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PENSIONS AND LABOR MARKET ACTIVITY: BEHAVIOR AND DATA REQUIREMENTS

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ABSTRACT

Pensions have played a key role in the transformation of the way workers are paid in the US labor market. This paper reviews and synthesizes what is known about the form and function of employer-provided pensions, and identifies areas where further information is most needed, for increasing our understanding of behavior and for guiding the pension policies of the next decade. There are a number of studies which explore the tax advantages of pensions, the special value of pension annuities and related insurance, and the value of pensions to the firm in regulating retirement, mobility and productivity. This paper investigates whether available evidence is consistent with behavioral models, highlights remaining questions, and attempts to determine what types of data would be most helpful in furthering our understanding of pension plans in the labor market.

Available evidence indicates that pensions must be viewed as part of a long-term employment relation. For this reason, researchers must move beyond descriptive studies toward structural models which permit tests between diverse pension theories. Studies of this kind have heavy data requirements. Specifically, we believe there is a pressing need for a nationally representative survey where the unit of observation is the firm, the establishment, or the pension plan. To understand the pension-wage and the pension-turnover/retirement relationship, more information is required on the processes determining compensation and employment. Combining information on employee characteristics, turnover and retirement patterns, company inputs and outputs, and the firm's overall financial characteristics would go a long way toward helping researchers distinguish among the leading explanations for why firms offer pensions. Of even greater utility would be longitudinal data combining company-side information with employment and wage histories of employees.

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Introduction

A revolution in US pay practices has occurred since the end of World War II: while labor compensation consisted primarily of wage payments in the mid 1940's, non-wage benefits today account for over one-third of total compensation (US Chamber of Commerce, 1989). Pensions have played a key role in this transformation of the way workers are paid.

Because pensions are an important part of compensation, and because they are exceedingly complex labor market institutions, employer-sponsored pension plans have commanded a great deal of attention from researchers and policy makers in the last ten years. This paper reviews recent studies in order to highlight research findings about what pensions do in the labor market. In doing so, our goal is to review and synthesize what is known, and to identify areas where further information is most needed, for increasing our understanding of behavior and for guiding the pension policies of the next decade in the US and abroad.

A number of facts may be cataloged from the studies cited in this review:

1. More than half of all private sector workers are covered by employer-provided pensions. Defined contribution plans offer workers an important tax shield and opportunities for a retirement annuity; nevertheless, three fourths of covered workers are covered by more complex defined benefit plans.
2. It might be thought that firms with pension plans would have to pay lower wages to offset having a pension, but there is almost no evidence supporting this view. It also might be thought that wages would fall at the point when workers vest in their plans and at the moment when they become eligible for retirement, but such dramatic wage changes are not observed once benefit entitlement occurs.
3. Workers with pension plans change jobs less often than do workers without pensions.
4. Pensions have a powerful influence on workers' retirement decisions. In defined benefit plans, retirement patterns are particularly responsive to incentives on qualifying for retirement benefits. This is due to accrual profiles which rise rapidly just before early or normal retirement, and exhibit sharp discontinuities just after reaching eligibility for retirement. There is some evidence that changes over time in defined benefit plans are moving to encourage even earlier retirement.
5. Within the set of defined benefit plans, pension provisions vary tremendously. Eligibility rules and retirement benefits vary along both age and years of service dimensions. Across firms there are also large differences in the position and pattern of benefit accrual profiles. There are many possible explanations for these differences but no single theory explains them all.
6. Pensions are inherently uncertain promises because benefit receipt may be conditional on survival, turnover, retirement, investment performance, and inflation. Workers do not understand many of these inherent uncertainties, though there is evidence that some may obtain wage premiums offsetting riskier pension promises.

7. There is almost no direct evidence on pensions' effects on productivity, and what little evidence there is suggests only a negligible effect.

8. Pensions are more common in large firms and in unionized firms.

Some of these findings are inherently contradictory and must be resolved to produce a clearer picture of pensions' role and function in the labor market. As we will show below, some explanations are available in the literature, but others remain outside our grasp. What we emphasize throughout this paper is that pensions are labor market institutions. As such, researchers and analysts need a more complete picture of how workers and firms benefit from pensions, in order to better judge various rationales for what pensions do in the labor market.

Our assignment in writing the paper was to review what was known, and what was not, in order to develop recommendations for new data in the pension area. We believe that the strongest need is for a nationally representative data set in which the unit of observation is the firm, the establishment, or the pension plan. To understand how pensions alter the price, the quantity, and the quality of labor, more insight is required into how pensions affect compensation and employment outcomes. We believe it would be most useful to distinguish among leading theories that emphasize firms' motivations for pensions. To this end the most useful data set would contain both information on the characteristics of a firm's (or firms') employees, their wages and turnover/retirement patterns, and their ages and seniority. Ideally this would be matched with information on other production inputs as well as outputs and firm financial data. Of even greater utility would be longitudinal data combining company-side information with employment and wage histories of the employees.

The discussion below is divided into five parts. Section I provides an overview of current theoretical and empirical research on the role of pensions in the labor market. Section II reviews in more detail five approaches to modelling what pensions do in the labor market. Section III reviews evidence on the impact of market structures and labor market institutions on pension outcomes. Section IV summarizes the discussion and offers recommendations for further research. Section V highlights data needs.

I. Overview Of Theoretical and Empirical Issues

A. The Approach to Modelling

Our review of the role of pensions in the labor market is organized within a supply and demand framework, where references to the supply side should be understood as pertaining to workers supplying their labor, and references to demand pertaining to firms' demand for workers. Specifically, on the supply side, as workers evaluate different wage offers, non-wage benefit

offerings, and job attributes when deciding which job to accept, they determine the rate at which they are willing to trade off pensions for wages. The framework also postulates that workers differ with respect to their tastes for pay and benefits, the sophistication with which they can process information about their benefit packages, and their views of other aspects of their jobs. Taking the firm's viewpoint, employers will offer a wage and benefit package in accordance with their anticipated effects on output and costs, aiming to maximize profits. Again, the model recognizes that firms differ in their perceptions of specific benefits: thus, a small employer might find it more expensive to provide a pension as compared to a larger firm which can spread fixed costs and risks, including those associated with pensions, across its larger work force. In addition, larger firms must be conscious of the effects of their actions on market prices.

In the general case, this framework explaining how pension outcomes are determined emphasizes that observed pension outcomes in the labor market are the joint product of workers' valuation of pensions, and firms' decisions about whether to provide pensions and if so, how to structure them. By aggregating decisions made by individual workers and firms to the market level, it is possible to study how pensions affect three labor market outcomes of key interest: the price of labor, the quantity of labor, and the quality of labor. Importantly, our approach recognizes that these key outcomes are not determined in a static way, but instead span time, incorporate uncertainty on both workers' and firms' parts, and are in other ways complex.¹

Much of the pension literature examines how pensions affect the price of labor. As we shall show in more detail below, measuring the price of labor when pensions are present is a complex task. For example, in a defined benefit pension plan, the pension promise is outlined in the pension formula specified by the sponsoring firm. This typically depends on past tenure, the worker's wage path over time, and the worker's retirement age. In a defined contribution plan, in contrast, the sponsoring employer specifies annual contributions to the plan, and retiree annuities depends strictly on annual contributions and the fund's investment performance.² Over time, an employee accrues a benefit entitlement based on past work, the value of which will depends on his plan specifics and, in a defined benefit plan, an expected future benefit accumulation to be delivered contingent on continued work at that firm. Valuing the pension also depends on other

¹For introductory discussions on the economics of pensions see Ellwood (1985); Ippolito (1986a); McGill (1984); and Munnell (1982).

² If the defined benefit plan were to terminate with insufficient funds to meet promised benefits, workers' accrued vested nominal pension benefits are guaranteed by the Pension Benefit Guaranty Corporation (PBGC). The PBGC is a federal pension insurance agency created under the 1974 Employee Retirement Income Security Act (ERISA), which guarantees benefits up to an annual maximum if a plan is terminated with insufficient funds. The agency charges an annual premium which is now less than fully experience rated (Ippolito, 1989). Unlike the defined benefit plans, defined contribution plans' liabilities equal to assets by definition. For this reason the PBGC is not required to insure defined contribution participants' benefits against plan termination.

factors including tax laws which shelter benefit accrual, the risks and returns to pension investments, and funding practices.

Pricing the resultant pension annuity is central to determining how workers value their benefit promise, and also to understanding how companies evaluate pension costs. Interestingly enough, there appears to be a wedge between workers' valuation of pension promises and what their employers perceive as pension costs. This can arise for many reasons. For instance, firms often face economies of scale in financial markets, can pool risks, and can frequently reduce adverse selection for insurance or annuities, making it possible for employers to purchase pension annuities at a lower price than could individual workers acting alone in the private insurance market. In general, therefore, pricing labor when pensions are in the picture requires devising a thorough understanding of what the pension promise is worth to the firm, and also how much workers would be willing to trade off in terms of wages to receive more pensions. In assessing this tradeoff, it is not sufficient to take a static one-period perspective; instead, pension accruals must be viewed in terms of their time path, and compared against the structure of wage payments over the worker's period of attachment to his firm.

Labor market analysts have also devoted some attention to understanding how pensions affect the quantity of labor employed. Along this line, labor market research investigates how pensions are used to attract and retain younger and middle-aged workers, and also how pensions act as a personnel tool to encourage older workers to retire. When these hiring and termination decisions are aggregated across workers in a firm, they determine the age and experience structure of firms' employee populations, the time remaining until workers leave their jobs, and the relation between active employees and the pool of retirees (and their benefits). In general, the literature concludes that pensions have a profound effect on employment patterns, particularly for older workers.

Analysts focus on the effects of pensions on labor quality because pensions are one method of influencing worker productivity. As we note below, however, researchers have been held back because data are often lacking with which to measure labor quality and output. Some dimensions of quality are readily observable, such as employees' levels of formal education.³ However other worker characteristics are more difficult to measure, including willingness to work, innate ability, and ability to make good long-range judgements. In addition, productivity may itself

³The distinctions among price, quantity and quality outcomes are intended to provide a rough guide for the discussion. They are not sharp since some outcomes are difficult to classify into a particular category. For example, age and experience of the work force may be considered a dimension of quality rather than quantity. In that sense, the labor market flows, and especially retirement rates, may be thought of as a dimension of quality. Similarly, work effort may be thought of as a dimension of labor quantity or quality. In addition, most of the prices are contingent on age of entry (Parsons, 1988), and on continued firm attachment (Lazear and Moore, 1988), and thus on the quantity outcomes.

be affected by such things as the firm's hiring, training, and compensation structure. For this reason, labor market researchers have only just begun to pinpoint the effect of pensions on labor quality.

While employees' demand for and firms' supply of pensions are the primary factors affecting the observed patterns of pensions and their consequences, these do not operate in a vacuum. In particular, factors influencing market imperfections and market structure also play key roles in shaping observed pension outcomes. Information shortfalls are a prime example of how market imperfections can work. Pensions are sufficiently complex instruments that both workers and their benefit administrators often have difficulty understanding the plan and its implications. For instance, studies show that workers in mid-career understand their plans only poorly.⁴ Unless the margin of well-informed agents is sufficiently large to ensure efficiency in the market, misinformation could affect employee responses to incentives and limit a pension plan's effectiveness in raising productivity. Imperfections in other markets have just begun to be examined, along with their implications for pensions. For example, there is some suggestion that liquidity constraints and imperfections in annuity and insurance markets prevent workers from separating savings and retirement decisions.⁵ As a result, work and pension profiles will tend to be adapted so as to better meet workers' desired consumption targets.

Other structural features of the labor market also affect pension outcomes. For example, where labor unions are present, pensions are more likely to be found, and to differ in form and structure from pensions found in nonunion firms.⁶ Firm size has also been shown to be important, in that large companies are more likely to offer pensions, and are more likely to offer defined benefit pension plans as well.⁷ Research also shows that some firms directly pursue a policy of paying higher-than-market wages which is not due to measured or unmeasured worker ability.⁸ If this "efficiency wage" policy is designed at least in part to reduce shirking and to economize on hiring, turnover and training costs, it would then raise worker productivity.⁹ Alternatively, firms offering pensions might be sharing rents (profits higher than competitive

⁴However there is evidence that workers nearer retirement age are better informed. See Mitchell (1988); Bernheim (1989); and Gusman and Steinmeier (1989a).

⁵See Burtless and Moffitt (1984); Nalebuff and Zeckhauser (1985); and Robb and Burbidge (1989).

⁶In the private sector see Freeman (1985), Gusman and Steinmeier (1986c and 1989a), and Ippolito (1985c); in the public sector see Mitchell and Smith (1989).

⁷Large firms have been found to pay higher than expected wages. According to Brown and Medoff (1989), much of this differential is unexplained. Large firms are also more likely to offer pensions (Kodlikoff and Smith, 1983) than are small firms (Andrews, 1985; Luzadis & Mitchell, 1988). Evidence that large firms are also more likely to offer defined benefit plans is reported in Kodlikoff and Smith (1983), Dorsey (1987), Ippolito (1985c) and elsewhere.

⁸See Katz and Summers (1989) and Krueger and Summers (1988).

⁹See Akerlof and Katz (1989) and Holzer, Katz, and Krueger (1989).

returns resulting from market power), which would explain why their workers also are paid wages higher than they could receive elsewhere.

Regulatory policy also weighs heavily on and shapes the role and function of pensions in the labor market. First and foremost, worker and firm valuations of pension promises depend crucially on tax policy and related legislation, including laws governing the features of tax-qualified pension plans. Much research has concluded that tax law permitting pension contributions and investment accruals greatly spurred the spread of pensions over the last four decades in the US (Ippolito, 1986a). Laws also constrain pension formation and administration in a myriad of other ways, including the nondiscrimination regulations pursuant to the Employee Retirement Income Security Act (ERISA) and subsequent extensions of this bill. Last but certainly not least, the passage of the Age Discrimination in Employment Act (ADEA) virtually eliminated mandatory retirement and restricted other wage and pension payments linked to age. The effects of these and other constraints on behavior created by the tax and regulatory system are explored briefly in Section III.

B. Empirical Pension Studies: Distinguishing Their Approaches

Empirical pension studies have explored many of the price, quantity and quality outcomes described above in Section A. In the remainder of this paper we seek to highlight these findings, and draw lessons from their conclusions. Prior to doing so, however it is necessary to outline the main empirical approaches if we are to reconcile some of their findings.

One approach to investigating pensions' role in the labor market is descriptive, with the goal being to explore the form and structure of one or many specific pension provisions. For example, cross-sectional plan characteristics and their correlates are explored extensively by Kotlikoff and Smith (1983), while pension accrual patterns as they differ across firms are examined by Kotlikoff and Wise (1985, 1987b). The latter study also describes cross-firm variation in accrual profiles at vesting, early and normal retirement ages and relates these benefit value variables to the characteristics of pension benefit formulas.¹⁰

Another set of studies is more analytical, seeking to relate pension outcomes to the factors shifting labor supply and demand curves. Most commonly such studies take a "reduced form" approach, which means that one or another pension provision or some other price, quantity or quality-related outcome is viewed as determined by supply and demand working together. For example, a key component of quantity such as the retirement rate or mobility rate, may be related statistically to vectors of worker, industry and occupational characteristics (Luzadis and Mitchell, 1987). In reduced form analysis, the supply and demand curves themselves are not separately

¹⁰Other informative pension descriptions appear in Ippolito and Kolodrubetz (1986) and Turner and Beller (1989).

estimated, although in rare instances some more basic parameters may be identified in a reduced-form study.

A few researchers have taken yet a more challenging path, hoping to unravel employers' and employees' "structural" demand and supply functions. In a simple (non-pension) case, econometric techniques permit structural estimation of a supply curve by holding factors constant that affect supply, leaving the demand curve free to trace out the position of the curve being held fixed. This is accomplished by having a single price term appear on one side of the equation being estimated, and a single quantity term in another. In the pension context, however, special problems arise in undertaking structural analysis. This is primarily because it is not satisfactory to focus on one dimension of the complex price, quantity, and quality-related outcomes. Thus, for example, in examining the price of labor, what matters is not just the level of a single wage, but rather the mix between wages and pension accruals over the worker's years at the firm. A further complication is that the structure of the pension promise, as reflected in plan provisions, affects the weights attached to current wages, future wages, deferred benefits for which payment is guaranteed, and the option value of the future pension, contingent on the course of continued employment and wages. Perhaps for these reasons, existing studies do not currently offer a full understanding of the simultaneous behavior generating pension outcomes. As a result, much empirical analysis "tests" partial explanations and accordingly includes only parts of the behavioral story, attempting to establish whether a single aspect of behavior is roughly consistent with available data. When only a part of the story is examined, the problem of omitted variable bias arises.

Nevertheless, not all the news is bad. Structural equations associated with individual workers have been estimated quite successfully in some cases, as in the retirement literature where clear evidence has emerged that pensions affect workers' retirement ages directly. This is possible because the dependent variable in individual-level data, namely the retirement age, is postulated to be influenced by the pension accrual rate (the independent variable). Because the right hand side pension term is taken to be determined outside any particular individual's decision problem, the retirement outcome can be formulated as a function of the net reward for continued work and simultaneous equations techniques need not be applied.¹¹

Below we identify and discuss in more detail a variety of empirical studies concerning pensions' role and function in the labor market. It must be stated at the outset, though, that we believe that structural analysis is of most value for predicting the effects of policy changes. Nevertheless, few structural studies currently exist in the pension literature. Producing more and

¹¹Adjustments may be made, however, for initial job choice by those with different preferences for retirement (Fields and Mitchell, 1984).

better studies which can do what is needed in the pension arena requires better data than researchers currently have.

If analysts are to undertake further structural analysis in the pension area, it will be necessary to obtain data which permits careful measurement of the separate elements of firms' compensation packages as well as detail on the worker side, and on the firm side. Three general types of data are currently available.¹² 1) Detailed plan provisions have been obtained in the form of cross-section surveys; these are limited in that they contain only partial information, and, because they capture differences at only a moment in time, cannot be used to isolate the effects of unobserved variables. 2) National-level time-series data have also been used to carry out pension analysis in some retirement research. However aggregation across companies hides interesting cross-sectional differences in behavior, and bias often results when relationships which are nonlinear at the firm level are estimated at the aggregate level. 3) Finally, a few analysts have used microeconomic longitudinal data, especially valuable for analyzing specific workers' retirement patterns as they age. Nevertheless existing panels like this are inadequate in other ways, which will be spelled out in more detail below.

We turn now to a more detailed description of available studies.

II. Modelling The Role and Function of Pensions in the Labor Market

Our purpose in this section is to review what pensions do in the labor market. Specifically, we analyze the nature of the pension promise, the effects of pensions on retirement, links between pensions and mobility, the effects of pensions on work incentives, and finish with a discussion of interdependence in decisions determining pensions and other labor market outcomes. The subsequent section reviews the impact of market imperfections and labor market institutions on pension outcomes.

A. The Nature of the Pension Promise:

Many people would probably agree that a primary function of employer-sponsored pensions is to help workers save for retirement. There are a number of reasons why pension provide an attractive vehicle for savings. For instance, pensions offered at the work place appear to help employees impose needed "self control", in that regular employer contributions directly to the pension plan eliminates the need for workers to make frequent (and difficult) saving decisions (Thaler and Shefrin, 1981). Group pensions also offer scale economies in investment and administrative costs, making a given dollar of contributions produce more in retirement income

¹²For detail on existing data sets which contain pension variables, see the Data Appendix in preparation for the Pension Research Council.

when the funds are invested on behalf of larger groups (Mitchell and Andrews, 1981). Advance commitment to work place benefit plans reduces moral hazard and adverse selection, thus giving employees access to lower-cost group retirement benefits than those obtained individually (Bodie, 1989). The fact that most pension benefits are paid out the form of an annuity also protects pension participants from outliving their retirement savings; this aspect of group pensions prevents risk-averse older persons from having to curtail consumption drastically so as to avoid outliving their incomes in old age (Kotlikoff and Spivak, 1981). Last but not least, tax law shields most pension contributions from income taxation until retirement, so that retirement savings carried out in a pension carries a substantial tax advantage over non-pension savings alternatives (Blinder, 1981; Ippolito, 1985c, 1986; Woodbury, 1983).

Some researchers focus on the risks inherent in pensions, and emphasize that workers might not actually receive promised pension benefits under some circumstances. For example, someone quitting a job prior to becoming vested loses pension rights, while even vested workers leaving their firm prior to retirement received a benefit which is likely to be eroded by inflation. Such capital losses serve to focus attention on the uncertainties inherent in the pension promise.

The value of retirement savings to the covered worker and its cost to the providing firm, depend on the course of future employment and wages. This value must therefore be discounted using an interest rate that takes account of both the deferred nature of the pension promise, and the associated risk. In turn, the value of a pension promise depends on one's view of what pensions are doing. Specifically, the value of a promised pension and how much it costs a firm to offer a pension depends on the nature of the employment arrangement.

In a spot market, a firm pays workers according to the value of their productivity in the current period, while a worker's asking price is determined by his opportunity cost in the current period. The key feature of the spot labor market is that it clears on the basis of productivity and labor costs at each moment in time, and the worker's remuneration in each period equals the value of his marginal product in that period. When a pension figures as a component of labor compensation, spot market theory predicts that, holding the productivity profile constant, wages are lower for workers whose pension accrual is higher, with the value of the pension being measured by its current period accrual rate.¹³ Data on wages and pension accruals would be predicted to show that, for workers of a given productivity level, in any given year, higher pension accruals are offset by lower wages.¹⁴

¹³We abstract from other non-wage aspects of the job in this discussion.

¹⁴If wages in period t are w_t , and the pension accrual P_t , the estimated tradeoff for a pension-covered worker is given by the coefficient a_p in the following equation: $\ln w_t = a_s + a_p P_t + a_x X$; see Ehrenberg and Smith (1987). The question we are discussing in this section is how P_t should be measured. As will be seen below, reliable estimates of a_p are still not available.

In a spot market, the portion of costs attributable to a pension is valued by the accrual pattern specific to that particular pension plan. For example, if a plan is a defined contribution pension, the firm pays a part of labor compensation in the form of a wage and the rest in the form of an immediate contribution to a pension fund held in the worker's name. In this case (and ignoring taxes), the pension accrual will be valued at the employer's contribution amount (perhaps adjusted for risk associated with the portfolio investment). In the case of a defined benefit plan, where benefits are specified according to a particular formula, the worker's spot pension accumulation is equal to the increment to his pension present value based on seniority to date, on the assumption that the current period is his last period of employment. Specifically, the pension valuation method employed in this scenario ignores the (possibly nonzero) probability that a worker might remain with the firm in future periods.¹⁵

Some analysts argue that the spot market approach does not apply to pension-covered workers. Here, the view is that the employment relationship is closer to a long-term contract, recognizing that pension-covered workers are frequently attached to jobs for long periods of time. In this vein, workers generally have reason to expect to be employed at that same firm in the future with some non-zero probability. In this type of labor market, it is not sufficient to consider pension promises accrued on the basis of work to date. In addition, the worker in each period accumulates a pension option value which reflects the expected value of a deferred payment, contingent on the course of work and pay in the future.¹⁶ In this more complex case, costing pensions must take into account compensation expectations reflecting value outside of the current period, and labor quantity measures should include expected attachment to the firm in future years.

It might be argued that despite the prevalence of long term attachment, the labor market for most employees operates as if it were a spot market. Indeed if workers' pension option values are small, focusing on the year-by-year pension accrual rates may yield an adequate measure of pension accumulations. However, the evidence strongly challenges both versions of the spot market model. Pension accrual rates are quite uneven in many private sector defined benefit pensions, tracing steep peaks and valleys as workers vest in their plans, or attain early and normal retirement (Bulow, 1981, 1982; Kotlikoff and Wise, 1985, 1987b). In the federal sector, pension plans with this trait are discussed by Leonard (1987), where at twenty years of service the worker's benefits are several times higher than at other points in the work life. We doubt the spot market model because wage levels do not appear to fall suddenly when pension accrual patterns

¹⁵The spot calculation also ignores any discrepancy between productivity and compensation costs in future periods such as might arise in the presence of specific investment, or in the opposite direction from repayment of a bond posted by the worker to insure productivity. See Lazear and Moore (1988) for a recent discussion of these issues.

¹⁶See Abowd and Manaster (1982); Lazear and Moore (1988); and Stock and Wise (1988b).

take a sharp jump upward.¹⁷ Indeed, given the specific role played by age and service in positioning these spikes, one would expect to see these age and service requirements mirrored in the formal wage and salary structures adopted by larger firms, but no such evidence has been uncovered. These irregularities in pension profiles highlight the need for a model which recognizes that working an additional year makes available to an employee a pension option value of rather significant proportions.

In a parallel manner, the long-term contract approach suggests that understanding pensions' role in determining quantities of labor employed must recognize that long-term employment is the right outcome to look at.¹⁸ Most models of employer demand for labor are theoretical thus far, and the few available empirical studies estimating structural labor demand equations are fundamentally flawed -- at least for analyzing demand for pension-covered workers. This is because these analyses typically assume that accrued pay in a given year is equal to workers' productivity, an assumption which ignores the possibility that at any age or tenure, productivity may not equal compensation calculated on a spot accrual basis.¹⁹ For example, if compensation structures defer a portion of the reward on the assumption of long term attachment, then measured compensation and implied productivity of younger workers would be systematically understated.

Pension valuation in both the spot and long-term context

The following example highlights the key difference in pension values calculated using the spot market versus the long-term contract approach. We use data from the 1983 Survey of Consumer Finance, the only nationally representative U.S. survey to provide labor market and demographic information from individuals together with matched information obtained from their

¹⁷See Kotlikoff and Wise (1985). What would be needed for the spot market to hold in view of these discontinuous pension accrual patterns is sudden productivity changes with age, but there is no reason to suspect these hold true. Although available data sets do not directly measure whether and how productivity profiles change with age, there is also evidence that wage profiles for workers with defined benefit plans are at least as steep as those without a pension (Ippolito, 1987; Mitchell and Pozzebon, 1987). In other words, workers with backloaded plans do not have depressed wages in later life, contradicting the spot market theory.

A spot market approach does more than predict that formal wage structures would offset pension accrual spikes which coincide with vesting and qualification for early and normal retirement benefits. It also would predict that the offsetting wage spikes would of necessity be revalued with changes in the inflationary environment. This is because pension spikes and back loading are highly sensitive to inflation. Hence formal wage and salary structures would have to be revised to mirror the changing importance of pension spikes as inflation varies. While there is some research on the effect of inflation on pensions (Allen, Clark, and Sumner, 1986), lack of data have precluded an analysis of changes in wage and pension structures with inflation.

¹⁸In the case of long term attachment, hiring and training costs are allocated over a number of periods. Just as the relation of per worker to per hour costs affect the optimal length of the work week, the size of hiring and training costs will affect the optimal length of attachment. This creates a bias against hiring older workers (Hutchens, 1986a).

¹⁹However productivity and compensation must match when aggregated over the full period of attachment (Lazear, 1979).

employers which also reports in detail the provisions of covered workers' pension plans.²⁰ In this sample, employees covered by defined benefit plans had on average \$20,000 in accrued pension value (\$1983), counting from their date of pension eligibility to the survey date and assuming the worker terminated immediately. On an annual basis, the annualized spot market accruals thus computed averaged about 3.8% of earnings. In contrast, long-term projected benefits were much larger. For instance, if pension wealth was calculated on the assumption of continued work until retirement age, the average pension accumulation was \$47,000 or almost 9% of annual earnings (Gustman and Steinmeier, 1989a).²¹

Analogous issues arise in calculating pension liabilities, which are most pertinent to pension funding patterns and how they appear on the sponsoring firm's balance sheet. For many years, corporate balance sheets specifically highlighted the spot market accrued liability, delegating projected liability to a footnote. In recent years, however, there has been increasing emphasis on funding for projected liabilities. Further, public policy has also focused on the importance of assuming prolonged attachment.²² This is because covered workers are currently guaranteed only their accrued benefits (the spot market view). What this implies is that these workers bear the risk of not receiving their projected benefits, particularly in the event of mergers, takeovers, and company shutdowns.²³

Several analysts employ hedonic models to evaluate whether and how pensions and wages offset each other in the compensation package. This approach is used to analyze the supply and demand for pensions at the market level by estimating the influence of worker- and firm-side factors influencing tradeoffs for pensions and wages. In the hedonic approach, some elements of the compensation package must appear on the left hand side, while others appear on the right hand side of a structural equation (Brown and Rosen, 1982; Ehrenberg, 1980; Smith and Ehrenberg, 1983). Several of these empirical studies are reviewed by Mitchell and Pozzebon (1987) who conclude that there is no concrete evidence that wages and pensions are directly traded off in the

²⁰Efforts are underway by the BLS to combine the information on the labor market variables for the National Longitudinal Survey of Mature Women (and their spouses) with employer provided information on their pension plans. The new Health and Retirement Survey will also attempt to provide joint information on covered workers together with plan descriptions obtained from their employers. Neither survey will be representative of the full population, in each case focusing only on those nearing retirement age.

²¹The accrued value of the pension is assumed to be proportionate to the fraction of pay from hire date until retirement, that the employee has earned to date. Further adjustments may be made to reflect likely turnover rates. See Barnow and Ehrenberg (1979).

²²A recent exception is the funding limitation in the Omnibus Budget Reconciliation Act of 1987 which links the funding limit to the accrued rather than the projected liability.

²³The rise of takeovers and such also raises questions about the strength of reputation effects which once were thought to insure workers against abrogation of implicit contracts. For a related analysis see Pontiff, Schleifer, and Weisbach (1989). On the other hand, most terminations do not impose large pension capital losses on workers because new plans (or spinoffs) give workers past service credit (Ippolito, 1986b).

compensation package. A very recent paper by Montgomery, Shaw and Benedict (1989) suggests that estimates are more sensible when pension values are measured assuming attachment is prolonged and lasts until retirement, as compared to assuming that the accrual is computed using a spot market concept.

Because very little firm-side information is used in the hedonic estimates derived to date, we cannot be sure that even the aggregate trade-offs between pension and wages are reliably identified. More generally, existing the hedonic estimates do not yet incorporate what we know about how pensions influence productivity on the demand side. In this sense, the hedonic models estimated to date have almost been reduced-form in spirit.

Irrespective of whether pensions are being measured with a spot or a long-term contract view, limitations in available data present serious problems. Existing surveys of plan formulas often lack good data on wages paid in the offering firms. However the SCF data suggest that information on plan descriptions can be used to estimate both the current period accrual rates and the option value of pensions if wage profiles used are very close to actual wages in the firm's narrowly defined industry (Gustman and Steinmeier, 1989a). Distortions will result, however, if the wages used are not closely linked to wages in the industry in which the pension plan is found.

An alternative way of assessing pension values is to take information obtained from individual worker interviews and join it with pension statistics taken from a different source matched according to each covered worker's reported industry. Unfortunately, however, this approach cannot isolate the structure of supply and demand because more information is required on specific firms' wage structures, employment policies, and work force characteristics. Researchers taking this tack have also been alerted to the fact that there is wide variation in pension plan provisions within industries (Kotlikoff and Wise, 1985, 1987b). Hence great care is required in selecting appropriate criteria for choosing "representative" plans to match with covered individuals working in a given industry. One possibility is to evaluate each plan separately before matching, and to attribute the average of the accrual profiles within a given industry to all covered workers in that industry. The alternative of trying to find average values for all pension plan parameters is probably very imprecise. By ignoring correlations among plan characteristics and nonlinearities within each pension plan's rules, there is a greater possibility of distorting the description of the average accrual profile.

A different possibility is to measure pension values by the pension receipts of retirees. A serious problem with this strategy is that the group of recipients is inevitably biased toward those who retire early. Insofar as younger retirees receive different benefits from older ones, the benefits estimates will need to be corrected for (choice-based) sample selection. Moreover, lump sum payments are likely to be missed entirely. In addition, given the rapid spread of pensions over the postwar period and the special treatment of those on board at start-up, pension payments received

by current retirees may not be representative of those expected by currently active employees (Ippolito, 1989).

Two further points should be made about the calculation of pension values. First, it is worth noting that approaches which rely on plan descriptions provided by covered individuals have some important weaknesses, primarily because workers are often unable to accurately report their pension plans' provisions. This is taken up again below in the discussion of imperfections in information. Second, there is evidence that pension plan provisions, and the associated accrual profiles, change substantially over time (Ippolito, 1989; Mitchell and Luzadis, 1988). Accordingly, it is inappropriate for researchers to assume that pension values are static, but rather must make specific allowance for the possibility that pension plans change over time. There currently exist no longitudinal nationally representative surveys of pension plans which would permit researchers to evaluate changes in pension values over time. Evidence on several dozen collectively bargained pension plans does show considerable fluidity (Mitchell and Luzadis, 1988), and it would extremely valuable to develop a more representative time-series of pension plans over several decades.

B. Pensions And Retirement:

In the last fifteen years, a vast retirement literature has progressed from reduced form studies which established a simple linkage between pensions and retirement outcomes, to structural analyses more suitable for distinguishing firm-side incentives from employee preferences. Recent structural retirement models also recognize that retirement decision-making takes place in an inter-temporal setting, to the extent that workers weigh both current and future retirement opportunities when deciding when to leave their jobs.²⁴ For this reason, most of these studies recognize the key role played by employer-provided pensions: most of the studies posit that in the neighborhood of the retirement age, pensions alter the rewards for continued work.

A great deal of empirical evidence has been amassed showing conclusively that pension reward structures do powerfully affect older workers' decisions about when to leave their main job.²⁵ Specifically, this occurs when an employee's rewards for continued work fall below the value of his or her full-time leisure, or below the returns from work on an alternative job plus any change in the value of leisure as a result of the job change. Researchers have also found that

²⁴This point was first recognized by Burkhauser (1979) who devised an income maximizing model of retirement and was incorporated in a utility maximization framework by Gordon and Blinder (1980). Fields and Mitchell (1984) went further by paying serious attention to the institutional richness of the life-cycle budget constraint facing older workers, while Gustman and Steinmeier (1983, 1985a) analyzed retirement in the face of a minimum hours constraint on the main job and reduced wage offers on partial-retirement jobs.

²⁵Earlier studies are surveyed in Mitchell and Fields (1982); Quinn, Burkhauser and Myers (1990) review the more recent literature.

workers with more generous pensions tend to retire earlier than do those with lower levels of pension benefits. Finally, workers tend to defer retirement when they are offered pension rewards for doing so; that is, employees continue to work when their pension plans provide them with higher benefit present values for continued work.

What these models have in common is that they posit that older workers formulate a sort of cost-benefit analysis, comparing the utility of continuing to work (including earnings) with the utility of retiring, where the latter is powerfully affected by social security and all relevant employer-provided benefits (including pensions). For instance, Social Security provisions such as the retirement earnings test are incorporated in the budget constraint formulated in a number of these studies. Proposed Social Security policy changes including the 1983 reforms, and ongoing proposals for crediting work after retirement on an actuarially fair basis, have also been simulated using these models (Burtless and Moffitt, 1984; Fields and Mitchell, 1984; Gustman and Steinmeier, 1985, 1989d). One important element of the post-retirement budget constraint that has not been properly modeled yet is post-retirement health insurance, a benefit which is only recently being recognized as extremely costly to providing firms, and tremendously valuable to retirees (Clark, 1987; Rappaport, 1988, 1989). What is not clear is whether such non-pension benefits typically offset, or exacerbate, retirement incentives inherent in pension provisions. Future firm-specific data collection efforts must recognize all important pre- and post-retirement benefit plans including pensions, so as not to erroneously attribute behavioral patterns to one benefit, when perhaps another might be even more influential.

Many studies estimate retirement equations for samples of men, but only a few analysts have examined women's retirement patterns. An important early study by Anderson, Clark, and Johnson (1980) develops the framework for analysis, elaborating on interdependencies of retirement decisions within the family. Several empirical studies have been conducted on the determinants of women's retirement patterns for the cohort of women retiring in the 1970's, and suggest a coherent story. Wives' own economic variables appear to have a relatively weak effect on their retirement patterns, while "non-economic" variables such as having a husband in poor health play a much more important role.²⁶ Whether the dramatic changes in women's labor market attachment patterns observed over the last forty years in the US will change retirement patterns among future cohorts of women has yet to be seen.

Researchers continue to seek better ways of formulating more realistic behavioral models, relaxing assumptions about perfect foresight and allowing for the fact that retirees face changing circumstances and sometimes change their minds, leading to reverse flows out of retirement.²⁷

²⁶See for instance Hanoch and Honig (1983); Honig (1985); Hurd (1988) and Pozzebon and Mitchell (1989).

²⁷See for instance Berkovec and Stern (1988), and Rust (1988, 1989).

These models improve on the life cycle/perfect foresight framework which suffers from misspecification bias. Such extensions typically demand more detailed information than has generally been available in the past, including workers' savings and consumption patterns over time. Some new and provocative findings are emerging from these studies, especially regarding the inability of older workers to borrow against future income and the role that this type of liquidity constraint plays in the retirement process.²⁸

There are problems with this new line of investigation, however. Incorporating information on consumption patterns may produce bias in retirement estimates if the consumption patterns of the aged are improperly modeled. Another problem is that savings and consumption measures are notoriously imprecise. Errors in measurement of consumption may spill over into the estimates of parameters underlying the retirement decision. Still another difficulty with recent studies on retirees' consumption patterns is that they typically ignore pensions' effects on retirement, partly because including pensions would be difficult econometrically, and partly because the authors use data sets which contain imprecise pension information. As a result, pension-covered workers have been eliminated from the sample, or else the effects of pension benefits are completely ignored in the analysis.²⁹

Although econometric advances have been made in the pension/retirement area, much empirical analysis has been limited in scope because of data problems. For instance, researchers rarely have access to accurate descriptions of the pension formulas covering retiring workers. Analysts using the Retirement History Survey (RHS), for instance, have nationally representative worker data but woefully inadequate pension information. This latter is because pension data in the RHS is self-reported. Accordingly, although the level of benefits is known, analysts are forced to impute rates of accrual using industry averages (Gustman and Steinmeier, 1986a). However as was mentioned earlier, this process is error-ridden because there is wide variation in accrual rates among pension plans. Only three study teams have obtained actual pension formulas to analyze the effects of pension incentives on retirement behavior, and conclude that there is strong evidence linking pension incentives to workers' retirement ages. Fields and Mitchell (1984) use a longitudinal sample of retirees from fourteen firms, while Burkhauser (1979), Stock and Wise (1988a, b) and Kotlikoff and Wise (1989) use a single firm. Because the data sets used are not representative of the entire universe of pension-covered workers, empirical findings cannot be generalized. The consequence of this data problem is that estimates of the effects of pensions

²⁸Questions about liquidity constraints, raised most recently by Robb and Burbidge (1989), have been explored by Burtless and Moffitt (1984, 1985) in an empirical retirement context.

²⁹The Retirement History Survey is employed by Rust (1988) and the National Longitudinal Survey by Berkovec and Siern (1988). Both data sources are criticized by Fields and Mitchell (1984) as being inadequate for the purpose of examining pension effects on retirement. This is because discontinuities in pension accrual profiles can be detected in the reported data, but the size of these discontinuities can only be crudely estimated.

on retirement available for policy analysis are severely limited. Either predictions must be derived using results drawn from a nationally representative data set containing imprecise self reported pension descriptions, or on a nonrepresentative sample containing good pension information. A high priority data need is a nationally representative longitudinal data set on workers as they near and enter retirement, linked with a clear and complete representation of their pension incentives over time.³⁰

There are several other data needs in the pension/retirement area. First, there is only one technically sophisticated study of the effects of enhanced early-retirement benefits or "early out windows" (Lumsdaine, Stock and Wise, 1990). Because publicly available surveys on the topic do not exist, this study uses data only from a single firm. Second, there is so far not enough information to compare data on actual pension incentives with evidence on what the workers themselves perceive about their pension plans. Such a comparative study would be valuable in comparing the biases from using self-reported versus actual pension formulas in the retirement context. To date, there is no objective evidence on the size of the biases that result when various types of self reported information are used as a basis for estimating the retirement incentives in pension plans.³¹

Lack of data has also stood in the way of evaluating demand-side explanations for differences in pension incentives between one firm and the next. One motivation for designing pensions to promote early retirement posits that it becomes increasingly difficult to monitor workers as they age (Parsons, 1983). Another explanation is that firms encouraging early retirement utilize their pension formulas to "buy out" more expensive older employees. Empirical work on the topic is in its infancy, but suggests that the buy-out hypothesis may be a fruitful one to examine (Luzadis and Mitchell, 1989). Yet a different approach to understanding demand-side differences in pension incentives postulates that some firms use defined benefit pension plans as a personnel tool to legally reduce older workers' compensation without violating age discrimination rules (Lazear, 1983; Hutchens, 1986a).³² However, there remain some unanswered questions about a number of these hypotheses, especially those that suggest that pension provisions should be keyed to the attainment of particular ages (perhaps with the exception of some minimum service

³⁰A promising data set for such an analysis is the NLS Survey of Mature Women, which is being altered for use as a retirement survey by matching employer-provided pension data to files of pension-covered women and their husbands. The prospective Health and Retirement Survey (HERS) also holds promise in this regard.

³¹The Survey of Consumer Finances provides self reported plan descriptions together with employer descriptions of the plans, but the survey was meant for other purposes and is not well suited for analysis of retirement. Bernheim (1988) has conducted a similar study in the case of Social Security benefit structures.

³²Though recent regulations require pensions to credit for work after normal retirement age, many plans continue to embody real financial penalties for work after early retirement eligibility.

criteria). More than 40% of all workers in defined benefit plans have years of service rather than age as a key factor determining pension eligibility (Gustman and Steinmeier, 1989a).

Once again a data set which includes information about firms, their pension plans and features of their work forces would go a long way toward promoting better understanding of the jointly determined pension and retirement outcomes. Such a data set would vastly facilitate testing of the demand side hypotheses about the motivation for pensions. Also, it would be possible to investigate the simultaneous interaction of demand and supply side relationships between pensions, compensation structure and retirement practices.

C. The Pension-Mobility Relation:

Several empirical studies have examined the relation of pension coverage to turnover, quits and layoffs. On the whole, these studies demonstrate that pensions affect not only mobility at older ages (retirement), but also are associated with reduced turnover among younger employees as well.³³ Tenure has also been found to be positively related to pension coverage.³⁴

It is generally assumed that the pension-mobility relation reflects the effect of a disincentive to move created by pension backloading. By backloading we mean that pension accruals rise more than proportionately as retirement age approaches. However there are a number of unanswered questions about the pension-mobility relation, which lead us to doubt the importance of backloading in reducing the cost of turnover by newly hired or prime age workers.

One explanation for the pension-mobility relationship is that some firms invest in workers by paying for substantial hiring and training costs. Hence these employers need to regulate turnover so as to guarantee a long enough pay back period to warrant the investment in human capital. A negative pension-mobility link may be due to the efforts of the firm to reduce mobility incentives among those already employed. A related hypothesis focuses on the selection of workers who are least likely to leave by virtue of their own preferences. If some workers are likely to be "stayers" while others expect high turnover ("movers"), it will pay the firm to discriminate among these different types of employees by sorting out those workers who, by preference, are movers. A bonus that is conditional on long term attachment is worth less to a mover and will achieve the desired goal (Salop and Salop, 1976). Such a bonus system also improves productivity since search, hiring, and training costs are reduced. Without a deferred payment system, workers contemplating changing employers have little incentive to take into account the effects of their decision to move on the employer.

³³See for instance Allen, Clark and McDermed (1987); Bartel and Borjas (1977); McCormick and Hughes (1984), and Mitchell (1982 and 1983).

³⁴See for instance Wolf and Levy (1984) and Allen, Clark and McDermed (1987b).

Some criticize this theory on the grounds that defined benefit pension plans are not particularly efficient ways to screen out likely quitters at the time of initial hire. This is because hiring and training costs typically occur at the beginning of the employment period, so employers would find most costly turnover close to the time of hire. However, defined benefit pension plans typically do not penalize short-time employees the most. Instead, pension formulas are typically quite back-loaded -- defined benefit plans impose large mobility costs on workers within ten years of qualifying for early retirement, but create much less of a turnover disincentive among newly hired employees (Gustman and Steinmeier, 1987, 1989a).

Another way in which pensions might reduce turnover is via their vesting provisions, which deter workers from leaving their firms until they have worked long enough to be guaranteed an eventual retirement benefit (Schiller and Weiss, 1979). However, pension accruals are small enough at the time of vesting so that losses due to turnover during the first years of employment are likely to be slight (Kodlikoff and Wise, 1985; 1987b). Direct calculations of the effects of reducing vesting from ten to five years also suggests that recent changes in vesting rules, and related requirements for crediting work at young ages, are unlikely to affect turnover behavior substantially (Gustman and Steinmeier, 1989d).

A fundamental question that still requires an answer is whether pension coverage is truly correlated with the difference between a worker's wage on his current job and on his next-best alternative. If there is a positive correlation, then estimating the effect of pension coverage on turnover will overstate the true effect of pension backloading in reducing turnover unless the gap is appropriately controlled for. Simply including a measure of the level of the wage on the pension-covered job, without controlling on alternative wages, will not eliminate this bias.

Empirical studies disagree on the actual extent to which pension backloading explains turnover. In some studies, backloading appears to explain much of the difference in turnover between those in pension and non-pension covered jobs (Allen, Clark and McDermed, 1987b). However these estimates are not internally consistent, since they suggest that a dollar of benefits due to pension backloading has a much greater effect on turnover than does an extra dollar of wages (Gustman and Steinmeier, 1987). A recent study suggests that the lower turnover is explained by a wage premium which is also paid to workers on pension-covered jobs and not pension backloading (Gustman and Steinmeier, 1990). Another of that study's finding also casts doubt on the view that pensions strongly deter mobility. It turns out that workers covered by defined contribution plans are also less likely to change jobs, even though defined contribution plans are not back loaded. This suggests that the apparent negative relationship between plan coverage and mobility may reflect the effects of omitted variable bias, with the pension measure taking the credit for the effects of an unmeasured wage premium.

At least as perplexing as the findings on backloading is evidence indicating that pensions reduce layoffs as much as they reduce quits or maybe even more. Allen, Clark and McDermid (1988) attribute this finding to the constraints that the implicit pension contract creates for the dismissal policies of the firm. Mitchell (1982) attributes the finding to a reduction in quits from the layoff status. Neither explanation has been tested directly.

Once again, firm-level data would prove invaluable in understanding whether pensions have been designed to affect mobility, and to understand whether such policies have been motivated by a desire to economize on hiring and training costs. Thus far, only limited data are available indicating the hiring and training costs of firms.³⁵ A data set obtained from firms which provided information on benefits, hiring and training, turnover rates of the covered work force, and wages would be enormously helpful.

D. Pensions And Work Incentives:

Under a defined benefit plan, the pension accrual rate declines after early or normal retirement age. The reason is that after qualifying for retirement, there is a cost to continued work that was not previously relevant; i.e., benefits are foregone (Bulow, 1982). As noted above, productivity may with increasing frequency fall below compensation even though at older ages downward wage adjustments are precluded by law. Therefore, the decline in the accrual rate may help to bring productivity into line with compensation.

Lazear (1979) has shown that, as part of a compensation scheme designed to increase productivity over the life cycle, it may pay for the firm and the worker to agree to make the wage profile steeper than the productivity profile. In that way, the worker posts a bond which will be forfeited if the worker is terminated due to shirking. The proceeds from the consequent increase in worker productivity can then be shared; hence we call it the "productivity-enhancement" theory of pensions. At the end of such a contract, employment must be terminated; otherwise, workers would like to extend the employment relation beyond the optimal time period. Lazear's analysis thus motivates mandatory retirement policies as devices adopted to overcome older workers' desire to continue to be paid above their productivity levels. An alternative to mandatory retirement is a defined pension benefit formula which generates benefit cuts for those working beyond normal retirement age; this brings compensation of older workers back into line with productivity. Lazear

³⁵The EEOP survey, a survey of firms, was undertaken in connection with an experimental Labor Department program that was terminated before completion. These data emphasize hiring and training costs for newly hired low-wage workers.

(1982) further argues that some pension plans' early retirement features provide severance pay that allows termination when a superior opportunity is available to the worker elsewhere.³⁶

Direct tests of this productivity enhancement theory are not currently available. In principle, it would be necessary to observe wage and productivity profiles for the same firm in the presence and absence of a pension, to determine whether productivity is higher, or the wage profile is made steeper, when a pension is offered for the firm time. Simple comparisons of productivity or wage profiles between firms with and without pensions will not do. When a set of systematic differences between the firms motivate one to adopt a pension of a particular type and the other to choose not to be covered, pensions are a dimension of outcome, not an explanatory variable determined by considerations outside the problem. Along the same lines, it should also be recognized that deferred compensation is only one of a number of compensation policies available to firms. Yet thus far there are no surveys that would permit analysts to relate pension provisions to parameters reflecting the availability of (and efficacy of) alternative supervision or compensation policies. Nor do we have any information on the differences among firms in the characteristic paths of worker productivity over the life cycle, or typical terms of attachment.

Though no direct tests of the productivity enhancement theory have yet been formulated, indirect approaches exist to evaluate the empirical applicability of the model. One approach asks whether observed plan characteristics and accrual profiles are consistent with the model. A second approach uses the model to explain differences among pensions adopted by different firms, to see whether observed behavior coincides with the model's predictions about relationships between pensions, mandatory retirement, and other characteristics of firms' personnel and supervisory policies. Last, pension plans are examined over time to determine whether they changed in a manner coincident with observed changes in the economic environment or in regulatory policy, as predicted by the model. Each approach is described briefly.

Broadly speaking, many if not all observed plan characteristics, accrual profiles and the association of pension coverage and mandatory retirement are consistent with the productivity enhancement view of pensions. In accordance with predictions, benefit accruals often become negative after the firm's early retirement age (Lazear, 1982). It should be noted that it is important

³⁶There remain several unanswered questions about the productivity enhancement hypothesis. It is not yet clear how this theory explains the importance of service-related criteria for retirement eligibility, and why it is not necessary to provide a strong work incentive for an individual hired at an early age who has qualified for retirement benefits, while a worker of the same age who joined the firm later may face a large cost to delayed retirement. Nor is it clear that the pattern of penalties which is directly created by pension back loading corresponds to the pattern which would be ideal to discourage shirking. The absolute value of the penalty rises, peaks typically after a decade or two of attachment, and then declines. In relative terms, the penalty rises as a fraction of the remaining wage until early or normal retirement age is reached. More generally, a given pension formula will create a contract that varies in its effect on workers hired at different ages, and with the inflation rate. These issues are not yet well addressed in current theory.

to distinguish between actuarial and economic incentives when evaluating incentives for early retirement (Ippolito, 1990). For instance a retiree accepting an early pension may appear to benefit from an actuarial subsidy if he retires early, but because continued wage growth is forfeited on leaving, the worker also forfeits the right to future benefit improvements once he leaves. Hence an actuarial early retirement incentive may fail to provide an economic incentive to accept early retirement. Nevertheless, when economic pension incentives are computed which take this into account, some researchers still find evidence for economic early retirement incentives (Fields and Mitchell, 1984). Nevertheless, negative accrual rates after early retirement are certainly not universal in the defined benefit arena (Gustman and Steinmeier, 1989a). Whether the accrual profile turns negative upon qualification for early retirement, and the associated extent of backloading up to the point where the worker qualifies for early retirement, appear to depend on the generosity of special early retirement benefits (Kotlikoff and Wise, 1987c).

One might try to evaluate the productivity enhancement theory and other behavioral pension models by using cross-sectional data to explain differences among pensions adopted by diverse firms. The evidence shows that cross-sectional studies often do reveal general patterns of association.³⁷ However, a problem with efforts to draw conclusions on the motivation for the pensions from cross-section profiles is that there is usually no information on what productivity, wages and employment would have been in the absence of pension plans. This is a standard selection problem: it cannot be concluded that removing a pension would produce outcomes similar to those in a firm which never had a plan, and vice versa. Hence such findings cannot generally be used to distinguish among theories because of the inability to be certain that observable variables adequately adjust for differences among firms adopting different pension plans. An innovative approach posits that delayed payment contracts of the Lazear type will result in discrimination in hiring against older workers (Hutchens, 1986a). The evidence is consistent with this view, inasmuch as pensions and mandatory retirement rules appear to have been more common in firms who avoided hiring older workers. A later paper finds supporting evidence that long term contracts are more in evidence when firms have a difficult time supervising employee output (Hutchens, 1986b). Unfortunately the data sets used contain no information on individual worker productivity, precise measures of supervision technology, and changes in product demand, and perhaps as a consequence, empirical results are subject to alternative interpretations.³⁸

³⁷Kotlikoff and Smith (1983) analyze the relation between plan characteristics and a wide variety of firm and industry factors. A related study using the SCF appears in Gustman and Steinmeier (1986c).

³⁸The limited power of cross-sectional tests when conducted with sparse data sets currently available is particularly striking when looking at union-nonunion pension plan differences. One-third of all workers covered by defined benefit plans were employed in union firms in 1983 (Gustman and Steinmeier, 1986c), where dismissal for cause in these firms is notoriously difficult (Medoff, 1979). Hence it would seem that unionized firms would not use

Evidence contrary to the productivity enhancement theory is offered by Crockett and Stern (1989), who review historical data on mandatory retirement provisions and find that relatively few workers were covered in the past, casting doubt on the notion of this type of long-term contract. These authors somewhat overstate their case, since they claim that all workers in a Lazear-type world would have been subject to mandatory retirement before it was prohibited, whether or not they had a pension. As Hutchens (1989) points out, whether a firm would adopt a long term contract of this type depends on supervision costs and the economic prospects of the firm. Nevertheless prior to recent reforms, half the labor force was not subject to mandatory retirement, which raises questions about the theory's generalizability. Better data would permit identification of cases when the theory applies, and when it does not; researchers should be warned against applying this model uniformly.

Crockett and Stern also offer other evidence against Lazear's theory. They argue that pension programs should all include powerful early retirement incentives, but find this prediction to be inconsistent with the data. They also contend that the theory predicts that workers who are subject to mandatory retirement should be less likely to retire early than are those who are not, and again do not find this prediction empirically substantiated. It must be said, however, that this study does not fully explain observed differences among firms in accordance with the costs of supervision or other factors affecting the value of a long-term pension contract. Indeed, the contribution of this study is that it emphasizes the importance of having more detailed information about the firm for use in pension analysis, and highlights the fact that there is probably more than one explanation for pensions' role and function in the labor market. The tests provide a clue that the motivation described by Lazear does not apply uniformly across all firms, but as yet do not establish why plan provisions have been adopted in some firms but not in others, nor can we say with any precision how plan provisions help companies attain multiple goals.

A different way to explain cross-sectional differences among pension plans focuses directly on productivity consequences of pension choices. One study added a productivity index to an industry-level wage equation where a pension measure already appeared as a control (Allen and Clark, 1987a). This productivity factor was found to have no significant impact on the estimated positive pension-wage tradeoff. That study also investigated the relationship between pensions and productivity in several descriptive specifications, concluding again that the relationship was not statistically significant. This is a puzzling conclusion, since it seems likely that profit-seeking firms would not offer costly pensions if they did not enhance productivity (assuming that pension benefits are not offset by equalizing wage differentials). However, it could also be argued that

pensions to deter shirking. Yet evidence in favor of the shirking hypothesis is drawn from a sample of union plans where the shirking hypothesis might appear to be least relevant (Luzadis and Mitchell, 1989).

statistically insignificant findings might result because entry eventually competes away productivity and profit advantage, and not because pensions fail to improve productivity. Moreover, it is important to recognize once again that cross-section data do not provide observations on productivity before and after the pension is adopted, and there is no easy way to remove the effects of self-selection by firms and subsequent market adjustments. In general, no strong conclusions can be drawn since at best the evidence is suggestive.

Last but not least, some researchers examine pension theory by evaluating whether pension plans changed over time in a manner coincident with observed changes in the economic environment or in regulatory policy, as predicted by the model. While this strategy comes closest to testing the theory, it has thus far been difficult to take into account all possible changes in other explanatory variables while dealing appropriately with unobservables. One example of this approach focuses on the sensitivity of pension incentives to inflation. Pension accrual profiles prove to be quite variable depending on the overall inflation rate (Kotlikoff and Wise, 1985, 1987b), which surprises observers expecting either that inflation would be neutralized by pension benefit formulas, or that inflation would be factored into the formulas so as to enhance productivity and deter mobility. So far, no longitudinal study systematically investigates the effects of inflation on pension plan provisions.³⁹ A different "natural experiment" occurred when mandatory retirement was abolished in the US (the mandatory age was first extended to age 70, and then abolished for the majority of all employees). If, as the model predicts, firms used pensions to offset the change in regulations, it would be expected that early retirement benefits would have increased when the mandatory retirement cap was lifted (Lazear, 1983). Evidence consistent with this hypothesis has been detected in large firms (Lazear, 1983) and union pension plans (Luzadis and Mitchell, 1989). However, as those authors recognize, the results do not rule out the possibility that other policies were responsible for the findings since during the period under study several other tax and regulatory changes occurred.

In sum, pension researchers have not yet distinguished empirically between different theoretical models of the effects of pensions on productivity. This should be a high priority in future research, in order to better inform analysis of the consequences of adopting alternative pension policies. In our view, a fruitful approach is to use longitudinal data on firms offering pensions through time, with careful documentation on the plans themselves, the firms' characteristics, and information about the workers at the firms. Only then will it be possible to standardize for observable and unobservable firm characteristics. Testable implications should then be developed and examined, and careful econometric specification developed to isolate key

³⁹Convincing explanations are also lacking for post-retirement pension adjustments documented by Allen, Clark and Sumner (1986).

structural parameters. In this way will it be possible to glean information about how regulatory changes interact with characteristics of specific firms and work forces.

E. Interdependence In Decisions Determining Pensions, Savings, Insurance, And Labor Market Outcomes:

Although a review of the insurance and savings motivations for pensions is beyond the scope of this paper, it is useful to at least mention in the present context the relations between labor market outcomes, pensions and savings and insurance decisions.⁴⁰ This is because workers' demand for pensions, and firms' supply of pensions, are intimately related to the supply of and demand for insurance and non-pension savings.

If workers and firms had perfect foresight, they could design pension and earnings streams to compromise in an optimal fashion between their conflicting objectives. In such a hypothetical world, analysts could focus solely on pay and pension profiles to evaluate the way that labor markets work.

Information on older workers' consumption paths could provide a check on estimates of key parameters such as the rate of time preference, estimates which have been obtained by observing retirement outcomes. However, as noted in the discussion of retirement behavior, retirees' consumption appears to decline with age, a path inconsistent with predictions from a simple life-cycle certainty model (Hurd, 1989; Robb and Burbidge, 1989). Of course in reality many different types of uncertainty plague both employees and employers, making work and savings behavior interdependent and more complex than would be the case in the hypothetical perfect certainty world.

1. Pensions in a risky environment

One type of uncertainty shaping the structure of pensions is uncertainty about the length of life, though this insurance motivation is clearly the not the sole rationale for pensions (Kotlikoff and Spivak, 1981). Pensions are also uniquely suitable as a vehicle for overcoming the effects of asymmetric information and adverse selection which would otherwise undermine the annuity market. If workers strongly value the annuity feature of the defined benefit plan, then the decision to provide pensions, and features of these plans, should reflect both the basic labor market considerations relevant to pension and retirement policy, as well as the demand for annuities derived from the savings and insurance motivation. What this means is that the decisions relating pensions to the interesting labor market outcomes like retirement and job change are not easily

⁴⁰For recent reviews of the insurance and retirement savings literature see Bodie (1989) and Hurd (1989), respectively.

separated from workers' and firms' decisions regarding savings and insurance. On the one hand this makes it very hard to model the workers' valuation of pensions, but on the other hand information on savings may be used to learn more about the relation of pensions to retirement. For example, Rust (1988, 1989) has used information on older peoples' joint labor supply and savings behavior to isolate tradeoffs between income and leisure in a dynamic context, as they adjust to unforeseen events such as changes in market opportunities.⁴¹

Another way that risk plays a role in the pension arena has to do with the risks presented by changes in the economic environment. For example, workers may use a defined benefit pension plan to insure each other against fluctuations in the economy, transferring benefits from well-off cohorts to those who experienced unusually low returns on invested pension assets (Ippolito, 1987). Another very important type of risk implicit in the pension promise has to do with the fact that workers do not actually know the real value of eventual benefits at retirement. For workers with defined contribution plans, pension assets fluctuate day by day as portfolio values change, and these fluctuations can dramatically alter benefit payouts. In the case of defined benefit plans, covered workers are also at risk (Green, 1985). Importantly, if a defined benefit plan terminates, current law guarantees nominal benefits (and only up to a cap); the worker is not guaranteed the full value of benefits indexed to wages until the worker's retirement date (Ippolito, 1989). What this implies is that terminated workers in a defined benefit plan bear inflation costs (having their benefits eroded between the termination and retirement dates), and also the loss of an option on benefits tied to pre-retirement wages that they would have accrued if the plan had not terminated (Ippolito, 1985c; Gustman and Steinmeier, 1989c). Termination and reversion patterns are being studied to determine whether worker and firm behaviors are responding predictably to pension reversions, in light of the theories outlined above. Because of the emergence of financial innovations affecting the incentives for pension plan termination, and the rise in pension overfunding due to the stock market boom, careful analysis is required to determine whether these have substantially changed the way firms and workers value pension promises.

More complete models are required which spell out the relation between pension uncertainty and the way pensions are valued, in order to better predict behavioral responses to pension policies. For example, requiring pensions to credit continued employment after the plan's normal retirement age raises the implicit price to the firm of providing a pension. These policies

⁴¹Empirical researchers face many pitfalls when incorporating information on savings and consumption into labor supply analyses, because (a) savings is measured very poorly in many data sets, (b) it is difficult to isolate changes in asset prices over time, (c) many simplifying assumptions are required to estimate such models which may make the model fairly unrealistic, and (d) people save for a number of different reasons, and the relative importance of the different motivations for savings probably varies with income (Rust, 1988; Bernheim, 1987). Thus far analysts primarily interested in retirement, for instance, have not formulated models sufficiently well specified to explain all relevant savings motivations.

will have a smaller impact on demand for pensions if workers strongly value the insurance these plans provide, versus if the sole purpose of the pension is as a tool of personnel policy. Conversely, the form and function of pension risk may in turn affect workers' labor supply decisions: for instance, a worker may postpone retirement in the event of adverse investment outcomes (Bodie and Samuelson, 1989). This area of research is, as yet, in its infancy.

2. Pensions and capital market imperfections:

A few analysts have noted the importance of capital market imperfections and in particular liquidity constraints affecting older workers' decisions on when to retire (Blinder, 1981; Crawford and Lilien, 1981; Burtless and Moffitt, 1984 and 1985). This is important in the pension context because borrowers cannot generally secure a loan with their future labor income; nor can lenders legally attach pension (or social security) assets in the event of default. This produces differences between the rates at which people can lend and borrow money, in turn influencing the labor market behavior of people who would have preferred to reallocate consumption from the post-retirement to their pre-retirement period by borrowing.

Some affected individuals who would have wished to borrow, may instead alter their retirement behavior so as to reallocate consumption from the period of retirement to the period of work. In other words, for some people, pensions or social security may concentrate too much income in the post-retirement period (Blinder, 1981).⁴² For those individuals, the retirement and savings decisions become inextricably intertwined. The degree of interrelationship could vary by income: for instance, pensions are often designed to benefit highly-paid executives, yet lower-wage workers become covered because of tax law, which requires them to be if the pension accruals are to be tax-exempt. On this notion, liquidity constraints could bind selectively for lower income workers (a tendency reinforced by the progressive structure of social security benefits). Higher-wage workers, not on the margin of borrowing, may act as though capital market imperfections are irrelevant to their pension and labor market behavior.

Although no empirical researchers have examined this phenomenon in the pension arena, some contend that Social Security has played a similar role. Specifically, as a consequence of the start-up phase of the social security system some workers may have attained old age with unexpectedly high post-retirement incomes (Burtless, 1986). This in turn may have lowered other

⁴²Liquidity constraints may work in the opposite direction when workers desire insurance against disability and can use pension plans' early retirement provisions to provide this protection (Nalebuff and Zeckhauser, 1985; Lapp, 1985).

If capital markets impose binding liquidity constraints, savings or at least the flow of marginal adjustments in savings is in the opposite direction from that predicted by more traditional life cycle explanations of savings. That is, despite the fact that earnings are realized prior to retirement, consumption is redistributed via pensions from the post to the pre-retirement period.

forms of savings including, presumably, pension saving. However there are important reasons to doubt that pensions caused too much income to be concentrated in the retirement period for the typical worker attaining retirement age in the last decade. For one thing, pensions differ from Social Security in that they are compensation packages voluntarily arrived at (from the viewpoint of employee groups if not for individual workers). In other words, workers who agreed to be voluntarily liquidity-constrained by a pension would have to be promised some other benefit to offset the cost of being over-pensioned. This seems logical even if pensions were a "self-control" mechanism used to force employees to save for their own retirement (Thaler and Shefrin, 1981); it is unlikely that resulting liquidity constraints would be highly distortionary.⁴³

It should also be noted that current retirees with pensions were highly unionized during their working careers. The major effect of unions is to increase the probability of pension coverage. They do not appear raise pension values, at least not among currently covered workers (Freeman, 1985; Gustman and Steinmeier, 1986c). It seems unlikely that unions would have over-burdened their workers with pensions. Indeed, in industries such as construction, there historically was no explicit bargaining over pensions; rather, bargaining was over total compensation and the union was free to allocate compensation between pensions and wages (Gustman and Segal, 1972). Hence there remains a question as to why unions in such a position would choose to over-pension their members.

In sum, analysts interested in studying pensions and labor market outcomes should recognize more clearly the interdependencies among retirement, savings and insurance, to avoid a distorted view of the behavior underlying pension choice. This suggests that future studies of the demand for and provisions of pension plans should attempt to incorporate information on both workers' and firms' financial status, though the burden of obtaining such data will be formidable.

III. Pensions, Market Structure and Labor Market Institutions

This section reviews available evidence on the impact of market structures and labor market institutions on pension outcomes. Four areas are investigated: the effects of imperfect information, the role of market structure, union effects, and regulatory constraints.

⁴³On the assumption that the life cycle model explains the pattern of consumption and savings over time, a direct examination of saving and dissaving provides ambiguous evidence about whether liquidity constraints are binding. On the one hand, there appears to be little direct savings for retirement (Venti and Wise, 1989b). This suggests a corner solution due to excess annuity income in retirement years. On the other hand, assets in the older population take the form of housing equity, and retirees do not tend to draw down their housing wealth even when it is possible to do so (that is, even in the case of those who move anyway; see Venti and Wise, 1989a). This suggests that there is little desire among retirees to shift consumption toward the present from the remaining retirement years or from bequests.

A. Imperfect Information

Because pensions are remarkably complex, modelers have begun to recognize that both workers and firms may be laboring under poor information and lack of understanding regarding what the pension plan does, and such imperfect information may lead to unexpected behaviors. For instance, workers who miscalculate may consume less optimally, or retire earlier or later, than they would wish if they had a better understanding of their pension rewards and risks. Also, pensions may be so complicated that it is not cost-effective for firms to purchase all the information required for optimal decision making.⁴⁴ Bodie (1989) argues, for example, that even pension experts make mistakes, focusing inappropriately on the replacement rates at the age of retirement, rather than on the more economically relevant path of pension incentives over the full range of retirement possibilities. Worker descriptions of plans have been compared with actual plan formulas and show that employees are poorly informed as to the details of the pension formula, including plan type (Mitchell, 1988). These comparisons also suggest that although the median worker has reasonable expectations about when he or she will be eligible for early or normal retirement benefits and pension amounts, a sub-group of workers is highly overoptimistic (Gustman and Steinmeier, 1989a). Some analysts have also compared peoples' retirement intentions with realized behavior, but this exercise requires using particular statistical assumptions about how expectations are formed and how expectations are realized (Anderson, Burkhauser, and Quinn, 1986; Bernheim, 1989; Manski, 1989).

To date, only one nationally representative data set, the Survey of Consumer Finances (SCF), matches worker descriptions of pension characteristics with plan descriptions provided by the employees' firms. Efforts are needed to collect more data of this kind which can be used to systematically assess how well workers and firms understand their pension plans' provisions, and what the consequences are of misinformation. Two target groups of workers should be mentioned: those approaching retirement for whom retirement benefit rules are most pertinent, and younger workers for whom accrual and eligibility rules are more important. The latter group is the one presumed to be able to adjust work effort and job change behavior in view of pension accruals and perceived pension losses upon termination. In addition, it would be helpful to obtain some indication of how well informed benefits administrators and personnel officers are, insofar as these individuals are instrumental in designing and implementing pension incentives. A survey of worker and firm knowledge of pension incentives and their time paths would provide the kind of consumer information that can enhance market efficiency.

⁴⁴Lazear (1985a) treats the plans themselves as distortionary and discusses the nature of these distortions.

B. Market Structure Effects

There is a fundamental problem which will continue to plague all research on the supply of and demand for pensions. This arises because the economics profession remains uncertain as to the specific mechanisms generating wage and employment outcomes at the level of the firm. While new data are providing some new methods of approach, there remain questions about the rationales behind particular wage profiles, and perhaps more fundamentally, about whether market rents play a role in shaping the compensation structure.

One set of questions focuses on the relative importance of human capital and on-the-job training, incentive contracts, and matching of workers to jobs. Research by Abraham and Farber (1988) questions whether observed positive wage/tenure relationships reflect true productivity increases with time worked, or instead better matching of long-time workers' skills with their job requirements. Various methods have been proposed to purge the selection bias discussed by Abraham and Farber, including one by Topel (1987) who focuses on lateral job changes of more experience workers. Related questions arise about the extent to which firms use layoffs to purge workers who are less well-matched to their jobs. Recent evidence suggests that workers suffering job loss due to plant closings find better jobs than do those who are laid off from ongoing firms (Gibbons and Katz, 1989). A related question is whether employee compensation is tightly linked to the supply price of labor, or whether specific workers receive rents on their jobs. Early efforts to address this question (Segal, 1986) have been taken more recently by Blanchflower, Oswald and Garrett (1989), who suggest that workers' wages include rents reflecting their firms' economic condition.

It has been established empirically that large firms pay higher wages even after controlling on all available measures of worker quality (Brown and Medoff, 1989; Katz and Summers, 1989). Pension coverage is more common in large firms than in small firms: pension coverage is 76% in large firms, but only 22% in small firms (Andrews, 1985).⁴⁵ Efforts to explain this phenomenon have compared the wages of pension covered workers with those of non-covered workers with similar measured characteristics, and arrive at the same conclusion: pensions are more common in large firms even after many other factors are held constant (Ippolito, 1986a; Mitchell and Pozzebon, 1987; Andrews, 1989).

Continuing uncertainty about the mechanisms determining compensation and employment will certainly spill over into the analysis of pensions. If labor markets, especially nonunion ones, are not fully competitive, future models of pension determination must begin to be modified to take these structural imperfections into account. If firms offering pensions are also paying higher

⁴⁵Although over 40% of all employees are attached to firms employing fewer than 100 workers (Oi, 1983; Oi and Raisian, 1985), 85% of pensions are held by workers in firms with more than 100 employees (Kodlikoff and Smith, 1983).

salaries than pay levels their employees could obtain elsewhere, then a steeper wage profile may not be necessary to avoid shirking by workers in pension-covered jobs. Moreover, as can be seen by our emphasis on Lazear's productivity enhancement theory, discoveries about the compensation/employment mechanism which would show that the human capital theory, the matching theory, or efficiency wage theories, are of more or less importance than have previously been realized, will have implications for our understanding of the pension/wage tradeoff over the term of job attachment.

C. Union Effects

A great deal of empirical evidence shows that union workers are more likely to have pensions than are their nonunion counterparts, and that pension plan characteristics vary systematically with union status.⁴⁶ For instance, despite the recent decline in unionization, Gustman and Steinmeier (1986c) find that in 1983 unionization raised overall pension coverage of US private sector workers by about eight percentage points, or 15% above what coverage would have been in the absence of unions.

While this research has yet to move beyond the descriptive stage, it seems clear that it must do more than simply graft a union variable onto empirical equations. This is because the union and nonunion sectors may differ fundamentally in terms of their pension objectives. A rich set of possibilities has been suggested in the literature, but no unifying theme has yet emerged. For instance, Freeman's (1985) "voice" model suggests that unions give more weight to "median" older workers as opposed to the nonunion work places where the marginal worker is favored. Hence pension rules would be expected to differ markedly in union versus nonunion plans; for example, underfunded pensions may help redistribute monopoly rents in favor of older union members (Weiss, 1985). When enhanced retirement benefits and age related incentives are adopted to induce older members to retire, there is a quid pro quo for younger members. They move up the seniority queue and obtain greater job security. Others, notably Ippolito (1985b), contend that pension plan underfunding plays a key role in maintaining an efficient contract between unionized workers and their employers; in this case, pension underfunding provides the union with incentives to keep the firm in business. Unions also appear to have a differential effect on pension retirement incentives, tilting benefit rules so as to encourage earlier retirement (Fields and Mitchell, 1984; Gustman and Steinmeier, 1989a). However among workers with pension plans, unionized employees do not appear to contribute more (Freeman, 1985), or have higher projected benefits (Gustman and Steinmeier, 1989a). On the other hand, reported benefits for currently retired union

⁴⁶See Freeman (1985); Hatch et al (1982); Kotlikoff and Smith (1983); and Leigh (1981).

workers are higher than are the benefits received by currently retired nonunion workers (Allen and Clark, 1986).

Though many of the answers are as yet unknown, there are nevertheless some empirical implications from the conclusion that pension mechanisms differ in the union and nonunion environment. One should be suspicious of descriptive efforts which include dummy variables representing union coverage, while constraining all other coefficients in the estimating equation to be the same between the union and nonunion sectors. This caution will become more important as one proceeds from reduced-form to structural analyses where the behavior, and thus the reactions to policy, may be very different between the two sectors.

D. Taxes, Social Insurance, and Regulatory Constraints

Tax policies, regulatory constraints and provisions of related government programs, most importantly Social Security, affect the choice of pension coverage and plan provisions, and the associated price, quantity and quality related outcomes resulting from the interactions of workers' and firms' decisions. While a detailed analysis of specific policies is beyond the purview of the present paper, this section sketches in general terms how government regulation affects the environment in which workers and firms make pension decisions.⁴⁷

Most analysts agree that tax policy has played a key role in motivating the growth of pensions since World War II in the US. The progressive income tax structure and changes in tax provisions over time increased workers' effective tax rates, and analyses of substitutability between pensions and wages model explicitly the tax advantages of deferred compensation (Ippolito, 1985a; Woodbury, 1989). As noted earlier, this tax advantage was especially strong for management; until the recent tightening of discrimination rules and ceilings, it was possible to target large tax breaks on management while controlling pension costs for lower-paid workers.

Another important set of regulatory policies shaping the pension environment are laws affecting the way in which pension benefit accruals are permitted to change as workers age. For instance, regulations in the last two decades raised the mandatory retirement age and then, for most of the private sector, outlawed the practice of imposing mandatory retirement ages. Anti-discrimination rules and provisions of the tax code now require the crediting of pensions after normal retirement age, mitigating the fall in compensation upon qualifying for normal retirement. Benefit ceilings have been lowered. Changes in discrimination rules reduce discrepancies between benefits paid to high and low wage workers and reduce the use of Social Security offsets, and

⁴⁷Pension studies with a policy focus are too numerous to list here in their entirety, but include work by Anderson (1987), Andrews (1989); Congressional Budget Office (1987); Clark, Bohmann and McDermed (1988); Feldstein (1981, 1983); Fields and Mitchell (1987); Gustman and Steinmeier (1985b; 1986b); Ippolito (1986a, 1989); Lazear (1983 and 1985b); Mitchell and Luzadis (1988); Mitchell (forthcoming); Munnell (1984); and Summers (1983).

bridge payments meant to raise pension benefits until Social Security kicks in. With the scheduled smoothing of relatively sharp incentives to retire at age 65 created by the Social Security benefit structure, and with the abolition of mandatory retirement, pensions emerge as the fundamental, but constrained instrument for firms to affect retirement behavior. Projecting from the past stream of legislation, it would not be surprising to see further regulatory efforts to limit early retirement incentives. Other legislation under consideration would regulate coverage, the provision of post retirement adjustments, and further regulate plan terminations. As is evident, a successful model of pensions must incorporate these effects of taxes, social insurance and regulation.

A general point to make is that mechanical (i.e. non-behavioral) approaches to examining pension policy must be inadequate. For instance, policy makers have from time to time proposed requiring all employers to offer pension coverage. A mechanical assessment of mandating pension coverage might assume, inappropriately, that firms without pensions would simply adopt them without changing other compensation and personnel policies. On the other hand a more informed policy evaluation would take into account changes in other forms of pay and employment levels, as a result of the rule change. A different pension policy suggested on Capitol Hill would mandate actuarial neutrality for pension benefit formulas. Some ignore the likely effects of doing so, but a careful analysis of such a policy must recognize that firms would certainly react by altering benefit levels and other provisions, as well as the availability of plans. Analogously, there is evidence that when the government abolished mandatory retirement rules, firms did not simply do away with mandatory retirement provisions, but rather altered their pension benefit rules to mitigate this change in the structure of labor costs. To understand the effects of these and numerous other actual and potential pension policies, one must understand the underlying and interdependent behaviors of individual workers, the firms employing them, and other factors which become important at the market level.

IV. Conclusions

This paper has surveyed the literature analyzing the reasons for and consequences of pensions in the labor market. The available evidence suggests that pensions are part of a long-term employment relation.

On the labor supply side, we describe a number of behavioral models relating pension incentives to workers' mobility, retirement, consumption and savings patterns. Many risks and benefits of various pension arrangements have been examined in the literature. However, we still have an incomplete picture of how workers value specific plan features including the provision of an annuity, uncertainties due to premature plan termination, imperfect inflation protection of benefits, and so on. To date, there is evidence consistent with many of the different worker-side rationales for pensions, but there is also evidence inconsistent with the theories as well.

On the labor demand side, several theories suggest that companies use pensions as a personnel tool, in order to affect productivity. However, existing research does not yet identify which of the competing theories is most accurate, or point out the relative importance of complimentary explanations. Empirical work has not yet identified many of the needed structural parameters. Thus there is no direct evidence of the value to the firm of using pension incentives to: induce retirement, reduce mobility by cutting hiring and training costs, or identify "stayers". More remains to be learned about how pensions fit into an overall compensation structure which enhances work effort. While there is evidence consistent with many of these explanations, we have also noted findings inconsistent with the various firm-side motivations for offering plans and for structuring the plans in specific ways.⁴⁸

In order for labor market analysis of pensions to advance, it is necessary to move beyond descriptive studies toward structural models which permit tests between pension theories. There is reason to worry that existing empirical estimates of the determinants of pension-related outcomes may be misspecified, because observed pension and related labor market outcomes are not yet fully understood. For example, models which estimate wage/pension tradeoffs could suffer from serious omitted variable bias, because they typically ignore the question of why firms offer pensions.

Structural pension models are also needed to inform pension policy of the next decade. If analysts are to judge whether observed or potential changes in pension regulation will be beneficial or detrimental, it is essential to develop a better understanding of how specific pension features are valued by both workers and firms. We must determine not only the broad outlines of behavior, but also the sizes of key parameters in equations reflecting choices made by the relevant economic agents. Because researchers have not yet formulated a comprehensive idea of what pensions do and why they exist, labor analysts are hampered in their ability to predict with any precision the likely effects of pension reforms of all kinds.

Structural estimation has heavy data requirements. For instance, developing and testing new models of pensions' effects on retirement, savings and consumption in view of uncertainty cannot be carried out with available surveys. Existing longitudinal data bases do not include good enough pension information to press forward on this front. Research breakthroughs also await the development of information of recent cohorts, so as to determine whether behaviors of people who retired during the 1970's still hold for retirees in more recent years. This is especially important

⁴⁸For example, Bodie (1989), in discussing the retirement insurance motivation for pensions recognizes the potential importance of personnel policies, and Lazear (1986), in discussing the incentive models of pensions, recognizes the importance of the retirement insurance motivation. But these motivations are not integrated in the context of a single analysis.

for studies on the effects of pensions on women's mobility and retirement patterns in the context of family retirement decisions. The National Institute on Aging is seeking to meet some of these needs via their proposed Health and Retirement Survey; also promising in this regard is a current proposal to incorporate pensions into the National Longitudinal Survey of Mature women.

In sum, we believe there is a pressing need for a nationally representative survey where the unit of observation is the firm, the establishment, or the pension plan. To understand the pension-wage and the pension-turnover/retirement relationship, more information is required on the processes determining compensation and employment. Combining information on employee characteristics, turnover and retirement patterns, company inputs and outputs, and the firm's overall financial characteristics would go a long way toward helping researchers distinguish among the leading explanations for why firms offer pensions.

V. Data Needs: Recommendations

There is a clear and pressing need for more and richer data sets on pensions, the firms offering the plans, and the workers covered by the plans. Poor or nonexistent data has seriously hampered researchers from developing the type of detailed understanding required for evaluating many pension regulations and predicting the effects of many proposed policies. Policy and research analysis would be best served by gaining access to information about workers, their pensions and their firms. Specific data needs and priorities for future data collection efforts include the following:

- A nationally representative panel of pensions with ongoing information on changes in plan provisions would be useful for documenting changing pension incentives over time.

- A nationally representative data set, preferably longitudinal and centered around the firm, is needed. It should match information on employee characteristics with employer-side data on the pension plans as well as other characteristics of firms, their inputs and their financial structure. Pension plan descriptions would best be accompanied by information on the distribution of wages of covered workers, their numbers, and other characteristics. Such information is highly sensitive. Perhaps relevant data could be collected but saved, made available only after a suitable number of years.

- A nationally representative survey would be useful, which augmented the information described in the point above with time-series of turnover and retirement rates by pension-covered workers. Information on offers of pension benefit enhancements would also be valuable. A statistical base with information about the firms offering such plans, their pension plans, and characteristics of their labor markets could be used to test demand-side hypotheses about the motivation for pensions, and to investigate the simultaneous demand and supply side relationships between pensions, compensation structure and retirement.

- If the data described above were augmented by longitudinal information on each firm's employees it would be possible to make more significant progress on the structure of supply and demand determining pensions. Two target groups of workers would be worth focusing on: older workers approaching retirement, and younger employees who may adjust their work effort or other behaviors in view of their pension accrual paths and perceived pension losses upon termination. It is important that information be gathered on the workers' activities once they leave the firm to determine their alternative activities. It would also be helpful to obtain some indication of how well-informed personnel officers are.

- Updated longitudinal information based on nationally representative surveys of individuals is being gathered to study retirement behavior. Crucially, plan descriptions from employers will be matched with information provided by individuals in the survey. To further analysis of retirement decisions, these data should provide more detailed information on workers' consumption and asset patterns over time. Efforts to determine covered workers' understanding of their pensions would improve behavioral analysis.

- Pension plan descriptions obtained from employers are complex and exceedingly expensive to code correctly. A centralized facility should be developed for coding employer plan descriptions in a standardized format, and for developing and maintaining appropriate pension software.

Such information is highly sensitive, and expensive to collect and archive. Nevertheless, updated information on plans that could be used to derive representative information on pension values, and the wage and characteristics of covered workers and their firms, would facilitate a great deal of future labor market analysis.

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