

# ***Employment Variability and Mass Production Technology in the British Automobile Industry during the Interwar Period***

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The experience of the British automobile industry between the two world wars casts light on issues which are important from both a historical perspective and from the point of view of economic theory. From a historical perspective the automobile industry is interesting because it advanced earlier than most British industries in developing bureaucratic employment patterns, though not going as far in this direction as its American counterpart. An investigation of the path followed by the British car manufacturers and a comparison of their industry with its American counterpart provides insight into the factors which favoured or retarded the development of bureaucratic employment systems.

The experience of the inter-war automobile industry also has implications for implicit contract theory. The period between the two world wars saw structural changes in the industry which were accompanied by a greater stability in employment patterns. Pronounced seasonal fluctuations in unemployment rates were characteristic of car manufacturing throughout the period before World War II but, while product demand continued to be strongly seasonal throughout the period, the nature and severity of the unemployment fluctuations changed. Of particular interest is the fact that seasonal fluctuations in employment tended to become less severe as mass production methods, accompanied by de-skilling of the labour force, gained a firmer hold on the industry. We have, therefore, a situation in which the replacement of skilled labour with unskilled and semi-skilled labour was associated with greater employment stability. This represents a scenario contrary to the one normally presented in the implicit contract literature, in which firms are assumed to be more reluctant to lay off skilled than unskilled or semi-skilled workers.<sup>1</sup>

This greater stability of employment was associated with the introduction of the bureaucratic employment patterns referred to above but

<sup>1</sup> Okun, *Prices and Quantities*.

it remains to be shown how this bureaucratization can be explained through economic theory. Changes in the seasonal employment pattern of the labour force in the inter-war car manufacturing industry might be due to three developments of this period, each of which will be considered in turn:

- (1) An increase in the capital-intensity of the industry throughout the period.
- (2) An acceleration in the rate of growth in employment in the later years of the period.
- (3) An increase in the importance of firm-specific human capital as a result of the adoption of mass, production techniques.

The paper begins with a comparison of developments in employment practices in the British and American automobile industries in Section I. Sections II and III will describe some important characteristics of the car industry before 1939, showing that there were significant changes in production methods between 1929 and 1934 and that the seasonal pattern of demand for cars remained relatively stable throughout the inter-war period. The remainder of the paper will be devoted to testing the hypothesis that changes in technology led to changes in employer behaviour. Theoretical arguments for such a change in behaviour will be presented in section IV, which draws upon human capital models and principal-agent theory.

Sections V and VI will be devoted to empirical analysis. It will be argued that the change in employer behaviour took the form of an increased desire to hold on to labour at a time when continued instability in demand meant continued instability in production. The implications of this were that, firstly, employment continued to exhibit seasonal fluctuations and, secondly, workers were laid off in such a way that they would continue to be tied to the firm. This could be achieved by relying upon short time and temporary stoppages rather than permanent lay-offs. That this did, in fact, occur is verified by analysing Ministry of Labour data applying to the industry as a whole and data from the National Union of Vehicle Builders applying to Coventry, one of the major car-producing centres.

1. The first three decades of the twentieth century saw some development in the direction of bureaucratic employment patterns in both the United States and Britain but the development was generally much stronger in the American than in the British economy. This reflected differences in the structures of firms, in labour markets, in government policies, and in the severity and timing of cyclical variations in output and employment. Jacoby has pointed to a growing stress on personnel management and the development of internal labour markets in the United States during this period, especially in the 1930s.<sup>2</sup>

<sup>2</sup> Jacoby, *Employing Bureaucracy*, chapters 7, 8.

Gospel argues that in Britain the relative abundance of labour in the early twentieth century provided a disincentive to the introduction of more sophisticated production techniques and the development of strong internal employment systems.<sup>3</sup> He also points to a lack of training of management as a factor preventing the emergence of strong internal systems of labour management.<sup>4</sup> The fact that British firms were slower in developing bureaucratic employment systems probably also reflects differences between the United Kingdom and the United States in the severity of economic fluctuations during the inter-war period. Both countries experienced labour shortages during the First World War and government interventions to maintain war production, which promoted the development of internal labour markets. Both countries also experienced a slack labour market in the 1920s and large-scale unemployment during the Great Depression but for the United States unemployment was less severe in the 1920s than was the case for Britain, where the effects of the tight labour market of the First World War were largely reversed as a result of high unemployment and the defeat of the unions in the engineering lock-out of 1922. In the 1930s, on the other hand, the position was reversed, with unemployment being much more severe in the United States than in Britain. This goes far in explaining the greater emphasis placed in the United States by both government and private firms on the need to stabilize employment in the 1930s. Apart from some abortive attempts at job sharing at the start of the depression this emphasis generally had little practical effect but car manufacturing was an exception. In 1934 the federal government set up the Automobile Labour Board (ALB) to issue rules governing lay-offs and rehires, after which the government and the Board pressured the automobile industry to reduce seasonal instability of employment.<sup>5</sup>

In the United Kingdom there was no equivalent of the ALB but throughout the inter-war period there existed the OXO system, which made it possible for firms to subsidize their employment policies through the system of unemployment insurance.<sup>6</sup> There was no comparable system operated by the government of the United States at this time, though Jacoby points out that in 1931 the Ford Motor Company relied upon Detroit's public relief agencies to supplement the meagre earnings of its workers on short time.<sup>7</sup> As far as Britain is concerned, Thomas indicates that the OXO system was less widely used in manufacturing as a whole than is often supposed but the vehicle industry, with its pattern of severe seasonal

<sup>3</sup> Gospel, *Markets, Firms and the Management of Labour*, p.6.

<sup>4</sup> *Ibid.*, p.7.

<sup>5</sup> Jacoby, *Employing Bureaucracy*, p.237.

<sup>6</sup> For a description of the OXO system see Thomas, 'Labour Market Structure and the Nature of Unemployment in Interwar Britain', p.136.

<sup>7</sup> Jacoby, *Employing Bureaucracy*, p.215.

fluctuations in product demand, seems to have made greater use of the system than other manufacturing industries in the 1930s. Even for the automobile industry the system does not seem to have been much used before 1934, although the system was already well known by the mid-1920s, when it received its name. Only from 1934 do automobile producers resort to temporary stoppages rather than permanent layoffs as a response to seasonal fluctuations in production, as will be demonstrated below in Section V. One of the tasks of this paper is to investigate the reasons for the greater attractiveness of the OXO system to car manufacturers after 1934.

2. The empirical analysis of the paper covers the period between 1926 and 1939 since by 1926 the OXO system was recognized to the extent that the Ministry of Labour in its published statistics separated workers regarded as 'wholly unemployed' from those experiencing 'temporary stoppages'. These years saw pronounced structural changes in the British car industry which make it useful to divide the inter-war period into three sections when discussing the industry. The three sub-periods selected are 1926-29, 1930-33, and 1934-39 since, although the car industry was at no time static, the pace of change which took place during the slump (1930-33) was so much more rapid than that before 1929 or after 1934 that it is not unreasonable to regard the industry as experiencing three phases.

The car manufacturing industry after 1934 differed from that before 1929 in a number of respects which will be discussed below. There was, however, one feature of car manufacturing which was common to the whole inter-war period. An important characteristic of the industry was a tendency for demand to exhibit seasonal fluctuations, a pattern which remained pronounced throughout the 1920s and 1930s. In the following table quarterly fluctuations in the number of current car licences are used as a proxy for fluctuations in demand. The data on car licences reveals the following situation:

<b>TABLE 1 - Number of Car Licences Current at the End of Each Quarter as a Proportion of the Mean for the Year (%)</b>				
<b>(Average for Each Four Four-Year Period)</b>				
	<b>28 February</b>	<b>31 May</b>	<b>31 August</b>	<b>30 November</b>
1926-29	82	104	110	104
1930-33	85	104	110	100
1934-37	87	102	108	102

Source: C.S.O., *Annual Abstract of Statistics*, No.82 (1938)

It is apparent that seasonal fluctuations in product demand continued throughout the inter-war period. The car manufacturing industry of the

1930s differed, however, from that of the 1920s in three major respects which have possible implications for employment stability. Firstly, firms within the car industry were somewhat more capital intensive during the 1930s than during the period 1926-29. Secondly, the industry was growing more rapidly during the later decade. Thirdly, the nature of the skills and experience required of the labour force had changed. The implications of each of these developments is dealt with below.

*2.1 - Increase in capital-intensity.* The capital-intensity of the British car industry rose during the inter-war period, though the increase was surprisingly small since the more widespread adoption of mass production methods tended to be associated not so much with automation as with reorganization of the workforce. In British car manufacturing as a whole the capital/labour ratio rose by 1.5 per cent in real terms between 1919 and 1937.<sup>8</sup> A rise in capital-intensity has possible implications for employment fluctuations because of the existence of depletion costs or costs which are incurred only when demand is greater than supply, including both the loss of present sales and the potential loss of regular customers. Mills has pointed out that when it is costly to change production rapidly firms have an incentive to hold inventories in order to reduce fluctuations in production.<sup>9</sup> A rise in the capital-output ratio would be expected to increase the cost of changing production rapidly so that during the later years of the inter-war period production, and hence employment, would be more stable than sales, which would not necessarily have been the case during the decade immediately following World War I.

Unemployment statistics are available on a monthly basis both for those workers regarded as 'wholly unemployed' and those experiencing 'temporary stoppages'.<sup>10</sup> If an increase in capital intensity was the predominant factor affecting seasonal fluctuations in unemployment we would expect both of these categories to fluctuate less during the 1930s than during the 1920s. As will be seen in Section V there was no significant reduction in seasonal fluctuations in 'temporary stoppages' during the inter-war period, though the fluctuation in numbers 'wholly unemployed' was significantly lower during 1934-39 than during the 1920s. This, along with the small scale of the change in capital-intensity, provides support for the view that a rise in capital-intensity was not the most important factor affecting seasonal fluctuations in employment.

*2.2 - More rapid growth during the 1930s.* During the period after the slump (1930-33) employment grew more rapidly on an annual basis than was the case during the 1920s, as can be seen from Table 2. Other things being equal, this might be expected to reduce the variability of the rate of

<sup>8</sup> Lewchuk, *American Technology and the British Vehicle Industry*, Table 9.2, p.187.

<sup>9</sup> Mills, 'Expectations, Uncertainty and Inventory Fluctuations'.

<sup>10</sup> For the definition of these terms see Section V.

unemployment of vehicle workers during the period 1934-39, as compared with 1926-29. If firms expect seasonally adjusted labour demand to be higher next year than in this year there is an incentive to hold on to surplus labour. At the same time, however, there was a decline in formal skill requirements of the industry during the inter-war period. In the absence of other considerations we would expect firms to be less anxious to hold on to unskilled and semi-skilled workers than to skilled workers and this would reduce the impact upon unemployment stability of growth in total labour demand. The story would be quite different if the decline in the importance of formal skills was offset by a growing importance of informal skills or on-the-job experience.

**TABLE 2 - Per Cent Growth Rates in the Car Industry, 1922-1939**

Year	British Car Production	Employment
1926	16.3	4.3
1927	7.2	2.7
1928	0.5	2.0
1929	10.3	4.5
1930	-7.0	1.0
1931	-6.3	1.7
1932	7.7	0.3
1933	28.9	3.8
1934	16.3	3.7
1935	21.3	5.3
1936	12.9	9.9
1937	3.3	12.0
1938	-10.1	10.3
1939	-10.6	18.4

Sources: Wyatt, *The Austin*, Table 7; Ministry of Labour Gazette.

2.3 A possible increase in the importance of firm-specific human capital. A case can be made that the growth of mass production in the car industry led to a growth in the importance of firm-specific human capital relative to general human capital, which, in turn, implies that employment would be more stable after 1934 than before. This case will be presented in two steps in Section IV of this paper. Firstly, it will be argued that the adoption of mass production methods may be associated with an increase in the importance of firm-specific experience relative to general skills, which, in turn, is associated with an increase in the fixed component of labour cost. Secondly, it will be shown that an increase in the degree of fixity of labour cost increases the incentive for firms to reduce the degree of fluctuation in the size of their labour force.

3. Throughout the inter-war period there existed within the British motor industry both firms which had progressed on the path towards mass production and firms which continued to employ more traditional craft systems. Ford, Morris, and Austin had already begun introducing mass production methods by the mid-1920s, though they were to advance still further in this direction at the start of the next decade. As early as 1914 the Ford Motor Company had adopted mass production methods at its plant in Manchester, while in 1923 Morris Motors introduced a system of flow production which was in advance of American practice at the time.<sup>11</sup> Austin also adopted a system of flow production during the 1920s. The firm first moved toward volume production in 1922 with the introduction of the Austin 7 but the real change for the Austin Motor Company came in 1925-6 when an extensive reorganization of its plant was undertaken. Previously all components had been delivered to and issued from central stores but the firm's factory was now reorganized so that components were conveyed directly from one work area to the next.<sup>12</sup>

At the same time that changes were taking place at the plants of the larger producers, however, there continued to exist many small car manufacturers employing traditional methods. In 1922 there were no fewer than 88 car-producing firms in Britain and in 1929 there were still 31, many of them catering for very specialized demand, such as luxury cars or racing cars.<sup>13</sup> The output of the majority of these firms was very small compared to the output levels of the mass producers. In 1931/2, for example, Daimler sold 474 cars and Lanchester sold 902,<sup>14</sup> compared with 50,337 for Morris<sup>15</sup> and 43,802 for Austin.<sup>16</sup>

By 1939 there were still a number of small craft-oriented firms in car manufacturing but the industry was clearly dominated by mass producers. This situation was the result of two developments which had occurred between 1929 and 1934:

(1) Some of the small producers went out of business. The total number of car producers fell from 31 in 1929 to 20 by 1939. Also the share in total British production of the six largest car producers rose from 68 per cent in 1929 to 90 per cent in 1938.<sup>17</sup>

(2) Reorganizations to facilitate greater mechanization and the use of flow production occurred at the plants of the larger firms. In 1933/4 the factories owned by the Morris Motor Company were rationalized so that

<sup>11</sup> Overy, *William Morris, Viscount Nuffield*, p.11.

<sup>12</sup> Wyatt, *The Austin 1905-1952*, p.104.

<sup>13</sup> Maxcy and Silberston, *The Motor Industry*, p.14.

<sup>14</sup> B.S.A., Ltd., board folders.

<sup>15</sup> Overy, *William Morris, Viscount Nuffield*, Table 1.

<sup>16</sup> Wyatt, *The Austin 1905-1952*, Table 10.

<sup>17</sup> Maxcy and Silberston, *The Motor Industry*, p.156.

each car component was produced in only one factory even if it was used in a variety of different models. At the same time full conveyor-belt methods and the moving assembly line were adopted in the production of the various components.<sup>18</sup> During these same years (1933/4) a reorganization occurred in the Austin works, including extensions to factory buildings and the introduction of a mechanized assembly line to the painting process, while Ford moved from Old Trafford, Manchester, to more modern premises at Dagenham, Essex, in 1932. The car manufacturers located in Coventry also introduced substantial changes in technology in the early 1930s. In particular, the adoption of mass-produced steel bodies in coachbuilding in the 1930s brought the application of large-scale manufacturing techniques. This transformed the body-building and trim shops, which were the stronghold of the National Union of Vehicle Builders, discussed below in Section VI. Change was not, however, limited to body building. The two largest and most successful of the Coventry firms, Rootes and Standard, both adopted new production methods in the early 1930s. Rootes, which controlled Hillman and Humber, reorganized its plants between 1929 and 1931 and in 1934 introduced time-study experts. Standard, following a financial crisis in 1927/8, reorganized and mechanized its assembly shops between 1928 and 1932 to facilitate mass production.<sup>19</sup>

As a result of these developments the industry was much further along the road towards full mass production by 1934 than it had been in 1929.

4. The adoption of mass-production methods in the twentieth century was associated with a decline in general skill levels. Braverman, in his study of the emergence of monopoly capitalism and large-scale factory production suggested that monopoly capitalism was characterised by the progressive reduction in skills for the mass of the workers, a redistribution of employment to those occupations where productivity increases have been lowest (such as service industries), and growth in the supply of wage labour as capitalism moved into domestic production and displaced domestic labour (i.e. women).<sup>20</sup> This suggests that the importance of general skills declined with the adoption of large-scale factory production. This certainly seems to have been true for British car manufacturing. In the early 1930s the proportion of operatives at the Austin works who were semi-skilled was 3/4, while in 1914 the firm had relied heavily upon skilled labour, with all but electrical parts being made in the factory.<sup>21</sup>

<sup>18</sup> Overy, *William Morris, Viscount Nuffield*, pp 53-54.

<sup>19</sup> Thoms and Donnelly, *The Motor Car Industry in Coventry Since the 1890s*, pp 95-98.

<sup>20</sup> Braverman, *Labor and Monopoly Capital*.

<sup>21</sup> Saul, 'The Motor Industry in Britain to 1914'; Zeitlin, 'The Emergence of Shop Steward Organization and Job Control in the British Car Industry: A Review Essay'.

While the importance of (general) formal skills declined, however, there is evidence that job-specific experience became relatively more important. Doeringer and Piore stress the importance of firm-specific skills in the development of segmented labour markets.<sup>22</sup> Internal labour markets developed because skills become more firm-specific and a worker's productivity became more and more a function of his on-the-job training and experience. Such a worker was more valuable to his current employer than he would be to alternative employers and to prevent him from leaving the firm would pay him more than his opportunity wage in the external labour market. The Doeringer and Piore model is based upon the argument that the adoption of mass-production methods created a need for a reduction in labour mobility because it was associated with an increase in the importance of job-specific and firm-specific skills.

Braverman pointed out that while there appeared to have been a decline in general skills it was by no means clear that the level of job-specific formal skills increased, where these are measured by the time it takes to reach maximum efficiency on a job. He argued, however, that modern factory production was associated with the increasing importance of on-the-job experience. General de-skilling of workers as a result of large-scale factory production left on-the-job experience as the only special skill that workers had left, a factor which might tend to tie them more closely to one firm. The view that semi-skilled workers were more attached to one firm than skilled craftsmen received some support from a 1968 study of three Luton firms (including Vauxhall), in which it was found that between 1/2 and 2/3 of semi-skilled workers surveyed had never considered leaving their firm, whereas only 30 % of craftsmen so responded.<sup>23</sup>

The growth in the relative importance of on-the-job experience which was associated with mass production may have arisen from a number of sources. Principal-agent theory points to the problems that might arise when monitoring costs are important or there is asymmetric information. Where such conditions exist they may give rise to implicit contracts that are based largely upon the reputation of actual or potential employees. In a mass-production industry employing largely unskilled or semi-skilled labour monitoring costs may tend to be higher than in a more craft-oriented system of production because of the greater difficulty of monitoring employees in large, as opposed to small, factories while the lack of the screening mechanism provided by formal apprenticeships increases information costs. As a result of such factors known reliability may become the primary reason for hiring a worker in a mass-production system, while in a more craft-oriented system of production formal skills may also be important. This would lead to the growth of bureaucratization as the firm is

<sup>22</sup> Doeringer and Piore, *Internal Labor Markets and Manpower Analysis*.

<sup>23</sup> Goldthorpe *et al.*, *The Affluent Worker*, Vol. 1, pp 26-28, and Table 10.

forced to develop its own screening mechanisms as a substitute for that previously provided, at least partially, by apprenticeship.

An increase in the importance of firm-specific experience of workers as a result of a more widespread adoption of mass-production methods suggests that labour may be viewed as a quasi-fixed cost. The idea that labour includes both fixed and variable costs was suggested by J.M.Clark, who pointed out that very few elements of the 'ultimate cost of labour' vary in proportion to the amount of work done.<sup>24</sup> Clark's analysis emphasized social costs rather than costs to firms but more recent writers, including Oi and Hart, have looked at the nature of labour as a partly fixed cost from the point of view of the firm rather than from the point of view of society.<sup>25</sup> This leads them to conclude that it may not be optimal for a firm to adjust the size of its labour force when there is a shift in demand for its product.

Fixed costs of labour represent an investment by the firm in its labour force. These fixed costs include training costs or investments in human capital, designed to improve the productivity of workers. The importance of such investments in human capital is frequently stressed in the literature relating to labour turnover. Becker suggests that if firms have large specific investment in their employees they will respond to declining demand for their product with relatively lower rates of lay-offs.<sup>26</sup> The reason is that even though the marginal product of specifically trained workers may be less than their wage the firm would suffer if they took other jobs.<sup>27</sup> In other words, the investment in human capital may not be recoverable to the firm when demand picks up again in the future.

In the context of the British car industry this would suggest that the increased adoption of mass-production methods would be associated with the introduction by firms of policies designed to tie labour to individual firms. One such policy would be to offer greater security of employment. We would therefore expect that unemployment fluctuations in the industry would be less severe during the period 1934-39 than during the period 1926-29 since, as demonstrated earlier, by 1934 mass-production methods had become more widely adopted within the industry. Furthermore, when unemployment fluctuations did occur after 1934 they would tend to appear in the form of temporary stoppages rather than in the form of 'permanent' unemployment.

5. It remains to be shown that a reduction in variability in unemployment rates in car manufacturing did in fact occur. Data on

<sup>24</sup> Clark, *Studies in the Economics of Overhead Costs*.

<sup>25</sup> Oi, 'Labor as a Quasi-Fixed Factor'; Hart, *The Economics of Non-Wage Labour Costs*.

<sup>26</sup> Becker, *Human Capital*, p.83.

<sup>27</sup> See also Barth, 'A Time Series Analysis of Layoff Rates'.

monthly unemployment by industry is available for workers covered by unemployment insurance from 1922, and from 1926 the unemployment statistics are broken down under the headings 'wholly unemployed' and 'temporary stoppages'. In the inter-war unemployment data the figures recorded under the heading 'temporary stoppages' included those persons recorded as unemployed on the date of the return who were either on short time or were otherwise stood off or suspended on the definite understanding that they were to return to their former employment within a period of six weeks from the date of suspension. In cases where there was no definite prospect of return within six weeks the individuals were included in the statistics as 'wholly unemployed'. It is significant whether any change in the behaviour of unemployment rates reflects a change in the tendency to dismiss workers in the lean season or a change in temporary stoppages, or both. Table 3 shows variances in the proportions of the work force 'wholly unemployed' for both the vehicle industry and 'all insured persons', while Table 4 shows variances in the proportion of the work force experiencing 'temporary stoppages'. F ratios are provided in the final columns of the two tables in order to indicate whether the differences between the two populations are statistically significant.<sup>28</sup>

From Table 3 we see that for three of the four years of the 1926-29 period variance in the proportion of the work force wholly unemployed was greater for the vehicle industry than for all insured persons in the United Kingdom, though the difference between the two populations was statistically significant in only two years (1926, 1928). For every year during the period 1934-39, however, variance in the proportion of unemployed was less for the vehicle industry than that for all insured workers, and the difference between variances was statistically significant for 4 out of 6 years.

The picture is quite different with respect to temporary stoppages. When we look at Table 4 we find no change after 1934 in the relationship between the variances of the two populations. The variance is higher for the vehicle industry than for all insured persons for every year of the 1926-39 period except 1926. It is apparent that for the vehicle industry after 1934 there was a decline in variability in the 'wholly unemployed' relative to the situation in both the industry itself before 1934 and to that in other sectors after 1934. There is, however, no such tendency in variability of 'temporary stoppages'. In contrast with the earlier post-war years fluctuations after 1934 appear to have been taken up by such stoppages.

<sup>28</sup> At a probability level of 0.95 with 11 degrees of freedom  $F = 2.82$  so that we cannot reject the hypothesis  $S_1^2 = S_2^2$  whenever the calculated F ratio is less than 2.82.  $S_1^2$  and  $S_2^2$  are the variances of the two populations being compared.

**TABLE 3 - Monthly Variances in Proportions Wholly Unemployed**

Year	Vehicle	All Insured	F Ratio
	Industry	Persons	
1926	1.769	0.246	7.190
1927	0.903	0.774	1.165
1928	0.998	0.348	2.867
1929	0.569	0.650	1.143
1930	3.842	3.283	1.170
1931	3.803	0.682	5.573
1932	0.696	0.262	2.653
1933	2.132	1.750	1.218
1934	0.594	0.843	1.418
1935	0.120	0.721	6.021
1936	0.221	1.234	5.588
1937	0.119	0.766	6.432
1938	0.175	0.231	1.324
1939 (11 mos.)	0.261	1.918	7.346

*Source:* Calculated from data in the *Ministry of Labour Gazette, 1926-1939*

**TABLE 4 - Variances in Proportion Experiencing Temporary Stoppages**

Year	Vehicle	All Insured	F Ratio
	Industry	Persons	
1926	0.686	2.550	3.720
1927	0.166	0.037	4.516
1928	0.539	0.274	1.970
1929	0.588	0.047	12.609
1930	4.060	0.728	5.580
1931	2.135	0.554	3.856
1932	1.385	0.667	2.075
1933	1.241	0.353	3.517
1934	1.250	0.233	5.358
1935	0.736	0.196	3.751
1936	0.300	0.122	2.466
1937	0.267	0.117	2.285
1938	0.561	0.194	2.898
1939 (11 mos.)	0.335	0.203	1.648

*Source:* Calculated from data in the *Ministry of Labour Gazette, 1926-1939*

It might be concluded that the contrast in behaviour between the vehicle industry and all industries simply reflected tightness in the supply of vehicle workers or a reduction in seasonal variations in demand for vehicles

but this would be inconsistent with the fact that the variances for temporary stoppages during the later years before the second world war continue to be higher for the vehicle industry than for the rest of the economy. This suggests that the industry continued to be one which was exceptionally prone to seasonal fluctuations in production.

What changed was the response of employers to the seasonal fluctuations. During the 1920s seasonal changes in labour requirements resulted in outright dismissals during the course of each year but in the years following 1934 fluctuations in labour requirements were accounted for by temporary stoppages and the number of wholly unemployed vehicle workers became largely independent of seasonal factors. This contrasts with the earlier period, during which both series exhibited marked seasonal variation.

6. Some further support for the hypothesis that mass production is associated with a greater need to hold on to labour can be drawn from the experience of Coventry, one of the major car-manufacturing centres. In Coventry, where several car manufacturers were based, producers were forced to compete with each other for unskilled and semi-skilled labour. They also had to compete for some types of labour with branches of the engineering industry. These conditions led, at times, to severe competition for labour. There were periodic labour shortages in the 1920s and these shortages became more acute after 1933 with shortages of skilled labour being particularly serious. In the early 1920s coachbuilding skills were at a premium, while the spread of mass-production systems in the 1930s created an increased demand for tool-room workers. Thoms and Donnelly list three major strategies adopted by Coventry firms in their efforts to acquire labour.<sup>29</sup> The first of these was dilution, which was especially important in coachbuilding, a section of the industry which, in the 1920s, employed largely skilled labour. The problem of skill requirements in coachbuilding was finally resolved in the 1930s, when the adoption of mass-produced steel bodies brought the application of large-scale manufacturing techniques. In addition, as indicated in Section III above, the two largest Coventry firms, Rootes and Standard, both reorganized their plants between 1928 and 1932 to facilitate mass production.

The second strategy was to recruit labour from outside the region. This became significant from the mid-1930s, when some firms brought in youths from regions of high unemployment under the government's juvenile transference programme.

The third strategy, and the one most commonly used in the short-run, was the poaching of labour from other firms. As Thoms and Donnelly point

<sup>29</sup> Thoms and Donnelly, *The Motor Car Industry in Coventry Since the 1890s*, pp 107-108.

out, this was already common in the 1920s and became increasingly important after 1935.<sup>30</sup>

The Coventry car-manufacturing industry, therefore, was characterized by de-skilling of labour in the 1930s. At the same time labour poaching was widespread and increasing in importance so that in the 1930s producers were forced to compete with each other for unskilled and semi-skilled labour. The car manufacturers now demanded labour with less formal skills than they had during the 1920s. If, however, labour had become more firm-specific as a result of the adoption of mass-production methods by firms, we would expect more stable employment patterns to have prevailed after 1934 than before 1929.

For this centre there exists a good source of data for the employment of a section of the car-manufacturing labour force. The State Insurance Contribution Books of the National Union of Vehicle Builders (N.U.V.B.) at Coventry list members for each quarter from 1922 to 1938, showing for each member the number of weeks worked in each quarter and whether or not unemployment benefit was received. A sample of 7% was used to estimate the proportion of members who experienced some unemployment during each quarter and also the average duration of unemployment experienced by those members who were not fully employed. Average unemployment rates for each quarter were estimated by using this data.

For the Coventry Division of the N.U.V.B. the mean rate of unemployment per quarter fluctuated more in the course of a year in the 1920s than in the period after 1934. This is brought out clearly in Table 5, which shows the mean and variance of quarterly unemployment rates for three periods. These are the late 1920s (1926-29), the slump (1930-33), and the mid- and late 1930s (1934-38). It can be seen that the variance for 1934-37 is significantly lower than that of 1926-29.<sup>31</sup> The N.U.V.B. data is therefore consistent with a levelling out of seasonal fluctuations during the mid 1930s.

	<b>Mean</b>	<b>Variance</b>
1926-1929	5.3	28.7
1930-1933	12.3	101.0
1934-1938	4.5	6.9

*Source:* Contribution Books, N.U.V.B.

<sup>30</sup> *Ibid.*, p.108.

<sup>31</sup> The F ratio for the two variances is 4.07. At a probability level of 0.99, with 20 and 16 degrees of freedom,  $F = 3.25$ .

7. In this paper it has been suggested that the British car manufacturing industry underwent major structural changes during the period of the 'slump' (1930-33) which tied workers more closely to individual firms and accelerated the development of bureaucratic employment patterns in the industry. As a result of these changes fluctuations in unemployment rates exhibited a pattern in 1934-39 which was markedly different from that prevailing in the 1920s. The structural changes discussed were an increase in the capital-intensity of the industry, a more rapid rate of growth in employment after 1934 than before 1929, and a more widespread adoption of mass-production methods.

The data for insured workers confirms that unemployment variability was, indeed, markedly different after 1934 than it had been before 1929. It was found that permanent unemployment of vehicle workers was much less subject to fluctuation during the later 1930s than during the 1920s and that this marked reduction in unemployment variability was not characteristic of the British economy as a whole. Temporary unemployment, on the other hand, continued to be characterized by severe fluctuations.

Confirmation that a change took place in the behaviour of unemployment rates in car manufacturing is provided by data for the Coventry division of the National Union of Vehicle Builders. It emerges that unemployment rates for the union's membership were comparatively stable throughout each year between 1934 and 1938, in contrast with the years 1926-29. It is therefore apparent that the introduction of mass-production methods into the car manufacturing industry during the inter-war years was associated with a reduction in seasonality of labour demand. This is particularly interesting because it was also associated with a decline, rather than an increase, in the skill level of the labour force.

Implicit contract theory emphasizes the desire of firms to hold on to skilled labour by providing greater employment stability. The experience of the British automobile industry, however, demonstrates that the development of more stable employment can be associated with de-skilling of the labour force. The reliance of firms on bureaucratic employment systems as they adopt mass-production methods can explain this result. The growing size of firms and the decline in importance of apprenticeship as a screening mechanism made it necessary for employers to rely on bureaucratic systems as a means of screening employees. This, in turn, implied tying workers more closely to the firm.

The historical experience of the British car industry between the two world wars, therefore, casts new light on implicit contracts and provides insight into the reasons for the bureaucratization of employment in Britain in the twentieth century.

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