

Dale T. Mortensen

Wage Dispersion

WHY ARE SIMILAR WORKERS PAID DIFFERENTLY?



Wage Dispersion



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Dale T. Mortensen
Wage Dispersion: Why Are Similar Workers Paid Differently?

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Why Are Similar Workers
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Dale T. Mortensen

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In memory of Thomas Peter, my Danish father.

Contents

| | |
|---|-----------|
| Series Foreword | ix |
| Foreword by Karsten Albæk | xi |
| Preface | xiii |
| Introduction | 1 |
| 1 Evidence in Search of Theory | 9 |
| 2 The Burdett-Mortensen Model | 35 |
| 3 The Shape of Wage Dispersion | 47 |
| 4 Wage Dispersion and Worker Flows | 71 |
| 5 The Wage-Tenure Relation | 97 |
| Appendix: An Existence Proof | 125 |
| Afterword | 129 |
| Bibliography | 133 |
| Index | 139 |

Series Foreword

The Zeuthen Lectures offer a forum for leading scholars to develop and synthesize novel results in theoretical and applied economics. They aim to present advances in knowledge in a form accessible to a wide audience of economists and advanced students of economics. The choice of topics will range from abstract theorizing to economic history. Regardless of the topic, the emphasis in the lecture series will be on originality and relevance. The Zeuthen Lectures are organized by the Institute of Economics, University of Copenhagen.

The lecture series is named after Frederik Zeuthen, a former professor at the Institute of Economics.

Karl Gunnar Persson

Foreword

At least since Adam Smith wrote about compensating wage differentials, economists have been interested in understanding why workers are paid differently. A main theory in this area takes the view that wage differentials are consequences of the productive capability incorporated in the workers and that interest centers on the decision to invest in productive capability or human capital. However, plain inspection and the evidence from empirical research suggest that this is not enough to explain wage dispersion.

Another topic, which is as old as the profession, is the attempt to understand unemployment. The major theory in this area is job search theory, whereby workers are assumed to face different options in the labor market. A natural question in this context is why similar workers should receive offers that differ with respect to wage rates, as is the assumption in the partial job search models.

This book is about the recent attempts to explain both transitions in the labor market and the distribution of wages in the labor market in a coherent way. The point of departure is the "Burdett-Mortensen model." In this general equilibrium model of the labor market, ex ante identical workers move between unemployment and ex ante identical firms, which pay different wage rates. The arrival of the Burdett-Mortensen model triggered a considerable and rapidly expanding literature. There are both empirical contributions, which attempt to estimate the parameters of the model, and theoretical contributions, which attempt to extend the basic model in order to improve the ability of the model to predict different phenomena in the labor market.

The book offers an introduction to the basic model, whereby both transition rates and wage distributions are obtained as endogenous entities. The extensions of the basic model are reviewed, especially models that allow for differences in firm productivity and different types of contracts

between employers and employees. In addition it is shown how other theories of wage determination can be incorporated into this framework, such that it is possible to understand empirical phenomena, which so far have been difficult to explain.

However, the book is not only a theoretical exercise. It also presents evidence of the relevance of existing empirical literature to wage formation. Furthermore, it contributes to the empirical literature by presenting calculations of empirical counterparts to the various theoretical concepts. The data source is the Integrated Database for Labor Market Research (IDA), the Danish matched employer-employee research database.

The book is an authoritative review of the fascinating line of thought, which makes it possible to make a complete characterization of important aspects of the labor market in a general equilibrium model described by very few parameters. Moreover, empirical-oriented researchers, who question the usefulness of estimating highly structural models, have found the basic line of thought relevant with respect to understanding empirical phenomena on the labor market.

Throughout the book Dale Mortensen emphasizes how wage formation in relation to the transition processes on the labor market can be viewed in game theory context. Frederik Zeuthen's solution concept of wage bargaining between employers and employees was the outcome of a process (the Zeuthen-Nash-Harsanyi solution, as it is sometimes called), and this volume thus falls very neatly into the Zeuthen Lecture Book Series.

Karsten Albæk

Preface

The book began as a record of my Zeuthen Lectures by the same title delivered at the University of Copenhagen in November 2000. Parts of the penultimate version were presented as a MacIntosh Lecture at Queens University in March 2002 and as a Schumpeter Lecture Series at Humboldt University in June 2002. The material is also familiar to the students in recent presentations of my course in graduate labor economics.

The empirical content of the book is based on joint research with B. J. Christensen, Rasmus Lentz, George Neumann, and Axel Werwatz. That project started subsequent to my 1998 research leave at the Centre for Labour Market and Social Research (CLS) in Aarhus, Denmark, where I was introduced to the Danish matched employer-worker data. I wish to thank my old friends and colleagues, Niels Westergaard-Nielsen and Henning Bunzel, who as CLS research directors supported and encouraged both the project and the book. My editor, Kathy Caruso, also deserves my gratitude.

I am particularly grateful to those individuals who read all or parts of the book and provided specific comments and corrections. These include Gadi Barlevy, Loujia Hu, Rasmus Lentz, George Neumann, Kenneth Burdett, Robert Shimer, Karsten Albæk, and Hugo Nopo. Research support from the National Science Foundation, the Danish National Research Foundation, and Northwestern University is also acknowledged.

Introduction

Both “good” and “bad” jobs coexist. In a U.S. context, a good job pays well, provides for a paid vacation, and offers health insurance and other related benefits. Of course, occupations that require more skill have a larger fraction of better jobs in all of these senses. Still, observably identical workers are found in both good and bad jobs in close proximity at the same time. These observations motivate the question addressed in these lectures: Why are similar workers paid differently?

In a hypothetical perfectly competitive market, each worker chooses employment that offers the maximal utility across all possible job opportunities. In this environment, wage differences across workers reflect only variation in individual worker ability and/or differences in the nonpecuniary attributes of the jobs held. Although hundreds if not thousands of empirical studies that estimate so-called human capital wage equations verify that worker characteristics that one could view as indicators of labor productivity are positively related to wages earned, the theory is woefully incomplete in its explanatory power. Observable worker characteristics that are supposed to account for productivity differences typically explain no more than 30 percent of the variation in compensation across workers in these studies. In what follows, I refer to the residual, the 70 percent of the variation that remains unexplained by worker characteristics, as wage dispersion.

There are numerous reasons for interest in a convincing theory of wage dispersion. First, wage inequality is a major source of household inequality in wealth and consumption. Labor income accounts for about two-thirds of aggregate income and a much larger share of the income of most households. Indeed, the households that earn the lowest wages are typically among the poorest in any country. Furthermore, real earnings of low-wage earners have actually fallen in the last twenty years in the United States while high-wage workers have experienced significant

growth in earnings. Growth in wage dispersion is a major contributor to the recent increase in U.S. wage differences across workers holding worker characteristics constant.¹ Second, the existence of differences in wages not accounted for by differences in ability raises questions about economic efficiency. For example, if the observed wage dispersion reflects differences in the marginal productivity of labor across employers rather than workers, then total output can be increased by encouraging the reallocation of workers from the lesser to the more productive activities. Finally, large wage differences across employers suggest the existence of significant match rents. How these are allocated between worker and employer can also affect the efficiency of the process by which workers are allocated to jobs. Hence, anyone interested in either efficiency or equity in the labor market needs to understand wage dispersion.

As suggested by the fact that standard wage equations explain a relatively small fraction of the variation in wages across individuals, documenting the existence of wage dispersion is a no-brainer. This fact should have long ago led labor economists to question the efficacy of the standard competitive model as the accepted mechanism of wage determination. However, many argue that the 70 percent of log wage variation is not explained by observed ability differences that can be accounted for by unobservables. Is it possible that the unexplained variation simply represents relevant unobserved worker characteristics?

There are systematic regularities in wage differentials supporting the alternative proposition that differences in pay policy exist across firms. This evidence suggests that different employers do pay similar workers differently. For example, the empirical literature on wage determination finds a positive association between wages paid and firm size. Large and persistent inter-industry wage differentials are also well documented. Krueger and Summers (1988) established that wage premiums in specific industries are similar across time periods and countries. Empirical studies on the firm size differential for the United States and other countries include Brown and Medoff (1989) and Oi and Idson (1999). According to Davis and Haltiwager (1996), increases in the magnitude of size effects have contributed significantly to dispersion in average wages paid across manufacturing establishment in the United States. Because all of these authors control for observable worker characteristics, the size and industry differentials reflect wage dispersion as defined earlier. Still, these measured differentials could be the consequence of correlations between unobserved worker ability and job attribute differences and the size and industry category of the employing firms.

Explanations for industry and size differentials fall, then, into two general categories. The differences can arise because different firms have different wage policies and/or because high paying firms employ workers who are more productive for reasons that are not observed in the data. In the literature on industry differentials, Krueger and Summers (1988) emphasize the former explanation while Murphy and Topel (1990) argue that unmeasured differences in individual ability tell the principal story. Although work by Dickens and Katz (1987) and Gibbons and Katz (1992) attempt to resolve the debate, their efforts were hampered by a lack of appropriate data.

Indeed, since the differential wage policy hypothesis implies the existence of a firm fixed effect in the wage equation and the unobserved ability argument suggests that one should include a worker fixed effect, matched panel data on individual workers and their employers is required to decide the empirical debate. Data of this kind has only recently become available. In their pathbreaking work analyzing data from both France and the state of Washington (United States), Abowd, Kramarz, and Margolis (1999), Abowd, Finer, and Kramarz (1999), and Abowd and Kramarz (2000a,b) have decomposed industry and size differentials into average employer and worker components.² They find that the two effects are roughly equally important in explaining inter-industry differences in both the state of Washington and in France while the average employer effect can explain over 70 percent of the size differential in both cases. These results provide ample evidence for the importance of wage policy as well as unobserved ability differences as sources of inter-industry and firm-size wage differentials.

What is the explanation for differences in worker pay policy? It seems clear that some form of imperfect competition is necessary. The notion of a pay policy presumes that employers have market power in the sense that each can set its own wage. This power is not monopsony in the literal sense of a "single buyer" of labor services but rather in the sense that each firm faces an upward sloping supply curve given the wages paid by competitors.³ Interestingly, Samuelson (1951, 554) sketched the essential elements of a pay policy theory in his economic principles text:⁴

The fact that a firm of any size must have a wage policy is additional evidence of labor market imperfections. In a perfectly competitive market a firm need not make decisions on its pay schedules; instead it would turn to the morning newspaper to learn what its wage policy would have to be. Any firm, by raising wages ever so little, could get all the extra help it wanted. If, on the other hand, it cut the wage ever so little, it would find no labor to hire at all.

But just because competition is not 100 percent perfect does not mean that it must be zero. The world is a blend of (1) competition and (2) some degree of monopoly power over the wage to be paid. A firm that tries to set its wage too low will soon learn this. At first nothing much need happen; but eventually it will find its workers quitting a little more rapidly than would otherwise be the case. Recruitment of new people of the same quality will get harder and harder, and slackening off in the performance and productivity of those who remain on the job will become noticeable.

Availability of labor supply does, therefore, affect the wage you set under realistic conditions of imperfect competition. If you are a very small firm you may even bargain and haggle with prospective workers so as to not pay more than you have to. But if you are of any size at all, you will name a wage for each type of job, then decide how many of the applicants will be taken on.

Why is the labor supply curve faced by an individual employer less than infinitely elastic? One of my own teachers, Martin Bronfenbrenner (1956, 577–578), makes explicit the argument hinted at in Samuelson's words:

The typical employer in an unorganized labor market is by no means a pure competitor facing market wages which he cannot alter. The mobility of the labor force, even between firms located close together, is low by reason of the inability of workers to wait for employment or risk unemployment, plus the inadequacy of the information usually available to them regarding alternative employment opportunities. This low mobility permits each to set his own rates and form his own labour market within limits which are sometimes quite wide. In the technical jargon of economic theory, the typical employer in an unorganized labor market has some degree of monopsony power and can set his own wage policy.

It is not that theorists have been totally silent on the issue of monopsonistic competition in the labor market. Phelps (1970) and Mortensen (1970) suggested a theoretical approach to the problem some time ago. They argue that employers face a less than perfectly elastic labor supply because unemployed applicants are willing to accept low wage offers and cannot instantaneously move to higher paying employers as Bronfenbrenner points out. In this environment, a high-paying employer profits by attracting and retaining a larger labor force. Still, a low-paying employer can survive. As a consequence of market friction, every employer has the power to set his or her own wage even when many competitors populate the market, and each will set a different wage to the extent that their circumstances differ.

The precise nature of the labor market equilibrium was not fully spelled out by either Mortensen or Phelps. As Rothschild (1973) asks,

what is it that induces the wage dispersion that is supposed to motivate job search? Subsequently, papers by Butters (1977) and Burdett and Judd (1983) originally, followed by Mortensen (1990) and Burdett and Mortensen (1998) more recently, resolve the problem by formulating the model as a noncooperative price setting game played in a market characterized by search friction. In addition, these authors identify reasonable conditions such that dispersion in wage policy is the only equilibrium outcome of imperfect wage competition even when all workers and employers are identical. The essential logic of the argument follows.

Imagine that jobs are identical and that workers have a common reservation wage, employers offer wages, and each worker accepts at most one wage offer and rejects all the others. Friction exists in the market in the sense that workers do not know the wages offered by all employers. At any point in time, a worker possesses information about only a subset of the wages offered. Since all jobs are identical, a rational worker accepts the highest wage offer in the sample provided that it is above the common reservation wage. The typical employer, knowing these facts, realizes that her labor supply is not perfectly elastic even if she is only one among many employers for the following reasons. No offer below the reservation wage will be accepted. If the worker who receives the employer's wage offer has no other, then the worker will take any acceptable offer. If the worker who received her offer has another alternative, then the worker accepts only if the employer's offer is higher. More generally, any worker accepts a particular employer's offer only if it is the largest in that worker's sample of known offers.

Every employer's labor supply is upward sloping in her own wage offer for the reasons just given. However, there is no unique common equilibrium wage that all the identical employers will offer if the value of marginal product exceeds the workers' common reservation wage. If all employers offer the value of marginal product, a deviant can earn a positive expected profit at the margin by paying the lower reservation wage. If all employers offered the same wage and that wage is less than the worker's value of marginal product, then a deviant employer can guarantee that all the workers receiving her wage will accept it by offering only a penny more. Because the extra penny breaks all ties, an individual firm's supply correspondence jumps up discontinuously at the common wage offered by all of her competitors. Since deviating is more profitable in both cases, there is no symmetric pure strategy solution to this wage setting game.⁵

Butters (1977), Burdett and Judd (1983), and Mortensen (1990) all show that a unique mixed strategy equilibrium exists to different versions of the wage posting game. However, there are both theoretical and empirical objections to this interpretation of the wage dispersion observed. On the empirical side, the wage probability density implied by the theory is generally increasing and convex when in fact observed distributions are unimodal and skewed with a long right tail. On the theoretical side, one wonders how interfirm differences in wages offered across firms can persist if they simply reflect an incentive to randomize. How does the market find such an equilibrium?

Mortensen (1990), Burdett and Mortensen (1998), and Bontemps, Robin, and vanden Berg (1999) offer an answer to these questions. Specifically, they point out that more productive firms offer higher wages when the model is extended to allow for employer heterogeneity in worker productivity. In other words, if the same worker is more productive in one firm than in another, then the more productive firm finds it more profitable to compete by offering a higher wage. In the limiting case of a continuum of employer types, a unique pure strategy equilibrium exists for each firm. Furthermore, the distribution of wages offered converges to that corresponding to the case of homogenous employers as the diversity in labor productivity across employers vanishes. Because the distribution of wage offers across employers in part reflects the distribution of employer productivity, the extended model can match the shape of wage dispersion actually observed, at least in principle.

In closely related models of job and worker matching introduced by Diamond (1982), Mortensen (1982), and Pissarides (1985), worker and employer bargain over match rents attributable to market friction after they meet. This hypothesis is firmly embodied in the theory of equilibrium search unemployment as summarized in Pissarides (2000).⁶ It too implies wage dispersion given productive heterogeneity across firms. Indeed, when embodied in a model of on-the-job search, its implications are very similar to those of the Burdett-Mortensen model.

The hypothesis that wage dispersion is largely the consequence of search friction and cross-firm differences in factor productivity is the organizing theme of the book. What are the implications of the hypothesis for worker and employer behavior? Are these implications consistent with data on worker flows and firm size? Is the distribution of employer productivity required to explain the wage dispersion observed plausible? Given productivity dispersion, are wages set by employing firms or are they bilateral bargaining outcomes? These are the kinds of questions that I try to answer.

The main body of the text is divided into several chapters. In chapter 1, more detailed evidence that similar workers are paid differently is provided, and a simple one-period model of wage dispersion designed to suggest explanations of the evidence is introduced. An intertemporal extension of the basic model, one that embodies the role of worker search behavior in the wage determination process, is the topic of chapter 2. Modifications of the theory that offer an explanation for the nature of observed wage dispersion, particularly the shape of the cross-firm distribution of average wages paid, are studied in chapter 3. In chapter 4, the hypothesis that firm wage policies are determined by profit-maximizing behavior is tested using Danish data and found wanting. Instead, bilateral bargaining outcomes are supported. Finally, recent work that extends the basic framework for the purpose of explaining intra-firm wage dispersion, particularly that associated with job tenure differences across workers, is reviewed in chapter 5.

Notes

1. See Katz and Autor (1999) and Katz and Murphy (1992) for detailed documentation of these facts.
2. See Abowd and Kramarz (1999) for descriptions of the matched employer-employee data sets currently available.
3. Manning (2001) provides a new and detailed exploration of the alternative implications of this kind of deviation from perfect competition.
4. Many thanks to George Neumann for reminding me of this passage. The fact that I had read it over forty years ago was clearly indicated by the underlining and the margin notes that I found in the text of my personal copy.
5. As Burdett and Judd (1983) show, the validity of this argument requires that some workers only receive one offer.
6. For reviews of recent developments and applications of both branches of the search equilibrium literature, see Mortensen and Pissarides (1999a,b).

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Note: Sources listed in the bibliography are not necessarily cited in the text.

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