

ON THE SEARCH THEORISTS' APPROACH
TO THE PHILLIPS CURVE

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Forschungsbericht/
Research Memorandum No. 209

Jänner 1985

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Zusammenfassung

Für die inverse Beziehung zwischen (Lohn)Inflation und Arbeitslosenrate der makroökonomischen Theorie fehlt eine mikroökonomische Fundierung innerhalb eines neoklassischen Modells. In einem neoklassischen Gleichgewichtsmodell ist die Beschäftigung immer auf dem Vollbeschäftigungsniveau und unabhängig von der Inflation.

Teil 2 dieser Arbeit zeigt wie die Suchtheorien eine Phillips-Relation innerhalb eines neoklassischen Modells erzeugen, in dem das Postulat der 'vollständigen Information' der Walrasianischen Gleichgewichtstheorie aufgegeben wird. Im Teil 3 wird eine ökonomische Begründung für das Bestehen inflexibler Preise in einer Marktwirtschaft mit unvollständiger Information gegeben. Das Keynes'sche Konzept unfreiwilliger Arbeitslosigkeit wird in Teil 4 aus der Perspektive der Suchtheoretiker untersucht, während Teil 5 eine kritische Beurteilung des suchtheoretischen Ansatzes vornimmt.

Abstract

The inverse relation between (wage)inflation and the unemployment rate of traditional macroeconomic theory lacks a microeconomic foundation in a neoclassical framework. Neoclassical reasoning implies that employment is always at the full employment level and independent of inflation.

In part 2 it is shown how search theory offers a derivation of the Phillips relation in a neoclassical framework by removing the complete information postulate of Walrasian equilibrium theory. Part 3 gives an economic rationale for sticky prices in a market economy with incomplete information, whereas part 4 Keynes' concept of involuntary unemployment is reexamined in the light of Search theory. Part 5 gives a critical evaluation why the search theorists' derivation of the short-run Phillips relation might not be convincing on theoretical grounds.

1. Introduction

The Phillips curve expresses an inverse relation between (wage) inflation and the unemployment rate.¹⁾ Higher inflation is associated with lower unemployment and vice versa. Among others, the following explanations were brought up for the negative correlation between inflation and unemployment.

- Increased demand for labor as a result of an increase in aggregate demand leads to an increase in nominal wages. This increase in labor costs will be passed on to prices since entrepreneurs are assumed to calculate their prices on the basis of a mark up rule. Hence, lower unemployment causes higher inflation.
- An increase in aggregate demand leads to an increase in prices since firms operate on a perfect competitive product market. The resulting increase in the demand for labor leads to an underproportional increase in nominal wages as workers have some form of money illusion. Lower real wages are the result, which induces profit maximizing firms to increase output and employment. Hence, higher inflation causes lower unemployment.

The first argument relies on sticky prices which do not react directly to changes in demand whereas the second mechanism is based on some form of money illusion. Workers do not ask for a proportional change in money wages when the price level changes. Thus, for the existence of the Phillips curve sticky prices and/or money illusion were required.

In a neoclassical framework, no Phillips curve could exist. Neoclassical reasoning implies that output and employment will increase only if real wages decline. In a neoclassical model, however, real wages could never change. A change in aggregate demand leads only to equiproportional changes in prices and nominal wages without affecting real wages. On the microlevel there is no causal relationship between aggregate demand and employment as traditional macro-economic theory suggests. Employment is always at the full employment level and independent of inflation.

The theory of the new microeconomics of inflation and unemployment offers a derivation of the Phillips relation in a neoclassical framework. Changes in aggregate demand are shown to have output and employment effects without relying on sticky prices and/or money illusion. Proponents of Search theory claim that their approach represents a microeconomic foundation for the macroeconomic relationship between aggregate demand and employment.²⁾

2. Basic Ideas of Search Theory

Incomplete Information

The standard Walrasian model rests on three assumptions:³⁾

- Firms and households are price takers in the output market and wage takers in the labor market.
- All actors are fully informed about all relevant alternatives. Each household and firm always knows the market clearing prices at every firm now and in the future. If prices changed somewhere in the economy, each actor would know the new price immediately.
- There exists no nonprice rationing. Buyers and sellers leave the market satisfactorily. No one wants to sell (buy) at a higher (lower) price than he or she could. Exchange takes place only when the auctioneer found the prices which are consistent with general market clearing.

Search theorists removed the second postulate of Walrasian equilibrium theory.⁴⁾ Firms and households are no longer fully informed about market opportunities. Actors have to incur costs to acquire information about everyone else's offers and demands and the properties of the goods and services offered.

Two propositions were made concerning the acquisition of information:⁵⁾

- The acquisition of information conforms to the laws of costs of production.
- Specializing in information is efficient. If gathering informations about market alternatives is more costly while employed than while not employed

(for firms as well as households), search specialists will appear on the market. Firms will engage in exchange with intermediary brokers and workers will become unemployed to search for job information.

Search Strategies

A huge amount of economic literature has been concerned with the question how a rational individual should determine his search for market alternatives.⁶⁾ Most of these models assume that the searcher knows the distribution of prices (wages) but not the price (wage) offer of a particular firm. His problem is to find the lowest (highest) possible price (wage) offer.

As searching incurs costs (costs of physical search plus foregone earnings if one searches while unemployed), the search rule at a fixed sample⁷⁾ requires the rational individual to determine the level of her search for information by the following calculus: she should look for alternatives until search costs c become greater than the expected gain g_{n+1} of an additional search activity:

$$g_n \geq c > g_{n+1} \quad (1)$$

Search costs depend on the number of observed firms. The expected price (wage) which the individual pays (receives) is the expected minimum value (maximum value) of n observations out of a sample with a probability distribution $F(x)$.

$$m_n = \int_0^{\infty} [1-F(x)]^n dx \quad (2)$$

The expected price m_n decreases with increased number of observations. The expected gain of an additional search activity consists of the more favorable offer - the price reduction (wage increase) - one could find.

$$g_n = m_n - m_{n+1} = \int_0^{\infty} 1-F(x)^n F(x) dx \quad (3)$$

The expected gain of an additional search activity is also a decreasing function of the number of observations n .

Stigler's search rule was criticized of not being optimal. Among others, McCall suggested a sequential search as an alternative decision rule.⁸⁾ The optimal search strategy for the labor market (but along similar lines for the product market) requires that workers sampling from an array of job offers should refuse a wage offer unless it exceeds the 'reservation wage'. This acceptance wage in turn is set to equate the marginal costs of further search with the marginal benefit of search.

If a worker accepts a wage contract after N wage offers, his revenue f consists of the value of the N-th wage offer x_N minus his search costs c.

$$f = x_N - cN \quad (4)$$

If the searcher receives a wage offer x in the first period and repeats his search activity in the same way in the subsequent periods, his maximum revenue f(x) will be

$$f(x) = -c + \max [x, E(f(x))], \quad \epsilon = E(f(x)) \quad (5)$$

As it appears from equation (5), for a search strategy to be optimal, the job seeker has to continue his search if $x < \epsilon$ and to stop searching if $x \geq \epsilon$.

Since the searcher knows the wage distribution, he is able to determine for each observed wage offer the expected value of the wage increase for an additional search activity. Under the condition that he accepts the N-th wage offer, the expected value of the job seeker's revenue will be

$$E(f|N) = E(x_N|N) - cN \quad (6)$$

so that his 'reservation wage' is given by

$$E(f) = \epsilon = E(E(x_N|N)) - cE(N) \quad (7)$$

The 'reservation wage' is the wage at which the expected value of the wage increase is equal to the expected costs of an additional search activity.

For $E(x_N|N)$ applies further

$$E(x_N|N) = E(x_N | x_N > \epsilon, x_{N-1} < \epsilon, \dots, x_1 < \epsilon) \quad (8)$$

that the job seeker accepts the labor contract at the N-th wage offer only if $x_N \geq \epsilon$ and all previous wage offers were smaller than ϵ .

Voluntary Unemployment and the Derivation of the Phillips Curve

From the search theorists' viewpoint unemployment is a voluntary activity. It is the result of the rational decisions of workers to become 'self-employed' to acquire information about job opportunities and wage differentials. Unemployment is considered an efficient form of 'producing' or 'investing' in information.

Phelps illustrates this with his 'island tale'.⁹⁾ In this parable, the economy is organized in islands between which information flows are costly. To gain information about the other islands, workers have to spend the day travelling to the islands instead of working on their jobs.

The quantity of this search unemployment will vary with aggregate demand. As aggregate demand decreases, prices and wages decrease too. Some workers will consider their wage cut as island specific. They expect wages on other islands to be higher. They will therefore quit their jobs and go on search for job alternatives. Because workers believe that their opportunities elsewhere have not diminished, the acceptance wage will fall less than proportionally to product prices. Real wage rates will therefore rise and profit-maximizing output and employment fall. This is one among several mechanisms by which search theorists explain the negative short-run Phillips relationship between wage changes and actual unemployment.

Phelps offered a further derivation of the short-run Phillips curve relation which is - similar to Alchian's derivation - also based on labor market consideration.¹⁰⁾ In Phelps' model, firms have a dynamic monopsony power. As a wage setter, each firm uses wages as an important recruiting tool. A rise of the firm's wages relative to wages elsewhere increases the proportion of unemployed workers sampling its wage the firm can expect to accept its offer. Additionally,

an increase of the firm's wage reduces the rate at which its present employees will quit.

As aggregate demand increases vacancies rise. This in turn creates an incentive for each firm to raise its wage relative to expectations of wage rates elsewhere. Increased wage offers in turn will gradually draw workers out of the unemployment pool. Since every firm raises its wage more than its expectation of the increase in the average wage elsewhere, every firm gets disappointed of its actual recruiting results. Its relative wage turns out to be less than intended. Firms will therefore adjust by increasing money wage rates. Similarly, workers will find out that their relative wage has not improved. They will therefore ask for wage increases. A relation between money wage increases (in excess of expected rate of increases) and unemployment below the equilibrium level will be the result.

Phelps & Winter derive a short-run Phillips curve which is based on product market considerations.¹¹⁾ In their model, Phelps & Winter analyze the optimal price-making behavior of a firm by assuming transient monopoly power of the firm with respect to its current customers. This monopoly power of firms arises because information flows are sluggish so that customers do not respond instantaneously to price changes. Firms, however, cannot indefinitely maintain their prices above the going market price without losing all their customers. Over time, information on price differentials diffuses through the market. Firms are therefore asymptotically competitive.

Phelps & Winter demonstrate two consequences of their departure from Walrasian perfect markets:

- Firms will pay higher real wages and increase their output at the same time.¹²⁾
- Firms will generally produce less than that output rate at which marginal costs equal price.

In the Phelps & Winter model the short-run Phillips relation appears by the following mechanism: an increase in aggregate demand leads to an upward

shift of the firms demand curve and to a proportional rise in wage rates. If firms believe that the going price of competing firms is unchanged (or increased less than their own) they might want to increase their price less than proportionally to their demand price. They will therefore meet the additional quantity demanded with greater output and thus greater employment. Output and employment will be increased in spite of the rise of real wage rates (money wages have increased proportionally to demand whereas product prices of the firms were raised less than proportionally). The reason for this lies in the firm's believe that a proportional rise of its price in response to increased demand would reduce its competitiveness. As firms learn that they are not experiencing a net loss of customers (the inflow of new customers just matches the outflow of customers) from their higher prices, they will continuously adjust their prices upward. A Phillips like relation between output and the rate of price increase will be the result.

In all presented models, no long-run Phillips curve exists. After the ellapse of some time, workers will find out that wages elsewhere are equally low (Alchian). They will adapt their expectations of the opportunities elsewhere. Search becomes therefore less attractive so that labor supply increases. The government has continuously to reduce money wages by reducing aggregate demand to prevent employment from rising. The same applies to Phelps theorizing. Maintenance of the lower unemployment rate requires that wage rates stay ahead of expectations as the latter are revised upward. A continuous increase in aggregate demand is therefore necessary to induce firms to raise their wages relative to competitors to get more workers. Likewise in the Phelps & Winter model. Only continuous demand shocks will have the effect of continuously confusing firms in their distinction between their own demand and aggregate demand so that a proportion of increased demand will be met by increased output and employment.

In the search models, the short-run trade off between unemployment and price(wage) inflation arises as a consequence of the abandonment of the full information postulate. It takes time for individuals to discover that as aggregate demand changes options elsewhere have changed too. At first, the failure to find other equally good job offers are taken as an unlucky string of searches.

Only after a while will people learn that their failure to find good wage offers reflects diminished alternatives in general. This lag of expectations behind actual developments induces

- workers to quit and to go on search or to refuse wage offers which they otherwise would have accepted (Alchian);
- firms to increase their wage rates to be able to hold the level of employment needed (Pheips);
- firms to increase their output prices less than proportionally to demand increases and thus to meet demand increases in part by an increase in output and employment (Pheips & Winter).

The lag of people's perception of the world behind changed reality is already sufficient for aggregate demand changes to have employment effects. Search theorists need no lag of wage rate changes behind prices to obtain variations in employment. Wage rates can increase (fall) as fast as other prices. Only the lag of discovery is necessary (and sufficient) for employment to be changed.

3. Sticky Prices

In addition to the derivation of a Phillips like relation between price and output changes, the Pheips & Winter model offers an economic rationale for prices to be sluggish. Firms will not change their product prices proportionally to demand changes because they cannot tell if changed demand for their products is a change also in aggregate demand which affects options elsewhere. Firms will therefore consider a proportional price increase in response to demand increases as reducing their competitiveness.

Sluggish price adjustment as the result of microeconomic optimizing behavior is also emphasized by Alchian. Alchian gives several reasons for price sluggishness. They follow quite naturally as soon as the full information postulate is removed. He argues that stable prices and inventories economize on information costs. Costs on unsold inventories are less than if firms attempted to obtain complete information about demand at each instant of time. Producing in advance at a less

expensive rate and holding an 'excess' for contingent demand enables the firm to adapt to changed demand without long advance reservation-type planning. The costs of these extra capacities are less than the costs of other ways of obtaining equally high convenience. Additionally, a seller who eliminates a nonpredictable fluctuating market clearing price by carrying a larger inventory to meet unforeseen demand fluctuations can offer his customers savings in costs of search. He makes prices more predictable and enables customers to plan their purchases more efficiently. If for example prices were high because of randomly high demand, some purchases would turn out ex post to be inappropriate. They turn out to be not optimal because they were undertaken in the expectation of a different price than actually occurred. However, revising such purchase plans and actions are costly. Stable prices help customers to avoid such losses. Customers will therefore be ready to pay a slightly higher price than the market clearing price in order to save on search and disappointed anticipations. For, this higher price to the buyer will still be lower than the sum of the average lower fluctuating price plus search costs.

Okun argues along similar lines.¹³⁾ He asserts that many product markets are characterized by long term contractual arrangements. Product heterogeneity and the resulting uncertainty about product quality and costly search makes customers willing to pay a premium to do business with customary suppliers. Firms, in turn, have an incentive to maintain stable prices to avoid giving customers an incentive to abandon the no-search-relationship and to begin exploring.

4. KEYNES' Concept of Involuntary Unemployment in the Light of Search Theory

Neoclassical theory presumes that in competitive labor markets actual employment reveals worker's true preferences between work and alternative uses of time. Stickyness of money wages were therefore considered an evidence for unemployment to be voluntary. Keynes, however, argued that workers are willing to accept a larger volume of employment at a lower real wage resulting from an increase of prices but will not accept money wage cuts. Stickyness of money wages are therefore no demonstration for unemployment to be voluntary.

Many Keynes interpreters thought that Keynes made this distinction between an increase in the price level and money wage cuts as a method of reducing real wages, because he assumed money wage illusion on the side of workers. Search theory offers, however, a more sophisticated explanation for Keynes' distinction between lowering real wages through nominal wage cuts or through a rise in the price level.¹⁴⁾ Search theorists argue that the difference between a price level rise and nominal wage cuts lies in their conveying different information. A rise in the price level tells workers that money wages everywhere have fallen relative to prices. A cut in one's own money wage, however, does not imply options elsewhere have changed. In their opinion, this was also the reason why Keynes defined involuntary unemployment in terms of price level changes. When one employer cuts wages, this does not signify cuts elsewhere, whereas a rise in the price level gives employees no reason to think their real wages to be lower than they are elsewhere. The revelation of information about prospects elsewhere makes the difference between a rise in the price level and money wage cuts as a mean to reduce real wages. Search theory, therefore, suggests the wage in the present job versus the wage in all other jobs as the relevant comparison instead of the money versus the real wage distinction.¹⁵⁾

5. Staying Employed as an 'Transaction Productive' Device

The search theorists' derivation of the short-run Phillips relation rests on the critical assumption that unemployment is an efficient way of searching for new job opportunities.

This proposition of search theory is not very convincing.¹⁶⁾ In labor markets with imperfect information, being employed is itself a recommendation to a prospective employer. The uncertainty of employers about qualifications of applicants induces them to base their evaluation of applicants on signals. Such signals are, for example, the education and the working biography of applicants. Applicants, in turn, who learn that employers use such signals as a basis for their evaluation, will have an incentive to invest in such signals which increase their probability of getting the job desired.¹⁷⁾ Clever applicants will also learn that employers have certain ideas and expectations of 'normal careers' for different occupations which are mainly influenced by successful workers in their own firms. In their

investment decision in 'transaction productivity', applicants will therefore try to imitate such successful careers, because their observance will increase the probability of being able to make such careers. This imitating behavior will lead to the development of 'standardized careers'.¹⁸⁾ Once 'standard careers' have developed, applicants are forced to follow them in order to be able to continue their own careers. For, any deviation from this standard path to success produces a negative market signal which lowers the probability of getting the job desired. Employers will be suspicious of applicants who deviate from these standard careers, whatever the motivation of applicants to do so might have been. In labor markets with standard careers, applicants can only communicate their special qualification and liability to potential employers by following these standard careers. The strategies of actors to reduce uncertainty have led to the development of special media of communication - standard careers - which become the only signals that are understood. By analogy, as in an economy with money as the medium of exchange only money can be used to articulate on the market.¹⁹⁾

Therefore, unemployment represents no rational option for job seekers. For, unemployed applicants will be considered as people who were not able to follow such standard careers. Employers will not consider them as appropriate workers for their firms. Unemployment represents therefore a depreciation of human capital which has to be avoided as a 'transaction productive' device.

FOOTNOTES

1. As has been shown by PHILLIPS with British data, PHILLIPS, A.W., The Relation between Unemployment and the Rate of Change of Money Wage Rates in the United Kingdom 1861-1957, *Economica* 25 (1958). For theoretical explanations LIPSEY, R.G., The Relation between Unemployment and the Rate of Change of Money Wage Rates in the United Kingdom, 1862-1957; a further analysis, *Economica* 27 (1960) and SAMUELSON, P.A. - R.M. SOLOW, Analytical Aspects of Anti-Inflation Policy, *American Economic Review* (1960).
2. PHELPS, E.S. et al. (Eds.), *Microeconomic Foundations of Employment and Inflation Theory*, New York 1970.
3. GROSSMAN, H.I., Aggregate Demand, Job Search, and Employment, *Journal of Political Economy* (1973), p. 1356, and PHELPS, E.S., The New Microeconomics in *Employment and Inflation Theory*, Introduction, in PHELPS (1970), p.4.
4. The new microeconomics offers also an economic rationale for the abandonment of the first assumption of the Walrasian Model. The third postulate of Walrasian equilibrium theory was dropped by a different type of theory, see BARRO, R.J., and GROSSMAN, H.I., A General Disequilibrium Model of Income and Employment, *American Economic Review* 61 (1971).
5. ALCHIAN, A.A., Information Costs, Pricing, and Resource Unemployment, in PHELPS (1970), p.29.
6. Exemplary STIGLER, G., The Economics of Information, *Journal of Political Economy* 69 (1961), McCALL, Economics of Information and Job Search, *Quarterly Journal of Economics* 84 (1970), WEITZMAN, M.L., Optimal Search for the Best Alternative, *Econometrica* 47 (1979).
7. Search rule at a fixed sample: STIGLER (1961).
8. McCALL (1970).
9. PHELPS (1970), Introduction.
10. PHELPS, E.S., Money-Wage Dynamics and Labor Market Equilibrium, in PHELPS (1970).
11. PHELPS, E.S. & WINTER S.G., Optimal Price Policy under Atomistic Competition, in PHELPS (1970).
12. Contrary to most of the other search models in which real wages move procyclically.
13. OKUN, A.M., Inflation: Its Mechanics and Welfare Costs, *Brookings Paper on Economic Activity* 2 (1975). For a similar argument for the labor market to rationalize sluggish wages see WILLIAMSON, O.E., WACHTER, M.L. and HARRIS, J.E., Understanding the employment relation: The analysis of idiosyncratic exchange, *Bell Journal of Economics* 6 (1975).

14. ALCHIAN, in PHELPS (1970).
15. See also TOBIN on Keynes' concept of involuntary unemployment, which slightly differs. He argues that Keynes had relative wages as an argument in the labor supply function. This because workers are more concerned about relative than absolute real wages. Labor markets are decentralized and any fall in money wages in one particular market would impair the relative status of the workers there. The only neutral and universal method of reducing real wages in a decentralized economy is a general rise in the price level. TOBIN's emphasis lies more on institutional facts and wage bargaining than on information imperfections. See TOBIN, J., Inflation and Unemployment, American Economic Review 52 (1972), p.3.
16. There are other criticisms against search theory which are mainly based on empirical arguments. REYNOLDS shows that search activity by unemployed workers are the unproductive consequences of dissatisfaction and frustration rather than a rational decision for improvement. Only a third of the cases could improve their jobs through search while being unemployed. Two thirds, on the other hand, could improve their jobs by looking for a new job while staying in the old one. REYNOLDS, L.G., The Structure of Labor Markets, New York 1951. Another criticism of search theory is concerned with the procyclical movement of quits implied by the theory. Whereas quit rates, in fact, move countercyclical.
17. See SPENCE, A.M., Job Market Signalling, Quarterly Journal of Economics 87 (1973) for the importance of market signals in labor markets with incomplete information.
18. The process described is very similar to what BRUNNER & MELTZER described in their model of the development of media of exchange. Different transaction chains converge to only one - money -, because ever more people follow certain transaction chains which are characterized by low transaction costs, see BRUNNER, K. & MELTZER, A.H., The Uses of Money: Money in the Theory of an Exchange Economy, American Economic Review 61 (1971). For a comparison of the structure of transactions between labor and product markets see MARIN, D., Transaktionstheoretische Grundlagen der personellen Einkommensverteilung, mimeo, Vienna 1980.
19. For the analogy between 'standard careers' and money as media of communication see MARIN (1980). See also CLOWER's explanation of unemployment in an economy with money as the medium of exchange. Unemployed workers could communicate to entrepreneurs their demand for their products only by offering money in exchange. Exactly this media of communication is what unemployed workers do not possess because they are unemployed. They are therefore not able to articulate to entrepreneurs their needs which in turn induces entrepreneurs not to produce and thus not to employ them. CLOWER, R.W., The Keynesian Counter-Revolution: A Theoretical Appraisal, in CLOWER, R.W. (ed.), Monetary Theory, Harmondsworth 1971. To buy or not to buy by offering money in exchange (no 'exit' or 'exit') is the language entrepreneurs understand. 'Voice' is not heard by entrepreneurs. For the concept of 'exit' and 'voice' see HIRSCHMAN, A.O., Exit, Voice, and Loyalty, Cambridge 1970.