

**Does a Reduction in the Length of the Working Week Reduce Unemployment?  
Some Evidence from the Italian Economy During the Great Depression**

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Revised, March 2005

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### **Abstract**

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## **Introduction**

The view that a reduction in the length of the work week may be an effective remedy against unemployment has a long history. During the thirties, for example, when the Great Depression raised unemployment to unprecedented levels, the reduction in the level of standard hours was the subject of a heated debate similar to the one which has recently taken place in some European countries. The issue, then like now, was whether this type of intervention would be effective in the fight against unemployment or would instead be counter productive.

The theoretical literature,<sup>1</sup> although extremely useful in clarifying the channels through which work sharing can affect employment, does not provide conclusive results. Different conclusions can be obtained depending on the type of labor market investigated (competitive or unionized), on the assumptions concerning the firm's objective function (cost minimization or profit maximization) and on the institutional and contractual setup (overtime pay, hiring and firing costs etc). In general, although economists are largely skeptical on the effectiveness of this policy instrument, theoretical models often achieve ambiguous results and do not exclude the possibility that this type of policy may be successful in increasing employment.

Also the empirical studies that have analyzed the experience of some European countries from the 1960s show conflicting results. Franz and Koenig (1987) and Hart (1987) for West Germany and Holm and Kiander (1993) for Finland found that the reduction in the length of the work-week produced positive employment effects while negative effects were found by Brunello (1989) for Japan and, more recently, by Hunt (1999) for West Germany. A major difficulty in assessing the effectiveness of work sharing arises from the fact that very few experiments are available and that these experiments often differ in the way this policy has been implemented.

In this respect a very interesting case study is provided by the experience of the Italian labor market during the Great Depression. Given the strong increase in unemployment during the period 1929-1933 as a result of the worldwide slump, the Italian government promoted at the end of 1934, a reduction in the length of the work-week from 48 hours to 40 hours. This measure had been preceded by a policy of

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<sup>1</sup> See, among many contributions, Ehremberg (1971), Calmfors (1985), Booth and Schiantarelli (1987), Calmfors and Hoel (1988) and Earle and Pencavel (1990).

nominal wage cuts and, differently from other experiments in democratic countries, it explicitly required that the reduction in hours be accompanied by a proportional reduction in weekly wages in order to avoid an increase in the hourly wage rate.

This experiment, which was preceded by heated debate, was one of the most decisive interventions among those undertaken during the thirties in the industrialized world.<sup>2</sup> The measures enacted in Germany in 1930, which introduced subsidies for firms which hired new workers and at the same time reduced the length of the work week,<sup>3</sup> and those introduced in the United States in 1933 with the National Industrial Recovery Act were not as radical and generalized as the Italian provisions.<sup>4</sup> The Popular Front government of L. Blum in France promoted a radical intervention which forced entrepreneurs and trade unions to sign the Matignon Palace agreements introducing the 40 hour work week; these provisions however remained largely unenforced.

In this paper we study the performance of the Italian labor market during the period 1929-39 and we try to evaluate the effectiveness of the 1934 reduction in the level of standard hours in increasing employment. The availability of monthly data on some labor market variables allows us to use standard econometric techniques to obtain a quantitative assessment of the impact of the reduction of the work week.

The paper is structured in three sections. The first section contains a description of the economic conditions faced by Italy during the Great Depression, with particular reference to the effects of the crisis on the labor market. We also discuss the main institutional features of the Italian labor market during the 1930s and the policies adopted by the Fascist government. In section 2 we analyze the theoretical issues that arise in the analysis of the employment effects of work sharing. In section 3 we investigate the employment effects of a reduction in the level of standard hours by estimating, at the industry level, a demand for workers and a demand for hours of work. We use, for this purpose, a panel derived from a survey of labor market conditions undertaken monthly by the Federation of Italian Industry for the period 1929-39.

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<sup>2</sup> See also Bentivogli and Sestito (1997).

<sup>3</sup> As is well documented by Silverman (1988), following Hitler's ascent to power, the Nazi government undertook a very radical work creation program that achieved miraculous results and strongly reduced unemployment. This program however was mainly based on public work policies and strict controls of labor flows. Work sharing was explicitly rejected as a means to dealing with unemployment.

## 1. The Italian labor market during the Great Depression

### *1.a. The Italian economy during the Great Depression*

The depression that hit the world economy in 1929 had serious consequences in Italy comparable to those observed in the other major industrialized countries. As we analyzed in detail in Mattesini-Quintieri (1997), all the available data indicate that the contraction was extremely severe.

Industrial production between 1929 and 1932 fell by approximately 33%. This was accompanied by a similar fall in employment (Fig.1), and a halving of real exports<sup>5</sup>, which went from 1,300 million lire at mid 1929 to about 650 million lire at the beginning of 1932.<sup>6</sup>

### **Figure 1 - Industrial production and employment indexes**

### **Figure 2 - Price indexes**

At the same time Italy experienced severe deflation with the wholesale price index passing from a value of 106 in March 1929 to its lowest value of 63 in April 1934 (Fig. 2). The cyclical downturn had its trough at the end of 1932 after which, with the exception of 1936, the Italian economy returned to growth until the beginning of the war. Beginning in 1934, prices started increasing, reaching at the end of the thirties the 1929 levels.

The severe output contraction was the combined result of the large fall in world demand and a very restrictive monetary policy<sup>7</sup>. The fall in international trade was a consequence of the huge contractionary shock that spread from the U.S. to the industrialized world, exacerbated by the attempt, in all countries, to reduce imports through a set of protectionist measures. Italy, in this respect, was no exception and tried to shed the productive system from international competition through an increase in

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<sup>4</sup> The National Recovery Administration tried to promote agreements that reduced the length of the work-week in several industries but, which however had a voluntary nature and were not uniformly accepted. For a good account of the NRA see Weinstein (1980).

<sup>5</sup> Nominal exports divided by the consumer price index.

<sup>6</sup> The industrial production index comes from Ministero delle Corporazioni (various years), exports, index of blue collar employment, consumer and producer price indexes come from ASSONIME, Bollettino di Ricerche Economiche, (various years).

<sup>7</sup> These are the main conclusions reached by Mattesini Quintieri (1997). For a detailed account of monetary policy in the interwar years see Cotula e Spaventa (1993).

tariffs that passed from an average of 4.5% in the period 1920-29 to 16.8% in the period 1930-40 and a series of non-tariffary barriers.<sup>8</sup> Perri and Quadrini (2002) claim that these policies had a negative impact on the Italian economy and played an important role in determining the economic downturn of the early 1930s.

The tight monetary policy adopted since 1929 was instead the result of the adherence of Italy to the rules of the gold standard which Italy had entered in December 1927 and officially abandoned only in September 1936. The chronic loss of reserves due to the balance of payments crisis experienced by the country during the depression imposed a continuous decrease in the money supply until 1935, when the monetary base had a sudden 26% increase.<sup>9</sup>

The consequences of the Great Depression on the Italian labor market were dramatic. The index of blue collar employment (Fig.1) that was 100 in 1929 went below 80 in 1932 and, as we can see in Figure 3, the number of people registered at the employment offices quadrupled in three years.

### **Figure 3 - Unemployment (number of unemployed registered at employment offices)**

#### *1.b. The Italian labor market during the Great Depression.*

A clear view of the working of the labor market during the Great Depression can be obtained only if we consider that the fascist regime had created a system of industrial relations that was very different from any of the systems prevailing today among industrialized countries but was also quite unique in the interwar period.

According to this system, denoted as “corporativismo”, the legitimate but often conflicting interests of employers and employees had to be reconciled with the supreme interests of the state<sup>10</sup>. The system was initially created through an agreement signed in October 2, 1925 between the representatives of Italian industrialists and the

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<sup>8</sup> Examples of these barriers are the requirement that Italian products have a minimum of Italian intermediate inputs, the prohibition of the import of goods through the postal service, the strict application of preference rules for domestic products in government and military purchases. For a list of these regulations see Guarneri (1988).

<sup>9</sup> The increase in the money supply was largely dictated by the need to finance military expenditure for the Ethiopian war.

<sup>10</sup> As the Carta del Lavoro, the social manifesto of the regime approved in 1926 stated, “production as a whole is a unit from the national point of view; its objective is unitary and can be summarized in the welfare of individuals and in the development of national power” (De Felice 1996a).

representatives of Fascist trade unions and was then codified in a series of laws approved in 1926.<sup>11</sup> These laws recognized as legal entities only the fascist trade unions and the associations and the Confederation of Italian industry. Only the representatives of these institutions could sign collective contracts and these contracts were legally binding for all employers and employees. The officials of the trade unions were nominated by the Government.

The activities of the unions and the associations of entrepreneurs belonging to the same sector were coordinated inside the Corporations, which were put under the control of the Ministry of Corporations.<sup>12</sup> Strike was illegal and could lead, for the promoters, to imprisonment. Controversies, both concerning the existing contracts or the formation of new contracts, had to be regulated by the state through a set of special magistrates, called labor magistrates.<sup>13</sup>

The labor market that emerged from this complex institutional framework was quite peculiar and is hard to interpret with the standard models currently used for the analysis of the labor market. However, the particular institutional set up and historians' accounts of labor market conditions during the 1930s suggest that this market was effectively close to the competitive model and quite different from today's unionized labor markets in Europe. Official trade unions acted mainly as a transmission mechanism of government policy decisions and had very limited bargaining power.<sup>14</sup> Entrepreneurs were able to hire and fire workers at will and could easily impose their conditions on the workforce that experienced high mobility in and out of unemployment. Case studies of some industrial firms<sup>15</sup> show a situation characterized by rapid turnover and workers experiencing long periods of unemployment.

The high degree of competition in the labor market was also strongly influenced by the relative backwardness of the Italian economy that was characterized by a huge agricultural sector which absorbed, in 1921, about 59% of the workforce and was

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<sup>11</sup> These laws are: L.3.4.26 n.563, R.D.1.7.26 n.1130, R.D.2.7.26 n.1131. For the legal aspects of the system see the first part of Vardaro (1988).

<sup>12</sup> This legal apparatus was not completely defined until 1934 with a law that established 22 corporations and created the "Consiglio Nazionale delle Corporazioni". Later on, in 1939, the corporations became part of the constitutional order and the members of this Council became automatically members of the Chamber of Deputies.

<sup>13</sup> The working of this system has been analyzed by Jocteau (1978).

<sup>14</sup> This does not mean, however, that they were not able, in some instances, to act in the interest of workers vis à vis the entrepreneurs. For particular case studies see Sapelli (1975) and De Felice (1996a) and Musso (1981).

<sup>15</sup> See Piva and Tattara (1983).



affected by widespread underemployment.<sup>16</sup> As is well documented in Toniolo and Piva (1988), there were a large number of unskilled workers willing to move to factories located within commuting distance from home and also the core of skilled urban workers that had cut their ties with agriculture was relatively small. Transatlantic migration, which was the traditional outlet for agricultural underemployment, was almost halted by the U.S. immigration acts of 1921 and 1924, and the attempts of the Fascist regime to restrain from the country to the cities were largely unsuccessful.

### *1c. Labor market policies*

Explaining why unemployment reached after 1929 unprecedented levels in most industrialized countries and why it remained so high for so long has been a challenge for modern macroeconomics and a battleground for competing theories.<sup>17</sup> Since the 1930s, most economists<sup>18</sup> have adopted the Keynesian view that blamed unemployment on the inability of nominal wages to adjust downward as prices decreased. Evidence of real wage rigidity indicated by countercyclical real wages and low-adjusting nominal wages has been found for most countries (Bernanke and Carey (1996) ) and competing theories, like the Lucas – Rapping (1969) model based on market clearing, rational expectations and intertemporal substitution of labor, have failed to provide a convincing explanation of unemployment, especially after 1933.

Even more problematic is the related debate on whether the persistence of unemployment was due to the active labor market policies pursued in many countries during the Great Depression. In the U.S., for example, the New Deal legislation and especially the NIRA has frequently been considered (Weinstein 1980, Temin 1989, 1990) a major determinant of the slow recovery that occurred between 1933 and 1939, and the persistence of high unemployment. A significant debate was also stirred by Benjamin and Kochin (1979, 1982) who presented evidence that in the U.K.

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<sup>16</sup> As an example, reported in Toniolo (1980), during First World War some 2.6 million male agricultural workers were drafted and left therefore agriculture, but the sector's output did not decrease.

<sup>17</sup> For a survey of the research on employment and unemployment during the 1930s, see Margo (1992).

<sup>18</sup> Although they disagree on what primarily caused the Great Depression, the monetary theory of Friedman and Schwarz (1963), the strictly Keynesian views of Temin (1989) and the gold standard theory of Eichengreen (1992) they all rely on nominal wage stickiness in explaining the severity and the persistence of the Depression.

unemployment benefits raised substantially the rate of unemployment.<sup>19</sup>

The problem of unemployment and the effects of labor market policies for the Italian economy in the interwar years have not been extensively investigated as in the British and American cases. A noticeable extension is Toniolo and Piva (1988) who provide a thorough discussion of existing labor market statistics and an interesting appraisal of labor market policies.

As these authors point out, when the crisis started deepening, the fall in employment became a source of deep concern for the Fascist government, which was consolidating its strategy of consensus. The discontent among workers was widespread<sup>20</sup>, and even though the propaganda of the regime tended to project an optimistic view of the future of the country, the authorities became aware of the need to intervene in the labor market.

Through the tight control over wages and labor market contracts the regime was able to pursue a set of active policies in the labor market. The two major types of intervention undertaken in order to fight unemployment were a policy of wage cuts<sup>21</sup> and the promotion of work sharing. A reduction of wages had been already implemented during the period 1926-27 when Italy pursued a very drastic deflationary policy in order to reenter the Gold Standard at the pre-war parity. When the Great Depression hit Italy, the need to control the increase in real wages, caused by the ensuing deflation, became again a priority. In November 1930 the regime imposed a generalized 8% wage cut. By the middle of 1931, however, employers started pressuring for a new reduction in nominal wages. The government did not impose from above another generalized wage cut, but rather let a gradual reduction of wages take place under the pressure created by the high level of unemployment. A new generalized wage cut was imposed only in May 1934. According to this provision, all the industries that had not reduced wages since November 1930 had to reduce them by 7% and all the industries that had partially reduced wages had to adjust them further in order to achieve a 7% reduction.

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<sup>19</sup> The Journal of Political Economy (vol.9, no 2) published four papers critical of Benjamin and Kochin and their reply. For further discussions see Eichengreen (1987), Hatton (1994) and Cole and Ohanian (2001).

<sup>20</sup> An interesting way to measure the situation of the labor market in a non-democratic regime is given by police reports. As shown by De Felice (1996b), police reports of unauthorized riots and demonstrations show a significant increase up to 1932, and then show a decrease in the following years.

<sup>21</sup> For an analysis of the policy of wage cuts see Mortara (1978) and Zamagni (1981)

In fig.4 we show nominal and real wages at the aggregate level. Nominal hourly wages decreased continuously until 1935, but this fall was not sufficient to prevent the increase in real labor costs due to the strong reduction in the price level. Real wages, computed by using the wholesale price index as a deflator, increased by about 40% between 1929 and the beginning of 1934. Such an increase is quite remarkable considering that it occurred in a period of rapid fall in aggregate demand.

#### **Figure 4 – Average industrial wages**

A similar pattern can be found for all the industries. In fig. 5 we show nominal wages and real product wages for eight industrial sectors that will be analyzed in the empirical part of this paper.<sup>22</sup> As for the aggregate data, in all industries we can observe falling nominal wages and increasing real wages until the period 1934-35<sup>23</sup> and then a reversal of the pattern in the following years.

#### **Figure 5 - Nominal and real wages in eight industrial sectors**

The reduction of working time was probably the most interesting among the labor market policies of the Fascist regime. During the Great Depression in all major countries the request for a 40-hour work week was at the center of the trade unions' policy against unemployment. As is well documented by Toniolo and Piva(1988), the Italian official trade unions made work sharing one of the pillars of their strategy and this gave rise to heated debate. While entrepreneurs and economists like Einaudi largely opposed a mandatory reduction in working time<sup>24</sup>, on the grounds that it would increase labor costs and therefore unemployment, the government was sympathetic to the position of the trade unions. However, being afraid that the adoption of the 40 hour work week independently of other countries would undermine the competitiveness of the Italian economy, the Italian authorities tried to promote the reduction of working

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<sup>22</sup> The data set will be carefully described in section 3. It is important to notice that, in constructing the real wage, we utilized price indexes for all sectors except construction.

<sup>23</sup> An exception is the textile sector, where real wages increase only until the beginning of 1933

<sup>24</sup> An indication of this is the strong opposition of entrepreneurs to the opinions expressed by Giovanni Agnelli, in an interview with the United Press, in which the chairman of Fiat proposed a 36 hour work week as a means of reducing technological unemployment.

time in the international arena.<sup>25</sup>

As diplomatic initiatives did not produce significant results, the regime decided to introduce the 40 hours work week in the Italian system by promoting an agreement, on October 11 1934, between the trade unions and the Federation of the Italian Industry. The agreement<sup>26</sup> contained four major points. i) As a general rule, all firms in which working time was greater than 40 hours a week had to reduce the work week to this limit. The practical determination of the reductions had to be made at the industry level taking into account the technical-economic characteristics of the sector. ii) A National Fund was established<sup>27</sup> to integrate the salaries of workers with large families and working fewer hours. Part of this Fund had to be financed by a 5% tax on the wages of workers for the hours exceeding 40 hours a week. iii) Overtime was substantially abolished, apart from exceptional cases which required 24 hour notice to the local trade union. iv) Monthly or weekly wages had to be reduced accordingly, in proportion with the reduction of the working time.

Analogous provisions were taken for white-collar workers and a similar agreement was signed between the trade unions and the association of employers in agriculture. The 40 hour work week was then established by law on October 26, 1937.

#### *1d. The employment effects of the shorter work-week: some descriptive evidence*

Evaluating the effects of the reduction in the level of standard hours requires careful econometric analysis which is the main contribution of this paper. However even a brief look at the data indicates that this policy might have had a significant impact on the Italian labor market. In Figure 6 we plot data on per capita weekly hours of work for eight industrial sectors, drawn from the data set that we will analyze in the following section. In all the cases, except for the textile sector, work hours show a decreasing trend for the whole decade 1929-39, and in all cases, except for the textile sector, a significant and permanent fall at the end of 1934 seems particularly evident, suggesting the occurrence of a structural change.

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<sup>25</sup> As documented by Toniolo and Piva (1988) the issue was debated at length inside the ILO, with the active involvement of the Italian delegate De Michelis. The debate culminated in the Geneva Conference of 1935 but disagreements among governments impeded the adoption of the emergency measures favored by the Italian government.

<sup>26</sup> For a complete text of the agreement see Ministero delle Corporazioni, *Sindacato e Corporazione*, December 1934.

<sup>27</sup> This Fund was called “Cassa Nazionale per gli assegni familiari agli operai dell’industria”

### **Figure 6 - Per capita weekly hours of work**

A highly suggestive picture of the evolution of the labor market during the 1930s can be obtained by plotting together, in Figure 7, the index of blue collar employment and the index of total hours of work.<sup>28</sup> From a cursory look at the data we can clearly see that, following the policy shift that occurred at the end of 1934, which is indicated by a vertical line, with the recovery of industrial production, employment grew faster than total hours, which seems to suggest that the regime was successful to some extent in its attempt to achieve work sharing.

### **Figure 7 - Employment and hours of work indexes, 1929-39**

Such a divergence between employment growth and growth in total hours seems indeed an important peculiarity of the Italian recovery from the Great Depression. If we consider, for example, similar indexes for the post war period,<sup>29</sup> reported in Figure 8, we see that the dynamics of employment and hours is completely different. For the whole period 1948-64 in fact, which coincides with Italy's economic miracle, employment grows consistently at a slower pace than hours.

### **Figure 8 - Employment and hours of work indexes, 1948-64**

This descriptive evidence on the effects of the reduction in the length of the work-week is reinforced by a look at the industry level data, drawn from the dataset we analyze in section 3. In Figure 9 we plot, for the eight industries of the sample the index of total employment, and the index of total work hours,<sup>30</sup> together with the a dotted line representing the change in standard hours occurred at the end of 1934. In all the sectors we find a tendency of employment to decrease during the first years of the depression and then a sharp recovery from the beginning of 1935. It is interesting to notice that the growth in employment per firm was particularly significant in the

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<sup>28</sup> Both these indexes are found in ASSONIME (various years). The data have been deseasonalized.

<sup>29</sup> The data are drawn from a survey performed from the Italian Ministry of Labor on a large sample of industrial firms, similar in many respects to the one we study in this paper, conducted in the 1930s by Federation of Italian Industry. The data are reported in Confindustria (various years). Data have been deseasonalized.

<sup>30</sup> Data have been deseasonalized for better readability.

mechanical sector, starting from 1935, stimulated also by the increase in military spending due to the Ethiopian War, the intervention of Italy in the Spanish civil war, and the general re-armament process which preceded World War II, following Germany's strong increase in military spending in the period 1933-35. On the contrary, employment in the textile sector, which represented a large part of Italian industrial production, shows some growth after 1933, but never returns to the level of 1929 probably because this sector was particularly hit by the protectionist measures that were adopted in the pre-war period by most countries.

What is particularly interesting is that in all the sectors the recovery from the depression was characterized, after the end of 1934, by faster growth in employment than in total hours of work. The fact that this phenomenon has characterized all the industries, again suggests the existence of an important structural change in the employment policies of firms after the signing of the agreement of October 11, 1934.

**Figure 9 - Employment and hours of work indexes  
in eight industrial industries, 1929-39**

**2. The demand for workers and for hours of work: theoretical issues**

The literature on the effects of work sharing on employment is extensive and includes many possible specifications of the labor market such as simple models of the demand for workers and hours of work (Ehremberg 1971, Calmfors and Hoel 1988) or more complex models which consider also the competitive supply of labor (Brunello 1989) or include unions and analyze the bargaining process in the labor market (Booth and Schiantarelli 1987). Although many studies conclude that "a reduction in normal working time is quite likely to be counterproductive as an employment promoting measure" (Calmfors and Hoel 1988, p 60), the results obtained by the large majority of the models vary significantly depending on the specification adopted. In some important cases that cannot be easily dismissed as irrelevant, work-sharing appears to be effective in increasing employment.

To illustrate the possibility that a cut in the level of standard hours can have

positive employment effects<sup>31</sup> we will analyze the simple model of a competitive firm that simply chooses employment and hours of work, taking unit real labor costs as given. Whether this model is adequate for the situation we analyze in this paper is obviously open to discussion. However, the low contractual power of the fascist trade unions, the few constraints imposed on entrepreneurs in determining employment, and the presence of a large number of underemployed people looking for better work, all aspects that we discussed in section 1b, seem to be sufficient reasons for adopting, as a framework of reference, the competitive model of the labor market with an infinitely elastic supply of labor.

If the assumption of perfect competition in the labor market can be justified on the grounds of the existing conditions of the Italian economy, the assumption of perfect competition in the product market is somehow harder to justify, especially if we consider industries like paper, armaments, chemicals, automobiles. We choose however not to dwell into this issue for the sake of simplicity. In general, when the assumption of imperfect competition in the product market is introduced, results become model-specific and difficult to generalize.<sup>32 33</sup>

We consider a firm that chooses the number of hours  $H$  and the number of workers  $N$  in order to maximize profits, given real unit labor costs  $W$ . Allowing for the existence of overtime, and denoting by  $w$  the hourly real wage rate, which are defined as unit labor costs divided by the product price, by  $b$  the fixed cost of employing an extra worker<sup>34</sup> and by  $\theta w$  ( $\theta > 1$ ) the overtime pay for any hour worked beyond the standard time  $H_o$ , unit labor costs are given by

$$W = b + wH \quad \text{for} \quad H \leq H_o \quad (1)$$

$$W = b + wH_o + \theta w(H - H_o) \quad \text{for} \quad H > H_o \quad (2)$$

If we also assume that there is a limit  $\tilde{H}$  to the number of overtime hours that a

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<sup>31</sup> Obviously, we are not trying to argue, in this analysis, that the policies could be “efficient” in the conventional sense of a potential Pareto improvement, but simply that they could increase employment.

<sup>32</sup> It can be easily shown, however, that main conclusions of the model would still hold if we considered the model of a firm facing a downward sloping demand for its product which applies a constant markup over marginal costs. In this case the real product wage would be constant, and the results of the model would be very similar to the ones obtained in this section.

<sup>33</sup> We could have limited ourselves to study a cost minimization problem which is agnostic with respect to the market form but we preferred not to do it because we wanted to show how positive employment effects of work-sharing can be obtained also in a more general framework, like that of profit maximization .

firm can employ, so that

$$H - H_o \leq \tilde{H} \quad (3)$$

and, following Feldstein (1967) we assume that technology is represented by a Cobb-Douglas production function<sup>35</sup>  $Y = H^\gamma N^\alpha$  where  $0 < \alpha < 1$  and  $0 < \gamma < 1$ ,<sup>36</sup> the maximization problem of the firm can be stated as the problem of choosing the level of H and N that maximize profits

$$\Pi(H, N) = H^\gamma N^\alpha - WN \quad (4)$$

subject to (1), (2) and (3). Taking derivatives with respect to N and equating to zero we obtain

$$\alpha H^\gamma N^{\alpha-1} - b - wH = 0 \quad \text{for } H \leq H_o \quad (5)$$

$$\alpha H^\gamma N^{\alpha-1} - b - wH_o - \theta w(H - H_o) = 0 \quad \text{for } H > H_o \quad (6)$$

and taking derivatives with respect to H and equating to zero we obtain

$$\gamma H^{\gamma-1} N^\alpha - wN = 0 \quad \text{for } H \leq H_o \quad (7)$$

$$\gamma H^{\gamma-1} N^\alpha - wH_o N - \theta wN = 0 \quad \text{for } H > H_o \quad (8)$$

Let us now define by  $H_1 = \frac{\gamma b}{(\alpha - \gamma)w}$  the value of H obtained by substituting (7) in (5)

and by  $H_2 = \frac{\gamma b - (\theta - 1)wH_o}{(\alpha - \gamma)\theta w}$  the value of H obtained by substituting (8) in (6). Notice

that always  $H_1 > H_2$ . Moreover, let us denote by  $\tilde{\Pi}(H)$  the implicit function obtained by substituting (7) and (8) into equation (4).

If  $\alpha > \gamma$ , depending on parameter values, we can distinguish three important cases.

i) If  $H_1 < H_o$  (and therefore  $H_2 < H_o$ ), profits are maximized for  $H = H_1$ . Since, as we can immediately see substituting  $H_1$  in (7) the optimal level of employment,  $N^*$  does not depend on  $H_o$ , a reduction in the number of standard hours does not have any effect on

<sup>34</sup> This parameter is meant to represent fixed costs faced by a firm such as, for example, training costs.

For convenience we assume that these costs are expressed as units of the firm's output.

<sup>35</sup> An alternative popular specification is the one proposed by Ehremberg (1971),  $F(H, N) = G(H)N$ , where  $G(H)$  is the productivity per hour of each employee and  $G(0) = 0$ ,  $G'(H) > 0$ ,  $G''(H) < 0$  and  $\gamma = G'(H)H/G(H) < 1$ . We use the Cobb-Douglas specification in order to obtain sharper results in our analysis.

<sup>36</sup> By assuming that the elasticity of output with respect to hours is less than 1 we assume that the intensity of work decreases with the length of the workday. The alternative assumption  $\gamma > 1$  would imply



employment.

ii) if  $H_2 > H_0$  (and therefore  $H_1 > H_0$ ), which can only happen if  $\gamma b > (\theta - 1)wH_0$ , profits are maximized for  $H = H_2$ . In this case  $N^* = N^*(H_2)$  and, differentiating, we can immediately see that  $dN^*/dH_0 \geq 0$  i.e. a reduction in standard hours has a negative effect on employment. This result which has been derived in other contexts also by Ehremberg (1971), Hart (1984), Calmfors and Hoel (1988) can be explained by the fact that, when firms are already operating with overtime, a decrease in  $H_0$  is equivalent to an increase in the fixed cost  $b$  per worker, i.e. it implies an increase in the cost per worker, but leaves the marginal cost of overtime unchanged. As a result, firms are induced to substitute longer working time for employment.

iii) If  $H_1 > H_0 > H_2$  we have a corner solution. Analyzing the function  $\tilde{\Pi}(H)$ , we immediately see that profits are increasing up to the point  $H_0$  and decreasing from  $H_0$  onward, which implies that the corner solution represents a maximum. In this case  $N^* = N^*(H_0)$  and  $dN^*/dH_0 < 0$  provided that  $\gamma b > (\theta - 1)wH_0$ . When fixed costs are not too large and firms are operating with a level of hours near standard hours, a reduction in standard hours will induce firms to reduce working time and to increase employment.

Let us now consider the case  $\alpha < \gamma$ . We see that when  $H \leq H_0$ , the function  $\tilde{\Pi}(H)$  is always increasing in  $H$ . When  $H \geq H_0$  instead the function is always increasing in  $H$  if  $\gamma b \geq (\theta - 1)wH_0$ , while it has a stationary point if  $\gamma b < (\theta - 1)wH_0$ . Since at this point however  $\tilde{\Pi}(H)$  is convex, this stationary point cannot be a maximum. The only maximum can be found, therefore, at the boundary, i.e. either at  $H = H_0$ , in which case we are back to case iii) above, or at the point in which  $H = H_0 + \tilde{H}$ . In this case  $N^*(H) = N^*(H_0 + \tilde{H})$  and  $dN^*/dH_0 < 0$ , if  $\gamma b < (\theta - \gamma)wH_0 + (1 - \gamma)\theta w\tilde{H}$ . If fixed costs are not too large, a reduction in the level of standard hours will have a positive effect on employment.

Summing up, the analysis shows that the employment effect of a cut in standard hours is zero when firms are operating below standard hours, but becomes positive when firms are operating near standard hours (provided fixed costs are not too high). When firms are already operating with overtime, a cut in standard hours will instead

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that as hours increase output increases more than proportionally, because the hours used for setting up and

have negative effects on employment but, if workers are working near the maximum level of overtime allowed by the legislation (provided fixed costs are not too high), a reduction in  $H_0$  has again positive employment effects.

In practice, when the maximization problem allows for an interior solution, a cut in the length of the workweek has either no effect or negative effects on employment, but when the solution is found at a corner, then the same measure has positive effects. Indeed, corner solutions can be extremely important and there is no reason for excluding them from the analysis. In particular, they might be extremely relevant in a period, like the Great Depression, where most firms were experiencing a decrease in the demand for their products. In that situation it is unlikely that firms would use overtime on a constant basis and therefore it is unlikely that a cut in the length of the work-week had negative employment effects. Rather most firms were probably operating near standard hours, just the situation in which the model predicts that work sharing may have positive effects on employment.<sup>37</sup>

### **3. Empirical evidence**

#### *3.1 The data*

We study the effects of the reduction in the number of standard hours by estimating, in line with the theoretical results of the previous section, a demand function for workers and a demand function for hours of work. We use, for this purpose, a panel derived by a monthly survey on labor market conditions undertaken by the Federation of Italian Industry (Confindustria) during the period 1929-39.<sup>38</sup>

The survey was conducted every three months on a sample of firms, which although probably not stratified, represented a relevant percentage of the total number of firms (between 16% and 24% of the universe) and covered a substantial fraction of total employment (about a half). As is usual in these kinds of surveys, the main problem is provided by the fact that the sample did not remain constant overtime, due to the

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closing down operations represent an increasingly smaller proportion of output.

<sup>37</sup> Further positive employment effects of work sharing could be found if, as is the case in many countries today, the legislation imposes limits on the minimum amount of hours of work for each employee. This case, which has recently been analyzed by Hunt (1999) does not apply to the pre-war Italian labor market and therefore will not be taken into account here.

<sup>38</sup> The data obtained were published periodically in ASSONIME (various years). The wage and employment series contained have been extensively analyzed by Zamagni (1976), (1994).

phenomenon of entry and exit of firms.<sup>39</sup> Because of the large number of firms in the sample and the way we construct our data, however, the problem does not appear very severe.

The data set contains monthly observations, at the industry level, on the number of workers employed, the number of hours worked, the total amount of wages and the hourly wage rate. In order to construct the monthly per capita number of hours, we simply divided the total number of hours worked by the number of workers. The construction of our employment series, instead, was more complex. Given the changes in the sample, in fact, the employment series have a wide variability that is due not only to the number of workers employed by each firm, but also to the entry and exit of firms in the sample. In order to minimize this problem, however, we could exploit the fact that the survey contains also data, collected every three months, on the number of workers registered by the surveyed firms at employment offices to make them eligible for “union” benefits<sup>40</sup> and reports the same number as a percentage of the total number of workers registered in each sector.

From the survey therefore, we can obtain, every three months, the total number of workers registered with firms and, at the monthly level, the number of workers that the firms surveyed were actually employing. In order to obtain monthly data on total employment at the sector level we applied the workers’ utilization rate to the data on registered workers.

The survey contains information on eleven major sectors up to December 1931. After this date, the data are reported at the level of sub-sectors and we aggregated them in order to make them compatible with the data on the first two years. This choice was dictated by the consideration that the first two years of the depression were actually very important and we preferred not to drop them in order to obtain a finer disaggregation. In this study we consider only eight of the eleven sectors included in the survey. Three of these industries in fact (food, beverages and agricultural products, energy and illumination and various) contained significant discontinuities that made them very

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<sup>39</sup> In order to minimize this type of problems, the survey was conducted with a month of overlap every three months. For a discussion of the statistical problems associated with the hourly wage rate series, see Barbieri (1938).

<sup>40</sup> Toniolo and Piva (1988) claim that since unemployment benefits were very small, workers often did not bother registering at employment offices. Unfortunately we do not know how this problem affects our data set. This is however a more serious problem if one tries to estimate the level of unemployment rather than studying, as we do in this paper, the dynamics of employment and hours of work.

difficult to analyze.

Real wages are obtained by deflating the nominal hourly wages reported in the survey with specific producer price indexes.<sup>41</sup>

### *3.2 Econometric analysis*

Consistently with the results obtained in section 2 and with the description of the labor market we gave in section 1b, we estimate a demand for workers and a demand for hours of work which are both functions of the real hourly wage rate and a variable representing the policy change i.e. the reduction in the length of the work-week.

Instead of estimating equations separately for each industry, we use a panel approach, which allows us to exploit the information provided also by the cross-sectional variability of the data and allows us to deal with the serious identification problem which arises when one tries to isolate the effects of a policy change such as the agreement of October 11, 1934. Potentially, one could use only the time-series dimension of the data and include a series of aggregate variables as controls. The omission of aggregate variables potentially correlated with the policy, however, could lead to inconsistent estimates of the effects of the policy on the variables of interest. In other words, if employment grew after 1934 for reasons other than the policy change, one would erroneously ascribe to this change a positive employment effect. In order to circumvent this difficulty, in this paper we, will try to exploit differences in the evolution of employment and hours accross industries and use simple unrestricted time dummies in the pooled regression to control for any macroeconomic effect. The panel approach will also allow us to control for unobserved industry heterogeneity through the use of fixed effects.

Given the high frequency of the data in our panel, the employment equation and the hours of work equation we estimate have a dynamic form and include lagged values of the dependent and independent variables. The dynamic employment equation is given by

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<sup>41</sup> For the sectors: paper and paper products,, chemical, wood and furniture, mechanic and textile the producer price index was obtained by ISTAT (various years) . For construction materials and mining the index is the one that was constructed consistently from 1913 to June 1938 by Prof. R. Bachi and can be obtained by ASSONIME (various years ) and the Rivista di Politica Economica. The last 9 months of these two indexes were obtained by applying the dynamics of the wholesale price index. For the construction sector no price index is available and we used the wholesale price index.

$$h_{it} = \sum_{j=1}^m \alpha_{1j} h_{i,t-j} + \sum_{j=0}^p \alpha_{2j} w_{i,t-j} + \sum_{i=1}^8 \alpha_{3i} \bar{h}_i + \lambda_t + \eta_i + u_{it} \quad (9)$$

while the dynamic hours of work equation is given by

$$n_{it} = \sum_{j=1}^m \beta_{1j} n_{i,t-j} + \sum_{j=0}^p \beta_{2j} w_{i,t-j} + \sum_{i=1}^9 \beta_{3i} \bar{h}_i + \lambda_t + \eta_i + u_{it} \quad (10)$$

The variable  $n_{it}$  is the logarithm of the number of workers employed in industry  $i$  at time  $t$ ,  $h_{it}$  is the logarithm of the average number of hours worked per week by each worker in industry  $i$  at time  $t$ ,  $w_{it}$  is the logarithm of the hourly wage rate in industry  $i$  at time  $t$ , deflated by the producer price index for that industry,  $\bar{h}_i$  is a dummy variable that, for industry  $i$ , takes the value of 1 from January 1929 to December 1934 and the value of 0 for the remaining period. The use of a dummy to represent the policy change is necessary since the level of standard hours depended on holidays and contractual agreements and, presumably, changed from sector to sector. Unfortunately, no detailed data is available on the issue. Each equation contains also a time effect  $\lambda_t$  that is represented by a monthly dummy and is common to all sectors, introduced to control for any macroeconomic effect that might have influenced the evolution of the labor market, and a permanent but sector specific effect  $\eta_i$  introduced to control for unobserved industry heterogeneity. The error terms of the employment equation and that of the hours equation are respectively  $u_{it}$  and  $v_{it}$ .

Since in this paper we focus on the effects of a reduction in the level of standard hours on employment and hours of work, we allow for the possibility that mandatory changes in the length of the work-week affect differently hours and employment in each sector. We instead restrict changes in wages to have the same effect on employment and hours independently of the sector.<sup>42</sup>

The dynamic panel is estimated using the Arellano-Bond GMM estimator<sup>43</sup>. This estimator optimally exploits all the linear moment restrictions that follow from the assumption of no serial correlation in the error terms and provides consistent estimates in panels which contain individual effects, lagged dependent variables and no strictly

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<sup>42</sup> This is done mainly for computational reasons and to keep the number of instruments small. However, it has also the advantage of giving us an overall assessment of the impact of real wage changes on employment and hours.

exogenous variables. This last aspect is particularly important in our case since the main explanatory variable in the two equations, beside the dummies representing the policy change, is the real hourly wage rate, which cannot obviously be treated as a strictly exogenous variable. In our estimate we treat  $w_{it}$  as predetermined (i.e. we assume that  $E(w_{it}u_{it}) \neq 0, E(w_{it}v_{it}) \neq 0$ , for  $s > t$  and  $E(w_{it}u_{it}) = 0, E(w_{it}v_{it}) = 0$ , for  $s \leq t$ ) and we use lagged values of the dependent and independent variables as instruments.

In table 1 we report the estimates of equation (9) obtained by including among the regressors  $m = 3$  lags of the dependent variable and  $p = 3$  lags of the independent variable. In the first part of the table we report the estimates of the hours of work equation under the assumption that the error term is homoskedastic while in the second part we allow for heteroskedasticity and we report the results obtained by using the Arellano-Bond one-step robust estimator. For expositional convenience, we omit from the table the coefficients of the time dummies.

As we can see from both estimates, the dummies representing the reduction in the length of the work-week are all highly significant<sup>44</sup> and all have a positive sign, indicating that, as expected, a reduction in the number of standard hours had the effect of reducing the number of hours worked by each individual. All the lagged values of the dependent variable enter significantly in our hours of work equation while only the current level of the real wage rate and the one month lag of this variable are significant. The coefficient estimates of the model imply a long-run wage elasticity of  $-0.117$  suggesting that the increase in real wages induced by the strong deflation that occurred in the first half of the 1930s had a negative but very small impact on the number of hours worked. In general, the results of the robust case are very similar to the results of the homoskedastic case but, as expected, the standard errors are sometimes higher in the robust case.

Since an estimator that uses lags as instruments would lose its consistency if in fact errors were serially correlated, we also report tests of the validity of the instrumental variables, i.e. tests of lack of serial correlation. We consider therefore the results of tests of first and second order serial correlation and the results of the Sargan

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<sup>43</sup> For the properties of this estimator see Arellano - Bond (1991).

<sup>44</sup> Passing from the homoskedastic case to the robust case all the coefficient remain extremely significant except that for the dummy that refers to the chemical sector that loses some significance from 1.6% to 11.1%.

test of over-identifying restrictions. This last one is reported only for the homoskedastic case since only in this event the Sargan test has an asymptotic  $\chi^2$  distribution. As we can see from table 1 the Sargan test from the homoskedastic estimator cannot reject the hypothesis that the over-identifying restrictions are valid. In both the homoskedastic and the robust cases the null of no first-order autocorrelation in the differenced residuals is rejected, but this is not a problem since  $u_{it}$  and  $v_{it}$  are first differences of serially uncorrelated errors and therefore  $E(u_{it}u_{i,t-1})$  need not to be zero. More importantly, we cannot reject the null hypothesis of no second order serial correlation, which is crucial since the consistency of the Arellano-Bond estimator hinges heavily upon the assumption  $E(u_{it}u_{i,t-2}) = 0$ .

**Table 1**

In table 2 we report the estimates of equation (10) obtained by including among the regressors  $m = 3$  lags of the dependent variable and  $p = 3$  lags of the independent variable. In both the homoskedastic case and the robust cases all the dummy variables  $\bar{h}_i$  that represent the reduction in the level of standard hours in all industries have a negative sign indicating a negative relationship between the length of the work-week and employment. Considering first the homoskedastic case, we notice that the  $\bar{h}_i$  are highly significant for five out of eight sectors. This number however increases if we consider robust estimation. In this case a very significant effect of the reduction in working time can be detected in six out of eight sectors. For the construction industry the dummy representing the policy change is significant at the 8.5% level, while for the textile sector this variable has the right sign but is not significant.

**Table 2**

It is important to notice that this result is consistent with the results of the model discussed in section 2, which indicated that the employment effect of a cut in standard hours is zero when firms are operating below standard hours while it is positive when firms are operating near standard hours. As we show in table 3, where we report the

average number of hours worked per week by each individual worker in the months before the policy change (i.e. the period going from January 1934 to October 1934), the three sectors where the per capita number of hours worked was the lowest were the construction, mining and textile sectors. While a shorter average work week can be justified in the construction industry also from the dependence of this type of production from weather conditions, and in the mining sector because of the hardship of this type of work, the fact that in the textile sector the average number of hours worked is the lowest is indicative of a very severe state of crisis and, presumably, of a sector operating below standard hours<sup>45</sup>. The textile industry therefore is just the one in which, in accordance with the model presented in section 2, we would expect to find no employment effect of the cut in hours.

### **Table 3**

In both the homoskedastic and the robust cases reported in table 2 the lagged values of the dependent variable are significant. The long run elasticity of employment to the real wage is negative but almost negligible (-0.0109).

As in the previous equation the Sargan test from the homoskedastic estimator cannot reject the hypothesis that the over-identifying restrictions are valid. The consistency of the estimates in table 2 is guaranteed by the fact that, in both the homoskedastic and the robust cases, the Arellano-Bond test cannot reject the null hypothesis of no second order serial correlation.

Summing up, our estimates reported in table 1 and 2 show that the reduction in the number of standard hours had an important impact on the Italian labor market during the 1930s. Controlling for macroeconomic effects through the use of time dummies, our estimates show that the implementation of the agreement signed by the trade unions and the association of Italian entrepreneurs at the end of 1934 induced a significant reduction on the average number of hours worked and, in most industries, had a positive effect on employment.

### **Conclusions**

This paper is a first attempt to analyze empirically the impact of the adoption of the forty hours work-week on the Italian labor market during the Great Depression,

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<sup>45</sup> Unfortunately, since we do not have the number of standard hours in each sector, we cannot provide precise calculations on this issue.



which was introduced by the Fascist government as an explicit measure aimed at reducing unemployment. Our empirical analysis on eight industrial sectors produces results that are consistent with the view that a reduction in the level of standard hours may be an effective remedy against unemployment

Can these findings shed any light on the current debate on work sharing? The main message of this paper is that the reduction in the hours of work should not be excluded *a priori* as an instrument to stimulate employment. However, as always happens when we analyze historical episodes, it is important to stress the very different context in which this measure was undertaken. Not only was Italy subject to an authoritarian regime but also, as in most countries during the thirties, labor markets were highly flexible and technological conditions allowed for a high degree of substitutability between insiders and outsiders.

More importantly, the reduction in the level of standard hours was accompanied by a corresponding reduction in the level of wages earned by individual workers and therefore did not give rise to an increase in the effective hourly wage rate. This aspect was essential in determining the success of work sharing in Italy during the Great Depression and represents a major difference with respect to the current proposals which do not imply a simultaneous reduction of hours worked and monthly wages.

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**Table 1**  
**Hours of work equation**  
 GMM estimates (all variables in first differences)

<i>Homoskedastic estimation</i>					<i>Robust estimation</i>				
<b>Dependent variable: <math>h_{it}</math></b>					<b>Dependent variable: <math>h_{it}</math></b>				
<b>Ind.var.</b>	<b>Coeff.</b>	<b>St. Er.</b>	<b>z</b>	<b>P&gt;z</b>	<b>Ind. var.</b>	<b>Coeff.</b>	<b>St. Er.</b>	<b>Z</b>	<b>P&gt;z</b>
$h_{i,t-1}$	0.4693	0.0350	13.39	0.000	$h_{i,t-1}$	0.4692	0.0408	11.48	0.000
$h_{i,t-2}$	0.0877	0.0383	2.29	0.022	$h_{i,t-2}$	0.0877	0.0379	2.32	0.021
$h_{i,t-3}$	0.1532	0.0347	4.42	0.000	$h_{i,t-3}$	0.1532	0.0353	4.34	0.000
$w_{i,t}$	-0.1135	0.0276	-4.11	0.000	$w_{i,t}$	-0.1134	0.0698	-1.62	0.104
$w_{i,t-1}$	0.1399	0.0341	4.11	0.000	$w_{i,t-1}$	0.1399	0.0524	2.67	0.008
$w_{i,t-2}$	-0.0326	0.0334	-0.98	0.329	$w_{i,t-2}$	-0.0326	0.0310	-1.05	0.293
$w_{i,t-3}$	-0.0030	0.0320	-0.09	0.926	$w_{i,t-3}$	0.0030	0.0343	-0.09	0.931
$w_{i,t-4}$	-0.0171	0.0259	-0.66	0.507	$w_{i,t-4}$	0.0171	0.0274	0.63	0.531
$\bar{h}_1$	0.0738	0.1241	5.94	0.000	$\bar{h}_1$	0.0737	0.0161	4.57	0.000
$\bar{h}_2$	0.0343	0.0422	2.41	0.016	$\bar{h}_2$	0.0343	0.0215	1.59	0.111
$\bar{h}_3$	0.0131	0.0195	4.66	0.000	$\bar{h}_3$	0.0613	0.0189	3.23	0.001
$\bar{h}_4$	0.0577	0.0118	4.90	0.000	$\bar{h}_4$	0.0576	0.0156	3.68	0.000
$\bar{h}_5$	0.0437	0.0127	3.45	0.000	$\bar{h}_5$	0.0437	0.0219	1.99	0.046
$\bar{h}_6$	0.0556	0.0119	4.65	0.000	$\bar{h}_6$	0.0556	0.0125	4.45	0.000
$\bar{h}_7$	0.0599	0.0123	4.88	0.000	$\bar{h}_7$	0.0599	0.0172	3.48	0.001
$\bar{h}_8$	0.0697	0.0128	5.46	0.000	$\bar{h}_8$	0.0696	0.0185	3.67	0.000
Sargan test: $\chi^2(944) = 801.33$ $\text{Pr} > \chi^2 = 0.9994$					Arellano-Bond tests: $H_0$ : no autocorrelation of order 1: $z = -2.61$ $\text{Pr} > z = 0.009$ $H_0$ : no autocorrelation of order 2: $z = 1.04$ $\text{Pr} > z = 0.2999$				
Arellano-Bond tests: $H_0$ : no autocorrelation of order 1: $z = -26.78$ $\text{Pr} > z = 0.000$ $H_0$ : no autocorrelation of order 2: $z = 0.99$ $\text{Pr} > z = 0.3232$					Instruments: four lags of $h_{it}$ and $w_{it}$				
Instruments: four lags of $h_{it}$ and $w_{it}$					Instruments: four lags of $h_{it}$ and $w_{it}$				

**Table 2**

**Employment equation**

GMM estimates (all variables in first differences)

<i>Homoskedastic estimation</i>					<i>Robust estimation</i>				
<b>Dependent variable: <math>n_{it}</math></b>					<b>Dependent variable: <math>n_{it}</math></b>				
<b>Ind.var.</b>	<b>Coeff.</b>	<b>St. Er.</b>	<b>z</b>	<b>P&gt;z</b>	<b>Ind. var.</b>	<b>Coeff.</b>	<b>St. Er.</b>	<b>z</b>	<b>P&gt;z</b>
$n_{i,t-1}$	0.7376	0.0331	22.23	0.000	$n_{i,t-1}$	0.7376	0.0709	10.41	0.000
$n_{i,t-2}$	-0.0909	-0.0413	-2.20	0.000	$n_{i,t-2}$	-0.0909	0.0569	-1.60	0.110
$n_{i,t-3}$	-0.2199	0.0328	6.70	0.030	$n_{i,t-3}$	0.2199	0.0322	6.83	0.000
$w_{i,t}$	0.0686	0.0435	1.58	0.115	$w_{i,t}$	0.0686	0.0353	1.94	0.052
$w_{i,t-1}$	-0.0776	0.0526	-1.47	0.140	$w_{i,t-1}$	-0.0776	0.0482	-1.61	0.108
$w_{i,t-2}$	-0.0033	0.0511	-0.06	0.948	$w_{i,t-2}$	0.0033	0.0305	-0.11	0.913
$w_{i,t-3}$	-0.0519	0.0400	-1.30	0.194	$w_{i,t-3}$	-0.0520	0.0135	3.86	0.000
$\bar{h}_1$	-0.0409	0.0156	-2.61	0.009	$\bar{h}_2$	-0.0409	0.0138	-2.96	0.003
$\bar{h}_2$	-0.0449	0.0158	-2.83	0.005	$\bar{h}_2$	-0.0449	0.0137	-3.27	0.000
$\bar{h}_3$	-0.0233	0.0158	-1.47	0.141	$\bar{h}_3$	-0.0233	0.0136	-1.72	0.085
$\bar{h}_4$	-0.0507	0.0157	-3.22	0.001	$\bar{h}_4$	-0.0507	0.0137	-3.71	0.000
$\bar{h}_5$	-0.0456	0.0167	-2.73	0.006	$\bar{h}_5$	-0.0456	0.0151	-3.01	0.003
$\bar{h}_6$	-0.0182	0.0150	-1.22	0.224	$\bar{h}_6$	-0.0182	0.0080	-3.28	0.002
$\bar{h}_7$	-0.0686	0.0177	-3.86	0.000	$\bar{h}_7$	-0.0686	0.0183	-3.75	0.000
$\bar{h}_8$	-0.0027	0.0146	-0.19	0.853	$\bar{h}_8$	-0.0027	0.0088	-0.31	0.757
Sargan test $\chi^2(827) = 811.08$ $\text{Pr} > \chi^2 = 0.9993$					Arellano-Bond tests: $H_0$ : no autocorrelation of order 1: $z = -23.09$ $\text{Pr} > z = 0.000$ $H_0$ : no autocorrelation of order 2: $z = -0.72$ $\text{Pr} > z = 0.4734$				
Instruments: three lags of $h_{it}$ and four lags of $w_{it}$					Instruments: three lags of $h_{it}$ and four lags of $w_{it}$				

**Table 3**

Average number of hours worked per week  
in the period January 1934 – October 1934

Paper and paper products	42.6
Chemical	43.5
Construction	36.8
Mining	38.9
Wood and furniture	39.0
Construction materials	40.3
Mechanic	43.0
Textile	38.8

Figure 1

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**Figure 2**  
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Figure 3

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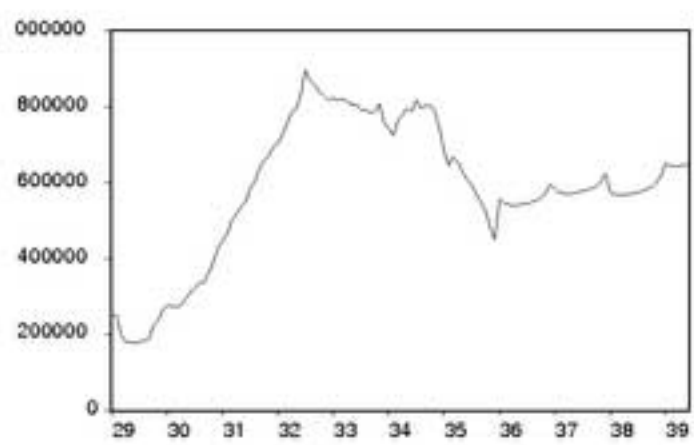


Figure 4

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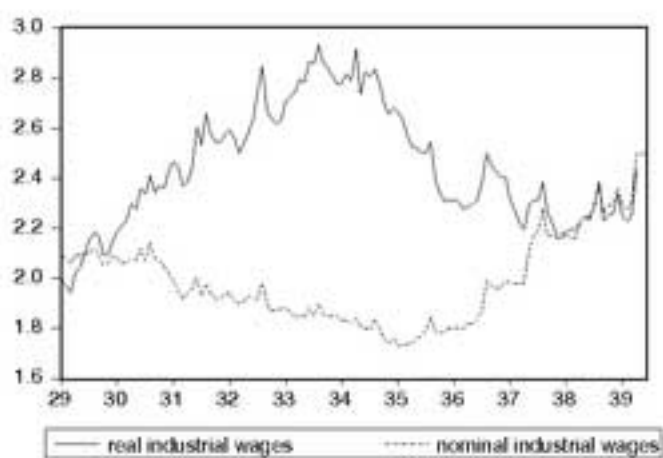


Figure 5

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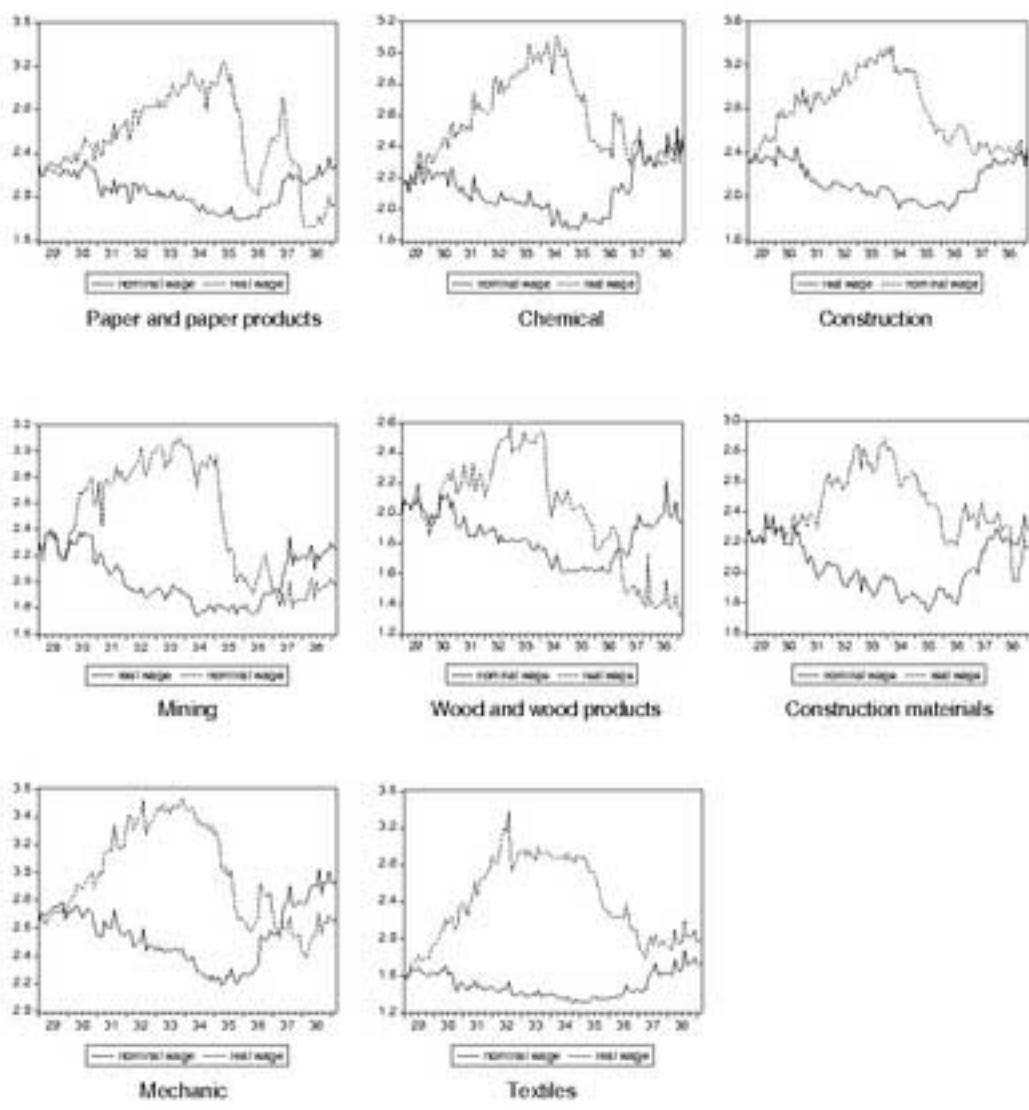


Figure 6  
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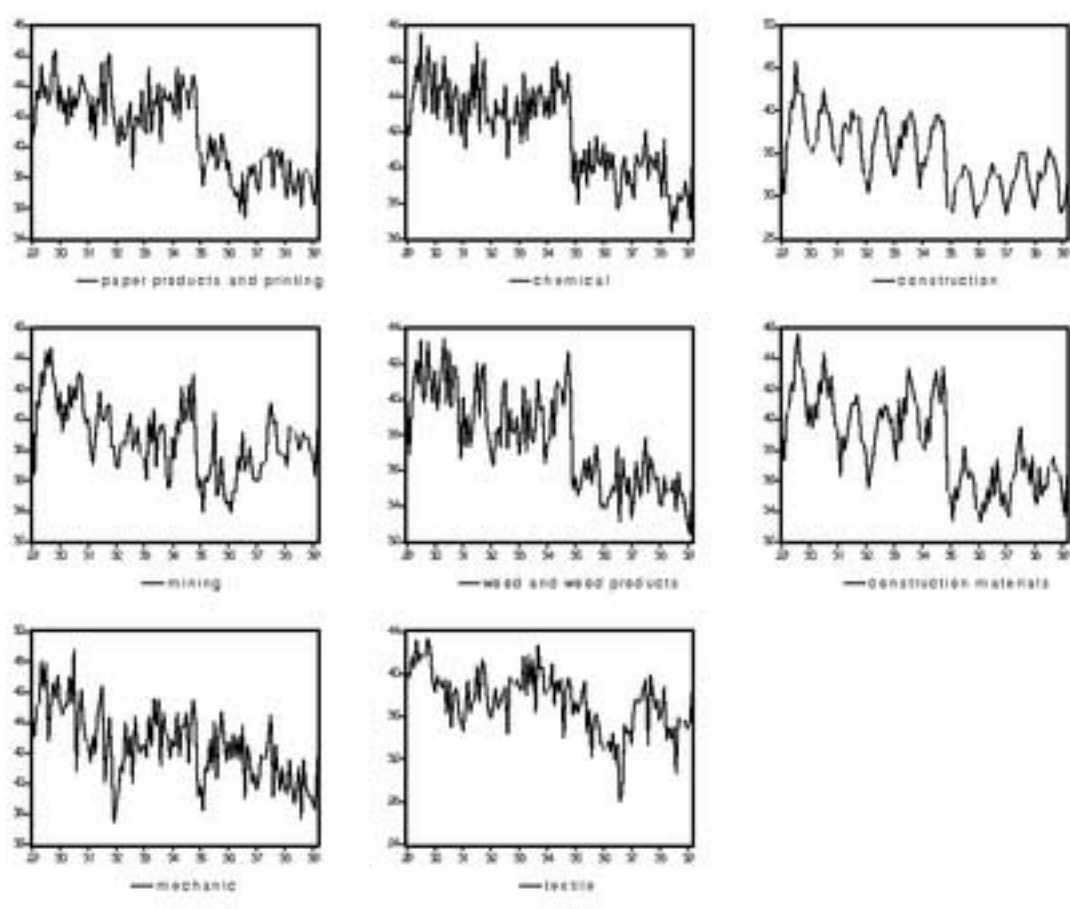


Figure 7

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Figure 8

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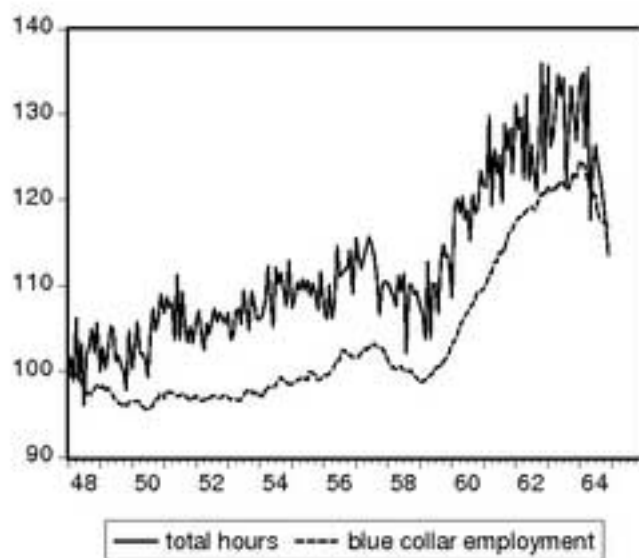


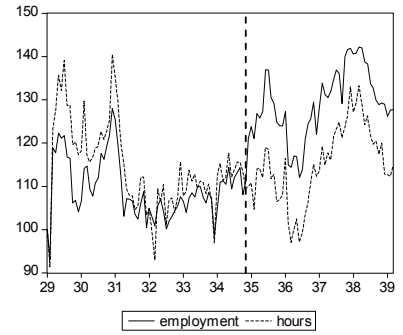
Figure 9



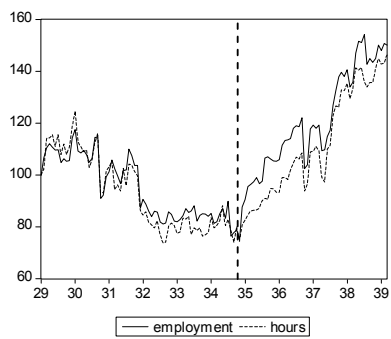
Paper and paper products



Chemical



Construction



Mining



Wood and furniture



Construction materials



Mechanic



Textiles