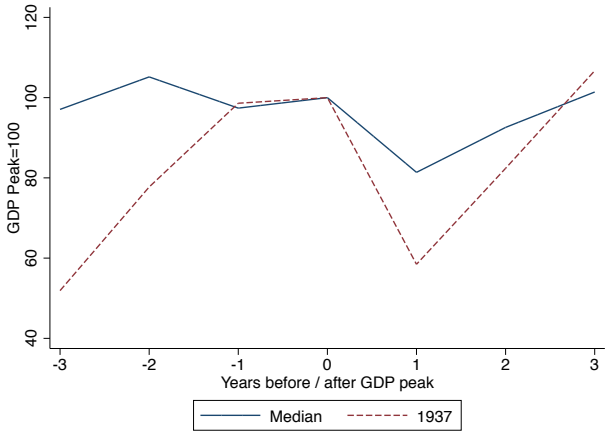
Figure 5: Real durables and motor vehicle consumption



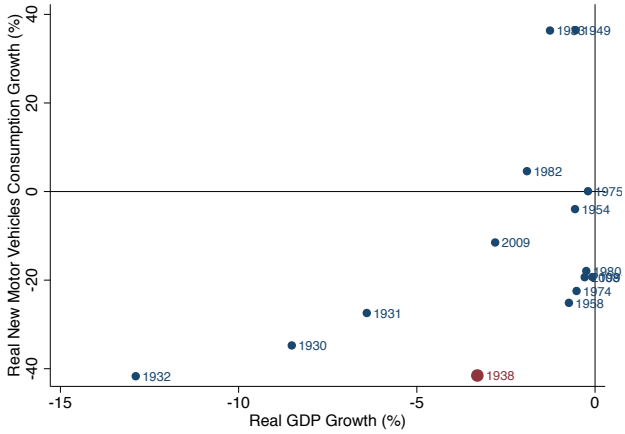
(a) Durables consump. around bus. cycle peaks



(b) Durables consump. growth against GDP growth



(c) Motor veh. consump. around bus. cycle peaks



(d) Motor veh. consump. growth against GDP growth

Notes: In (a) and (c), median includes all post World War II business cycles in which annual real GDP fell (1948, 1953, 1957, 1973, 1980, 1981, 1990, and 2007); (b) and (d) include all years of negative GDP growth since 1929, excluding 1945-47. Sources: (a) and (b): NIPA table 1.1.3; (c) and (d): NIPA tables 1.1.3 and 2.4.3.

The solid line in figure 5(a) shows the median behavior of durables consumption in postwar U.S. recessions. The dashed line shows the behavior in 1937. Of course, given that the decline in GDP was more severe in 1938, we would expect durables to fall more. To adjust for the decline in GDP, figure 5(b) shows a scatter plot of the change in durables consumption and the change in GDP in all years with negative output growth since 1929, excluding 1945-47.

The decline in durables consumption spending in 1938 is anomalous when compared to postwar recessions or to the Great Depression. In postwar recessions, durables consumption spending has never fallen by more than eight percent in a single year. In 2009, when GDP declined by 2.8 percent, just slightly less than the decline in 1938, durables consumption spending fell by 'only' 5.5 percent.[27] Many economists have noted and attempted to explain the 17.2 percent decline in durables consumption in 1930 (Mishkin 1978, Romer 1990, Olney 1999). Less noted is the fact that durables spending fell by almost exactly the same amount in 1938 (17.1 percent), despite a decline in output only 40 percent as large.

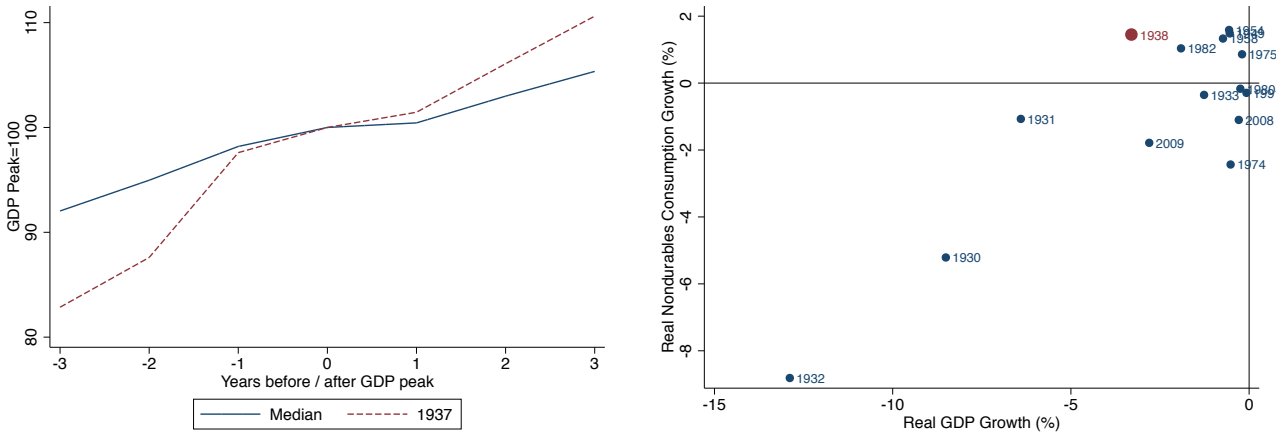
One can understand this pattern better by studying the two largest components of durables consumption spending, household durables including furniture and appliances, and new motor vehicles. From 1937 to 1938, household durables spending declined by 9.6 percent and new motor vehicles spending fell by 41.5 percent.[28] This decline in household durables spending was far larger than in a typical recession, but not extraordinary given the large decline in GDP. By contrast, the 41.5 percent decline in new motor vehicles spending was remarkable (figures 5(c), 5(d)) even given the magnitude of the 1938 recession. Since the beginning of the BEA series in 1929, only one year saw a larger decline in auto spending: in 1932, spending fell by 41.7 percent, 0.2 percentage points more than in 1938. But whereas in 1938 real GDP fell 3.2 percent, in 1932 it fell 12.8 percent.[29]

[27] NIPA table 1.1.1.
[28] NIPA table 2.4.3.
[29] NIPA table 1.1.6a.

3.3.2 Nondurables Consumption

The poor performance of durables spending in 1937-38 was matched by unusually strong nondurables spending. From 1937 to 1938, nondurables spending *rose* by 1.4 percent (figure 6(a)). This reflected an increase in real spending on food and beverages of 2.2 percent, an increase in spending on clothing and footwear of 1.4 percent, and a decrease in spending on energy of 1.1 percent.[30] A scatter plot of changes in GDP and nondurables spending (figure 6(b)) shows how unusual it is for nondurables spending to rise during a large recession. The 1937-1938 recession is the only time since 1929 in which nondurables spending rose during a recession in which annual GDP fell more than 2 percent.

Figure 6: Real nondurables consumption



(a) Nondurables consump. around bus. cycle peaks (b) Nondurables consump. growth against GDP growth

Notes: In (a), median includes all post World War II business cycles in which annual real GDP fell (1948, 1953, 1957, 1973, 1980, 1981, 1990, and 2007); (b) includes all years of negative GDP growth since 1929, excluding 1945-47. Source: NIPA table 1.1.3.

3.3.3 Investment

Economists often expect that consumer durables and investment will behave similarly. Both are sensitive to interest rates and to expectations of future income. To some extent, this

[30] NIPA table 2.4.3.

intuition holds true in 1937-1938. Business investment—nonresidential structures, equipment, and inventories—did poorly. Oddly, on an annual basis, residential investment rose in 1938. This result is, however, sensitive to the use of annual data. Gordon and Krenn's (2013) quarterly estimates of residential investment show a 25.4 percent decline in residential investment between the second quarter of 1937 and the second quarter of 1938.[31]

3.3.4 The 1920-21 Recession

The preceding analysis uses data from the National Income and Product Accounts (NIPA) which begin only in 1929. It is also of interest to compare the 1937-38 recession with that in 1920-21. Shaw (1947) provides data on commodity output for different components of consumption in this period. While not directly comparable to NIPA data, Romer (1989) argues that the Shaw data are accurate and unbiased. Table 5 shows the behavior of components of consumption between 1919 and 1921. Interestingly, as in 1937-38, nondurables consumption rose between 1920 and 1921 while durables consumption fell by a large amount. Relative to the decline in durables consumption as a whole, the decline in auto purchases was, however, not unusually large. Consumption of household appliances fell by significantly more than that of motor vehicles.

[31] Gordon and Krenn (2013) provide monthly and quarterly estimates of real GDP components back to 1919. To construct these estimates, they use the Chow and Lin (1971) interpolation procedure. They choose monthly interpolators from the NBER macrohistory database. After 1929, the average of the monthly estimates is constrained to be equal to the NIPA data. Before 1929, monthly estimates average to the annual data in Gordon and Veitch (1986).

The Gordon and Krenn data provide a valuable addition to our knowledge of the interwar period. In this section, though, I focus on the annual NIPA data. In part this is because the unusual sectoral behavior of the economy in 1937-38 likely altered the usual relationship between Gordon and Krenn's interpolators (like industrial production) and real GDP. Thus Gordon and Krenn's quarterly estimates may be less precise in this period. Nonetheless, qualitative conclusions from the quarterly Gorden and Krenn data are similar to those obtained from annual data. In particular, the quarterly data for the 1937-38 recession show an unusually large decrease in durables consumption (-24 percent from the second quarter of 1937 to the second quarter of 1938) and an unusual increase in nondurables consumption (plus 1.3 percent). (These figures are from the Gorden and Krenn (2013) 'split qrtly' series.)

Table 5: Consumption 1919-21

Change in Real Output of Consumer Goods		
	1919-20	1920-21
Perishables	1.9%	6.2%
Semi-Durables	-7.5%	9.3%
Durables	2.4%	-24.6%
Household appliances	14.2%	-38.0%
Motor Vehicles	11.7%	-23.2%
Memo: Real GNP	-1.1%	-2.4%

Sources: Consumption - Shaw (1947); GNP - Romer (1989).

3.3.5 Sectoral behavior and existing theories of the recession

The sectoral pattern of output is not easily explained by any existing theories of the 1937-38 recession. Theory and empirics suggest that increases in federal taxes (and decreases in transfers) should decrease all forms of consumption, not only durables consumption. Parker et al. (2013), for example, find that the economic stimulus payments of 2008 increased nondurables consumption. And it is unclear why a monetary policy shock should affect one credit sensitive good, autos, so much more than it affects other durable goods or housing. Cole and Ohanian's (2001) union wage shock hypothesis also does not easily explain the disproportionate decline of the auto industry. If wages rose in many industries, why was the auto industry uniquely affected?

4 An auto industry supply shock

The recession's anomalies strongly point to a role for the auto industry in causing the recession. I have shown that manufacturing employment fell most in Michigan, and that motor vehicle spending fell over 40 percent. The mystery is deepened by the fact that auto prices *rose* in the fall of 1937.

Table 6 shows the percent change from 1937 to 1938 in the price indexes for the major components of GDP. Measured by the GDP deflator, prices economy-wide fell 1.8 percent.

Table 6: Prices 1937-38

Price Index	Change 1937-38 (%)
GDP	-1.8
Consumption (PCE)	-2.3
Durables	-0.1
Furniture and furnishings	-3.2
Household appliances	0.4
New motor vehicles	5.0
Nondurables	-4.9
Services	0.1
Private Investment	-2.9
Nonres. structures	-1.9
Equipment	2.4
Trucks, buses, trailers	12.0
Autos	3.6
Residential	3.2
Exports	-4.6
Imports	-7.6
Government	0.5

Source: NIPA tables 1.1.4, 2.4.4., and 5.5.4.

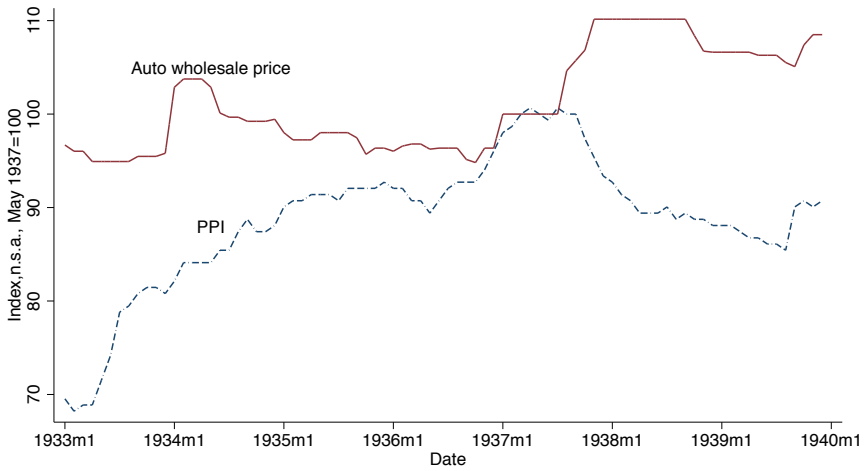
Measured by the personal consumption expenditures deflator, consumer prices fell 2.3 percent. Prices for most sub-categories of output also fell. A notable exception was the price of autos. Prices of autos purchased by consumers rose 5.0 percent; prices of autos purchased by businesses increased 3.6 percent. Truck and bus prices rose 12 percent.

Other measures of auto prices confirm a large price spike with the introduction of 1938 model year cars in fall 1937. According to the BLS wholesale auto price index, nominal auto prices rose by more than 14 percent from December 1936 to December 1937.[32] Since most prices were falling, this meant that the real price of autos rose by even more. This price increase is more extraordinary when compared to the behavior of auto prices during the economy's recovery from 1933 to 1937. Figure 7 shows the path of auto wholesale prices and the PPI. Until fall 1937, nominal auto prices were essentially flat while economy-wide prices rose steadily. Thus the real price of autos trended down. In fall 1937, this trend was abruptly reversed.

One might worry that this price increase reflects a change in the type of automobiles

[32]NBER macrohistory series m04180b.

Figure 7: Wholesale Prices



Sources: Auto price - NBER macrohistory series m04180b, underlying data from the BLS and NBER calculations; PPI - FRED series PPIACO.

being sold, i.e. an increase in the quality of the product. But a wealth of data suggest that this was not the case. Adjusted for the weight of cars purchased, nominal prices rose by 9.0 percent from 1937 to 1938; prices per horsepower rose 8.1 percent (Ward's Reports 1938). Raff and Trajtenberg (1996) use hedonic regressions to compute a more sophisticated bi-annual quality-adjusted price index for new cars. They find that real quality adjusted prices fell continuously from 1922 to 1936, but then rose 16 percent from 1936 to 1938. In 1938, even prices for unchanged models rose. For example, Chevrolets were essentially identical in the 1937 and 1938 model years. The two model years had identical engine displacement, horsepower, and wheelbase.[33] Yet the price of a Chevrolet Master De Luxe Two Door Town Sedan, the most popular model, rose from $690 in the 1937 model year to $750 in the 1938 model year.[34]

The prices I observe are 'Delivered in Detroit' prices. These were the manufacturer recommended prices including basic accessories and federal taxes. Consumers could expect to

[33] *Automotive Industries*, 76:9, February 27, 1937 p. 291; *Automotive Industries*, 78:9, February 26, 1938, p. 264.

[34] Quantity data (for 'most popular model' statement) from Heasley 1977; prices from *Automotive Industries*, 77:20, November 13, 1937, p. 718.

Figure 8: Advertisement for a 1938 Plymouth.

Source: `http://www.flickr.com/photos/paulmalon/5744021193/`.

pay different amounts depending on their state taxes and on transportation charges (General Motors 1937, pp. 19-20). A possible concern is that these prices do not accurately reflect the actual transaction prices which consumers' paid. The main margin through which transaction prices could differ was through varying allowances for used car trade-ins (Federal Trade Commission 1939). This concern is mitigated by two facts. First, the delivered in Detroit prices match those published in advertisements, suggesting that they were strongly correlated with the actual transaction prices a consumer could expect to pay. Figure 8 shows an advertisement for a 1938 model year Plymouth sedan. The price on the ad, $685, exactly matches that published in the industry trade journal *Automotive Industries* on November 13, 1937. (The same car cost $620 in the 1937 model year.) The second reason to believe that transaction prices did indeed rise for the 1938 model year is that industry observers were unanimous in stating that this was the case (*Automotive Industries*, fall 1937 issues).

4.1 Why did auto prices rise?

Auto prices rose because manufacturer's costs rose. Those in control of the auto industry took as given that they ought to respond to higher costs by raising prices. For example, Alfred Sloan, the CEO of General Motors, said in July 1937 (*Automotive Industries*, 7/31/37, p. 142): "Naturally, this trend toward rapidly increasing costs must, of necessity reflect itself in the form of a substantial increase in selling prices, with due regard for the effect of volume." In explaining a planned price increase, a vice-president at Hudson Motor Company said (*Automotive Industries*, 8/14/37, p. 206): "Practically every product entering into the manufacture of our cars, including wages, has risen substantially in price. Naturally, this affects the price of our own product." The increase in costs referred to by these executives had two components: a strike / unionization induced wage increase and a raw material price increase.

4.1.1 Unionization

Unionization in the auto industry occurred in the context of rapid unionization in many sectors of the economy.[35] The percent of nonagricultural employees organized in unions rose from 13.1 percent in 1935 to 24.5 percent in 1940. Much of this increase was the result of successful efforts by the Congress of Industrial Organizations (the CIO) to organize heavy industry. Given the large number of unemployed workers, the CIO's success may be surprising. Auto manufacturers could not have found it difficult to hire unskilled workers. Despite this, two factors made the automobile industry ripe for unionization.

First, worker discontent was widespread. One important reason was the seasonal aspect of employment, in which workers lost their jobs during the model year changeover with no guarantee that they would be rehired. Second, the dependence of manufacturers on certain key parts-producing plants made it easy for a strike at one plant to cripple an entire firm. This second factor had long contributed to high wages in the auto industry. Fear of labor

[35] Unless otherwise noted, facts in this section are drawn from Galenson (1960).

unrest at key plants was sufficient to cause management to share rents with workers (Raff 1991).

The United Automobile Workers (the UAW), a largely independent affiliate of the CIO, began its organizing drive in November 1936. A key aspect of their strategy was the sit-down strike, in which workers occupied factories, preventing any production from occurring. The most important sit-down strike began on December 28 and 29, 1936 at Fisher body plants in Cleveland and Flint. Fisher body was a division of General Motors, and these plants were crucial links in the corporation's supply chain. Halting production at these two plants was sufficient to disrupt three-quarters of General Motor's total production. Strikes spread to other plants and by early February, weekly vehicle production at General Motors had declined to 1,500 units from 53,000 units in mid-December.

With the help of Frank Murphy, Michigan's democratic governor, and pressure from President Roosevelt, these strikes led to an agreement between the UAW and General Motors on February 11, 1937. General Motors agreed to recognize the UAW as a bargaining agent for its members. The agreement itself secured no wage increases, but General Motors unilaterally increased wages while the sit-down strikes were ongoing. After organizing GM, the UAW organized sit-down strikes at Chrysler and reached a collective bargaining agreement on April 6. Despite UAW efforts, however, Ford was not successfully organized until 1941. This reflected extreme ideological opposition to unions by Henry Ford and Ford's willingness to use physical force to keep unions out.

The UAW's efforts to organize the industry led to industry-wide wage increases. Between October 1936 and July 1937, average hourly earnings rose 22 percent from 79 cents to 96 cents (Sayre 1940, table 5A). The gap between auto industry wages and wages in manufacturing as a whole widened (Sayre 1940). Even at non-unionized Ford, wages rose. Average hourly earnings at Ford's River Rouge plant rose from 81 cents in 1936 to 88 cents in 1937.[36] Unionization increased labor costs both by raising wages and by forcing manufacturers to run

[36]The source is payroll records from the Ford Motor Company Industrial Archives, accession AR-65-106. I am grateful to Warren Whatley for providing me with these data.

plants overtime to make up for strike-related production shortfalls. This continued beyond the spring of 1937, since even after the UAW negotiated collective bargaining agreements, divisions within the UAW led to sporadic wildcat strike activity (*Automotive Industries*, 7/31/1937).

4.1.2 Raw Material Price Increases

Automobile production consumes large quantities of raw materials. The first column of table 7 shows the pounds of commodities necessary to produce a typical 'small car' (Ward's Reports 1938). It took 1,919 pounds of steel, 357 pounds of cast iron, 89 pounds of cotton, 70 pounds of rubber, 51 pounds of glass and smaller quantities of copper, lead, zinc, manganese, aluminum, tin, wool and mohair, chromium, antimony, nickel, and cadmium.

The prices of many of these commodities rose rapidly in late 1936 and spring 1937. The second two columns of table 7 compare the cost of purchasing the amount of each commodity necessary for a car at early summer 1936 and early summer 1937 prices. Over this period, the price of the entire package of commodities needed to produce a small car rose almost 20 percent, from $89 to $106. (This can be compared to a typical small car price in the 1937 model year of roughly $575.) At least part of these price increases are explained by actual and expected rearmament demand in Europe. The League of Nations (Economic Intelligence Service 1938, p. 77) wrote:

> From the autumn of 1936 until the spring of 1937, there was a period of rapidly rising prices for primary products. The recovery of industrial production and intensification of rearmament expenditure in many countries had increased the demand for raw materials, until the point was reached at which real shortages of such materials were anticipated in spite of the relaxation of many restriction schemes controlling their production and export. At this point, in view of the fear of future shortages, a speculative demand for commodities developed and was superimposed upon the high normal demand.

Table 7: Raw material and hours to produce a small car

Material	Lbs. needed for car	$ cost			
			1936		1937
Steel	1919	$	39.4	$	48.2
Cast grey iron	357	$	3.4	$	4.2
Rubber	70	$	11.2	$	13.9
Cotton	89	$	10.9	$	11.4
Glass	51	$	8.4	$	9.1
Copper	34	$	5.8	$	7.4
Lead	31.5	$	1.4	$	1.9
Zinc	14.5	$	0.8	$	1.0
Manganese	14.5	$	0.5	$	0.7
Aluminum	10.6	$	2.2	$	2.1
Tin	4	$	1.8	$	2.3
Wool and mohair	3.5	$	1.1	$	1.2
Chromium	2.8	$	1.3	$	1.2
Antimony	1.5	$	0.2	$	0.2
Nickel	0.8	$	0.2	$	0.2
Cadmium	0.7	$	0.7	$	0.9
Raw material total		$	89.2	$	105.9
Hours	100 hours	$	79.1	$	96.0

Notes: Prices used are the May to July average in each year. Wages are the October 1936 and July 1937 values.

Sources: Raw material required for small car: Ward's Reports (1938); Steel-NBER macrohistory series m04155; Iron-NBER macrohistory series m04010c; Rubber-NBER macrohistory series m04077b; Cotton-NBER macrohistory series m04006a; Glass-NBER macrohistory series m04131; Copper-NBER macrohistory series m04153; Lead-NBER macrohistory series m04017; Zinc-NBER macrohistory series m04092b; Manganese-*Commodity Yearbook* (1940), p. 395; Aluminum-*Commodity Yearbook* (1940), p. 46; Tin-*Commodity Yearbook* (1940), p. 615; Wool-NBER macrohistory series m04087b; Chromium-U.S. Geological Survey, Chromium Statistics (prices are annual averages); Antimony-*Minerals Yearbook* (1939), p. 724; Nickel-*Minerals Yearbook* (1939), p. 605 (annual average); Cadmium-*Minerals Yearbook* (1939), p. 730 (annual average); Wages: Sayre (1940).

A natural question is how large the raw material price shock was relative to the unionization induced wage increase. This is difficult to answer precisely, given a lack of definite information about the labor needed to produce a small car. But one can make a rough guess. In 1937, wage earners in the motor vehicle industry worked 895 million hours to produce 4.8 million vehicles, or 186 hours per vehicle.[37] This is certainly an upper bound for the average number of hours worked to produce a small car, since these figures include truck production. In table 7, I assume it took an average of 100 hours of wage earner labor to produce a small car.

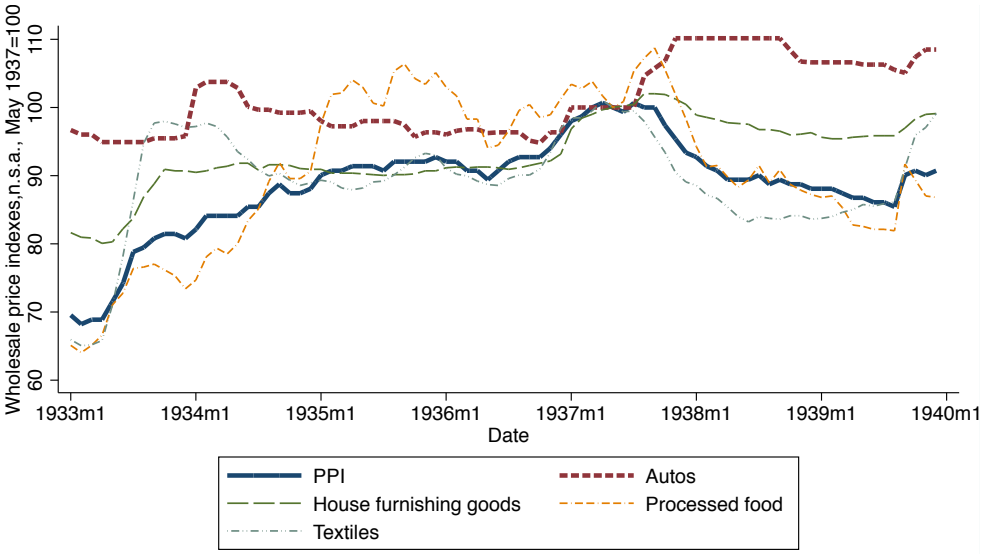
In this hypothetical example, the effects of the increase in wages and the increase in raw material prices are almost identical. But this exercise may understate the importance of the wage relative to the raw material price increase. The nominal wage increase was persistant, even as auto production and employment plummeted in late 1937 and early 1938 (Sayre 1940), but the raw material price increases were at least partially reversed as the U.S. fell deeper into recession. By July 1938, for instance, the price of the 1919 pounds of steel needed to produce a small car had fallen to $46 from $48, and the price of the 70 pounds of rubber needed had fallen to $9 from $13. Insofar as these price movements were not entirely a surprise, they suggest that wages may have played a more important role than raw materials in manufacturers' pricing decisions.

4.2 The timing of the auto price increase

Manufacturers' labor and raw material costs rose in spring 1937. But auto prices were little changed until the introduction of new model year vehicles in fall. The BLS wholesale auto price index was literally unchanged from January to August 1937 (figure 7). This nominal rigidity distinguished the auto industry: in many other industries, costs rose in late 1936 and early 1937. In these other industries, prices tended to rise at the same time as costs

[37] Hours worked are from a BLS table from the UAW Research Department collection in the Reuther Library archives, Box 11, folder 11-12. I am grateful to Warren Whatley for providing me with this document. The number of motor vehicles produced are the sum of the number of passenger cars (NBER macrohistory series m01107a) and trucks (NBER macrohistory series m01144a).

Figure 9: Wholesale prices 1933-39



Sources: PPI - FRED series PPIACO; house furnishing goods - NBER macrohistory series m04095a; textiles - NBER macrohistory series m04064a; autos - NBER macrohistory series m04180b; processed foods - NBER macrohistory series m04055.

rather than with a several month lag. Figure 9 shows the behavior of auto wholesale prices along with those for processed food, home furnishing goods, and textiles. All prices rose in late 1936 and / or early 1937. Auto prices were unique in rising further in fall 1937 and remaining high during the recession.

The nominal rigidity of auto prices may in part be explained by the industry's concentration. In 1937, the big three (General Motors, Chrysler, and Ford) accounted for 85 percent of all passenger car and truck sales (Federal Trade Commission 1939, p. 27).[38] Unsurprisingly, the big three coordinated their price setting (Federal Trade Commission 1939),[39] a process that was likely eased by the setting of prices only once a year. Evidence that the auto manufacturers attempted to prevent frequent price changes comes from the minutes of a 1932 meeting of auto industry sales managers. The minutes state: "The committee agreed that the members of the National Automobile Chamber of Commerce would not change prices

[38]General Motors accounted for 39.7 percent of sales, Chrysler 23.2 percent, and Ford 21.9 percent.

[39]These efforts were complicated by Ford's general unwillingness to collude. Henry Ford was unwilling to join the Automobile Manufacturer's Association which facilitated collusion. The result was that Ford became the price leader. See Federal Trade Commission (1939) pp. 31-34.

on any car models from the day preceding the New York show until the closing date of the Chicago show" (qtd. in Federal Trade Commission 1939, p. 34).

Importantly, in the summer and early fall of 1937 contemporaries recognized that auto manufacturers' costs had risen and that this would lead to higher car prices in future months. For example, in an article published on July 31, 1937, the industry trade publication, *Automotive Industries*, reported (p. 135):

> General Motors Corp. divisions had only ten days uninterrupted work from Feb. 11, the date an agreement was signed with the United Automobile Workers, through the June quarter, stated Alfred P. Sloan, Jr., chairman of the board, bitterly assailing the union for its inability to prevent wildcat strikes. He blamed the union for a decline in earnings during the second quarter compared with the like quarter of 1936. He said the company was unable to meet the demand for its cars because of interference with production. Demand currently is equal to the company's ability to supply. Indirectly, labor troubles had another effect upon earnings, Mr. Sloan pointed out. Net income declined in relation to unit and dollar sales volume as a result of two general wage increases, numerous adjustments, and the need for using high-cost night shift operations in an effort to make up production deficiencies. Earnings were also affected by higher materials costs. High car prices for 1938 will result, he forecasts.

Ford and General Motors, but not Chrysler, did raise prices some in August 1937, before new model year vehicles were introduced (*Automotive Industries*, 8/7/1937, 8/14/1937, and 10/16/1937), but this price increase was seen as insufficient to cover the increase in costs that had occurred (*Automotive Industries* 9/18/1937, p. 374). Hence further price increases were expected. The president of Buick told the press on September 13, 1937 (qtd. in *Automotive Industries* 9/18/1937, p. 374): "We are not yet ready to disclose our price structure but I can tell you that due to the increased cost of labor and materials the prices will have to be somewhat higher."

5 How did the price shock effect sales?

5.1 Theory

Like an investment good, consumer durables purchases are likely to have a high intertemporal elasticity of substitution (Barsky, House, and Kimball 2007). In particular, expected future price increases will significantly increase current durables purchases as sales are pulled forward.[40] The bulge in sales will be followed by a large drop in sales after the price increase occurs. Thus the elasticity of demand with respect to a price change that is expected will be much larger than the (static) elasticity of demand with respect to price. I shall argue that this phenomenon is the key to understanding how the price increase for 1938 model cars had significant macroeconomic effects.

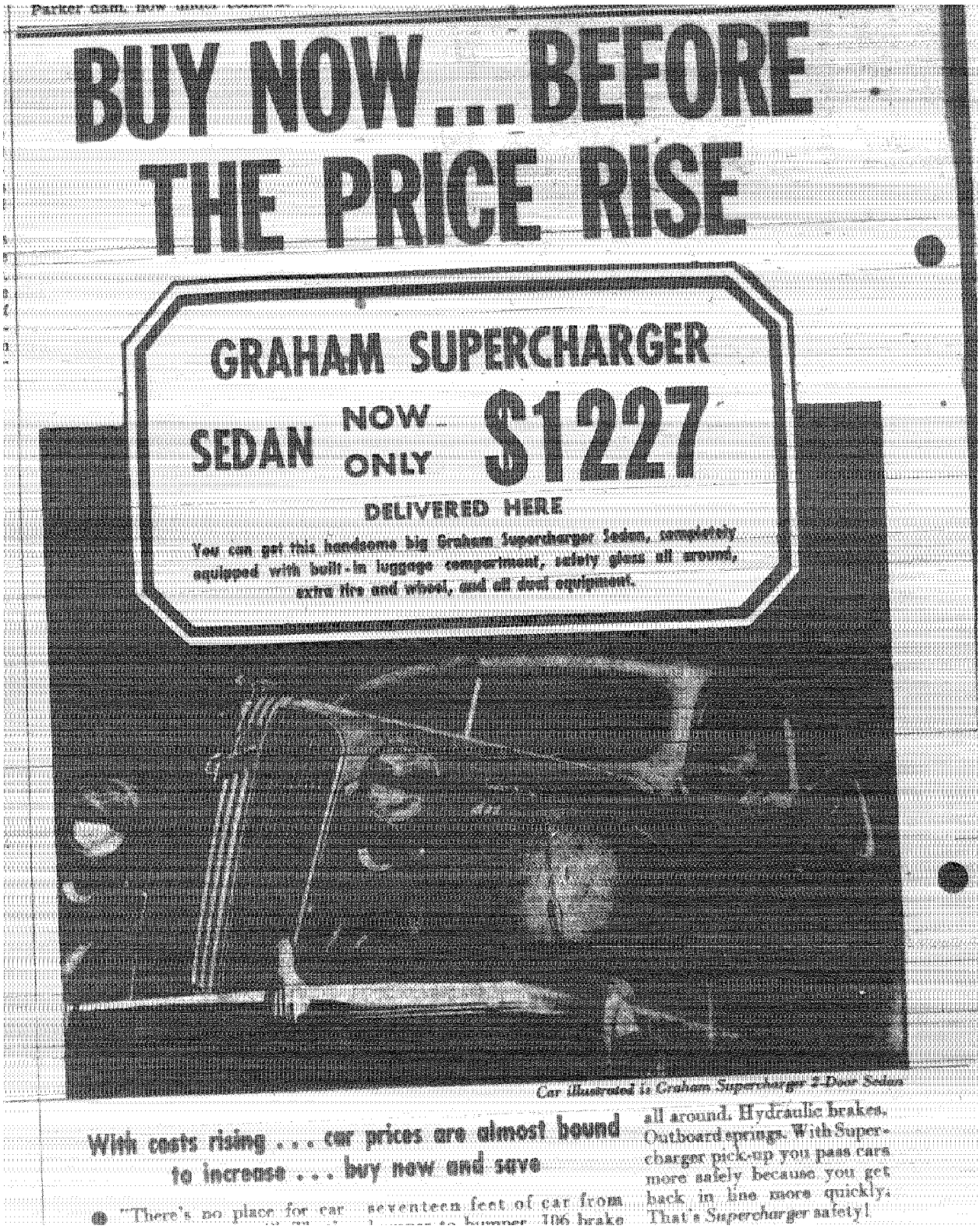
5.2 Narrative Evidence

As discussed above, during the summer and early fall of 1937 price increases were widely expected within the auto industry. Contemporary industry observers reported that consumers also expected prices to increase and that this drove up sales prior to the introduction of new model year vehicles in October and November. For example, an article on the front page of the July 24, 1937 issue of *Automotive Industries* stated (p. 103): "The public has the impression, probably well founded, that 1938 cars will be somewhat higher in price and not much different from the present models. This is leading to current buying in considerable volume." A confirmation of this view comes from an ad appearing in the *San Francisco Chronicle* on August 8, 1937 (figure 10). This ad, for a Graham Supercharger, encourages customers to "buy now . . . before the price rise." It suggests that higher prices were expected, and that they motivated purchases.

In 1938, General Motors sponsored a study on the effect of auto prices on demand which

[40] Busse, Simester, and Zettelmeyer (2010) provide contemporary evidence from employee pricing in summer 2005 for the importance of this mechanism as a determinant of auto sales.

Figure 10



BUY NOW...BEFORE THE PRICE RISE

GRAHAM SUPERCHARGER

SEDAN NOW ONLY $1227

DELIVERED HERE

You can get this handsome big Graham Supercharger Sedan, completely equipped with built-in luggage compartment, safety glass all around, extra tire and wheel, and all deal equipment.

Car illustrated is Graham Supercharger 4-Door Sedan

With costs rising . . . car prices are almost bound to increase . . . buy now and save

"There's no place for car ... seventeen feet of car from ... bumper to bumper. 106 brake ... all around. Hydraulic brakes. Outboard springs. With Supercharger pick-up you pass cars more safely because you get back in line more quickly. That's Supercharger safety!

From the *San Francisco Chronicle*, August 8, 1937.

was presented at a joint meeting of the American Statistical Society and the Econometric Society. The published volume begins with an essay by a General Motors employee S. L. Horner (1939) summarizing the reasons General Motors sponsored the study and providing an overview of the determinants of auto demand. Horner emphasizes the importance of price expectations, particularly in 1937 (p. 14-15):

> During periods of rising costs, such as that which took place in 1937 when labor costs were rising so rapidly, prospective automobile purchasers tend to anticipate an increase in the price of automobiles. This is particularly apt to be the case when the advance in costs continues over a considerable period of time without an increase in automobile prices. Automobile buyers are sufficiently well informed to realize that any such increase in costs must, in time, cause an increase in automobile prices. And, if they do not arrive at this conclusion themselves, they are almost certain to have it impressed upon them by dealers and salesmen within the industry. Thus, during the spring and summer of 1937, dealers and salesmen were urging people to buy their new cars, before prices increased. This tends to cause a bulge in sales which is followed, after prices are increased, by a decline in sales.

Horner attributes low sales in 1938 to the fact that "many people, anticipating that an increase in automobile prices would be made when the 1938 models were announced, purchased cars in the 1937 model year which they otherwise would have purchased in 1938" (p. 14).

5.3 Quantitative evidence

The hypothesis that price expectations boosted sales in summer and early fall 1937 and depressed sales in 1938 has a testable implication. If the hypothesis is true, then a statistical model of auto sales that incorporates determinants of auto demand other than auto prices and price expectations should underpredict sales in the summer of 1937 and overpredict sales

in 1938. In this subsection, I construct such a model and use it to quantify the effect of the auto price shock.

In addition to autoregressive lags and seasonal dummies, there exist an almost limitless number of possible variables that might have predictive power for auto sales. I proceed by considering only variables that measure the stance of monetary and fiscal policy and / or were deemed important by contemporary and current forecasters of auto sales.

Horner (1939) provides a useful guide to how contemporaries thought about the determinants of auto sales. He argues that the following equation fits annual sales well:

$$log(Sales)_t = \beta_0 + \beta_1 log(GNP)_t + \beta_2 log(GNP_t/GNP_{t-1}) + \epsilon_t \tag{2}$$

As a guide to how modern economists forecast sales, I consider the reduced form forecasting equation for light vehicle sales in the Michigan model of the U.S. economy (Hymans et al. 2002, equation C33). This equation includes two proxies for the state of the macroeconomy: a distributed lag of real personal disposable income and the change in the unemployment rate.

Below I describe each variable I use and the reason for its inclusion. In appendix A.1, I discuss how I use information criteria to select the number of lags to use for each variable.

5.3.1 Seasonal Effects

In the interwar period, auto sales exhibited a strong seasonal pattern, with winter sales far below summer sales. Seasonal patterns were partly driven by the weather: muddy roads made driving unpleasant or infeasible in much of the country during the winter and spring. But a large driver of seasonal patterns was also the introduction of new model vehicles. Until 1935, new model vehicles were introduced in January of each year. Thereafter, in a change coordinated through the National Industrial Recovery Act, new models were introduced in October or November (Cooper and Haltiwanger 1993). To account for the resulting change

in seasonal patterns, I include both a full set of monthly dummies and a set of monthly dummies interacted with a dummy variable equal to one in 1935 and after.

5.3.2 Real Personal Disposable Income

Both Horner (1939) and the Michigan model include a measure of national income. Horner (1939) uses GNP, and the Michigan model uses real personal disposable income. For my purposes, disposable income has the attractive feature that it reflects both the evolution of wages and profits in the private sector and changes in taxes and transfers. Thus it proxies for the state of the economy and fiscal policy actions. Unfortunately, there is no monthly series for disposable income in the interwar period. But Harold Barger constructed a seasonally adjusted quarterly measure of nominal personal disposable income.[41] I deflate this by the CPI and convert it to a monthly series with linear interpolation.

Note that since auto sales cause income as well as vice versa, including real disposable income in the forecasting model will bias the results against finding a large effect of the exogenous auto shock. For example, if sales were unusually low in 1938, this would have lowered real disposable income, leading my forecast to underestimate the level of sales that would have occurred absent the shock. Since I will measure the impact of the shock as the difference between forecast and actual sales, this will have the effect of reducing the size of the measured shock.

5.3.3 The Money Supply

Neither Horner (1939) nor the Michigan model include a measure of the money supply or interest rates. However, since I wish to know what part of the decline in auto sales cannot be accounted for by macro policy, I need a measure of monetary policy in the forecasting equation. Theory suggests that interest rates rather than the quantity of money ought to be most directly linked to sales. The proportion of cars sold on credit exceeded 50

[41] NBER macrohistory series q08282a. Underlying source is "Unpublished data from the files of Dr. Harold Barger."

percent in every year from 1919-1939 (Olney 1999, Table II), providing an obvious channel through which interest rates could affect sales. Since interest rates changed little in 1937-38 (figure 1(b)), however, they will be unable to forecast the decline in auto sales between 1937 and 1938. To make sure I do not understate the possible impact of monetary policy on sales, I instead include the quantity of money, specifically the seasonally adjusted broad money stock (currency held by the public plus demand and time deposits of commercial banks).[42]

5.3.4 Recession Dummy

The Michigan model includes the unemployment rate. Unfortunately, this is unavailable at a monthly or quarterly frequency before 1929. As an indicator of general business cycle conditions, I instead incorporate a dummy variable equal to 1 in a month between an NBER business cycle peak and trough (inclusive of the peak and trough month).

5.3.5 Results

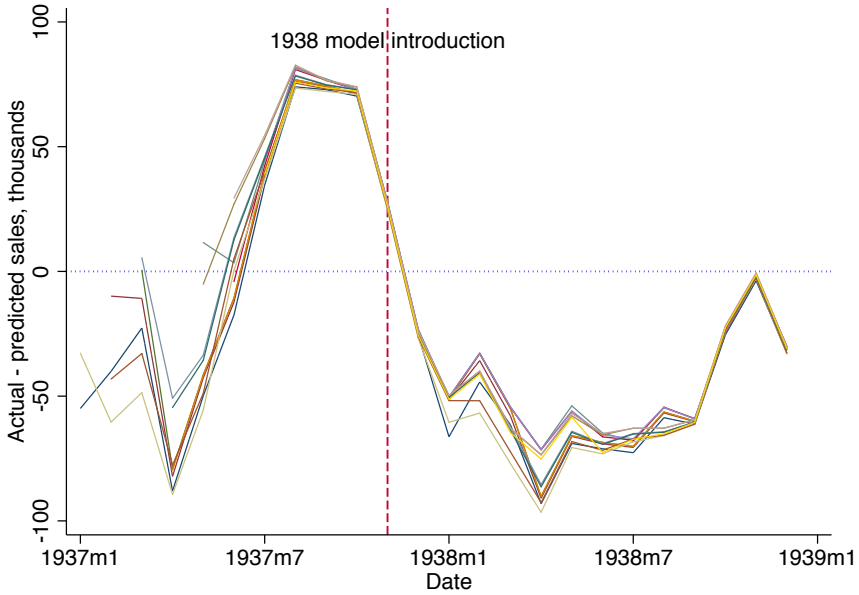
Monthly auto sales data begin in 1925.[43] To allow for up to 12 possible lags, I estimate each model over the period January 1926-March 1937. I choose March 1937 as the end date, since it is roughly when unionization was complete and is thus the earliest consumers would have started to expect price increases for the next model year. Appendix table A.2 shows the estimation results for the optimal specifications chosen by AIC and BIC information criteria. Both specifications are parsimonious and have excellent in-sample fit. The coefficients themselves are of little interest, since the goal of this exercise is forecasting, not inference.

Figure 11 shows the difference between actual and predicted auto sales in 1937 and 1938. Since the forecast is somewhat sensitive to the start date, I graph the difference between the

[42]NBER macrohistory series m14144a, computed by the NBER from underlying data in Friedman and Schwartz (1970), *Monetary Statistics of the United States.*

[43]As is standard in the literature (e.g. Cooper and Haltiwanger 1993), I use new registrations as the measure of sales. Unfortunately, data on actual sales are not reported in the interwar period. Purchasers of new cars were legally obligated to register their vehicles although some lag was possible (*Survey of Current Business* 1934). Data on registrations were reported monthly in the *Survey of Current Business.* I take the data from NBER macrohistory series m01109.

Figure 11: Actual minus predicted auto sales



Source: See text.

AIC and BIC forecasts and actual auto sales for all forecast start dates from January 1937 to July 1937.[44] The models perform poorly and disagree significantly in the spring of 1937. In this period actual sales are *less* than forecast sales, perhaps reflecting the effects of strikes in the auto and other industries.[45] But beginning in mid-summer 1937, there is remarkable agreement among the forecast models. All predict sales below actual from July to November 1937, and all predict sales above actual from December 1937 to December 1938. One might worry that the bulge in summer 1937 is not evidence of sales being shifted forward, but rather of sales making up for the short-fall earlier in the spring. But the bulge is larger than the earlier shortfall. Using the forecast median, the cumulative difference between actual and predicted sales from January to May 1937 is -223,000, whereas that from June through November is 294,000.

[44] The forecasts have slightly different coefficients since they are estimated over slightly different samples, depending on the forecast start date. For example, if the forecast start date is February 1937, the model is estimated over the period January 1926 to January 1937.

[45] *Automotive Industries*, 7/31/37, p. 138 wrote: "Psychological unrest, combined with an actual loss of purchasing power due to the strikes in various industries this year, can probably be blamed more than anything else for the failure of automobile sales to set new records in May and June."

Table 8: Aggregate implications

Year	Auto sales (thousands)	Auto sales w/o auto price shock (thousands)	Change in real GDP	Change in real GDP w/o auto price shock, M=.8	Change in real GDP w/o auto price shock, M=1.5
1936	3404		12.9%		
1937	3485	3336	5.1%	5.0%	4.9%
1938	1890	2506	-3.2%	-2.7%	-2.2%

Sources: Real GDP is from NIPA table 1.1.6A. Auto sales data are from NBER macrohistory series m01109 (see text).

Qualitatively the forecast exercise fits remarkably well with the narrative evidence and theoretical consumption response. In summer and early fall 1937, before the price increase occurs, sales are higher than they otherwise would have been; after the price increase, sales are far lower than they would have been.[46]

Table 8 shows the quantitative implications of the forecasting exercise for the aggregate economy. Columns 2 and 3 show annual auto sales and forecast auto sales in 1936, 1937, and 1938.[47] If not for the price shock, unit sales would have fallen by 'only' 25 percent between 1937 and 1938; instead, they fell by 46 percent. Column 4 shows the actual percent change in real GDP. Columns 5 and 6 show counterfactual estimates of GDP growth without the auto price shock. I compute the counterfactual GDP level as

$$GDP_{cf} = GDP + (Sales_{cf} - Sales) \cdot P \cdot M, \tag{3}$$

where X_{cf} is the counterfactual estimate of X, P is the average retail price of a passenger vehicle, and M is the multiplier for automobile spending. For P, I use the estimate in Suits (1958, p. 279) for the average retail value of cars sold in 1937, \$808. For the value of the

[46] One might wonder why forecast sales are still below actual sales in November 1937, even though prices had by then risen. There are two possibilities: one is that 1937 model vehicles may still have been sold at the old lower price in the first part of the month. Second, since the data are registrations, they may have some lag relative to actual sales.

[47] Forecast sales in 1937 equal actual sales through March plus forecast sales for April to December. The forecast is the median of the specifications minimizing AIC and BIC for start dates from January to July.

multiplier, I use 0.8 in column 5 and 1.5 in column 6. In her survey of the literature, this is the likely range for the government spending multiplier found by Ramey (2011).[48] Columns 5 and 6 show that expectations of price increases boosted sales and thus GDP growth in 1937 but made the recession in 1938 much more severe. The auto price shock explains as much as a third of the 1938 GDP decline.

6 Can the auto price shock explain the recession's anomalies?

6.1 Timing

In the interwar period, auto production and sales were highly correlated (Cooper and Haltiwanger 1993). Auto manufacturers appear to have emphasized a target inventory level rather than production smoothing (Kashyap and Wilcox 1993). Thus as sales collapsed in fall 1937, so did production. From January 1937 to January 1938, auto sales fell 48 percent while auto production fell 50 percent.[49] To what extent does this decline explain the rapid decline in industrial production as a whole?

Automobile production had a 4.79 percent weight in the Federal Reserve industrial production index (Federal Reserve Board 1940). Hence even very large swings in auto production can account only for modest swings in industrial production as a whole. The key to the quantitative importance of auto production for movements in the industrial production index is the large input-output linkages between auto production and other manufacturing sectors. Fortunately, while working for the Bureau of Labor Statistics (BLS), Wassily Leontief con-

[48] Estimates of the multiplier come with substantial uncertainty. Some authors (e.g. Barro and Redlick 2011) have found government spending multipliers as low as 0.5 while others have found multipliers above 2 (e.g. Alumnia et al. 2010). And of course, the multiplier for autos spending may not be the same as that for government spending. But, as noted by Hall (2009), there is no obvious reason that the multiplier for government spending should be any different from that for consumption spending. For more on multipliers in conditions like those in 1937, see also Fishback and Kachanovskaya (2015) and Gordon and Krenn (2013).

[49] NBER macrohistory series m01109 and m01107a.

Table 9: Share of industry group output purchased by the motor vehicle industry

Industry group	Share of net output purchased by motor vehicles industry
Durable manufactures	
Iron and steel	12.5%
Machinery	1.7%
Transportation equipment ex. autos	0.0%
Nonferrous metals and their products	5.2%
Lumber and products	0.7%
Stone, clay, and glass Products	2.7%
Nondurable manufactures	
Textiles and products	0.9%
Leather and products	0.4%
Manufactured food products	0.0%
Alcoholic beverages	0.0%
Tobacco products	0.0%
Paper and products	0.1%
Printing and publishing	0.0%
Petroleum and coal products	0.4%
Chemicals	0.9%
Rubber products	19.8%
Minerals	
Fuels	0.4%
Metals	10.6%

Source: Calculated from the 1939 38x38 input-output table in BLS (undated).

structed a 38x38 input-output table for the 1939 U.S. economy (BLS, undated). Although a smaller version was published in Leontief (1951), until now the unpublished larger table appears to have been unnoticed and unused by economists. The larger table is a valuable source of information on the linkages connecting auto production with the rest of the economy.

Table 9 shows the share of net output consumed by the motor vehicle industry for each Federal Reserve industry group. Demand from auto manufacturers was particularly important for steel production. Aside from the construction sector, the auto industry was the largest purchaser of steel products. To get a rough quantitative sense of the importance of the auto industry for the timing of industrial production movements, I construct an industrial production index that excludes autos and the share of other sectors consumed by the

auto industry ('purged industrial production').[50] Formally,

$$IP_{xauto,t} = IP_t - v_{auto} IP_{auto,t} - \sum_{i=1}^{18} w_i v_i IP_{i,t}, \tag{4}$$

where w_i is the share of industry group i net output purchased by the auto industry, v_i is the share of industry group i in total industrial production, and $IP_{i,t}$ is the seasonally adjusted value of the industrial production index for industry group i (indexed to 1935-39=100). Industrial output weights and indexes are from the Federal Reserve (1940).

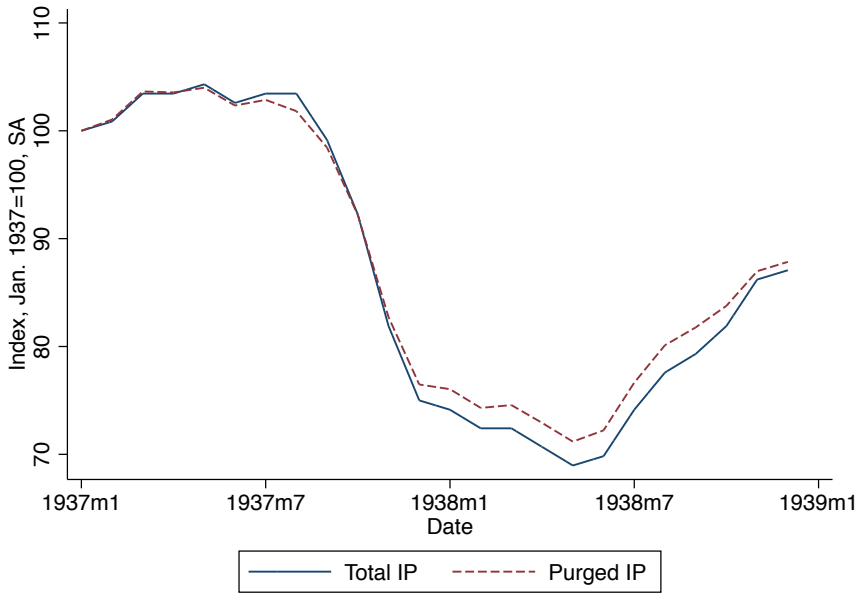
Figure 12 shows the path of total and purged industrial production in 1937 and 1938. In the summer of 1937, when auto sales were brought forward due to expected higher prices, total industrial production (which includes autos) exceeded the purged index. This result confirms the view expressed in the *Review of Economics and Statistics* summary of the 1937 economy that "During the spring and summer months [of 1937], the maintenance of manufacturing output at the high level attained in 1936 was due almost entirely to sustained activity in the iron and steel and automobile industries" (Crum, Gordon, and Wescott 1938, p. 45). In the late fall, once auto prices rose, total industrial production fell below purged industrial production. This exercise suggests that the auto shock likely contributed to the rapid decline of industrial production in fall 1937 by boosting production in late summer and lowering production in early winter. Quantitatively, however, the impact of autos on industrial production is modest. The overall industrial production index fell 24 percent from September to December while the purged index fell 22 percent.

6.2 Geography

To see how the auto shock may explain variation in state outcomes during the recession, I construct a measure of the share of manufacturing employment in each state in a 'synthetic'

[50] This is similar to the procedure used by Temin and Wigmore (1990) to understand the effect of auto and steel production growth on overall industrial production growth in spring 1933.

Figure 12: Total and purged industrial production



Sources: Total industrial production - Federal Reserve (1940); purged industrial production - see text.

auto sector ($Share$).

$$Share_j = e_{auto,j} + \sum_{i=1}^{16} w_i e_{i,j}, \tag{5}$$

where $e_{auto,j}$ is the share of state j wage earner employment in the motor vehicle industry, w_i are the sectoral linkages from table 9 (the share of industry i output used in the production of motor vehicles), and $e_{i,j}$ is the share of wage earner employment in state j in industry i. Employment shares are from the 1937 *Census of Manufactures*. Table 10 shows the values of $Share$ for each state. Unsurprisingly, the highest values are in the traditional centers of the auto industry, Michigan, Indiana, and Ohio.

Michigan, Indiana, and Ohio—in that order—were also the three states with the worst manufacturing employment outcomes in the recession (figure 4). This link is almost certainly causal: since demand and employment in the auto industry were determined nationwide, it cannot have been poor conditions in these states that caused the decline in auto industry employment. And it is unclear what, if any, third factor would have caused both an outsized

Table 10: Share of state manufacturing employment in the synthetic auto sector

State	Share	State	Share
AL	3.4%	NE	0.6%
AZ	2.4%	NV	0.1%
AR	0.7%	NH	0.7%
CA	5.5%	NJ	4.0%
CO	3.0%	NM	0.5%
CT	4.1%	NY	3.7%
DE	1.8%	NC	0.9%
FL	0.7%	ND	0.1%
GA	1.4%	OH	11.5%
ID	0.5%	OK	1.7%
IL	4.5%	OR	1.1%
IN	14.0%	PA	5.7%
IA	1.8%	RI	2.3%
KS	1.6%	SC	0.9%
KY	2.2%	SD	0.2%
LA	0.9%	TN	1.8%
ME	0.6%	TX	1.3%
MD	3.9%	UT	1.0%
MA	2.6%	VT	1.2%
MI	47.9%	VA	0.8%
MN	2.5%	WA	1.1%
MS	0.7%	WV	3.8%
MO	6.3%	WI	10.2%
MT	0.3%	WY	0.3%

Sources: See text.

Table 11: State employment outcomes and synthetic auto share

Panel A: Including Michigan

	Private employment change 37-38	Private employment change 37-38	Private employment change 37-38	Manufacturing employment change 37-38	Manufacturing employment change 37-38	Manufacturing employment change 37-38
Share	-0.332***	-0.353***	-0.327***	-0.584***	-0.482***	-0.450***
	(0.0965)	(0.0809)	(0.0764)	(0.143)	(0.103)	(0.105)
Impact of 1 standard deviation increase (percentage points)	*-2.4*	*-3.0*	*-3.3*	*-4.2*	*-4.2*	*-4.5*
Sample	All states	States with > 50,000 wage earners	States with > 100,000 wage earners	All states	States with > 50,000 wage earners	States with > 100,000 wage earners
Observations	48	31	22	48	31	22
R-squared	0.205	0.396	0.478	0.267	0.430	0.482

Panel B: Excluding Michigan

	Private employment change 37-38	Private employment change 37-38	Private employment change 37-38	Manufacturing employment change 37-38	Manufacturing employment change 37-38	Manufacturing employment change 37-38
Share	-0.499**	-0.612***	-0.506**	-1.342***	-0.988***	-0.895***
	(0.238)	(0.210)	(0.215)	(0.332)	(0.256)	(0.279)
Impact of 1 standard deviation increase (percentage points)	*-1.5*	*-2.0*	*-1.8*	*-3.3*	*-2.5*	*-2.4*
Sample	All states	States with > 50,000 wage earners	States with > 100,000 wage earners	All states	States with > 50,000 wage earners	States with > 100,000 wage earners
Observations	47	30	21	47	30	21
R-squared	0.089	0.233	0.226	0.266	0.347	0.351

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Note: Constant not shown. Sources: Employment data are from Wallis (1989). Construction of *Share* is described in the text.

decline in auto industry employment and poor employment outcomes in these three states.

Some contemporaries noticed this link and blamed the auto industry. A.A. Berle Jr., the assistant secretary of state, advocated government planning of auto production noting that "the motor industry in 1937 undertook largely to increase its output and sales. It did this at the cost of suspending much of its activities in 1938 and causing widespread distress in the Detroit and Ohio areas" (*Automotive Industries*, 8/27/1938, p. 242). General Motors in particular attracted public attention when on one day, January 1 1938, it laid off 30,000 workers (*Automotive Industries*, 1/1/38 and 1/15/38).

To more formally assess the link between the auto sector and state employment outcomes, I estimate the simple regression of state employment change on *Share*. Results are in table 11. Panel A includes Michigan while panel B excludes Michigan. The high share of employment linked to the auto industry explains why Michigan does so poorly in the reces-

sion, and hence excluding Michigan from the regression reduces the statistical significance of *Share* and the R^2. The tables also shows results for subsets of states with significant employment in manufacturing, since many small states have trivially low values of *Share*. Even in the regressions excluding Michigan, there is strong evidence that the share of employment linked to the auto industry was negatively correlated with state outcomes during the recession. Results are generally statistically and economically significant. In the specification including all states, a one standard deviation higher value of *Share* lowers total state employment growth in the recession by 2.4 percentage points and lowers manufacturing employment growth by 4.2 percentage points. Among the 22 states with more than 100,000 manufacturing wage earners, employment in the synthetic auto sector explains 48 percent of the variation in manufacturing employment outcomes. This is evidence that the auto shock played a role in generating large geographic variation in 1937-38.

6.3 Sectors

The auto shock can explain the anomalous decline in motor vehicle consumption during the recession. As noted above, the forecasting exercise suggests that absent the price shock, unit auto sales would have fallen by 25 percent between 1937 and 1938 rather than the actual 46 percent. Measured in chained 1937 dollars, total durables consumption fell 17.6 percent from 1937 to 1938.[51] With the conservative assumption of no multiplier effect on other durables purchases, and that 70 percent of passenger car sales were to consumers, the decline in durables consumption would have been 11.9 percent absent the auto shock.[52]

The principle other anomaly in the recession is that nondurables consumption *rises*. It is possible that this reflects a relative price effect of the auto shock. Households may have spent some of the income that they would have spent on autos on nondurable items like clothing

[51] NIPA table 1.1.6a. In section 3.3, I report percent changes of the current BEA quantity indexes, which differ slightly.

[52] It is standard to assume that 70 percent of passenger car sales are to consumers. See Olney (1991), p. 95.

and food.[53] In February 1937, a pound of lard cost 18.2 cents and a standard two-door Ford sedan cost \$585.[54] Buying the Ford meant giving up 585/.182 = 3214 pounds of lard. In February 1938, the price of a pound of lard had fallen to 14.2 cents while the price of the Ford had risen to \$665. Buying the Ford in 1938 meant giving up 665/.142 = 4683 pounds of lard. Thus consumers may have chosen to buy more lard and fewer Fords.[55] This effect could also rationalize why employment rose in so many states. In all states in which manufacturing employment rose, the value of *Share* is below 3 percent. Manufacturing employment in these states had little direct connection to auto demand. The increase in nondurables consumption—perhaps due to the relative price shock—may explain the unusually good performance of these states in the recession.

7 Conclusion

The 1937-38 recession exhibits timing, sectoral, and geographic anomalies not easily explained by monetary policy, fiscal policy, or economy-wide unionization. The decline in industrial production from September to December 1937 is the largest three-month decline in the history of the Federal Reserve and Miron-Romer series going back to 1884. Manufacturing employment rises in 8 states despite a 12 percent decline nationwide, and durables consumption falls over 17 percent while nondurables consumption rises.

This paper argues that a supply shock in the auto industry explains a significant part of these anomalies. Labor strife and raw material price increases raised costs for auto manufacturers in early 1937. However, nominal price rigidity meant that prices for new autos did not rise until late summer and fall. For several months consumers expected the price increase, leading to a bulge in purchases in the summer and early fall of 1937 followed by a

[53] Of course, this effect would have pushed down the multiplier associated with the decline in autos spending in 1938. Thus insofar as the auto shock explains the increase in nondurables consumption in 1938, it is less likely to explain a large portion of the recession itself.

[54] Lard prices are from NBER macrohistory series m04027 and are the retail price of lard in New York. Ford prices are from *Automotive Industries*, 11/13/1937.

[55] Data on lard production are from NBER macrohistory series m01142a; data on Ford production are from Heasley (1977).

collapse of auto sales and production in 1938. This hypothesis is confirmed both by narrative evidence and by a quantitative forecasting exercise. I construct a forecast of how sales would have behaved absent exogenous developments in the auto industry. This illustrative exercise implies that in 1938, 600,000 more cars would have been sold, and GDP growth would have been as much as one percentage point higher. Equally important, there is strong evidence that the auto shock contributed to the anomalous timing, geographic, and sectoral patterns of output in the recession. Absent this shock, the 1937-38 recession would have been both less severe and less unusual.

Table A.1: Lag possibilities for forecasting model

Variable	Lags considered
Log Auto Sales (Dependent variable)	1-12
Log Real Personal Disposable Income	0-12
Log Difference Money	0-12
Recession Dummy	0-12
Total number of specifications	26,364

A Appendix

A.1 Lag selection

Ideally, one would like to consider all possible lag combinations of variables used in the forecast model as well as run the model with all variables in levels, logs, differences, and log differences. To make computational time reasonable, I limit these possibilities in several ways. First, I consider only models with the dependent variable (auto sales) in logs. Preliminary regressions suggested this yielded as good a forecast (measured by information criteria) as any other transformation of the dependent variable, and it is the form preferred by Horner (1939). Since there may be a trend to log auto sales, I include a time trend. Second, based on results from preliminary regressions, I include only the log of real personal disposable income, the log difference of the money supply, and the level of the recession dummy. Third, I do not consider specifications in which lags are skipped. Thus I consider, for example, all possible specifications with 4 lags or 12 lags of log disposable income, but I do not consider a model with just the 4th and the 12th lag. Table A.1 summarizes the specifications I consider.

To choose what lags to include, one does not simply want to choose the model with the best fit. Such a procedure would select an overparameterized model with poor out-of-sample performance. An approach to dealing with this problem is to select models by minimizing an information criterion. An information criterion rewards in-sample fit but penalizes additional right hand side variables, including lags. For each model, I compute the Akaike information

criterion (AIC) and Bayesian information criterion (BIC), where

$$AIC = Nln(SSR) + 2P, \tag{6}$$

and

$$BIC = Nln(SSR) + ln(N)P. \tag{7}$$

N is the number of observations, SSR is the sum of squared residuals (computed relative to the level of auto sales), and P is the number of parameters estimated (Enders 2004, p. 69).

Both the AIC and BIC reward better fit and punish additional variables, but the BIC punishes additional variables more. The BIC will never select a model with more right hand side variables than the model selected by the AIC. Both information criterion are standard and have theoretical appeal. Asymptotically, the BIC will select the correct model. But in a small sample, Monte Carlo studies suggest the AIC may perform better (Enders 2004, pp. 69-70). I evaluate both the AIC and BIC for each possible specification.

A.2 Forecasting model estimation results

Table A.2: Forecasting model estimation results

Dependent variable is log auto sales	Preferred by min. AIC	Preferred by min. BIC
Lag log auto sales	0.682***	0.527***
	(0.0855)	(0.0632)
Lag 2 lag auto sales	-0.309***	
	(0.100)	
Lag 3 log auto sales	0.139*	
	(0.0779)	
Log real disposable income	1.163***	1.110***
	(0.253)	(0.214)
Log difference money	2.173***	2.433***
	(0.704)	(0.719)
Recession dummy	0.0424	0.0588
	(0.0584)	(0.0601)
Lag recession dummy	-0.0884	-0.160**
	(0.0801)	(0.0622)
Lag 2 recession dummy	-0.0619	
	(0.0614)	
Time trend	-0.00197***	-0.00196***
	(0.000481)	(0.000461)
Sample period	Jan. 1926-March 1937	
Observations	135	135
R-squared	0.969	0.966
AIC	1462	1463
BIC	1558	1550

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Note: Seasonal terms and a constant are omitted from the table.

References

[1] Alumnia, Miguel, Agustin Benetrix, Barry Eichengreen, Kevin H. O'Rourke, and Gisela Rua. 2010. "Lessons from the Great Depression." *Economic Policy*, 25:62, pp. 220-265.

[2] *Automotive Industries*. Various issues. Philadelphia: The Chilton Co.

[3] Barro, Robert J. and Charles J. Redlick. 2011. "Macroeconomic Effects from Government Purchases and Taxes." *Quarterly Journal of Economics*, 126, pp. 51-102.

[4] Barro, Robert J. and Chaipat Sahasakul. 1986. "Average Marginal Tax Rates from Social Security and the Individual Income Tax." *Journal of Business*, 59:4, pp. 555-566.

[5] Barsky, Robert B., Christopher L. House, and Miles S. Kimball. 2007. "Sticky-Price Models and Durable Goods." *American Economic Review*, 97:3, pp. 984-998.

[6] Beney, Ada M. 1936. *Wages, Hours, and Employment in the United States, 1914-36.* New York: National Industrial Conference Board.

[7] Blanchard, Olivier, and Roberto Perotti. 2002. "An Empirical Characterization of the Dynamic Effects of Changes in Government Spending and Taxes on Output." *Quarterly Journal of Economics*, 117:4, pp. 1329-1368.

[8] Bureau of Labor Statistics. "Full Employment Patterns, 1950." Undated and unpublished.

[9] Busse, Meghan R., Duncan I. Simester, and Florian Zettelmeyer. 2010. "'The Best Price You'll Ever get': The 2005 Employee Discount Pricing Promotions in the U.S. Automobile Industry." *Marketing Science*, 29:2, pp. 268-290.

[10] Calomiris, Charles W., Joseph Mason, and David Wheelock. 2011. "Did Doubling Reserve Requirements Cause the Recession of 1937-1938? A Microeconomic Approach." NBER Working Paper 16688.

[11] Chow, Gregory. C. and An-Loh Lin. 1971. "Best Linear Unbiased Interpolation, Distribution, and Extrapolation of Times Series by Related Series." *Review of Economics and Statistics*, 53:4, pp. 372-375.

[12] Cole, Harold L. and Lee E. Ohanian. 2001. "New Deal Policies and the Persistence of the Great Depression: A General Equilibrium Analysis." Federal Reserve Bank of Minneapolis Working Paper 597.

[13] 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, pp. 779-816.

[14] Cole, Harold L. and Lee E. Ohanian. 2009. "How Government Prolonged the Depression." *Wall Street Journal*, February 2, p. A17.

[15] Cooper, Russell and John Haltiwanger. 1993. "Automobiles and The National Industrial Recovery Act: Evidence on Industry Complementarities." *Quarterly Journal of Economics*, 108:4, pp. 1043-1071.

[16] Crum, W.L., R.A. Gordon, and Dorothy Wescot. 1938. "Review of the Year 1937." *Review of Economics and Statistics*, 20:1, pp. 43-52.

[17] Darby, Michael R. 1976. "Three-and-a-Half Million U.S. Employees have been Mislaid: Or, an Explanation of Unemployment, 1934-1941." *Journal of Political Economy*, 84:1, pp. 1-16.

[18] Economic Intelligence Service of the League of Nations. 1938. *World Economic Survey 1937/38*. Geneva: League of Nations.

[19] Eggertsson, Gauti B. and Benjamin Pugsley. 2006. "The Mistake of 1937: A General Equilibrium Analysis." *Monetary and Economic Studies.*

[20] Eichengreen, Barry. 1992. *Golden Fetters*. New York: Oxford University Press.

[21] Enders, Walter. 2004. *Applied Econometric Time Series*. John Wiley and Sons.

[22] Federal Reserve Board of Governors. 1939. "Revised Indexes of Factory Employment Adjusted for Seasonal Variation." *Federal Reserve Bulletin*, October, pp. 878-887.

[23] Federal Reserve Board of Governors. 1940. "New Federal Reserve Index of Industrial Production." *Federal Reserve Bulletin*, August, pp. 753-771 and 825-882.

[24] Federal Trade Commission. 1939. *Annual Report of the Federal Trade Commission*.

[25] Fishback, Price V. and Valentina Kachanovskaya. 2015. "The Multiplier for Federal Spending in the States During the Great Depression." *Journal of Economic History*, 75:1, pp. 12-162.

[26] Friedman, Milton and Anna Jacobson Schwartz. 1963. *A Monetary History of the United States, 1867-1960*. Princeton, NJ: Princeton University Press.

[27] Gabaix, Xavier. 2011. "The Granular Origins of Aggregate Fluctuations." *Econometrica*, 79:3, pp. 733-772.

[28] Galenson, Walter. 1960. *The CIO Challenge to the AFL: A History of the American Labor Movement 1935-41*. Cambridge, MA: Harvard University Press.

[29] General Motors. 1937. *Annual Report of General Motors Corporation, Year Ended December 31, 1936.*

[30] Gordon, Robert J. and Robert Krenn. 2013. "The End of the Great Depression 1939-41: Fiscal Multipliers, Capacity Constraints, and Policy Contributions." Northwestern University Working Paper.

[31] Gordon, Robert J. and John M. Veitch. 1986. "Fixed Investment in the American Business Cycle, 1919-83," in *The American Business Cycle: Continuity and Change*, Robert J. Gordon, ed. Chicago: University of Chicago Press for NBER, pp. 267-335.

[32] Hall, Robert E. 2009. "By How Much Does GDP Rise if the Government Buys More Output?" *Brooking Papers on Economic Activity*, fall, pp. 183-249.

[33] Hausman, Joshua K. 2014. "Fiscal Policy and Economic Recovery: The Case of the 1936 Veterans' Bonus." Working Paper.

[34] Heasley, Jerry. 1977. *The Production Figure Book for U.S. Cars*. Osceola, WI: Motorbooks International.

[35] Horner, S. L. 1939. "Statement of the Problem" in *The Dynamics of Automobile Demand*. New York: General Motors Corporation, pp. 3-18.

[36] Hymans, Saul H., Joan P. Crary, E. Philip Howrey, and Janet C. Wolfe. 2002. *The Michigan Econometric Model of the U.S. Economy*.

[37] Irwin, Douglas A. 2012. "Gold Sterilization and the Recession of 1937-38." *Financial History Review*, 19:3, pp. 249-267.

[38] Kashyap Anil K. and David W. Wilcox. 1993. "Production and Inventory Control at the General Motors Corporation During the 1920's and 1930's." *American Economic Review*, 83:3, pp. 383-401.

[39] Lebergott, Stanley. 1964. *Manpower in Economic Growth; the American Record since 1800*. New York: McGraw-Hill.

[40] Leontief, Wassily. 1951. *The Structure of American Economy, 1919-1939; An Empirical Application of Equilibrium Analysis*. New York: Oxford University Press.

[41] Lewis, W. Arthur. 1949. *Economic Survey, 1919-1939*. London: G. Allen and Unwin.

[42] Long, John B. and Charles I. Plosser. 1987. "Sectoral vs. Aggregate Shocks in the Business Cycle." *American Economic Review*, 77:2, pp. 333-336.

[43] Mishkin, Frederic S. 1978. "The Household Balance Sheet and the Great Depression." *Journal of Economic History*, 38:4, pp. 918-937.

[44] Olney, Martha L. 1991. *Buy Now Pay Later: Advertising, Credit, and Consumer Durables in the 1920s*. Chapel Hill, NC: University of North Carolina Press.

[45] Olney, Martha L. 1999. "Avoiding Default: The Role of Credit in the Consumption Collapse of 1930." *Quarterly Journal of Economics*, 114:1, pp. 319-335.

[46] Parker, Jonathan A., Nicholas S. Souleles, David S. Johnson, and Robert McClelland. 2013. "Consumer Spending and the Economic Stimulus Payments of 2008." *American Economic Review*, 103:6, pp. 2530-2553.

[47] Park, Haelim and Patrick Van Horn. 2013. "Did the Reserve Requirement Increments of 1936-1937 Reduce Bank Lending? Evidence from a Natural Experiment." Working Paper.

[48] Raff, Daniel M. G. 1991. "Making Cars and Making Money in the Interwar Automobile Industry: Economies of Scale and Scope and the Manufacturing behind the Marketing." *Business History Review*, 65:4, pp. 721-753.

[49] Raff, Daniel M.G., and Manuel Trajtenberg. 1996. "Quality-Adjusted Prices for the American Automobile Industry: 1906-1940," in *The Economics of New Goods*, Timothy F. Bresnahan and Robert J. Gordon, eds. Chicago: University of Chicago Press, pp. 71-108.

[50] Ramey, Valerie A. and Daniel J. Vine. 2006. "Declining Volatility in the U.S. Automobile Industry." *American Economic Review*, 96:5, pp. 1876-1889.

[51] Ramey, Valerie A. 2011. "Can Government Purchases Stimulate the Economy?." *Journal of Economic Literature*, 49:3, pp. 673-685.

[52] Romer, Christina D. 1989. "The Prewar Business Cycle Reconsidered: New Estimates of Gross National Product, 1869-1908." *Journal of Political Economy*, 97:1, pp. 1-37.

[53] Romer, Christina D. 1990. "The Great Crash and the Onset of the Great Depression." *Quarterly Journal of Economics*, 105:3, pp. 597-624.

[54] Romer, Christina D. 1992. "What Ended the Great Depression?" *Journal of Economic History*, 52:4, pp. 757-784.

[55] Roose, Kenneth D. 1954. *The Economics of Recession and Revival: An Interpretation of 1937-38*. New Haven, CT: Yale University Press.

[56] Sayre, R. A. 1940. "Wages, Hours, and Employment in the United States, 1934-39." *The Conference Board Economic Record*, II:10.

[57] Shaw, William Howard. 1947. *Value of Commodity Output since 1869*. New York: National Bureau of Economic Research.

[58] Suits, Daniel B. 1958. "The Demand for New Automobiles in the United States." *Review of Economics and Statistics*, 40:3, pp. 273-280.

[59] *Survey of Current Business*. 1934. "Index of Sales of New Passenger Automobiles." April, pp. 16-19.

[60] Telser, Lester G. 2003-2004. "The Veterans' Bonus of 1936." *Journal of Post-Keynesian Economics*, 26:2, pp. 227-243.

[61] Troy, Leo. 1957. "Union Membership, 1939 and 1953," in *Distribution of Union Membership among the States, 1939 and 1953*, ed. Leo Troy.

[62] Velde, Francois R. 2009. "The Recession of 1937—A Cautionary Tale." *Economic Perspectives*, 33, pp. 16-37.

[63] Wallis, John Joseph. 1989. "Employment in the Great Depression: New Data and Hypotheses." *Explorations in Economic History*, 26, pp. 45-72 .

[64] Ward's Reports Inc. 1938. *Ward's 1938 Automotive Year Book*. Detroit: Ward's Reports Inc.