The third is the concept of the impulse, which grew out of Capital and Time, but which did not finally emerge until the essay on "Industrialism" in Economic Perspectives. I think of a major invention, or other major change in circumstances, like the opening up of a new market, as generating a chain of consequences, some of which by theory can be followed out. I did not have this idea when I wrote my Theory of Economic History; it is needed to complete the analysis which I gave in that earlier book.

During the years since 1965, while I have been writing my later books, I have been a retired professor; but I have been allowed to continue to work in Oxford, at All Souls College. Though I have useful discussions with colleagues at Oxford, I have not been a member of a group, as I was in early days at ISE. Those who have worked closest with me have been visitors to Oxford, and postgraduate students, who themselves come and go. For though in Oxford our first degree students are mainly British, most of our postgraduate students come from abroad. When they have done their two or three years, they go back to the places, very often distant places, from which they have come. Such contact as one can then maintain with them must then be largely by correspondence — unless one can go and see them at their homes or places of work. I have indeed done a good deal of that.

It has so happened that a considerable number of economics post-graduates, and of other economists who have visited Oxford, have come from Italy. And it is not so far from England to Italy as it is to places further afield! I have explained the importance of my knowledge of Italian (which is still, I fear, little more than a reading knowledge) in the beginnings of my economics. It has been a great thing for me that I have again been able to use it in the contacts with Italian economists which I have been able to develop during the last twenty years. We now feel that a year which does not contain a visit to Italy is a year in which there is something missing. And now, when we come to Italy, we come to see our friends.

\[\text{Oxford} \quad \text{John Hicks}\]

Structural and Transitory Determinants of Labour Mobility: "Holt's Conjecture" and Italian Experience

1. Introduction

Labour mobility, especially in recent years, has attracted the attention of trade union and industrial relations experts, sociologists and students of politics. This growing literature has, unfortunately, not been matched to date by an equal interest on the part of economists. Indeed, the only theoretical model of the labour market to be founded on the turnover rate is that of Holt. He assumes that the two main components of turnover — the flows of hirings and separations (layoffs and quits) — are random variables which remain essentially constant as aggregate demand varies. However, this assumption, which we shall call "Holt's conjecture" (and which R. Hall and others have gone so far as to call "Holt's law"), cannot be justified either on theoretical grounds or on the basis of our empirical tests.

The central conclusion of our study is that the flows of both hirings and separations are considerably affected by both cyclical (or transitory) determinants connected with the demand for labour, and by structural determinants connected with the proportion of employment accounted for by marginal workers with a lower degree of

\[\text{The equations proposed in this article are part of the Banca d'Italia's econometric model, M2 BI. The authors wish to thank the participants in a seminar held in the Banca d'Italia's Research Department, during which a preliminary draft was discussed. Our special thanks go to P. Maggi for his constant and invaluable help in the collection of data and econometric estimation, to P. Carmignani of the CESPE for helpful discussions regarding the criteria adopted in the preparation of statistics and their reliability, to E. Pinelli of the Ministry of Labour for his cooperation during the collection and analysis of the data used for the empirical test, and to D. Siniscalco for a number of useful discussions of the subject. The authors remain, of course, responsible for the views expressed and any remaining errors.}\]
job stability. In the case of Italy, furthermore, the turnover rate has been quite considerably affected since the "hot autumn" of 1969 by the greater strife in industrial relations (the so-called Workers' Statute) and, in particular, by the trade unions' "freezing of layoffs" and firms' "freezing of hirings", as well as by the fall in quits in the face of rising unemployment. Both these determinants of a socio-political nature have had a stronger effect since the oil crisis of end-1973 and the growth in expectations of greater unemployment associated with the embargo of the oil-producing countries. In addition, our theoretical model is capable of generating, together with the market and socio-political determinants described above, an inversion of the Phillips curve (with clockwise loops rather than the traditional anticlockwise ones) when demand for labour is particularly high. As will be shown, this can be the result of an increase in the flow of quits which is not offset by a reduction in the flow of layoffs and an increase in that of hirings.

"Holt's conjecture" and the implications of its theoretical construction for the labour market and the Phillips curve are examined in the next section. In Section 3 we describe our basic model and its implications for the structural and transitory determinants of labour mobility. In Section 4 we set out the results of the empirical test made with reference to the flows of hirings and separations in Italy. We then discuss the implications of the model and present our conclusions.

2. "Holt's Conjecture" and the Implications of Its Construction

Let P be the probability that a single unemployed worker finds one vacancy in a unit of time and P, the probability that the ensuing job interview ends with acceptance on both sides. The probability that an unemployed worker will find work, P, can therefore be expressed as the product P, P, multiplied by the number of vacancies, VP, P. The probability of a hiring in the unit of time chosen, P, can, in turn, be expressed as the reciprocal of the average time it takes an unemployed worker to find a job, 1/T. Thus, if in equilibrium the average search time is two days, the probability that the worker will find employment is, on average, equal to one half per day. Analogously, the probability that a firm will fill a vacancy in a unit of time, P, can be expressed as the sum of the product P, P, for all unemployed workers, UP,P = 1/T. It follows, as Holt also suggests, that with random sampling of the available job offers, P, and P, can be considered as proportional to the number of unemployed workers and that of vacancies respectively.

\[ P_v = \frac{VP_v}{T_v} = \frac{1}{T_v} \]

\[ P_s = \frac{UP_s}{T_s} = \frac{1}{T_s} \]

where T, and T, which are respectively the average duration of unemployment and the average time taken to fill a vacancy, can be expressed as the reciprocals of P, and P, and T = 1/P, is analogous to T, and T, and represents the average time taken to search for a single vacancy.

Multiplying the probability of a hiring in a unit of time, P, by the total number of unemployed, U, (or P, by V), one obtains the flow of hirings, F (identically equal to the flow of vacancies filled) in the unit of time,

\[ F = \frac{U}{T} = \frac{V}{T} = \frac{UV_P}{T} \]

The flow of hirings can, therefore, be expressed as the ratio of a "stock" (the number of unemployed workers or the number of vacancies) to a "time" (the average duration of unemployment or the average time to fill a vacancy).

In conditions of stochastic equilibrium, F can be considered as approximately constant and interpreted as:


i) the flow of vacancies filled, which by definition is equal to
the flow of hirings;
ii) the flow of new vacancies;
iii) the flow of separations (layoffs and quits). In conditions
of stochastic equilibrium, the flow of separations can be considered as
approximately constant, in view of the negative correlation between
layoffs and quits as demand changes. In fact, at lower levels of
demand a larger number of layoffs tends to be matched by a smaller
number of quits (and vice versa at higher levels of demand). When
the unemployment rate oscillates stochastically about a given value,
the flow of separations must tend to equal that of hirings (vacancies
filled). Otherwise, the stochastic equilibrium value of the un-
employment rate originally assumed would change. It also follows
that the flow of new vacancies must tend to equal these magnitudes.
The conditions of stochastic equilibrium therefore ensure the equal-
yarity of the turnover rates i), ii) and iii).

Dividing both the members of [2] by the total labour force,
LF (taken here as an exogenous variable of the model) one obtains:

\[ T_s = -\frac{u}{f} \tag{2a} \]
\[ T_r = -\frac{v}{f} \tag{3a} \]

where \( u \) and \( v \) indicate respectively the rate of unemployment, \( U/LF \),
and the vacancy rate, \( V/LF \), and where \( f = F/LF \) is the turnover rate.

From what has been said, it follows that \( F \) in Holt’s model can
only be considered constant if its components in \( [2] \) are constant or
vary so that they offset each other. In conditions of stochastic
equilibrium, it can be assumed that \( T_s \) and \( P_s \) are given parameters.
\( T_s \) can be interpreted as a technical constant determined by the
information conditions in the economy. \( P_s \), on the other hand,
tends to increase on the labour demand side at higher levels of
productive activity but, under the same circumstances, to decrease on
the supply side, and vice versa. These conditions suggest that \( P_s \) is
relatively stable, in the absence of unsystematic oscillations. Finally,
it seems reasonable, for the reasons set out under point iii), that,
with \( F \) given and with \( P_s \) and \( T_s \) also given (in the sense indicated
above), the product UV should show relatively small cyclical oscil-
lations and, therefore, that \( U \) and \( V \) should move in opposite
directions as demand varies.

The central postulate of Holt’s analysis is that the rate of change
of the money wage a worker in search of employment desires, \( w^d \),
can be expressed as a decreasing function of the time spent in search
of a job, \( T_s \). This search time, \( T_s \), in turn, is proportional to the
unemployment rate, \( u \), with \( f \) given:

\[ w^d = s(u; f) \tag{4} \]

The unemployment rate can, in turn, be expressed in terms of \( V 
using the flow relation [2]:

\[ \frac{u}{f} = \frac{T_s}{P_s V} = \frac{1}{k v} \tag{5} \]

with \( k = (P_s/T_s) LF \).

In order to close the model, one can take the identities,

\[ U = LF - E \]
\[ V = J - E \]

where \( E \) and \( J \) are respectively total employment and the total supply
of jobs. Dividing both relations by the total labour force, one obtains

\[ \frac{u}{f} = 1 - e \]
\[ \frac{v}{f} = 1 - e \]

with \( e = B/LF \) and \( j = J/LF \). Subtracting the second relation from the
first, one obtains:

\[ v = u + j - 1 \tag{6} \]

The relations [4], [5] and [6] form a system of three equations in the
three unknowns \( w^d, u \) and \( v \), which, given \( f \) and \( k \), can be solved for
any given value of \( j \). This is the ratio of the total supply of jobs (the
sum of the jobs already filled and vacancies) to the total labour force,
and is the parameter of the demand for labour whose value at any
moment determines the "stochastic" equilibrium solution of the
system.

In Figure 1, equation [6] is shown for two different values of \( j 
with j > j_0 \). Given the inverse relationship between \( u \) and \( v \), [5],
(represented by the downward sloping curve), the intersection of [6]
and [5] determines the equilibrium values of \( v \) and \( u \). Finally, the
latter variable determines the corresponding value of $\hat{w}$ in [4], in the lower section of the figure. The uniqueness of the solution and the characteristics of the model depend crucially on the assumption that $f$ can be considered constant in conditions of stochastic equilibrium — an assumption which, rather than "Holt's law", we would be prepared to call "Holt's conjecture". For the reasons just mentioned, the assumption appears fairly reasonable as long as $j$ fluctuates within limits close to its stochastic equilibrium value. But, as we shall try to show in the next section, there is no reason for considering $f$ to be constant a priori in disequilibrium conditions. On the contrary, there is reason to believe that it is not constant but tends to vary systematically as the conditions of the labour market change. A number of implications of this confutation of "Holt's conjecture" will be discussed in Section 4.

3. Structural and Transitory Determinants of Labour Mobility

As we have pointed out, the assumption of a constant turnover rate (and, therefore, of constant flows of hirings, separations and new vacancies) limits Holt's model to conditions of stochastic equilibrium and contrasts with the derivation of a Phillips curve in disequilibrium conditions. There are at least three reasons for expecting the flow of hirings not to be constant but, on the contrary, an increasing function of both the level and the rate of change of the demand for labour, $i$

i) in the first place, as can be seen from [2], when there is an increase in the demand for labour, the increase in $V$ will tend to occur 'before' there is any decrease in $U$. Their ex post product may prove to be relatively stable for statistics regarding sufficiently long periods; but statistics collected at the aggregate level (even on a quarterly basis) may still underestimate the variability of this aggregate within the period;

ii) furthermore, in conditions of involuntary unemployment, given the minimum acceptance wage rate, an increase in the rate offered by firms will have the effect of increasing the probability that the finding of a vacancy will lead to acceptance on both sides. The flow of hirings will be correspondingly high. This suggests that, as a first approximation, $P_v$ in [2] should be rewritten as an increasing function of the difference between the rate of change of the average money wages paid to workers and offered to applicants, and the rate of change of the average wage demanded, $w'$. In conditions of disequilibrium, the demanded wage can diverge from the offered wage,

$$P_v = \pi(w' - \hat{w}), \pi > 0$$

where $w'$ can now be thought of as the average of the frequency function of the money wages demanded by workers in search of employment. In particular, at the beginning of a sharp and unexpected increase in demand, $w'$ will tend to increase since the number of vacancies, $V$, increases for any given number of unemployed workers, $U$. The rate of change of wages, $w'$, will only increase, instead, because the number of unemployed workers and the average duration of unemployment tend to fall in subsequent periods. This effect is reinforced by the greater uncertainty of the labour market for the single worker compared with firms, which, from time to time, decide and, therefore, know what their employment policy is. The single worker is ready to mistake a higher offered wage for a better employment opportunity than those considered on average to be available in the labour market. The probability, $P_v = 1/T_v$ of finding a single vacancy can, on the other hand, be considered constant as a first approximation (though it is conceivable that it also tends to increase as demand increases, since a higher $v/u$ ratio would suggest less interference between one unemployed worker and another in their search for a job).


As an illustration, this implies that ex ante $w'$ can be empirically considered as approximating actual $w'$ and ex ante $w'$ with a distributed lag of the values recorded in earlier periods (in conditions of over employment, these relation may be inverted, cf. Section 5).
The above are short-term (i.e., transitory) effects in the sense that they depend on the variations in the demand for labour, i.e., \( j \). These variations, in turn, are reflected in short-term variations of the opposite sign in the unemployment rate. But:

iii) there is a more fundamental reason of a structural nature for expecting higher flows of both hirings and separations, not only when there is an increase in the demand for labour, \( j \), but also when there is a higher level of demand, \( j \), and, therefore, also in the long-term. In particular, at the same time as demand expands, increasingly marginal labour, which, as is well known, is characterized by higher turnover rates, is taken into production. The higher turnover of these marginal workers is due both to the fact that they are the last to be hired during an expansionary phase and the first to be laid off in a recession, and to their greater propensity to quit. This higher quit rate of marginal workers is due to their inferior career prospects and to the fact that their seniority privileges are usually equally limited. Furthermore, it is much more difficult for trade unions to defend workers in these more marginal jobs when they are laid off. It is to be expected, therefore, that the average turnover flow will have a cyclical pattern as a result of the cyclical variations in the proportion of less stable marginal workers in employment. The possibility that the flow of hirings, \( F \), varies as a direct function of the level of labour demand (in the long term) and of changes in labour demand (in the short term), as the above considerations would suggest, has been recognized from time to time by Holt himself. Nevertheless, he has never gone on to draw the theoretical conclusions, despite the existence of earlier studies along these lines and the possibility of testing the empirical validity of his "conjecture" regarding the fundamental constancy of the turnover rate.

Finally, beyond a certain rate of expansion of the demand for labour, the increase in the flow of quits may not be offset by the fall in layoffs (the flow of which can, of course, never be negative), so that there is an increase in the flow of separations. We shall return to this point in Section 5.

The points raised above suggest that a distinction should be made between the flow of hirings, \( f_h \), and the flow of separations, \( f_s \). In particular, in conditions of disequilibrium, the flow of hirings as a percentage of the labour force, \( f_h \), will, in view of what we have said, be an increasing function of the Keynesian parameter of the demand for labour, \( j \), of its rate of change, \( j \), and of \( P \), which, in turn, depends on \( w^* \) and \( w^0 \).

\[ f_h = C(j, j, w^*, w^0) \quad C(j) > 0, C_i > 0, C_{w^*} < 0, C_{w^0} > 0 \]

where \( C(j) \) represents the long-term change in \( f_h \) as a result of a change in the level of \( j \) and the consequent structural change in the composition of the labour force discussed above under point iii). In addition, \( C_i \) represents the short-term change in \( f_h \) as a result of the disequilibrium changes described above under points i) and ii). Finally, the other two derivatives give the sign of the changes in \( f_h \) accompanying the changes in \( P \) and, therefore, in the arguments of [10].

For every given level of \( j \) and, therefore, when the market has reached an equilibrium rate of unemployment (\( u = u^0 \)), \( f_h \) in the above expression can be interpreted indifferently, not only as the flow of hirings, but also as the flow of separations, \( f_s \), or of new vacancies, \( f_v \) (expressed as a percentage of the labour force, along the lines of Holt's model). But, notwithstanding this coincidence for every given level of \( j \), these parameters are now an increasing function of the level of \( j \) (\( C(j) > 0 \) in [11]) and of its short-term

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8 See, in particular, S. Brinman, "Labor Mobility, Increasing Labor Demand, and Money Wage-Rate Increases in Manufacturing", in The Review of Economic Studies, October 1964.
variations ($C_\uparrow > 0$). Furthermore, in conditions of disequilibrium, ($i \neq 0$), the flow of new vacancies and of layoffs and quits not only may now diverge between themselves, but also be substantially different from the flow of hirings (vacancies filled), as may the total flow of separations.

For example, in an expansionary phase, ($\Delta > 0$), a bigger flow of hirings may be accompanied by a smaller flow of separations, as a result of a smaller flow of layoffs which is not offset by an increase in quits (and, analogously, for $i < 0$). This, in turn, suggests that the sign of the change in the flow of separations corresponding to a change in the total supply of jobs, $i$, cannot be determined a priori (unlike the sign of the flow of hirings), since the two components of the flow of separations (the flows of layoffs and quits) respond to changes in $i$ with changes of opposite sign. We shall return to this point later.

In particular, defining $V = V - V_{-1}, \hat{U} = U - U_{-1}$, and calling the level of the flow of new vacancies and that of separations (layoffs and quits) in the same unit of time respectively $F_\downarrow$ and $F_\uparrow$, we can write:

$$F_\downarrow - F_\uparrow = \hat{U} = - \hat{E} \text{, } F_\downarrow - F_\uparrow = \hat{V}$$

for a constant labour force, where $F_\downarrow$ denotes the flow of hirings. Dividing both members by the total labour force, $LF$, we have:

$$[12] \quad \frac{F_\downarrow - F_\uparrow}{LF} = \hat{u} = - i$$

$$[13] \quad \frac{F_\downarrow - F_\uparrow}{LF} = \hat{\nu}$$

where $i = \frac{\hat{u}}{LF}$

It should be noted that, in the conditions of non-Walrasian equilibrium discussed above,

$$F_\downarrow - F_\uparrow = F_\downarrow - F_\uparrow = 0$$

implies the previously mentioned equality of flows of Holt's model:

$$F_\downarrow = F_\uparrow = F_\downarrow$$

The total flow of separations can, in turn, be expressed as:

$$[12'] \quad F_\downarrow + \hat{U} = F_\downarrow - F_\uparrow + F_\uparrow = \hat{E} + \hat{E}_\uparrow = \hat{E}(P_\uparrow + P_\downarrow)$$

where $F_\downarrow$, $\hat{U}$, $F_\uparrow$ and $\hat{E}$ indicate respectively the flow of quits, the flow of layoffs, the probability of a quit and the probability of a layoff in the unit of time chosen, and $(P_\uparrow + P_\downarrow)$ is the corresponding probability of a separation. Dividing both members of $[12']$ by the total labour force, we obtain:

$$[14] \quad \frac{F_\downarrow + \hat{U}}{LF} = (1 - u) \frac{(P_\uparrow + P_\downarrow)}{LF}$$

the unemployment constraint of the model. This constraint makes it possible, for given values of the other variables, to determine $P_\uparrow$ or $P_\downarrow$. In particular, the latter can be expressed, as a first approximation, as an increasing function of the vacancy rate, $v$.

$$[15] \quad P_\downarrow = f(v); \quad F_\downarrow > 0$$

4. The Empirical Test

For a first empirical test of our hypothesis, we have used data regarding Italy. The figures for the flows of hirings and separations prepared by the Ministry of Labour refer to workers in manufacturing industry effectively employed in the factories surveyed. Firms with less than 12 employees are excluded and this makes the empirical test of our hypothesis more difficult, since it is likely that turnover is highest precisely in these smaller units, as they have a larger proportion of unstable marginal worker. It follows that the turnover...
(hiring, separations) of the available sample underestimates the variance of the universe.

Our empirical test covers the period from 1965-IV to 1974-II. The estimations do not go beyond 1974 because data were not available for subsequent years at the time our econometric estimates were made. Some checks made by Fabrizio Carnignani of the CESPR (the Centro Studi di Politica Economica of the Italian Communist Party) suggest, moreover, that the figures for the flow of hirings are overestimated by about three percentage points in both the third and the fourth quarters of 1973. The data for 1971 and 1972 also seem to contain some inaccuracies, though much less marked. However, rather than wait for a longer and more accurate series to be made available, we decided to publish the results up to 1974 and to update them when this became possible.

Another difficulty is that the period considered, from 1965-IV to 1974-II, saw a profound change in the climate of industrial relations in Italy. As Figure 1 shows, both the flows of separations (gross of changes in the labour force) and that of hirings fell sharply after the second quarter of 1969, as a result both of the weaker demand for labour, in accordance with what was suggested in the previous section, and of the greater strike which accompanied the wage negotiations of the "hot autumn" of 1969 and the subsequent introduction of the Workers' Statute, which made it more difficult for firms to lay off workers legally. The fall became even sharper after the end of 1973 because of fears of a further worldwide reduction in aggregate demand and employment as a result of the oil embargo. This caused the trade unions and workers to "setty their ranks" against layoffs and reduced the flow of quits. In addition, there was the passing of the law regarding individual labour disputes in August 1973. Under this law, disputes concerning employee workers in both the public and the private sectors were entrusted to (often politically motivated) lower court magistrates (who came to be known as pretori d'assalto) rather than to the higher courts. This resulted in cases being decided within two months instead of several

years and thus discouraged firms from laying off workers. As Figure 1 shows, however, firms responded to this fall in separations by considerably cutting back their hirings, the flow of which fell on an annual basis from 32 per cent of the labour force employed in manufacturing industry in 1969 to less than 25 per cent in 1974.

The third factor which makes it difficult to carry out an empirical test of equation [11] in the previous section is that we have no measure of the total supply of jobs (S, the sum of the number of employed workers and that of vacancies), since job vacancy statistics are not available in Italy. For this reason, in the specification of the equation of the flow of separations [12']

\[ F_s = E(P_s + P_r) = E P_r \]

we have approximated the probability of a separation, \( P_r \), by taking as a measure of the level of the demand for labour the ratio of unemployed workers to employed workers in manufacturing industry, or:

\[ \frac{F_s}{E} = P_r = \alpha + \beta \frac{U}{E} + \gamma \left( \frac{U}{E} \right); \; \alpha > 0, \beta < 0, \gamma \geq 0 \]

where the expected signs reflect the hypotheses discussed in the previous section. Not having statistics referring exclusively to unemployed blue-collar workers in manufacturing industry (to which, instead, both the flows and the number of employed workers used as the denominator of \( f_s \) and \( f_r \) refer), we have taken a measure of the total number of unemployed blue and white-collar workers. The latter, as is well known, represented a fairly small and constant proportion of total Italian manufacturing employment over the period in question.

Expressing the total flow of separations as a ratio of the total number of employed workers, it follows that:

\[ f_s = \frac{F_s}{E} = \alpha + \beta \frac{U}{E} + \gamma \left( \frac{U}{E} \right). \]

The flow of hirings has been approximated analogously, to give the reduced form:

\[ f_s = \frac{F_s}{E} - \alpha + \beta \frac{U}{E} + \gamma \left( \frac{U}{E} \right) . \]
With βCo and where γCo also reflects the effect, Ci>Co4, in expansionary conditions, along the lines discussed in [11].

Relation [12], \( f_t - f_0 = \left( \frac{\Delta F}{E} \right) = \dot{u} \) (dividing both members of the equation by the total number of employed workers rather than by the total labour force) is true, however, only if a constant labour force is assumed. Since it is well known that there were, instead, changes in the Italian labour force during the estimation period, the use of [12] requires that \( f_t \) should be gross of the changes in the labour force in manufacturing industry,

\[ \frac{\Delta F}{E} \]

In other words,

\[ f_t = f_0 + \frac{\Delta F}{E} \]

Subtracting the members of [18] from those of [17] gross of \( \Delta F \), [19] implies:

\[ a = \dot{\alpha} \quad \beta = \dot{\beta} \quad (\gamma - \dot{\gamma}) = 1 \]

As we emphasized in the previous section, the sign of the effect of changes in the demand for labour — measured in our equation by the variable \( \left( \frac{\Delta F}{E} \right) \) — on the flow of separation, \( \gamma \) is uncertain a priori because the changes in the two components of this flow (layoffs and quits) are of the opposite sign. This uncertainty is further complicated in our specification by the fact that the flow of separations is considered gross of the changes in the industrial labour force, which should, in turn, be negatively correlated with \( \left( \frac{\dot{U}}{E} \right) \).

In order to take account of the fall in the flow of separations and of the consequent fall in that of hirings, partly attributable to the previously mentioned "exogenous" events (the Workers' Statute, the law regarding individual labour disputes and the oil embargo), the econometric estimation of the model includes two dummy variables, each of which is introduced in the period in which the corresponding events occurred: the first, \( d_1 \), in the period from 1970-I (as a result of the climate accompanying the introduction of the Workers' Statute) to 1973-III; the second, \( d_2 \), in the period from 1973-IV (which saw both the new law concerning the pretori d'assalto and the oil crisis) to the end of the period considered, 1974-II. It should be remembered that the inaccuracies in the statistics for the third and fourth quarters of 1973, to which attention was drawn above, imply an understimation of the coefficients of both dummy variables, which, in turn, "purifies" the estimated coefficients of the other two independent variables.

The empirical test of the model is shown in the following table. In accordance with what we said above in connexion with the dummy variables, the estimation was divided into three periods. The first was unaffected by the "exogenous" events which were subsequently to reduce turnover and goes from 1965-IV to 1969-IV. The second, from 1970-I to 1973-III, includes the dummy variable, \( d_1 \), which represents the introduction of the Workers' Statute and the strike which was present in the aftermath of the 1969 "hot autumn". Finally, the dummy variable, \( d_2 \), is added in the third period, from 1973-IV to 1974-II, to take account of the other two determinants.

As can be seen, despite the approximations made necessary by the lack of certain data and inaccuracies in the measurement of others, the results shown in Table 1 are in line with the a priori expectations of our model. In particular, in all three periods the coefficients of the variables are of the sign and order of magnitude expected on the basis of [20].

In addition, the significance of the coefficient of the ratio of unemployed to employed workers, \( U/E \), (which measures the structural dependence of both turnover flows on the level of the demand for labour) is extremely high in all the equations. The coefficient of the change in the ratio of unemployed to employed workers, \( U/E \), (which measures the cyclical or transitory effect of changes in the demand for labour) is also significant for the flow of hirings in all three periods (with Student's \( t \) rising from a minimum of 2 in the first period to more than 2.5 for the equation covering the whole period of estimation). In accordance with the a priori expectations of our model, the coefficient of this variable in the flow of separations equation is less significant. As we have argued, this coefficient is a
measure of \( \gamma \) in [16], and the sign of this parameter is uncertain \textit{a priori}, partly because the flow of separations is gross of changes in the labour force. In fact, since these changes are negatively correlated with the rate of change in the ratio of unemployed to employed workers, they reduce the significance of the coefficient in question, the sign of which is positive in all the equations. This, in turn, means that a cyclical reduction in the demand for labour tends to reduce the flow of quits less than it increases the flow of layoffs. Even though this sign is uncertain \textit{a priori}, the positive value obtained should cause no surprise, given the well-known limited propensity to quit in a labour market such as Italy's, characterized by a high level of structural unemployment. The standard error of the regressions — of the order of magnitude of 5 per cent — is also satisfactory. The Durbin-Watson statistic, on the other hand, still shows some positive auto-correlation among the residuals, even in the "complete" equation of the flow of hirings for the whole period (equation 5, Table 1).

Another characteristic of the above estimates is that, whereas they are in line with the conditions of the first two inequalities of [20], they diverge somewhat from the third \((\gamma - \gamma') = 1\). This is presumably due to the fact that while the flows of hirings and separations (Ministry of Labour) are calculated as a ratio of average employment during the quarters considered, those regarding the unemployed not only include, as already mentioned, the (small) share of white-collar workers in manufacturing industry but also refer to the \textit{end} of each quarter. For this reason, and in an attempt to reduce the auto-correlation among the residuals still present in equation 5 of Table 1, an "imputed" ratio of unemployed workers to employed workers was calculated from the difference \((\gamma - \gamma')\), as implied by [19]. The results obtained are shown in Table 2.

One interesting feature of these estimates (in which the set of constraints implied by [20] is, of course, respected) is the significance of the coefficient of the changes in the ratio of unemployed to employed workers \([U/E]\). This coefficient is even more significant than the estimates shown in Table 1, especially in equation 5 regarding the flow of hirings. There is also a reduction in the positive auto-correlation of the residuals compared with equation 5 in Table 1. As in that case, the values regarding the dummy variables are highly significant and indicate a sharper "exogenous" reduction in both turnover flows from 1973-IV onwards. As was also to be expected, the coefficient of the changes in the ratio of unemployed to employed workers, which is uncertain \textit{a priori} in our model, is not significant, especially in the complete equation, [6], of Table 2.

It should be noted that these estimates confirm the results obtained by Tarantelli in earlier tests made with reference to American industry. Both these estimates and those discussed in this article

---

\[\text{Sources of data: Ministry of Labour and ISTAT.}\]

**H** = Flow of separations in manufacturing industry, gross of changes in the labour force.

**UE** = the number of employed workers in industry divided by the number of unemployed workers (source: Ministry of Labour).

\(\gamma\) = rate of change in (\%)

\(\gamma'\) = dummy variable (from 1970-III to 1972-II).

\(\gamma''\) = dummy variable (from 1973-IV to 1974-II).

\(E^2\) = correlation coefficient (corrected for degrees of freedom).

SE = standard error of the regression as a percentage of the dependent variable.

**COST** = coefficient of the regression.

The values given in brackets beneath the coefficients are their standard errors.
TABLE 2

ESTIMATES OF THE RATES OF TURNOVER IN MANUFACTURING INDUSTRY

<table>
<thead>
<tr>
<th>Equation</th>
<th>Dependent variable</th>
<th>Constant</th>
<th>$\delta_{\delta}$</th>
<th>$\delta^*$</th>
<th>$\delta^{**}$</th>
<th>$R^2$</th>
<th>SE</th>
<th>DW</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>$\delta_1$</td>
<td>9.53</td>
<td>-228</td>
<td>518</td>
<td>.81</td>
<td>.05</td>
<td>.80</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(.26)</td>
<td>(.03)</td>
<td>(.13)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2)</td>
<td>$\delta_2$</td>
<td>9.13</td>
<td>-228</td>
<td>482</td>
<td>.85</td>
<td>.05</td>
<td>.80</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(.26)</td>
<td>(.03)</td>
<td>(.13)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Period: from 1965-IV to 1969-IV</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| (3)      | $\delta_3$        | 9.12     | -250            | 646         | 1.46        | .81   | .05 | 1.06 |
|          |                   | (.30)    | (.05)           | (.10)       |             |       |     |     |
| (4)      | $\delta_4$        | 9.13     | -230            | 454         | -1.46       | .81   | .05 | 1.06 |
|          |                   | (.30)    | (.05)           | (.10)       |             |       |     |     |
|          | **Period: from 1965-IV to 1973-III** |

| (5)      | $\delta_5$        | 9.04     | -227            | 821         | -1.40       | .82   | .05 | 1.32 |
|          |                   | (.32)    | (.05)           | (.10)       |             |       |     |     |
| (6)      | $\delta_6$        | 9.04     | -227            | 170         | -1.40       | .81   | .05 | 1.32 |
|          |                   | (.32)    | (.05)           | (.10)       |             |       |     |     |
|          | **Period: from 1965-IV to 1974-II** |

Sources of data: Ministry of Labour and ISTAT.

$\delta_{\delta}$ = "inverted" ratio of unemployed workers to employed workers in industry.
$\delta^*$ = rate of change of the "inverted" unemployment rate. (For the other symbols, see the legend of Table 1).

reinforce our original hypothesis concerning the incorrectness of "Holt's conjecture". In fact, contrary to the implications of "Holt's conjecture", our estimates reveal that the two main components of turnover depend considerably — and not transitorily but also,

1953-71 on the basis of quarterly data regarding American manufacturing industry (Sources: U.S. Department of Labor, Employment and Earnings Statistics and Economic Report of the President):

\[
\delta_3 = 4.1 - .52 \frac{u}{u + .\frac{.12}{u^2}} \\
(4.41) (3.32) (0.56)
\]

D. W. = 2.03 R$^2$ = .62 S.E. = .06

and, analogously,

\[
\delta_6 = 3.71 + .4 \frac{u}{u + .45} + .45 \frac{u}{u + .45} \\
(7.60) (0.059) (3.32) (0.19)
\]

D. W. = 1.57 R$^2$ = .75 S.E. = .04

where $u$ is the unemployment rate of the U.S. manufacturing sector.

and above all, structurally — on the level of and the cyclical changes in, the demand for labour, as well as on determinants of a socio-political nature, which are particularly important in Italy's case.

5. Some Implications and Conclusions

In Section 3 we said that, beyond a certain level of demand, the increase in the flow of quits might not be offset by the fall in that of layoffs, which in any case cannot be less than zero. This implies that, when demand for labour is at a high level, there may be a larger increase in the flow of separations than in that of hirings and, therefore, a rise in the rate of increase in wages and in the unemployment rate. Before concluding, therefore, it seems desirable that we should take a closer look at these implications of the theoretical considerations underlying our model and of the empirical tests described above.

The condition for a rising Phillips curve can easily be derived from our model. If the flow of hirings (equal, in equilibrium, to the flow of separations) is expressed as an increasing function of the vacancy rate, the relation between $u$ and $v$ can be rewritten as:

\[
[2'] \quad \delta_3 = \Psi (v) = k \cdot u \quad v
\]

where $k$=($P_i$,$P_o$) LF. The condition for this "Beveridge curve" to be rising rather than falling is that the relation between $u$ and $v$ in the figure below should change sign. This implies the existence of a level of $v$, $v^*$, in the relation between $u$ and $v$ at the point where the inversion takes place.

Differentiating totally [2'], we obtain:

\[
k v d u - k v d v = \Psi (v) d v.
\]

From which, at the minimum,

\[
\frac{d u}{d v} = \frac{\Psi (v)}{k v} = \frac{v \Psi (v) - k v}{k v^2} = 0,
\]

and, in addition, $\frac{d u}{d v} > 0$ which, in view of [2'] implies:

\[
\frac{d v}{d v} - \Psi = \Psi.
\]
It follows that from the first order condition for a minimum we obtain, for $v = v^*$ in Figure 2,

$$
[2^{**}]
\frac{v \Psi}{\Psi} = \eta_v = 1
$$

where $\eta_v$ is the elasticity of $h_v$ with regard to changes in $v$.

The significance of the aforementioned condition is that at the point where $u$ is a minimum, corresponding to $v^*$, any change in $v$ is entirely reflected in a change of the same sign in $h_v = u v_k$.

Taking the logarithm of $h_v$ and differentiating totally,

$$
[2^{***}]
\Delta \log h_v = \Delta \log u + \Delta \log v + \Delta \log k.
$$

We thus find (assuming, for the sake of simplicity, that $k$ is constant) that when $u$ increases with increases in $v$ (i.e., an inversion of the "Beveridge curve") and $h_v$, $\Delta \log u > 0$ and, therefore, $\Delta \log h_v > 0$, so that $(\Delta \log h_v = \eta_v h_v) > 1$, to the right of $v^*$ in Figure 2. Analogously, to the left of $v^*$, we expect that $0 < \Delta \log h_v < 1$. The elasticity, $\eta_v$, is, of course, zero in the particular case postulated by Holt, in which $f$ is constant.

Finally, it should be noted that, since $k = p_t$, $LF$ varies as described above, in conditions of disequilibrium, the more $P_s$ increases with $P_t$ and with $LF$ both constant, the more the inversion of the Beveridge curve will tend to be "held up" and completely neutralized in the limiting case of a new job being accepted before the previous job is left, (so that $v$, $k$ and $f$ increase with the same value of $u$).

The possibility of an increase in the flow of quits which is not offset by a decrease in the flow of layoffs (which, in any case, cannot be negative) and an increase in that of hirings (since $P_s$ cannot rise above a certain maximum value and, therefore, $T_s$ fall below a certain minimum, positive value, $T_s > 0$), implies an increase in the unemployment rate in [14]. This can be interpreted in terms of an inversion of the labour supply curve in the $W, u$ plane. It should be noted that, in the vicinity of the inversion, $h_v$ increases with $u$ since $P_s$ cannot exceed the maximum level $P_t$ (corresponding to the minimum value of $T_s$, $T_9$). It follows that the disequilibrium relation between $W$ and $u$ can lie in the neighbourhood of the rising section of $S$ in Figure 3.\(^{13}\) In the figure $u^*$ ($d/dP_t$) is the "minimum" value of $u$, in correspondence with which the inversion in the relation occurs — the loop of the Phillips curve, originally discussed by Lipsey, becomes clockwise instead of anticlockwise.

The dotted curve, $S'$, represents a possible (econometric) interpolation of the "Phillips curve"; estimated for a period in which both the traditional section and the section which is "perverse" are large. It is worth noting that this produces a distorted estimate of the slope of the curve, which, in general, will be all the more inclined compared with the real curve the greater the number of periods in which the economy — or (more realistically) some sectors — shifted along the rising section of the curve.

To conclude, the empirical test of the hypothesis put forward in this article suggests that the components of turnover (the flows of hirings and separations) depend crucially — and not only transitonally but also, and above all, structurally — on the level of, and the changes in, the demand for labour. The empirical test also highlights the importance of other, socio-political, determinants. These have been especially important in the case of Italy (and presumably, of France and the United Kingdom) in view of the strife which has been a feature of industrial relations since the end of the 1960s.

As Figure 1 shows, the flows of hirings and separations on an annual basis fell from values of around 32 per cent of the total number of workers employed in manufacturing industry just before the 1969 "hot autumn" to a level about ten percentage points lower (i.e. by more than 25 per cent) at the end of the period considered. The corresponding values derived from provisional statistics for 1975 and 1976 show a further sharp fall in turnover to 10-12 per cent, as can be seen from the table at the bottom of the page.\(^{14}\)

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\(^{13}\) For a theoretical framework which is different, but nonetheless consistent with the approach adopted here, see B. Coser and D. Luskin, "The Phillips Relation...", op. cit., p. 39 note 1, and the comment by J. Vandekamp (together with the authors' reply) in the same review.

\(^{14}\) The figures refer to manufacturing industry. It should be noted that the flows of separations are given here net of the changes in the labour force in manufacturing industry. The figures in brackets are derived from the corrections made by F. Carmignani of the CISPE in the recent study mentioned in the text. Unfortunately, the "corrections" for the early 1970s are not available, though they
Our estimates give the order of magnitude of the relative importance of the "market" and "exogenous" socio-political factors which have given rise to the changes in turnover rates in Italy. The orders of magnitude for the period from 1973-IV to 1974-II are, of course, to be treated with considerable caution in view of the shortness of the period. On the other hand, the further falls in the values of the components of turnover in 1975 and 1976 suggest that the order of magnitude of the dummy variable is underestimated as a result of the lack of complete data for 1975-76 (and, on the basis of what we know, also for the last two years).

We must also point out that, although our dummy variables do not explicitly describe the mechanism whereby the changes in the turnover flows are dependent on the previously mentioned socio-political determinants, the link clearly goes from the "freezing of layoffs" (and, in part, from the fall in quits), imposed by the trade unions since the early 1970s in an attempt to protect employed workers, to the "freezing of hirings" decided by firms as a "vendetta" of the market. This would suggest that the two dummy variables used in our model in connexion with the flow of hirings should be replaced by a lagged variable connected with the flow of separations (which would continue to depend on the two dummies). We plan to incorporate this and other possible improvements in the theoretical reference model and the empirical test in a subsequent paper and to disaggregate the empirical tests of the flows of layoffs and quits by productive sector, size of firm and type of work. 10 Cambridge, Mass. F. Modigliani - E. TaranteLLI

should be much smaller. The started values are estimates, since the official ones are not yet available.

10 Preliminary estimates show, as was to be expected, that the flows of layoffs and quits depend respectively positively and negatively (with a very high level of significance) on the "structural" ratio of unemployed workers to employed workers.

<table>
<thead>
<tr>
<th>Year</th>
<th>εₜ</th>
<th>ηₜ</th>
<th>Year</th>
<th>εₜ</th>
<th>ηₜ</th>
</tr>
</thead>
<tbody>
<tr>
<td>1973</td>
<td>6.80 (5.9)</td>
<td>5.18</td>
<td>1975</td>
<td>1.35</td>
<td>2.88</td>
</tr>
<tr>
<td>II</td>
<td>5.81 (5.3)</td>
<td>6.10 (5.1)</td>
<td>II</td>
<td>2.44</td>
<td>2.89</td>
</tr>
<tr>
<td>III</td>
<td>9.00 (6.2)</td>
<td>9.61 (6.4)</td>
<td>III</td>
<td>3.12</td>
<td>3.48</td>
</tr>
<tr>
<td>IV</td>
<td>7.90 (4.6)</td>
<td>6.70 (5.7)</td>
<td>IV</td>
<td>2.36</td>
<td>3.84</td>
</tr>
<tr>
<td>1974</td>
<td>4.64</td>
<td>3.78</td>
<td>1976</td>
<td>1.00</td>
<td>2.80</td>
</tr>
<tr>
<td>II</td>
<td>4.76</td>
<td>4.04</td>
<td>II</td>
<td>3.81</td>
<td>5.20</td>
</tr>
<tr>
<td>III</td>
<td>4.37</td>
<td>4.24</td>
<td>III</td>
<td>4.15</td>
<td>3.69</td>
</tr>
<tr>
<td>IV</td>
<td>2.70</td>
<td>4.10</td>
<td>IV</td>
<td>2.99</td>
<td>3.84</td>
</tr>
</tbody>
</table>

Crowding Out: the Real Issues*

1. For some years, "crowding-out" has attracted the attention of both practical men and academic economists, but the two groups have been, in the main, concerned with crowding-out under quite different circumstances. From the practical point of view, the problem has been one of competing claims on resources that are limited for valid reasons. Thus with the money supply increasing as fast as is thought to be consistent with preventing an acceleration of inflation, the demands made by government in the capital market may be such as to squeeze out some private borrowing. If industrial investment is to be protected, then government should reduce its total expenditure and thus its claim on resources. The economists, for their part, have in the main been examining a different situation — one where production is assumed to be below capacity so that output could be raised by raising total monetary expenditure. The question of physical crowding-out need not therefore arise. They have then considered the extent to which fiscal action alone, unaccompanied by any complementary increase in the stock of money could bring about a desired expansion in real output. Thus the question is whether some private borrowing may be crowded out by the increased shortage of finance although no physical constraints on output have yet been encountered. The academics have therefore been considering what can fairly be described as an academic question. Of course it does not follow that nothing of practical value can be learned from models that embody restrictive assumptions of this kind. Immediate and direct practicality must not be regarded as a decisive test. It is, however, proper to ask whether the academic inquiry, eagerly pursued down some intriguing by-ways of theory, may not have diverted too much attention from the more central

* The author is indebted to Mr. Andrew Stevenson of the University of Glasgow for some valuable comments.