

# Introduction to SAM :

## Search and Matching in the Labor Market :

[Sem0057]

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Academic Year 2024-2025

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# 1 Historical Origins

- The origin of search goes back to Stigler (1961) in the 50s when he noted the existence of price differential for identical cars in the suburbs of Chicago.



Figure 1: The Phelps Book

- Consumers were “searching” for a low price
- In same way or another, this search process was linked to imperfect and limited information.
- These search ideas were not necessarily linked to the labor market.
- Stigler won the Nobel price in 1982
- His micro textbook “price theory” is probably the best book for understanding economics and with many references to great economist of the 20th century.

- In the macro labor literature, in the late 60's in the presidential address to the *American Economic Association*, **Milton Friedman** introduced the concept of the Natural Rate of Unemployment

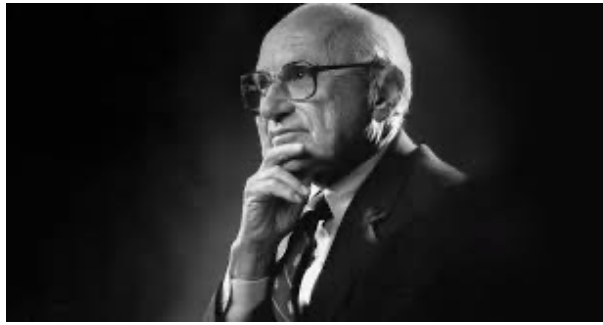


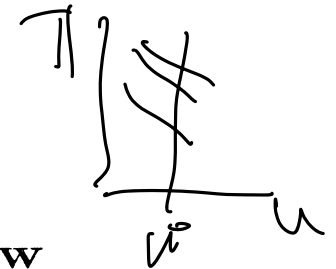
Figure 2: Milton Friedman

- The presidential address

**The American Economic Review**  
Volume LVIII                      MARCH 1968                      Number 1

**THE ROLE OF MONETARY POLICY\***  
*By MILTON FRIEDMAN\*\**

Figure 3: Milton Friedman



- The definition of NRU

supply of labor that will produce downward pressure on real wages. The "natural rate of unemployment," in other words, is the level that would be ground out by the Walrasian system of general equilibrium equations, provided there is imbedded in them the actual structural characteristics of the labor and commodity markets, including market imperfections, stochastic variability in demands and supplies, the cost of gathering information about job vacancies and labor availabilities, the costs of mobility, and so on.<sup>8</sup>

You will recognize the close similarity between this statement and

Figure 4: Milton Friedman

- The concept of the NRU was well defined but completely postulated *without any micro-foundation*.
- In the subsequent years a vibrant research on the microfoundation of the NRU

## 2 60s and 70s: One Sided Search

- 1968: Phelps book (Phelps (1970) on **Microfoundation** of NRU. Different chapters with different approaches

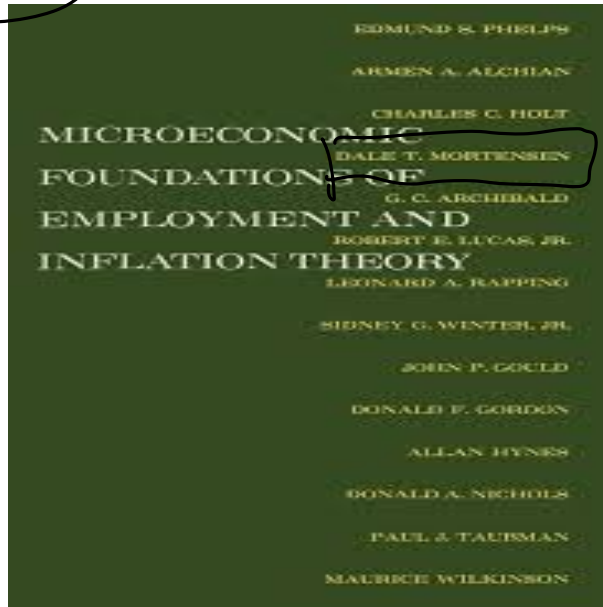


Figure 5: The Phelps Book

- Young and Radical economists laid out the foundation of macro labor for the subsequent 50 years.



Figure 6: Youth Radical Scholars in Tthe 70s

- A young scholar **Dale Mortensen** wrote a chapter in the Phelps book on the Search theory as a way to derive a micro-founded NRU, with real rigidities (as opposed to nominal rigidities)
- Incidentally, Phelps got the Nobel prize in for Economics in 2008.
- Models were mainly 1 sided search with focus on worker behaviour. *with I*
- McCall (1970) model, partial equilibrium search is the key contribution of microfoundation of NRU using search

### 3 80s and 90s: Towards Equilibrium Unemployment Theory

- Two key brand of the macro research literature are important for obtaining a key model of SAM

#### 1. Macro research with Microfounded Frictions

- 1982: Coconut Economy by Peter Diamond, probably the first to apply the matching function in a simple macro economy (matching with increasing returns to scale) and obtains multiple equilibria.
- The Coconut Paper Diamond (1982b)

#### Aggregate Demand Management in Search Equilibrium

Peter A. Diamond

*Massachusetts Institute of Technology*

Equilibrium is analyzed for a simple barter model with identical risk-neutral agents where trade is coordinated by a stochastic matching process. It is shown that there are multiple steady-state rational expectations equilibria, with all non-corner solution equilibria inefficient. This implies that an economy with this type of trade friction does not have a unique natural rate of unemployment.

#### I. Introduction

Some economists attribute fluctuations in unemployment to misperceptions of prices and wages. Others attribute such fluctuations to lags in adjustment of prices and wages (including staggered contracts). It seems to be a shared view that there would be no macroeconomic unemployment problems if prices and wages were fully flexible and correctly perceived. This paper introduces a third cause for macro unemployment problems—the difficulty of coordination of trade in a many-person economy. That is, once one drops the fictional Walrasian auctioneer and introduces trade frictions, one can have macro unemployment problems in an economy with correctly perceived, flexible prices and wages.

Using a barter model with identical, risk-neutral individuals where trade is coordinated by a stochastic matching process, this paper

Valuable discussion with Sidney Winter; helpful comments from Stanley Fischer, Jerry Hausman, James Mirrlees, Richard Schmalensee, Eytan Sheshinski, Robert Solow, and Martin Weitzman; research assistance by Drew Fudenberg and Michael Whinston; and financial support from NSF are gratefully acknowledged.

[*Journal of Political Economy*, 1982, vol. 90, no. 5]  
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□□□

Figure 7: Introduction of the Matching Function

- Many issues were still open to arrive to a coherent model.
  - \* How do you determine wages in SAM Models? Dale Mortensen mentions "wage indeterminacy"
  - \* Diamond (1982b) and Diamond (1982a) proposes NASH Bargaining as a natural way to solve for wage indeterminacy

2. Rational Expectations Models with Saddle path

– 1985 Chris Pissarides, the behaviour of wages, vacancy and unemployment in a matching environment with Rational Expectations. Pissarides (1985)

– The 1985 AER paper

Short-Run Equilibrium Dynamics of Unemployment, Vacancies, and Real Wages

By CHRISTOPHER A. PISSARIDES\*

In this paper, I study the dynamics of adjustment in a labor market, following an exogenous shock to the real value of output. Some of the stylized facts of business cycles, with which the predictions of the model are consistent, include first, real wages do not fully reflect fluctuations in the real value of labor's marginal product, so real profits fluctuate more than real wages. Second, unemployment responds to output shocks, but its response is slow. Finally, in countries where there are good data on vacancies, like Britain, we observe that vacancies respond more quickly to shocks and with greater amplitude than unemployment.

Several authors have constructed models to explain why output shocks are absorbed partly by real wages and partly by unemployment (the empirical regularity in the United States is discussed by Robert Hall, 1980). Implicit contract models (Costas Azariadis, 1979; Oliver Hart, 1983) have successfully explained why real wages may not reflect output shocks, and the models with asymmetric information and severance pay have also had some success in explaining fluctuations in unemployment. Bargaining models (Ian McDonald and Robert Solow, 1981) and efficiency wage models (Janet Yellen, 1984) appear to be more successful in explaining fluctuations in unemployment, but formalizations are still in their infancy. The models have not yet been subjected to the same scrutiny as implicit contract and earlier models.

\*London School of Economics, Houghton Street, London WC2A 2AE. Work on this paper was started at NBER's Summer Institute in July 1983 and later completed at the Industrial Relations Section of Princeton University. I thank both institutions for their hospitality and financial support. I also thank the referee and seminar participants at the universities of Boston, Chicago, Iowa, Wisconsin, and Yale for helpful comments.

One feature shared by all these models is that they are static. They explain how real wages and employment respond to shocks in a comparative-static framework but say nothing about the adjustment path from one equilibrium to the next. Also, the models say nothing about job vacancies, either in equilibrium or during the adjustment process. By contrast, this paper takes the view that by modeling job vacancies explicitly, one can learn more about the behavior of unemployment and real wages, both in equilibrium and during the adjustment to equilibrium. Thus, the model developed below is explicitly dynamic, and in it job vacancies play a critical role in the transmission of output shocks to real wages and unemployment.

A job vacancy indicates a willingness by a firm to hire a worker.<sup>1</sup> It is equivalent to unemployment of capital, so just as workers move between the states of employment and unemployment, jobs move between the states of occupancy and vacancy. I model the interaction of vacancies and unemployment by using ideas from equilibrium search theory, where there is continuous wage recontracting and perfect anticipation of the adjustment paths of all endogenous variables. Job vacancies enter the model via their influence on job contacts, which depend on the number of firms looking for workers. Some firms may not wish to hire and so they may not be actively engaged in the search process. Only firms with job vacancies are actively engaged in search, so the number of job contacts and

<sup>1</sup>For more discussion of the concept of vacancies, with empirical evidence for the United States and Britain, see, respectively, Katharine Abraham (1983) and my paper with Richard Jackman and Richard Layard (1983). Earlier contributions incorporating vacancy-unemployment interactions (but without explicit micro models and with a peripheral role for wages) include Charles Holt and Martin David (1966) and Bent Hansen (1970).

Figure 8: The 1985 AER paper

## 4 90s: Macro Labor General Equilibrium Theory

### 4.1 Macro Matching

WEEK 3

- 1991: First edition of the Pissarides Book: Equilibrium Unemployment Theory. It is mainly job creation
- 1994: Mortensen-Pissarides. Job Creation and Job Destruction in the Theory of Unemployment. Mortensen and Pissarides (1994)
- 2000: 2nd edition of the Pissarides Book. Pissarides (2000)

- The first edition in 1990

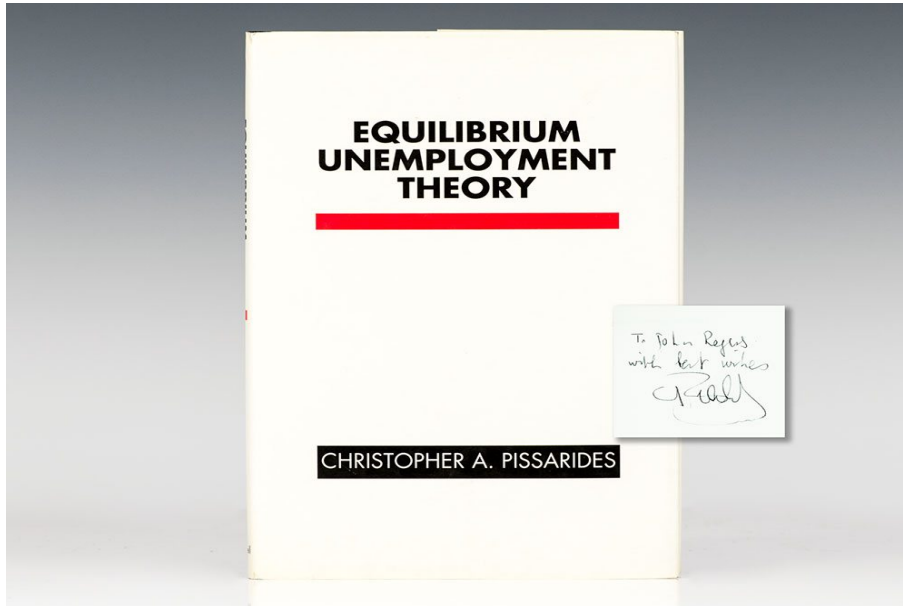


Figure 9: Introduction of the Matching Function

- The second edition in 2000

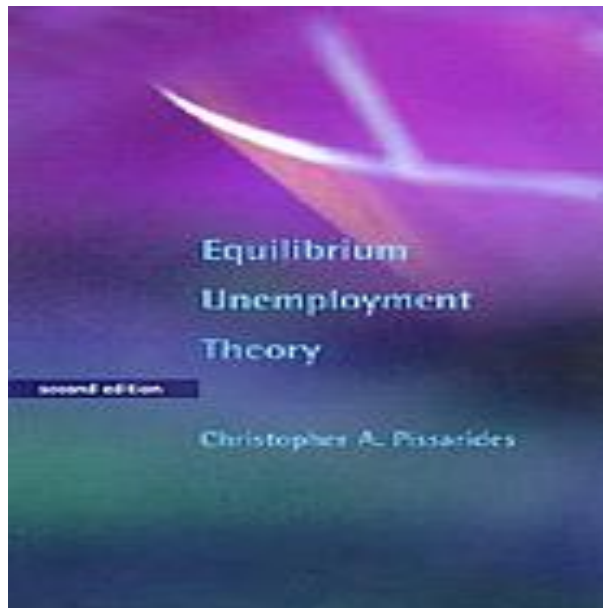


Figure 10: Introduction of the Matching Function

## 4.2 Wage Dispersion and on the Job Search

WSH 4

- 1998 Burdett Mortensen) Obtain equilibrium wage dispersion with homogeneous workers when on the job search is present
- Models with endogenous on the job search (e.g. Pissarides 1994)

- The Coconut Paper Diamond (1982b)

### INTERNATIONAL ECONOMIC REVIEW

May 1998  
Vol. 39, No. 2

#### WAGE DIFFERENTIALS, EMPLOYER SIZE, AND UNEMPLOYMENT\*

BY KENNETH BURDETT AND DALE T. MORTENSEN†

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The unique equilibrium solution to a game in which a continuum of individual employers choose permanent wage offers and a continuum of workers search by sequentially sampling from the set of offers is characterized. Wage dispersion is a robust outcome provided that workers search while employed as well as when unemployed. The unique nondegenerate equilibrium distribution of wage offers is constructed for three cases: (i) identical workers and employers, (ii) identical employers and an atomless distribution of worker supply prices, and (iii) identical workers and an atomless distribution of job productivities.

#### 1. INTRODUCTION

Empirical research has documented that inter-industry and cross-employer wage differentials exist, are stable, and cannot be explained by observable differences in worker or job characteristics that might require compensation. Why should workers of apparently equal ability be paid differently on similar jobs? Many have attempted to provide an explanation.

Some writers have argued that workers sort on nonobservable ability in ways that explain the data without contradicting first principles of competitive market analysis, for example, Murphy and Topel (1987). Others appeal to alternative theory with 'efficiency' and 'fair' wage-type arguments, for example, Kreuger and Summers (1987a, 1987b). Utilizing equilibrium sequential search theory, several different authors have provided insights into how a dispersed wage equilibrium can exist, or more precisely, how difficult it is to generate dispersed wages as an equilibrium phenomena. (See, for example, Diamond 1971, Albrecht and Axell 1984, and Burdett and Judd 1983.) Here we show that persistent wage differentials are

\* Manuscript received January 1995.

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Figure 11: Endogenous Wage Distribution



## 5 Radical Ideas Become Mainstream

2011  
DMP

- Nobel Prize in Economics to DMP
  - Peter Diamond (D)
  - Dale Mortensen (M)
  - Christopher Albert Pissarides (P)



Figure 12: Introduction of the Matching Function

## 6 Other Key Contributions in the path toward mainstream

- Directed Search and Competitive Search Equilibrium

- Espen Moen (1998)
- Robert Shimer (1996)

WEEK 4

EFFICIENCY  
WEEK 3

- Search and Money and Monetary Economics

- Randall Wirtzt

- Daron Acemoglu Contribution to SAM

- SAM and wage inequality
- Distribution of Jobs (good versus bad jobs)
- Role of training and schooling

WEEK 4

- Business Cycle properties

- Shimer (2005). Business Cycle properties of the DMP model.
- Shimer Critique

- Beyond Labor

- SAM Models applied to finance
- Wassmer and Weil (2005)

- The role of institutions and European Unemployment

- Euroclerosis
- Fixed term contracts

WEEK 5

## 7 Current Research in SAM

- Technical Search
  - Technical Search ‘Almost theory’ and very technical and theory oriented
- Empirical Search and structural estimation of search models
  - Administrative and micro data to estimate models
- Search Models applied to issues beyond the labor market.
  - SIR Models and epidemiologic research around covid

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