THE DEMAND FOR OLDER WORKERS:
THE NEGLECTED SIDE OF A LABOR MARKET

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Abstract

Despite extensive study of the work and retirement decisions of older individuals, the nature of employers' demand for older workers remains relatively unexplored. This paper investigates the plausibility, pervasiveness, and causes of limited employment opportunities for older workers by examining age discrimination, long-term employment relationships, and partial-retirement work options. The central theme is that much of the differential treatment of older workers that persists over time is likely to be part of a privately efficient, economic equilibrium. Provisional implications for Social Security and age-work policy choices are drawn.

Introduction

Although it has been popular to emphasize the apparently voluntary nature of many retirements, older Americans who might instead continue to work confront a number of obstacles in the labor market. Retirees often complain that they were "shown the door" in subtle, and sometimes not-so-subtle, ways. Individuals who linger beyond the firm's desired separation age frequently encounter increased financial and non-monetary incentives to retire. Re-employment prospects for older prime-age workers, the "young old," and the able "older old" can be less than attractive:

> All of our job losers wanted full-time employment at close to the same salary and level of responsibility as their last long-term position, preferably in the same line of work. They did not want the more leisurely pace of part-time employment that older workers are said to yearn for. But, for the majority, getting it all turned out to be impossible.
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> Brudney and Scott (1987: 145)

> ... former supervisors, skilled workers or secretaries are unamused at the prospect of competing with a teenager to flip a hamburger or serve at a drugstore till ... This is not the semi-retirement they dreamt of.
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> *The Economist* (9/16/89: 18)

An unexpected drop or erosion of earning power poses a late-career risk to income and, to a lesser extent, retirement savings or annuities. For a large percentage of older workers, particularly for women and minorities, the image of a well-paid career job held until full retirement is largely false (Ruhm and Sum 1989, Doeringer 1990, Grad 1990).

Despite extensive research efforts that have examined the work and retirement decisions of older individuals, the nature of employers' demand for older workers remains an under-researched topic. Inadequate data sources and other empirical problems no doubt have limited research opportunities. Nonetheless, there are various insightful theories and empirical findings that can inform our understanding of the specific problems faced by older workers. This paper helps fill this gap in the retirement literature by drawing some of these ideas together to examine three key aspects of the demand for older workers that appear to limit their employment opportunities. Section I considers the

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problem of old-age discrimination in labor markets, and asks whether competition in product and labor markets is likely to eliminate any significant discrimination over the long haul. Section II examines the labor-market problems of older workers within the context of the long-term employment arrangements that many employers and workers seem to prefer. It considers whether older workers are simply caught in a particular part of a career cycle, reaping the costs as well as the benefits. Section III asks why part-time employment offers and other "bridges to retirement" are often unattractive. Section IV concludes with implications for the recent stronger orientation in Social Security policy toward encouraging greater work among older Americans.

The central theme of the paper is that much of the differential treatment of older workers that persists over time is likely to be part of a privately efficient, economic equilibrium. Firm behavior and market processes that exclude or limit many older workers, or depress their earnings, may often reflect productive and market efficiencies. Life-cycle aspects of the demand for (and supply of) older workers act to produce age-correlated adversities. New opportunities for older workers may continue to be generally confined to relatively low-paying, labor-hungry sectors and occupations such as certain retail and clerical work (attractive, often part-time, jobs for some but perhaps not most older workers). A key conclusion is that, although old-age prejudice can persist, many of the labor-market problems faced by older workers may have little or no basis in age discrimination. These arguments imply that policymakers should approach the encouragement of longer working lives with added caution.[1]

I. Age Discrimination

A. Prejudice

Many older workers believe that they are victims of widespread discrimination by current and potential employers. This section of the paper assesses the plausibility of this belief and identifies the circumstances under which this discrimination could persist.

Because the word discrimination is rather imprecise, this paper draws a careful distinction

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[1] The current study is divided into two parts. Part I, the current paper, examines the problems of older workers mainly from an applied theoretical perspective. Part II, a follow-up paper in progress, evaluates empirical findings in greater depth and more fully assesses the implications for public policy.

between prejudicial discrimination and statistical discrimination, each of which is discussed in turn. Prejudicial economic discrimination towards a group of workers (e.g., older workers) is defined to exist when equal productivity -- actual, or predicted -- is not rewarded with equal pay or employment opportunity. Models of this phenomenon have been analyzed extensively by Gary Becker, Kenneth Arrow, and others, with variants that include prejudice by consumers, prejudice by co-workers, and imperfect competition in product or labor markets. Prejudicial discrimination is often taken to imply willful, malicious intent, manifested by unreasonable decisions regarding hiring policies, pay levels, and promotions. However, it may be the case that intentional or overt malice often has nothing to do with it, and that groups are discriminated against because of faulty information regarding their true productivity; this is one type of statistical discrimination. Although these models have usually been applied to other minority groups and women, they are also appropriate in the context of older workers.

In his classic attempt to explain prejudicial discrimination based on willful intent, Becker (1971) developed a model in which all individuals in a majority have uniform "tastes" or prejudice against a minority; for example, older workers. In this extreme case, prejudicial discrimination can persist in a stable equilibrium, creating losses of both equity and efficiency. However, once less-prejudiced and eventually non-prejudiced employers or managers enter the market, discrimination is competed away through a usurping expansion of output by non-prejudiced firms. Profit-maximizing incentives and competition will ultimately weed out firms that indulge "tastes" for prejudicial employment, although the timing of the adjustment process is not specified.

In light of persistent wage differentials for blacks and other groups, many economists (including Becker) have questioned the prediction that competition will inevitably eliminate prejudicial discrimination. Arrow (1972) showed that prejudice can lead to a persistent wage differential when its elimination is impeded by fixed personnel investments and other costs associated with hiring and releasing workers. Although a wage differential should induce profit-maximizing firms to hire cheaper replacement workers (e.g., replacing somewhat younger workers with same-grade older ones), this may not be cost-effective for the firm if the net personnel costs of replacing its work force are sufficiently

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high. Unlike other minority groups, older workers have not experienced a prominent or obvious group wage differential. However, hiring probabilities have the same basic determinant -- estimated or predicted productivity -- as wages. The profit incentives to eliminate a prejudicial hiring differential are also blunted by the costs of work-force turnover. Prejudicial discrimination may, therefore, particularly through hiring restrictions, persistently harm older workers under efficient conditions that reflect costs of work-force turnover. (It is argued later, in section II, that the net personnel cost of hiring older workers is typically high.) Other privately efficient conditions can also support persistent prejudicial discrimination, but many of these hypothetical cases appear unlikely to be particularly important in the case of older workers (appendix A).

A more relevant source of discrimination against older workers is likely to be erroneous stereotypes or other information problems. If the actual average productivity of older workers tends to be underestimated by firms, then older workers will tend to be underpaid and underemployed. In an extension of the definition of prejudicial discrimination given above, Arrow (1972, 1973) showed that general misperceptions of the productive characteristics of a minority group can become "self-fulfilling prophecies." A false belief in a group's low average ability or productivity results in limited financial rewards, causing workers in the group to under-invest in human capital, thereby reinforcing the initial expectation. Firms can hardly be faulted for giving low rewards to workers with limited training and skills, and yet the shortfall of human capital may be endogenously caused by employers' own false beliefs, thus failing to reflect the true innate abilities and willingness to train and work of a group like older workers. Erroneous generalizations or beliefs about a group's abilities, especially if held by all employers in a market, may thus be capable of self-perpetuation.[2] However, it is questionable that an endogenous response to erroneous stereotypes could be the main cause of shortfalls of human capital among older workers in lieu of exogenous, life-cycle work and investment incentives.

It is also not at all clear that erroneous group generalizations can survive market competition.

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[2] False beliefs may also be maintained by the psychological phenomenon of "cognitive dissonance" (Festinger 1957; Akerlof and Dickens 1982). In this phenomenon, tension between preferred, convenient, or established beliefs and observed facts causes individuals to "see what they want to see."

It is inefficient and costly for a firm to maintain erroneous or misleading beliefs about a group like older workers. Persistent underestimates of the average productivity of older workers would cause the firm to exclude or screen out too many of them, or underpay them, which competitors can exploit. Employers that can more accurately evaluate worker productivity tend to profit and expand, while inefficient evaluators tend to be driven out of the market. Although capability and willingness to learn varies among firms, a firm with largely correct beliefs should eventually be found in most any market, and these beliefs should through competition tend to capture the market. Thus, over time, a surviving employer's perceptions of a group's productive characteristics should converge toward their true value.

Learning is not costless, and the personnel costs associated with work-force turnover are likely to retard the process of competitive elimination, causing some group misperceptions to remain. Moreover, "self-fulfilling prophecies" that underrate a group's innate abilities (as opposed to observed productivity) may be especially difficult for competition to eliminate. However, lingering group misperceptions describing older workers appear to have been on the wane for some time. In its landmark study of age discrimination, the Department of Labor (1965: 17) stressed what it saw as insufficient or inaccurate knowledge of the true qualities of older workers. In response, the Age Discrimination in Employment Act (ADEA) was soon passed, and there has been considerable public discussion over the past 25 years aimed toward eliminating erroneous stereotypes about older workers. Because both competitive efficiency and socially-stressed group equity have been pushing firms in the same direction, it seems quite plausible that competition, the ADEA, and social sanctions together may have ameliorated many of the group misperceptions about older workers. It may not be a coincidence that most age-discrimination suits have been individual-disparate-action cases as opposed to class-action suits (Siskin 1982).

B. Statistical Discrimination: A Formal Model

Models of statistical discrimination focus on costly, imperfect information and employer uncertainty about the productive characteristics of groups and individual workers.[3] Even for

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[3] Arrow (1972; 1973), Phelps (1972), McCall (1972), Spence (1973; 1974), Aigner and Cain (1977), Borjas and Goldberg (1978), Lundberg and Startz (1983), Cain (1986: 722-29), Lundberg (1991).

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established workers, measurement or monitoring of actual or prospective on-the-job productivity is usually imperfect, thereby creating problems of performance evaluation. I now consider how limited information can affect the personnel decisions of benign, profit-maximizing employers.

Statistical and prejudicial discrimination are not mutually exclusive, as we shall see below. If a profit-maximizing firm judges members of a group based on a group generalization, then a key issue is whether the group generalization is accurate. Where false group stereotypes persist, they lead to prejudicial discrimination. This phenomenon will be called prejudicial *group statistical discrimination.* A trickier issue concerns the use of <u>accurate</u> group generalizations to inaccurately judge <u>exceptional</u> (or non-average) members of the group. This will be called *individual statistical discrimination.* While posing various dilemmas, individual statistical discrimination may be of most concern where its extent or typical magnitude differs systematically across groups.

Following Aigner and Cain (1977), suppose that older workers and younger workers are competing for a limited number of jobs. These could be jobs with a new firm, internal promotions, or jobs that will remain after others are eliminated. The firm is seeking the most qualified candidates, and the hiring and pay of successful applicants is determined by their expected marginal productivity based on personnel evaluations. It is company policy to simultaneously evaluate the applicants on the basis of a "y score," where y is an attempted summary measure of an applicant's true skill level (all individual subscripts "i," for applicant i, are suppressed). The precise nature of y differs across occupations, jobs, and sections within the firm -- in some cases, y might be based on a resume, for example, while in others it may be based on some sort of additional or alternative evaluation or test. An applicant's true skill level or future marginal productivity is unknown to the firm and is given by q. The y-score measurement equation, reflecting company knowledge and policy, is known to be

(1) $$y = q + u$$

where u is a mean-zero error term with constant variance. The true skill level q in the relevant population has mean α and constant variance, and q and u are joint normally distributed with zero covariance.

For each applicant for a particular job, the firm wants a forecast of q, given y and the relevant α, and it can be shown that the mathematical expectation is

$$(2) \qquad\qquad E(q|y, \alpha) = (1 - \gamma)\alpha + \gamma y$$

where γ is the squared coefficient of correlation between q and y $(0 < \gamma < 1)$, which measures the "reliability" of y as a measure of q. Jobs are given to the applicants with the highest forecasted q's.

Using this purely merit-based method of evaluation to make hiring, promotion, or retention decisions, the firm finds that it is periodically charged with age discrimination! The question is why, and where might be the basis of any legitimate charge of old-age prejudice (or at least disadvantage)? Several answers might stem from the fact that equation (2) is merely a forecast, derived from the underlying population regression function

$$(3) \qquad\qquad q = (1 - \gamma)\alpha + \gamma y + \epsilon$$

where ϵ is a well-behaved individual error term. If the firm categorizes workers by age, it may assign a different α (i.e., group average) to older workers than younger workers, and the α for older workers may be lower for a number of reasons, such as the belief that certain requisite physical or mental capacities eventually decline with age, or that human-capital investment generally falls in later work years. The possibility (discussed below) that an older worker may be viewed as a riskier candidate or worker may come into play as well. If a negative group misperception (the perceived α is less than the true α) results in a shortfall of the average reward to older workers through either a low employment probability or low wage -- that is, if this average reward falls short of the average older worker's true marginal product for this reason -- then prejudicial *group statistical discrimination* against older workers is said to exist.

However, Aigner and Cain assume that competitive elimination ensures that surviving firms will act as if they know the true α's without bias (as argued earlier). If competition eliminates misperceptions about relative group productivities, then any assignment of a lower α must be largely accurate for the relevant group of older workers, and there is no significant source of prejudicial age discrimination here. Similarly, old-age bias in the construction of evaluations or "y scores" might be

alleged, but the hypothesis of competitive elimination, once again coupled with ADEA-based scrutiny, again predicts that persistent, significant bias in evaluations leads to foregone profits, a poor reputation, lawsuits, and eventual departure from the industry.[4]

This does not imply, however, that problems for individual older workers have disappeared. The ϵ term in equation (3) implies that, in a world with costly and incomplete information, *individual statistical discrimination* is inevitable for workers in <u>any</u> group. All workers are rewarded according to their <u>estimated</u> marginal product. There is "equality of opportunity" in the sense that groups with the same marginal productivity on average place the same proportion of applicants on average into the desired jobs (while also receiving the same pay on average). Nonetheless, most individuals within each group are not rewarded precisely according to their true productivity, despite cost-efficient efforts to obtain the best information possible, and in some cases individual errors may be quite large.

I next consider the possibility that older workers may suffer greater *individual statistical discrimination* than prime-age workers. If true, this hypothesis implies that age-discrimination laws might do better at some point to explicitly encourage more detailed individual evaluations.[5]

By taking the highest expected q's based on y's and α's, the firm hires or rewards the highest q's on average, but individual mistakes are commonly made. Mistakes that "under-reward" or "over-reward" are costly, but they are also costly to eliminate. In its struggle to survive competitively by efficiently employing or rewarding workers according to true marginal products, the firm has a financial stake in reducing the $Var(q|y)$, and it will thus seek to improve y as a forecaster of q as long as the marginal benefits of doing so exceed the marginal costs. But $Var(q|y) = Var(\epsilon) = Var(\epsilon|y)$, and this matters to individual workers not as a profit-maximizing choice variable of the firm, but as it concerns the firm's mistakes, or instances of unfair treatment. From the perspective of individual equity alone, reducing the $Var(q|y)$ as far as possible would be preferred, but it is unlikely to be cost-

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[4] Equation (1) assumes (through the mean zero for u) that y scores are unbiased.

[5] That individual statistical discrimination may pose a larger problem than group discrimination for older workers is suggested not only by the argument that competition should largely eliminate group discrimination, but also by the fact that the closest approximation that researchers have achieved to ϵ (the "unobserved heterogeneity" of recent econometric earnings studies in labor economics) has often been found to be surprisingly large.

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efficient for the firm to do so.

Therefore, while competition and social sanction may act to largely eliminate prejudicial group-discrimination against older workers, they are likely to leave considerable individual statistical discrimination, and yet the implications of the latter are not one-sided. Individual statistical discrimination is unfair to specific older workers, but these individuals are nevertheless rewarded according to their predicted productivity based on a reasonable, objective expectation. Individual inequities may be correctable in a fair number of cases (within the firm or elsewhere), as superior information is revealed following a firm's initial decisions. Furthermore, worker satisfaction is not a free good -- if the $Var(\epsilon)$ results in high turnover, morale problems, or a poor reputation, then a firm will optimally reduce this dispersion further. Other points are mentioned below. Most important of all, perhaps, the problem of individual statistical discrimination is faced by all workers regardless of age or group membership, and it also has important symmetries whereby some gain and some lose from their assignment of average group character traits (e.g., older workers below group means tend to benefit from the group generalizations).

Individual statistical discrimination can be treated like a "negative externality"-- in minimizing the $Var(q|y)$ to its profit-maximizing level, the firm may not fully account for the "external" individual equity costs to workers. However, identifying the social optimum is not merely improbable in this case, but apparently impossible.[6] In practice, such individual discrimination has come to be viewed overall as a mild form of "social friction" or "social pollution," from which some groups (such as blacks, owing to imprecise test scores; Aigner and Cain 1977) may suffer more than others.

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[6] One could ask whether social welfare would increase if firms were forced to invest more in learning about individual workers' true productivity, q. The cost to firms must be weighed against any net utility gain for workers. But without knowing individual utility functions, it is difficult or impossible to measure the total net utility change among workers. One way of defining total worker equity costs is the disutility incurred by those who are truly underpaid and who recognize themselves as such. Although these equity costs can be lowered by further reducing the $Var(q|y)$ ($= Var(\epsilon)$), it will not generally be possible to identify this as a clear gain for workers overall. Reductions of $Var(\epsilon)$ will reduce pay, for example, for many workers who were previously overpaid. By assuming a diminishing marginal utility of income, one might argue that the net gain to workers overall is positive (overpaid workers lose less than the underpaid gain). But other problems are raised by cognitive dissonance (e.g., many more workers than are actually underpaid may believe that they are underpaid). To disregard utility or disutility that stems from cognitive dissonance may be difficult, even if it is not permanent.

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Consequently, although it causes problems for older individuals and presents dilemmas (see Appendix B for further discussion), individual statistical discrimination must still meet a test of <u>differential</u> adverse treatment of older workers. That is, in order to warrant special concern, this discrimination must be judged or found to be worse for older workers than for most other groups of workers.

Pronounced individual statistical discrimination may result for older workers if their employment is viewed by firms as relatively risky. Consider the appropriateness of differing distributional assumptions in the y-score measurement equation (1), letting $Var(q)$ and $Var(u)$ differ across groups. The question is which assumptions are most appropriate for older workers ("o" subscripts below) vs. prime-age workers ("p" subscripts).

$Var(q_o) > Var(q_p)$ seems most appropriate. That is, older workers tend to have greater variance in their true productivity or productive capacity. Levine (1988, chaps. 13-14) cites empirical studies that support this view (although these studies are rather old and may be outdated now). Variance that increases with age may reflect health factors, variably increasing tastes for leisure, variable abilities to re-train and adapt to changing technologies, markets, etc., and variable abilities to interact and combine strengths with other (e.g., younger) workers.[7] In general, factors that determine productivity for all workers tend to become more variable with increasing age. Individual older workers may have more varying degrees of relevant experience and abilities, as well as commitment, and informal communication, learning, and teaching skills (e.g., older workers are often claimed to show less interest or enthusiasm for future-oriented projects, and they may exhibit higher variance in this attribute). Work ethic and company loyalty have been found to be generally strong among older workers, and they have less non-illness absenteeism and improved accident rates on average, but there is variability here as well.

Other things equal, does $Var(q_o) > Var(q_p)$ make older workers "more risky?" The answer is: not necessarily. This is so because the reliability (γ) of "y scores" in measuring q is also at issue here, rather than the variance of q alone. The relevant (conditional) variance or "measure of risk" is

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[7] The risk of a worker's unwillingness or inability to learn new skills (owing, e.g., to educational vintage) may be particularly worrisome to many higher paying employers (AARP 1989).

(4) $$\mathrm{Var}(q|y) = \mathrm{Var}(q)(1 - \gamma).$$

As shown in appendix C, an increasing $\mathrm{Var}(q)$, by itself, implies that the "signal/noise" ratio in y --

$\mathrm{Var}(q)/\mathrm{Var}(u)$ -- grows with age, which may make $\gamma_o > \gamma_p$ (i.e., the y score may be a more reliable

indicator of q for older workers). It follows that $\mathrm{Var}(q_o|y_o)$ is greater than, less than, or equal to

$\mathrm{Var}(q_p|y_p)$ -- i.e., older workers are more or less risky in particular jobs -- depending on the specific

values of parameters. $\mathrm{Var}(q_o) > \mathrm{Var}(q_p)$ implies that older workers are more risky if their signal/noise

ratio in y is <u>lower</u>. A necessary (though not sufficient) condition for this is that $\mathrm{Var}(u_o) > \mathrm{Var}(u_p)$.

What determines the relationship between $\mathrm{Var}(u_o)$ and $\mathrm{Var}(u_p)$? There are offsetting factors at

work here that likely differ in their relative intensity across experience levels, tenure, sectors,

occupations, and time. On the one hand, career employers or those in a worker's career field tend to

have superior information about individual older workers who have an established "track record." This

implies that unobserved individual variability tends to be lower for older workers, i.e., $\mathrm{Var}(u_o) <$

$\mathrm{Var}(u_p)$. In addition, in many cases because of their valuable experience and importance in other

strategic ways (e.g., through effects on less senior workers), firms have a further incentive to know

more about older individuals.

On the other hand, $\mathrm{Var}(u_o) > \mathrm{Var}(u_p)$ may be true instead because:

(1) There may be greater uncertainty about the relevance and usefulness of older vintages of education, training, and experience,

(2) If obtaining more extensive information on individuals is difficult (due to problems of measurement, legality, or respect for privacy), it is likely that $\mathrm{Var}(u)$ increases as $\mathrm{Var}(q)$ increases with age,

(3) The ADEA, while countering old-age prejudice, may have had the unintended consequence of increasing the litigation risk of employing older workers (Becker 1990), which affects workers' productivity net of litigation costs, and

(4) Because senior older workers tend more often to fill, or to be eligible for, supervisory or higher-level positions, uncertainty is added in several ways -- e.g., (i) the productivity of supervisors is hard to measure because of effects on, and from, subordinates, and (ii) "promotion lotteries" may be a work incentive for the young (Lazear and Rosen 1981) but a cause of greater uncertainty about older workers passed over for promotions.

On balance, although evidence is sketchy and very limited, it seems plausible that $\mathrm{Var}(u_o) >$

$Var(u_p)$ is often correct, and is more likely to be true, for example, if workers with little "track record" are being compared.[8] $Var(u_0) > Var(u_p)$ may be the more general case among new-hires, and a major, if not necessarily dominant, case in established career-employment relationships.

All things considered, it seems likely that in many sectors and activities, the employment of older workers, especially new hires, is relatively risky. It follows immediately that the $Var(\epsilon)$ (= $Var(q|y)$) is greater for older workers in these cases, and thus as a group, older workers may face a particularly large number of grievous inequities through individual statistical discrimination. Three particular concerns follow. First, older workers may be more psychologically or physically vulnerable to setbacks caused by individual discrimination. Second, if firms or their agents are risk-averse, then they may screen out more older workers or offer to pay them less than the group's average productivity (Aigner and Cain 1977).[9] Third, efficient matching of workers to jobs or assignments means that unreliable information about older workers can actually lower the expected value of their output, again screening out more older workers or reducing their average pay (Rothschild and Stiglitz 1982).

Each of these concerns, however, is ameliorated by life-cycle, institutional, or market mechanisms. For the group as a whole, inaccurate or excessive assignments of greater risk should once again be weeded out over time by competitive elimination and social sanction. Thus, rather than a problem of stereotype, the increasing $Var(\epsilon)$ is viewed here as the first of several life-cycle-related problems considered in this paper.[10] The problem of greater vulnerability is offset by greater savings and other resources for the typical older worker, as well as more likely eligibility for payments from private pensions, Social Security, and unemployment insurance. Dispersion in risk-aversion across firms may tend to lower the group penalties for greater risk, firms may be able to insure or self-insure

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[8] The strongest argument for $Var(u_0) < Var(u_p)$ is the "unobserved-heterogeneity" argument that career employers tend to have greater information about older individuals who have an established "track record." This argument implicitly assumes that (1) a firm's knowledge about individual workers is monotonically increasing with age (preferably, for this argument, at a constant rate) -- i.e., the firm has learned significantly more about the relevant older workers than it has about competing prime-age workers, (2) distinctions between workers based on hard-to-measure characteristics, such as commitment, can be effectively drawn, and (3) these hard-to-measure characteristics, rather than uncertain future health risks and the like, are most important.

[9] It has recently been shown by Baldwin (1991) that the concavity of the production function, together with other properties, implies that even a risk-neutral firm will tend to offer lower wages and less employment to a group with more uncertain productivity.

against mistaken job assignments, and a market for "test instruments" to better evaluate individual older workers should also be activated (Aigner and Cain: 182-3). All problems of employment risk may be attenuated by "trial periods," although, as a mutual investment with uncertain returns, these may be relatively costly for older workers.

C. Lingering Issues

The most commonly heard argument about older workers remains that of erroneous stereotyping -- the claim that many individuals underestimate the α's for older workers, and despite market discipline, this spills over into firm behavior. The real problem here, however, may be at least two-fold. First, if any individual's average value in production is not just relatively low, but lower than it was previously, it is only natural to dispute the alleged reduction. Second, this productivity shortfall may largely reflect a lack of current human capital (e.g., recent training), with little or no bearing on innate productive ability or on remaining productive capacity. The distinction between actual and potential productivity is believed to be important for other groups (e.g., for women and blacks), and it may also be important for older workers *per se*. But the key issue here is whether the shortfall in human capital is endogenous to the employment system (reflecting possible systemic unfairness, as, for example, with "feedback effects" from erroneous stereotypes) or largely exogenous (e.g., life-cycle determined). An argument of endogeneity through false stereotypes and social "norms" of retirement, for example, might be possible -- but also complicated by competitive elimination, the ADEA, etc., and imprecise or difficult concepts of a pervasive "norm." This issue boils down to a difficult empirical question, but exogenous human-capital-investment incentives over the life cycle may be paramount.[11]

Another issue is that, while rewards to workers may be generally determined by equation (2) above (predicted productivity), it was stated that this is "company policy." Equation (2) can be

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[10] Note that part of the life-cycle effects on risk may stem from a "compositional effect" rather than from the traits of older workers *per se*. That is, all workers within various categories of jobs may have the same variance of q or u, but these variances differ between job categories, and certain high-variance categories may contain a disproportionate number of older workers (e.g., supervisors, or any job or occupation with an increasingly obsolete set of skills). Even if the firm treats older workers and other groups the same within a job category, if more older workers have entered high-variance job categories, then as a group they still face a higher $Var(\epsilon)$ for this reason when group comparisons are made across all job categories.

thought of as an aggregation of various decision functions throughout the firm. If individual managers or supervisors are given some latitude in their personnel decisions, parts of a firm may shun older workers, for example, while other parts favor older workers. The firm is liable for age discrimination only as a whole, and thus it may impose a balance between older and younger workers on its employment aggregates, while tolerating discrimination within components. While perhaps resulting in no easily discernable systematic age bias overall, this policy is still relatively inefficient in job assignments. Competitors that run a "tighter ship" should be able to exploit this.

Another potential problem is that a firm with superior information about its long-time, older, career employees might be able to pay the most valuable ones less than their true value (still more than their predicted value elsewhere). But this depends on the workers' costs of changing jobs and undergoing a "trial period" elsewhere and also on the firm's concern for worker morale and its reputation as a "fair" employer. If a problem exists here, it is also faced by many experienced career workers regardless of age, although older workers may be more susceptible due to higher expected costs of changing jobs.

A final question raised by the above model is that errors of individual statistical discrimination are not directly correctable in the case of once-and-for-all hiring decisions. This means that some superior older job applicants may be penalized simply by their age if the relevant α happens to be lower for older workers. If the α's are the same or similar across firms, as is the applicant's superior skill relative to α, then "scarring" effects may result (through past salary comparisons, recommendations, etc.), whereby a superior older worker is repeatedly denied fair employment or

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[11] Building on the earlier definition and extensions, exogeneity vs. endogeneity also appears to be the relevant question for assessing whether a negative group risk premium (in wages or hiring probabilities) constitutes prejudicial discrimination. If the risk in employing older workers is not caused by imprecise testing, feedback effects, or other factors endogenous to the employment system, but rather by exogenous life-cycle effects, then it seems hard to argue that a group risk penalty here is prejudicial discrimination; in this case, predicted productivity simply accounts for legitimate, exogenously imposed risk. On the other hand, some factors affecting the riskiness of an aging work force, such as certain compositional effects discussed in the previous footnote, may be viewed by some as endogenous. In this view, for example, older workers face differing needs for, and uncertainties about, re-training, and it is arguably discriminatory to penalize some older workers for risks that have ensued endogenously from unpredictable technological and market shifts.

compensation. However, this possibility applies to errors of individual statistical discrimination for all workers. In a competitive labor market, with trial periods and differing α's and ϵ's across firms, whether older workers or others often experience a succession (i.e., a clear non-random pattern) of individually discriminatory hiring denials is an empirical question.

D. Assessing the Discrimination Argument

Persistent differential treatment of older workers may on the whole reflect a relatively small amount of prejudicial discrimination (a situation that the ADEA should have generally improved). Individual statistical discrimination and, as argued in the rest of this paper, several other sources of labor-market adversity that are simply correlated with age, are probably more important overall (although this remains, in the end, an empirical question). A similar conclusion is reached empirically in Sandell (1987: 231), which concludes that "age and age discrimination by themselves may not constitute the dominant cause of older people's employment problems." Prejudicial discrimination may be a smaller factor for older workers *per se* than it is for other minority groups (prejudicial adversities faced by other groups can, of course, persist or carry lingering effects as workers age). This does not imply that the labor market problems of older workers deserve less attention or sensitivity. Rather, any assessment of the marginal contribution of age to older workers' problems must carefully consider efficient firm behavior and market processes that yield adverse categorical treatment by age even where no prejudicial age discrimination is involved.[12]

Several additional factors suggest that non-prejudicial causes of adverse outcomes for older workers must be given careful attention:

(1) As mentioned, older workers, unlike blacks and other labor-market groups, have suffered no prominent group-average wage differential. In fact, older workers prior to retirement or partial retirement are typically at or near their lifetime earnings peak. Lost earnings and lengthy search upon job displacement may result from economic factors (e.g., specific human capital) that operate quite apart from, or in addition to, any prejudicial discrimination.

(2) The valuable experience of older workers, their positive influences on younger workers, other commonly cited attributes like company loyalty and work ethic, and the obvious fact that all workers grow old suggest that firms should be inclined to employ older workers efficiently. As noted, in case

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[12] If employed carefully together, the factors discussed in appendix A, coupled with the turnover argument in the text, may be used to construct a plausible, *a priori* argument in support of the belief that older workers may be victims of substantial and persistent age discrimination. However, solid evidence in support of this view remains lacking.

some firms have failed to appreciate the favorable attributes of older employees, older workers have been the subject of much positive literature and press in recent years, making it harder for firms to underestimate their productivity.

(3) Labor-market problems for older workers have persisted despite the ADEA and other efforts, suggesting that causes other than old-age prejudice are important. Despite enforcement shortcomings, employers have certainly been made aware that prejudicial age discrimination is illegal, and the number of age-discrimination charges has risen dramatically.

(4) Despite some recent broader interpretations of the ADEA, the U.S. Supreme Court has refused to grant to old-age status the same Constitutional protections against labor market prejudice that civil rights legislation has provided to racial minorities and women (Levine 1980, 1988). The Court has acknowledged some of the many reasons that firm behavior and market processes may tend to exclude older workers or lower their earnings with economic efficiency, rather than prejudicial age discrimination, as the underlying cause.

Discrimination arguments can also be misleading in other ways. Because low-paying unskilled or semi-skilled work tends to be readily available to all comers regardless of age (Doeringer and Terkla 1990), most of the relevant non-health-related labor-market problems faced by older workers affect those with a history of middle-class or higher incomes. Consequently, the interests of the elderly poor or near poor tend to be de-emphasized in debates over age discrimination. As this example suggests, the catch-all concept of "age discrimination" in the labor market may tend to work better as a political slogan (drawing attention to a difficult set of problems) than it does as a guarantor of sound analysis and public policy. The remainder of this paper explores and develops a considerable list of non-prejudicial causes of adverse outcomes for older workers.

II. Work and Pay Over the Life Cycle

The problems faced by older workers are best understood within the context of lifetime work patterns. The typical individual makes substantial, if not most, human capital investments early in life, works for one or more employers during a career, and eventually retires. Many of the decisions and much of the behavior observed over the life-cycle of the worker are determined by worker and employer expectations about future as well as current job performance and compensation. This section of the paper considers the implications of long-term, implicit contracts between firms and career employees. These long-term employment arrangements are hypothesized by economists to address the desires and needs of firms and workers for productivity incentives and pay, risk compensation, and

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training. In the latter and final stages of their career cycles, older workers reap particular benefits as well as costs.

A. Long-Term Implicit Employment Contracts

It is natural, from an economic perspective, to view the input of older workers as a factor of production. Just as labor can be differentiated by skill level, with each level treated as a distinct input in a factor-demand system, one can, in principle, do the same with labor differentiated by age. Research in this vein, however, has been limited by the specificity, quality, and relevance of available data. The few existing studies have found that evidence of viable substitution possibilities across age tends to be weak and inconsistent at best.[13] Most importantly, basic production and factor-demand theory appears to be a largely inadequate framework for addressing many of the important issues in the labor market for older workers. If long-term employment relationships reward older career workers but also limit new opportunities with increasing age, then additional explanations are required.

Recent modeling of implicit "life-cycle employment contracts" (Kuhn 1986) has been led by Edward Lazear and others. Despite possible erosion in recent years, long-term job attachments in the U.S. remain widespread. If a major subset of jobs is well characterized by long-term implicit contracts, then departures from spot-labor-market models are required.[14] As summarized by Gustman and Mitchell (1990) and others, pension studies during the past decade have generally rejected the spot-market view.[15] In an implicit contract, both firms and employees desire and benefit from particular institutional arrangements, although at certain points in time, one party may prefer to "breach" the

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[13] Recent estimation of a multi-factor, translog demand system (Levine and Mitchell 1988a,b) has confirmed that substitutability across age groups appears to be weak. The authors used eight age-sex groups, far more than previous researchers. Of twelve possibilities for a substitute relationship between an older and younger group (using the elasticity of factor complementarity), all but two were statistically insignificant. The significant findings were not wholly consistent with theory. Total-factor-price elasticities contained some negative Hicks-Allen partials (unreported, but discussed with the authors), not an uncommon anomaly in demand-system studies.

[14] Estimating a standard factor demand system, for example, assumes a spot labor market. This results in systematic biases if workers are not paid the value of their marginal product at each point in time, as they may not be in a long-term contract.

[15] Observed pension values typically accrue very unevenly over the career cycle, with sharp peaks and valleys as workers vest and attain retirement ages. Wages, meanwhile, do not generally offset this pattern. These observations seem consistent with a spot market only if very sharp changes in productivity occur at certain ages, which seems implausible.

implicit contract or accepted agreement if possible. The key point is that both the employer and employee voluntarily enter into and proceed with the agreement in the expectation and understanding that both parties benefit overall.

The best-known theory involving an implicit contract is the theory of specific human capital (Becker 1975), which is discussed in greater depth further below. By implicitly agreeing to share the investment cost of firm-specific training, workers and firms can share in the eventual productivity benefits.

Another commonly accepted contractual labor-market theory has been formalized by Filer and Petri (1988) (see also, e.g., Quinn 1978). Implicit (or partly explicit) contracts allow early retirement from jobs with dangerous or arduous work conditions. On the supply side, these allowances can be viewed as a compensating pay differential. A key implication is that pension allowances should be structured endogenously, responding to variations in the type of work. On the demand side, these early-retirement rules may reflect a firm's desire to shed older workers because of diminishing capacity for arduous employment (Burtless 1987; Mitchell, Levine, and Pozzebon 1988).[16] In general, the pattern of productivity over the life cycle affects Social-Security and pension incentives to retire, with an inducement to earlier retirement if productivity and earnings tend to decline among older workers (Lazear 1985: 56). Like previous researchers, Filer and Petri detect expected statistically significant relationships between retirement ages and job characteristics, and they also find some support for pension endogeneity.

An increasingly prominent but less settled theory with somewhat similar implications is Lazear's (1979, 1981, 1983) deferred-payment-contract theory of pensions, wage profiles, and efficient retirement.[17] This theory will be considered in depth here because of its important implications for retirement rules and the willingness of many firms (large firms in particular) to employ older workers.

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[16] With greater advancing age, despite medical advances, physical productivity can still decline in many jobs. A common age-related physical handicap is deteriorating vision, which requires special investments (in lighting, panels, keyboards, etc.) if it is not to hinder many older workers (Berkowitz 1988). Links also seem to exist between job-market difficulties, inactivity, and mental or physical health. A positive, but slow working, development is that jobs increasingly require more cognitive than physical abilities; the physiological literature suggests that cognitive abilities deteriorate much less than physical abilities with advancing age.

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Lazear's theory starts from the observation that worker productivity and on-the-job effort, particularly in large firms, often cannot be constantly monitored or easily measured. The latter is one reason why firms often pay employees largely on the basis of time input (hours worked, or a standard salaried workweek) as opposed to individual output. But the firm is certainly not indifferent to the work or effort level of individuals on the job and to the workplace or company "norm" of on-the-job behavior. Many firms must thus institutionalize some way of addressing the "principal-agent" (or, for short, "agency") problem of motivating imperfectly or loosely monitored workers (the "agents") to perform at a high level (as the "principal," the firm, would like).

According to Lazear's theory, firms can reduce on-the-job shirking or malfeasance and raise career productivity by paying workers less than the value of their marginal product (VMP) when young and more than their VMP (a wage premium) when old, often with an additional "deferred payment" in the form of a pension.[18] Competition forces the present value of the representative or typical worker's total career compensation to equal the present value of career marginal product. Workers found to be shirkers during their careers are dismissed and forced to forfeit their remaining deferred payments. In view of this threat, the prospect of deferred compensation in the not-too-distant future -- seniority wages and benefits, as seen by younger workers; pensions, as seen by older workers -- tends to improve work effort, industriousness, and commitment to the firm among workers of all ages. A deferred-payment compensation profile is thus equivalent to having workers post an implicit performance bond. This attracts workers who plan to establish a long-term diligent career and provides for the establishment of a continuous work incentive. The resulting increase in productivity over the "career cycle" is a Pareto improvement, typically shared by workers and firms.

A modified form of deferred-payment incentives is provided by promotion lotteries (see, e.g., Lazear and Rosen 1981, Carmichael 1983a).[19] Career contests reward hard workers with prized, higher-paying, successive promotions and opportunities. This solution to the problem of work

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[17] Lazear's work extends an earlier conceptual model formulated by Becker and Stigler. For a reference to this early work and other related contractual models, see Hutchens (1989).

[18] In a special case, but not Lazear's main theory, deferred payments may be confined solely to pensions.

incentives tends to leave among older workers a fairly sizable contingent -- sometimes called

"deadwood" -- with much diminished prospects of further advancement. Such workers with less

incentive to work hard cannot be dismissed because a fail-safe guarantee of some job with seniority pay

makes risk-averse younger workers willing to engage in promotion lotteries. However, without

suboptimally cheating on its implicit guarantees or losing too much valuable human capital, a firm

may strive to shed many "deadwood" older workers (for example, via actuarial losses embodied in the

pension plan's benefit structure).[20]

A major *ex-post* consequence of competitive deferred-payment contracts is that workers must be

forced (e.g., through mandatory retirement) or induced to retire at a target time where deferred

payments fully equate the present value of career compensation to career productivity. In Lazear's

theory, these induced-retirement arrangements are resisted by some older workers (*ex post* in their own

implicit contracts), but the arrangements are generally favored by most workers overall because they

enhance the lifelong value of careers by boosting worker productivity at all ages. Older workers thus

reap the benefits of a productive career work environment and deferred payments (high seniority wages

and pensions provide the return on a worker's implicit bond), but they also face the cost or risk of an

unwanted mandatory or induced retirement. This is an an important prediction because no very

plausible alternative explanation of the previously widespread institution of mandatory retirement has

been advanced to this point. Discrimination arguments, for example, like those discussed earlier (see

also Levine 1988) are difficult to sustain. How could so many prejudiced firms, faced with the need to

compete, get away with the "misused" human resources of mandatory retirement for so long? It is

entirely plausible that this situation could only have been sustained because mandatory retirement,

while costly *ex post*, served a larger, and on balance more valuable, social purpose.[21]

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[19] The full deferred payment becomes an expected value contingent on advancement. For this reason, and also because of difficulty in measuring individual productivity, competition may force the value of career compensation to equal career productivity only for the average worker.

[20] "Deadwood" workers, like others without (in this case, having lost) a vertical career track, are still motivated by pensions and seniority pay. Moreover, the most common pension-benefit formula, the "terminal earnings formula," provides incentive to work for late-career promotions where possible. On the other hand, a "deadwood" worker may simply want to hang on to a job and "put in time" (since $w > VMP$) while expending as little effort as possible, which might explain, for example, certain moves to "cut out middle-management fat."

Pension plans can be a powerful tool for targeting retirement dates in lieu of mandatory retirement. Actuarial pension-value decline past a certain age in effect brings an older worker's total compensation down into line with his or her productivity. The pension-value peak thus acts as an implicit "buyout" of the contract, and may serve as efficient severance pay, which induces workers to retire only when the value of their alternative use of time exceeds their value to the firm (Lazear 1983). Some cases allow the targeting of not just one, but a "window" of years in which the value of career compensation equals career productivity. An actuarial drop in pension wealth with additional years of work as modeled in Lazear (1983), for example, need not retire all workers immediately if some receive differing levels of non-pecuniary satisfaction from work.[22] Nonetheless, pension plans and legislation have tended to impose homogeneous rules on workers, which might act to the detriment of workers as a whole (Nalebuff and Zeckhauser 1985) and perhaps firms as well.

Pension laws and the ADEA have also increasingly restricted the downward flexibility of total career compensation, which may have unintended adverse consequences. Lazear's theory implies that actuarial pension decline (like mandatory retirement before it), by negating an older worker's pay premium, helps to "internalize" the external costs to society of inefficiently delayed retirements. If firms were forced to allow older workers to continue in career jobs indefinitely with no actuarial pension loss and no alternative cut in compensation, then one cohort or generation of older workers would benefit, while firms, at first, incur economic losses. The next generation would then find that some firms have failed, and many or most remaining firms will not offer deferred-payment-productivity enhancements (sharply rising wage profiles and/or significant pensions). These external social costs are internalized in good measure by the system of actuarial pension loss past some age. By allowing firms to successfully carry out the terms of the implicit contract, any single generation of older workers tends

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[21] This type of divergence between an ex-ante and ex-post optimum is commonly referred to as a "dynamic inconsistency." At the socially efficient date of retirement in Lazear (1979, 1981), the worker's constant or declining VMP = his/her rising reservation wage ($w*$). However, the contractual seniority wage is substantially higher ($w > w*$), which creates the worker's intention to stay on this job and the need for forced or induced retirement. For discussion, see, for example, Mitchell (1988), Hutchens (1989), and Lazear (1990, 1991).

[22] Another case in which firms are indifferent with respect to the length of the contract is discussed by Lang (1989: 134).

to be prevented from imposing external social costs on firms and the next generation of workers.[23]

B. Assessing Lazear's Theory

The contracts modeled by Lazear have been commonly viewed as first-best efficient, making any government interference welfare reducing. Analogous to the argument of the previous paragraph, this would very clearly imply that: (i) the recent outlawing of mandatory retirement partially breaches *ex post* a long term contractual arrangement from which many older workers have benefited throughout their careers, (ii) gains from this accrue only to some recent and perhaps current older workers, and (iii) while long-term deferred-payment contracts continue to exist, with retirement induced through means like implicit pension buyouts, they are now less socially efficient (generating a smaller lifetime gain for workers as well as firms) than continuing to allow mandatory retirement in some form.

In a recent paper, however, Lang (1989) demonstrates that the implications of Lazearian contracts are somewhat more complicated. Implicit bonding is not costless, and as a result, it is actually not possible to get to first-best efficiency in a Lazearian contract (which is now widely-acknowledged). Several authors, using different arguments, have pointed out that bonding must be costly.[24] Lang assumes that bonding is costly because workers discount the future more heavily than firms. As a result, both work hours and the retirement age may be set suboptimally in a Lazearian contract. Retirement may be forced before the optimal age (that is, even though the worker's reservation wage still lies below his or her VMP in the career firm), and this can occur even for some workers who are paid less than the value of their marginal product. It follows that it might be possible to improve social welfare by prohibiting mandatory retirement, although this remains debatable.[25]

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[23] Other types of productivity-enhancing mechanisms might be adopted instead (e.g., efficiency wages), but in theory, these would be less efficient since competition has forced firms to adopt, or stress, the best method for their technologies. A recent paper by Akerlof and Katz (1988) shows that the value of the implicit trust fund in deferred payments does not generally rise fast enough by itself to deter shirking early in a career, suggesting the co-existence of efficiency wages (see also Gustman and Steinmeier 1987, and e.g., Straka 1989).

[24] Lazear has noted that otherwise the wage profile is indeterminate. Hutchens (1986) shows that workers must be paid a premium to compensate for the risk of a firm's cheating on the contract (by dismissing non-shirkers and confiscating their bonds). Dickens, Katz, Lang, and Summers (1989) show that if bonding is costless at the margin, then firms will deter shirking solely by requiring large bonds. However, under certain conditions (where monitoring does not serve other purposes), if we observe that firms do in fact monitor workers, then bonding must be costly.

Lang clearly implies in the conclusion of his paper that making mandatory retirement illegal may be socially beneficial. However, even in Lang's model, workers and firms are still doing the best that they can with the available information, and the equilibrium may be inefficient only in the sense that costless bonding (highly unlikely, or impossible, in this problem) would be more efficient.[26] In this way, it seems, Lang's result may simply add to the "dynamic inconsistency" implied above in the discussion of Lazearian mandatory retirement. *Ex post*, a now somewhat larger social gain could indeed stem from changing the nature of the agreement by prohibiting mandatory retirement, but this may still tend to subvert the more socially valuable long-run, *ex-ante* incentive for firms to offer mutually beneficial deferred-payment contracts.[27]

A similar problem noted by Lazear (1988: 23) and others is that implicit pension buyouts and the like cannot generally be tailored to individual cases or specific groups. Explicit severance buyouts, which can be tailored in this way, create moral-hazard and legal problems; workers may reduce effort to try to sweeten an anticipated buyout offer, and courts may object if an explicit buyout is offered only to some older workers. Thus, like the problem of individual statistical discrimination, firms can only seek to efficiently retire the <u>average</u> older worker, implying that many <u>individual</u> workers are likely to be retired before (or after) the (unconstrained) optimal age. Ippolito (1989: 22) points out, however, that selective wage increases might be able to offset the pension loss for preferred workers.

Another problem concerns Lazear's assumption that workers are risk neutral (except in the case

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[25] As Lang acknowledges (p. 131), the intuitive explanation behind his formal proofs is somewhat difficult to grasp. Essentially, Lang's model demonstrates that giving workers an incentive to not shirk implies that there is a maximum-hours constraint (those with work days of 14 hours, for example, seem generally more inclined to shirk -- take some leisure on the job -- than those with 8-hour work days). Consequently, workers may be constrained to work fewer hours than they wish (or would otherwise be optimal). This is consistent with the common finding that in terms of actual vs. desired hours many or most workers overall report themselves as under-employed while far fewer are over-employed (Kahn and Lang 1987). The maximum-hours or no-shirk constraint similarly implies that the retirement age is set suboptimally (too early), where the worker's VMP on the career job still exceeds his or her reservation wage.

[26] I thank Robert Hutchens for pointing this out to me.

[27] Lang's "suboptimal retirements" may fall into the same class as individual statistical discrimination -- a class of social frictions that impose costs on individuals, individual rights, and thus society overall, but which do so as integral parts of an efficient overall system. As before, if the system is truly efficient ("maximizing the size of the pie"), Pareto-improving compensations should be possible, and the ADEA, Social Security, and private pensions may to some extent perform this role.

of promotion lotteries). If workers are instead risk averse, then early-peaking actuarial pension values, for example, may reflect insurance against unplanned early retirement due to poor health or against similar contingencies like declining productivity (Bodie 1990). This is not necessarily inconsistent with Lazear's theory, but it further dislodges the clarity of a first-best, perfect-information optimum (Lazear 1983: 84). In a related vein, Lazear has been forced to argue that for reputational reasons, firms are reluctant to undertake late or post-career cuts in compensation, even though implicitly promised deferred payments are an easier target for cost cutting than explicitly contracted pay.[28] Because morale and recruitment policies, together with evolving legal sanctions, matter to firms, the "reputational mechanism" has some effect, but this may be weakened by economy- or sector-wide cost cutting or inter-generational conflict. Nonetheless, the implicit contract's career productivity gain may generally be worth more to workers than the attendant late-career risks -- otherwise, firms might face recruitment or retention problems until they changed their compensation structures (this also depends, however, on other sources of high labor productivity, such as large amounts of capital per worker, and on employer sensitivity to turnover). The voluntary acceptance of all implicitly contracted shared risks is debatable.

This and other tensions between the short run and long run raise further questions or doubts. Whether or not they are jointly planned, inducements to retire (i.e., less favorable terms for continued employment) clearly reveal a reduced willingness to employ older workers. The complexities of pensions, interrelated compensation, productivity measurement, and life-cycle planning raise some doubt about the cognizance of workers allegedly "agreeing to" Lazearian contracts. While inducements to retire at some point may come as no surprise to many workers, the timing of inducements might, and firms may have superior information about the true value of worker productivity, both past and present. Voluntarily accepted pension inducements leave open questions of: (1) adequate planning for

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[28] Hutchens (1986) has shown that the Lazearian equilibrium involves finite probabilities of *ex-post* contractual "cheating" by firms. Recent theories of the corporate financial perspective on pensions argue that firms will act in the best interests of shareholders first, which can jeopardize retiree benefits, for example, under bankruptcy (Bodie, Light, Mørk, and Taggart 1987). Hutchens (1989: 56) suggests that this is another reason why Lazearian contracts may be found predominantly in large, established firms (these firms may care most about their reputations, and are less likely to fail).

inflation and health risks (Bodie 1990 argues that very few retirement planning professionals have adequately apprised workers of post-retirement inflation), and (2) worker preferences for the *changed conditions* that have generated "voluntary" withdrawal (Quinn 1990 has made this point to stress that a voluntary acceptance of a pension inducement to retire, for example, is not necessarily the older worker's preferred outcome, perhaps even *"ex ante"*). There would seem to be room for an alternative theory of retirement incentives as a profit-maximizing personnel tool alone, conditional on worker perceptions and available information.[29]

Lazear's theory and some related empirical work by Medoff and Abraham have challenged the traditional view in labor economics of seniority, wages, and productivity (Hutchens 1989). According to human-capital theory, younger workers generally earn more than their VMP's as they acquire on-the-job training and experience, while older workers earn less than their VMP's to give the firm a return on its part of specific human-capital investment. Lazear's theory does not explain why wages grow with experience, holding tenure in the firm constant, while human-capital theory attributes this to continuing investment in general human capital. Recent empirical studies (e.g., Kotlikoff 1988, Blakemore and Hoffman 1989) have brought advancements but no real resolution of the issues here. It has been insufficiently recognized that despite certain outward appearances, Lazearian contracts and human capital may be complements rather than alternatives. There are a number of plausible career paths for VMP, the wage, and the reservation wage which are consistent with both theories (Kuhn 1986). One plausible profile has the wage first above VMP (a base period of specific-human-capital formation), then below it (implicit-bond posting, coupled with employer returns to specific human capital), and finally above it again in the latter stages of the career cycle (deferred payments outweigh remaining employer returns to human capital). This profile seems particularly likely if the typical VMP path rises sharply at first, and then with diminishing returns to additional years in the firm.[30]

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[29] Productivity enhancements from deferred compensation, *ex-post* consequences for older workers, and the maintained freedoms of firms might be dimly or "powerlessly" recognized by a typical younger worker. Probings of a union or reputation effects may counter limited information to some extent. While many older workers may recognize deferred compensation as such, and others may believe or rationalize that they are not "overpaid," still others might at some point "feel guilty" about late-career over-payments -- a feeling that firms may encourage and exploit. Depending on the competitive nature of the equilibrium, firms may or may not earn *ex-post* economic rents from this.

In his generalized contract theory, Kuhn (1986) shows that Lazear's model is a special case in which *ex-post* economic rents to workers are always strictly positive while rents to firms are non-positive. In the more general contract: (1) wages can rise either faster (as in Lazear's model) or more slowly than VMP, depending on conditions, or both of these phenomenon can occur in different parts of the same contract (as suggested above), (2) there is a restricted form of rent sharing -- *ex-post* rents to both workers and firms must be strictly positive, and (3) the set of feasible contracts can often be empty. While again not really inconsistent with Lazear's basic theory, Kuhn's results further qualify the properties of a presumed deferred-payment equilibrium.[31]

Lazear's theory also challenges the traditional view of pensions as simply tax-free and scale-economies-preferred savings institutions (Mitchell 1988). This traditional view, while again not necessarily a strict alternative, implies different interpretations of vesting policies, actuarial non-neutrality, etc.[32] From this perspective alone, actuarial pension loss might be viewed as evidence of a declining demand for older workers with greater age, but the suddenness or steepness of the loss would remain rather puzzling.

In sum, Lazear's theory has generated much interest and may help to explain important features of the long-term employment relationship, but the set of relevant models and particularly their full empirical and policy implications are not fully settled. Although Lazear's theory has received enough empirical support to make it worth investigating further (e.g., Hutchens 1987, Kotlikoff 1988), empirical shortcomings of the theory have also been raised by Gustman and Mitchell (1990) and others. A modified form of Lazear's theory, with greater room for demand-side retirement inducements

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[30] When a job involves both specific training and promotion ladders, it can be efficient to pay older workers more than their VMP's (Carmichael 1983). Higher levels of human capital as a reward for career advancement might also be part of an efficient solution to the agency problem, while resolution of the agency problem could be part of a firm's return to human capital investment. A fairly extensive literature (e.g., Altonji and Shakotko 1985) has attempted to disentangle the wage-profile effects of human capital, job matching (Jovanovic 1979), incentive contracts, and unobserved heterogeneity.

[31] Because firms also earn *ex-post* rents, for example, the profit loss from delayed retirements may simply cause reduced rent sharing with workers (leaving a less detrimental effect, perhaps, on the willingness to offer new deferred-payment contracts to younger workers).

[32] Existing empirical evidence (e.g., Kotlikoff and Wise 1984) again tends to suggest that there is some truth to both views.

and other factors (how much room is ultimately an empirical question) may eventually hold sway. While interpretations will differ at present, Lazear's current theory might help explain, for example, why pension inducements shifted toward earlier retirement between the 1960s and the mid-1980s (Mitchell and Luzadis 1988; Ippolito 1989) and why "downsizings" have focused on older workers in recent years. Many U.S. firms in the 1970s and 80s have faced accelerated technological competition (e.g., in computerized production), as well as the need to adjust to increasing prohibitions of mandatory retirement. The former may have created an unusually large decline in the productivity of older workers with outmoded training, skills, etc., while the latter may have further encouraged firms to offer financial retirement incentives sooner. Both implicit contracts that discourage outright dismissal and the ADEA raise the costs of non-pension means of shedding older workers. Lazear (1981) has shown how pension inducements can promote efficient separations upon changes in the relative value of workers across activities. Employers may have also shed older workers in this way as the entry of baby-boom workers depressed wages for younger cohorts. A study of work and retirement transitions, with controls for training, background, wages, etc., might seek to test such hypotheses.[33]

C. Human Capital and the Problem of Short Tenure

Specific human capital, as noted, is a main feature of long-term implicitly contractual employment relationships. Due to its specialized usefulness in a single firm or sector, specific human capital creates *ex-post* rents (the worker can earn more by staying than by switching to an alternative firm; the firm can earn more from the specifically trained worker than from an untrained alternative). The implicit contractual decision of sharing investment costs and returns has been formalized by Hashimoto and Yu (1980) and Hashimoto (1981). Established career workers reap the benefits of shared returns to specific human capital (including greater job security), and this continues when workers become older. However, older workers face the cost or risk of lost specific human capital when or if their career job terminates. They also face costs or risks brought on by declining life-cycle incentives, both inside and outside of the career firm, for renewed human-capital investment.

Declining life- or career-cycle incentives for human-capital investment may be a far-reaching

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[33] Related recent tests with data on pension plans are discussed in Part II of this study.

constraint on older workers that operates through expectations of short job tenure or remaining tenure. Some claim that older workers do not have shorter expected tenure than younger workers, but this is generally true only in comparison to the very young who are "job shopping." Entry-level workers compete with job shoppers, but most older workers shun, or are well-distanced from, entry-level positions, meaning that they compete instead with settled prime-age workers. With few remaining work years on average, an older worker (though unlikely to quit) can seldom credibly signal to an employer a plan of long tenure in comparison to a settled prime-age worker.[34]

Expected short tenure has several adverse consequences. First, as stressed by Hutchens (1986, 1988), the shorter the average tenure of workers, the more often the firm incurs turnover related costs and thus the higher are its labor costs, *ceteris paribus*.[35] In addition, since older workers generally seek to enter or remain within a firm at higher levels where recruitment, training, and other turnover costs are generally higher, the labor cost premium attached to the practice of hiring or re-training older workers can be higher still. Perhaps most importantly, short tenure lowers the return to a firm's investment in a worker's productivity. As noted above, optimizing workers and firms are generally expected to share investments in firm-specific training or learning, with workers being paid, *ceteris paribus*, more than their VMP while learning and (to compensate and share *ex-post* rents) less than their VMP after learning. The investment return accruing to the firm is

$$\sum_{t=0}^{T} (\text{VMP}_t - w_t)\, h_t\, (1 + r)^{-t}$$

where t indicates post-investment period t, T is the expected remaining tenure of employment, w_t is the wage rate, h_t is hours per worker, and r is the discount rate. Because T is lower for older workers on average, settled younger workers tend to generate a higher return. The relative investment loss from training or re-training a typical older worker vs. younger worker may also be higher if, by virtue of their occupational levels or other factors, older workers call for more costly human-capital

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[34] Among those who separate from the firm, prime-age workers are also more likely to be willing or able to completely return if desired.

[35] This also holds for any quasi-fixed (per worker) costs associated with implicit contracts. Hutchens (1986) shows that Lazearian contracts introduce such costs.

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investment.[36] In any case, a relative shortfall of investment returns may generally force firms to make older workers either pay more for human-capital investment (e.g., through lower wages) or forego it.

The short-horizon/low-return problem also inhibits human-capital investment by most older workers themselves, which holds back their productivity. This supply-side choice, made in light of retirement plans and the life cycle, further limits the demand for older workers. General training (e.g., in computer skills) tends to be particularly unattractive to older workers since workers must usually pay for it themselves in some way.[37] The opportunity cost of training, principally any foregone earnings, is high for older workers with seniority -- consumption and/or retirement savings plans must be traded for a less certain human-capital return. The non-tradability of human capital fundamentally discourages its acquisition at more advanced ages (Merton 1983).

More than just training or education is involved in human-capital investments. In several cases, like that of academic research scientists, work itself tends to be a type of investment (in current and future knowledge or "learning by doing," derivative works, etc.). Apparently because the future payoffs decline with age, the work of scientists has been found to generally decline with greater age, ceteris paribus (Levin and Stephan 1991). Migration (at least before full retirement) and job search, viewed as new investment, may also be less attractive to older workers because the payoff period is shorter and the chance of labor-market success tends to be lower. Immobility reduces hiring opportunities, makes workers less valuable in some jobs (e.g., where periodic re-location is requested or required), and may raise the bargaining leverage of firms seeking to dampen older workers' earnings.

Human capital growth through "learning by doing" may also slow or cease during a worker's career for other reasons. No clear law says that added years of "experience" always lead to higher productivity. If older workers without significant physical limitations actually lose productivity,

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[36] In some cases, training costs for older workers may instead be lower due to greater prior experience with the basics of the production process.

[37] Which is not to say that some older workers won't undertake such re-training (journalists often find the exception to the rule to be newsworthy). In theory, at least, workers must pay in some way for investments that cannot be secured by the firm, although informal training is hard to appropriate. Many firms now offer formal general training that workers do not have to "pay for," at least out of pocket, unless they leave the firm. Young workers may commonly pay for training through lower entry level wages. Similar wage dampening for older workers may be inhibited by the ADEA.

however, then technological change and outmoded skills are probably the cause. As technology progresses and markets change, differing degrees of obsolescence of human capital spread across industries and/or occupations, dictating the importance of insufficient re-training to older workers. One recent study of managers and professionals argued that:

> The most important factor associated with earnings and productivity changes over the life cycle that we have observed is the incentive to invest in further training ... agism, physiological aging, and changing attitudes toward work are of little importance here, relative to the effects of skill accumulation, obsolescence, and employer/employee incentives to invest further in such training (Andrisani and Daymont 1987: 67).

Overall, it is clear that the private incentives for investment in older-worker human capital are in general significantly lower than for younger workers, but it is difficult to say whether workers and firms generally under-invest from a social point of view.[38] Particularly because life-cycle effects on human-capital formation are largely exogenous, it may be difficult to argue that private incentives for human-capital formation in older workers should be altered in some broad-based way. Specific human capital creates benefits as well as costs for older workers. It supports the relatively high productivity and wages of many older workers, but in alternative jobs or occupations, older workers are very likely to be less productive, at least initially. After acclimation to new work in an alternative assignment or firm, a lower VMP may well persist in so far as it is determined by the type of job and not the individual's innate skills and other characteristics. Re-assignments, re-training, and new jobs are discussed further in section III.

D. Do Firms Have Optimal Age Structures?

A small literature elsewhere has addressed a related question: does the career-cycle pattern of job tasks, promotion prospects, etc., imply an optimal age structure within firms? Welch (1979) developed a model of "career phases" in which workers perform different sequential tasks through their careers. This restricts substitutability across age and implies an optimal age structure. However, this sort of model has not yet been linked with a Lazear-Rosen type theory of promotion lotteries or a more general model (also encompassing human capital).

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[38] For modelling of human-capital investment over the life cycle, see, e.g., Blinder and Weiss (1976).

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Earlier retirements enhance the promotion prospects of younger workers (Cantrell and Clark 1980, 1982; Clark and Cantrell 1986), thus improving worker commitment and morale while lowering turnover (Parsons and Cho 1989). Morale may also be improved -- offering dynamic gains in productivity and competitiveness (Straka 1990b) -- by a clearing out of "deadwood" older workers. Firms may benefit simply from the new ideas of promoted younger workers, and both retirement by age and not re-assigning older workers could be efficient if determination of individual productivity among older workers is "too difficult or embarrassing" (Levine 1980). Allen and Clark (1987) have concluded that many firms appear to prefer prime-age workers with in-house experience, while pension incentives, etc., may vary across firms with conditions that generate preferred age structures.

Difficulties and challenges in combining "the old with the new" in production may have had important effects on older workers in recent years. Workers' career cycles tend to parallel the product- or life-cycle of technologies, firms or industries, and occupations. New technologies or approaches sometimes render older workers' skills almost completely obsolete. But various types of skills and experience are often not made obsolete, or totally so. Firms are thus challenged to optimally phase out or alter outmoded technologies by employing both these technologies and their associated older human resources in a profit-maximizing fashion.

New technology may tend to eliminate or even reverse the established status hierarchy in a firm, which is typically based on seniority and experience on the shop or office floor. For example, young software writers for computerized custom production runs in manufacturing can become as important, or even more important, than experienced older workers steeped in the more traditional skills of standardized mass production (Chew 1990). If the basics of production remain unchanged, however, then optimal adaptation may tend to place older workers into advisory roles while challenging them to adopt new skills or approaches in order to maintain status, leadership, and rewards. A gradual phasing out of older technologies may also tend to coincide with the withdrawal of older cohorts into retirement.

Long-term implicit contracts also face uncertainties due to shocks from technological change and

other market or demographic factors. An unsettling implication of Lazear's theory is that an aging work force poses risks to the future cash-flow solvency of major firms (Lazear 1988). Increasing older-worker and retiree compensation liabilities (wage premiums and pensions) that lie ahead as baby-boomers age may threaten even soundly managed, forward-looking firms. Lazear maintains that implicit wage commitments and defined-benefit pensions are all, to some extent, real liabilities that are affected by unpredictable events (firms are committed to paying principal plus interest on implicit-bond advances [VMP - w] received from younger workers). Late-career wages are real liabilities to the extent that workers are not fooled by "money illusion." Pensions have tended to become real liabilities through pegging to end-of-career wages, and because of some increase (until recently) in *ad hoc* cost-of-living adjustments. That implicit benefit promises do in fact create liabilities subject to legal enforcement has become clear from fallout surrounding the recent Federal Accounting Standards Board (FASB) ruling on pre-funding of health-insurance benefits (p. 37), a vexing and uncertain liability due to medical-cost inflation (Clark and Kreps 1989).

All of this is a potential financing problem under Lazearian contracts because the firm must rely on its past strategies in investing assets to provide income receipts that meet liabilities to the aging work force each period (Lazear 1988: 79). Despite losses to nominal-asset holders in the 1970s and early 1980s, almost all assets continue to bear nominal rates of return. It follows that even a dedicated bond portfolio may not be a good hedge against a firm's uncertain real liabilities to older workers and retirees. As a result, firms may become less willing in future years to employ or maintain the compensation of long-time older employees (appendix D). Lazear's theory also predicts that the scheduled future increases in Social Security's normal retirement age should tend to induce firms to re-structure their pension and compensation profiles in order to encourage a commensurate increase in the length of the typical career (Lazear 1985). The predicted net outcome on career retirement dates is thus uncertain, although both the change in Social Security and potential financing problems put downward pressure on pension levels and other compensation. If emerging corporate policies do indeed cut back on future employment or particularly compensation for older workers and recent retirees, then

this will tend to put a heavier burden on personal saving strategies, Social Security, and the market for post-career employment of older workers.

E. The Problem of Re-contracting

Another important question raised by Lazear's theory is why firms do not simply "re-contract" with older workers at w = VMP. This leads into the more general issues of wage rigidity, re-assignment, and part-time work among older workers. Hutchens (1986) demonstrates that it is difficult for workers to "re-negotiate" a new Lazearian contract and continue in their old jobs, or in similar jobs elsewhere. The reason is that for these jobs, in which the agency problem is important, a firm still optimally requires a Lazearian type of deferred-payment structure. This means that, in order to "re-contract," older workers must first accept a very large wage cut (to return to w < VMP for a time in order to post another implicit bond). Presumably, if this large a wage cut would be unacceptable to workers, however, then prior to pension legislation in 1974, at least, older workers and firms might have sought to recontract at w = VMP (or a little higher, as a risk premium against the firm's cheating) with the threat that an older worker caught shirking will lose part of his or her pension.

Why have we not seen any, or at least not very many, of these types of "re-negotiated" implicit contracts? Hutchens shows that the fixed costs associated with deferred-payment contracts -- which follow from the risks of "contractual cheating" (shirking by workers, dismissal of non-shirkers by the firm) and are invariant with respect to contract length -- give firms an incentive to hire or promote younger replacement workers instead. Thus, here is a reason why large firms in particular may employ older workers in desirable jobs or occupations where the agency problem is important, while refusing to hire or "re-hire" older workers, even at reduced pay, into these very same types of positions.[39]

Many older workers would prefer, but are very seldom offered, a type of phased-in career retirement (preferably within the career firm) in which work hours, but not hourly pay, are reduced from full time. In addition to actuarial pension loss, a worker can typically receive no pension at all

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[39] Other considerations include re-training and wage rigidity strengthened by the ADEA. Wage rigidity may stem, for example, from a long-term contract that insures younger workers against future uncertainty about individual productivity (Smith 1977, Harris and Holmstrom 1982). Levine (1988) suggests at various points, seemingly over-optimistically, that older workers might be quite willing to "re-negotiate" wages downward in exchange for some form of career continuance.

before complete retirement from the firm (zero hours). These rules cut substantially into any worker's anticipated compensation for partial-retirement work within the career firm, and most firms do not even bother to offer such work on a systematic basis.[40] One of the problems forestalling a system of phased-in career retirements, even one that accepts pay reductions, is the potential effect of individual productivity evaluations and heterogeneous pay and re-assignments on age-discrimination lawsuits, worker morale, and industrial relations. Individual determinations can be demeaning and contentious. Retirement rules designed for the average older worker, and applicable to all, may be less costly to defend as non-discriminatory. Other constraints inhibiting phased-in retirements are discussed below.

III. Retirement Bridges

Older workers find limited opportunities for phased retirement both outside and inside a career firm. Re-employment with another firm usually entails a considerable drop in pay and status. Recent research (e.g., Ruhm and Sum 1989, Grad 1990, and Ruhm 1990) shows that most older workers do not enter full retirement from a full-time career job of long duration but, rather, either change full-time jobs or pass through a period of part-time work. This has generated a new interest in "bridge jobs" that often provide "bridges to retirement" (Doeringer 1990). Available bridge jobs currently appear to remain generally limited to relatively unattractive sectors and occupations, with the partial or phased retirement that most older workers "dream of" available only to a fairly small minority (e.g., professionals like physicians or others with scarce skills). This section surveys the labor-market factors that limit the prospects for later-life, post-career employment and thus tend to segregate new opportunities for older workers into "secondary" sectors and occupations.

A. Re-training, Job Competition, and Short Tenure

Most new jobs require at least some new training, which again raises the problem of expected

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[40] Some press accounts claim to see an increasing number of partial-retirement programs in recent years. As discussed more in part II of this study, however, many of these scattered programs appear to be "un-retirement," rather than phased-retirement, schemes. An initial separation of most older employees may remain preferred by firms, with a subsequent selective re-hiring of retirees on new terms (perhaps after older workers have had a chance to see their alternatives elsewhere). See, e.g., Root and Zarrugh (1987) and Belous (1990) for further discussion.

short tenure for older workers. Shorter human-capital-investment horizons may tend to exclude older workers from a significant subset of jobs. At the extreme, Thurow (1975) has developed a "job competition" model in which workers compete for positions that provide most or all of the relevant training on the job (Thurow argues that most relevant training is often provided on the job, much of it informally). This model is aimed primarily at entry-level positions, but due to technological change and skill obsolescence, older workers may be forced to compete for a significant subset of higher-level jobs based on their trainability and net training costs. If individuals must compete for fixed-initial-wage job slots that are the first rung of "ladders" for on-the-job training, then this competition will be largely based on workers' relative training costs and net returns to the firm. The resulting concept of "internal labor markets with limited ports of entry" suggests that an older worker, largely because of his or her natural disadvantage in the human-capital-investment horizon, will tend to be placed toward the back of the labor-supply "queue" of applicants for these type of jobs. (This is also consistent with the observation of reduced prospects for older workers during recessions.) If an older worker would be just as productive as a younger one after training, then this may seem "unfair."

But the key issue again is the exogeneity of the true source of the human-capital problem. If the (exogenous) life-cycle investment horizon is the main issue here, and if firms were forced to provide the same training opportunities to all workers regardless of age or expected tenure, then the shorter period of returns from older workers, by making labor more expensive to employ, would likely cause all workers, eventually, to be trained less on the job over their lifetimes and other inputs to be substituted to an extent for labor. This would make all firms so constrained less competitive with their unconstrained (e.g., international) rivals. All this is not to deny the older worker's problem, but it is relevant to our view of the optimal nature and extent of government intervention.[41]

In point of fact, some firms known for long-term employment and extensive investments in

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[41] Internal labor markets and the cost of obtaining information about "outsiders" may deny access to some superior older workers as efficient screening procedures again pose efficiency-equity tradeoffs in hiring (Holzer 1987). As before, this individual statistical discrimination applies to all "outside" job applicants, but the problem may tend to be worse for older workers due to a greater variance in skills or abilities, while the average older worker may fare worse due to a greater concentration in skills that were firm-specific or now lie in unsought specialty areas. Carrington (1990) finds support for a theory that more specialized displaced workers have less incentive to re-train.

human capital do indeed seem particularly reluctant to hire older workers. This may also be related to fast-developing technologies that demand up-to-date, sequential training. The commitment device of heavy up-front investments by firms in typically younger workers may inspire worker enthusiasm and loyalty, causing workers to reciprocate with specific investments of their own (e.g., in further specialized training). Larger firms may benefit from career-long employment relationships due to long gestation periods in R&D and product evolution, or to a need to maintain trade secrecy. Mutual commitments to a long career relationship remain common in other sectors as well, but while beneficial to many firms and younger workers, these relationships tend to screen out new older workers.

While their human-capital-investment horizon is a disadvantage, older workers also have life-cycle advantages over young workers (though not necessarily over middle-aged workers). They usually have a "proven record" and valuable experience, as well as "contacts" or "friends in the business," which are important in many fields. With greater resources in general to fall back on, they can typically afford a longer job search, if desired, for the best available employment "match." As long as these types of natural or exogenous life-cycle phenomena exist, they are going to impart to workers different relative strengths and weaknesses by age. Middle-aged workers with experience may always tend to have the greatest relative advantages in this regard. It is not at all clear that it would be socially advantageous for government policies to broadly intervene (beyond providing educational assistance to the young and social insurance for the old).[42]

B. Seniority Costs, Wage Expectations, and Tagging

Lazearian re-contracting problems, outmoded or lost human capital, and all other previously discussed inducements toward an optimal age structure within firms appear to effectively force many or most post-career older workers to choose between full retirement and a lesser, or at least lower-paying, job.[43] This type of job, be it a re-assignment or a position in a new firm, can be a rewarding or welcome change for some, but it can also be difficult for older workers to accept. Some older workers

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[42] This is not to say that no arguments for intervention can be constructed, only that such arguments are not immediately obvious. Any intervention might be best undertaken through subsidies to training or experiments in better combining older and younger workers in production.

[43] Self-employment is a popular alternative for those with considerable wealth or less risk aversion.

appear to be better prepared or better counseled than others to confront the realities of the market for bridge jobs. For those who are insufficiently prepared, problems can arise with regard to pay expectations, reservation wages, or stigmas attached to lower-level jobs.

Firms seeking to re-employ older workers must balance all labor costs against productivity, factor-substitution possibilities, and the costs of alternative inputs. The average pay and cost of older workers reflects countervailing patterns and institutions, but as noted it tends to be high, with the most significant determinants of an older worker's wage (apart from human capital) appearing to be current-job tenure and experience. Nominal earnings, health insurance (Root 1984), and defined-benefit pension costs (Barnow and Ehrenberg 1979), all generally rise with age, although real wage profiles do tend to flatten out. To compensate for added costs from employing older workers, the ADEA and subsequent court rulings allow reductions in older-worker fringe benefits via an "equal-cost rule" (if benefit costs exceed those for comparable younger workers, then older-worker benefits can be reduced to equate net costs). A 1989 Supreme Court decision (*Public Employment Retirement System of Ohio v. Betts*) made a controversial allowance for further reductions (Kosterlitz 1990), which has now been disallowed by the Older Workers Benefit Protection Act of 1990. Federal tax law (deductability provisions) has also increasingly encouraged "non-discrimination" in fringes (Andrews 1989; Scott, Berger, and Black 1989). Root (1984: 72) reported that as of the early 1980s one half of firms paid "full and equal" benefits to older workers. Tax-law changes in 1982 and 1984 imposed a new first-payor status on private health insurance for those over 65, or those with a Medicare-covered spouse over 65, in order to reduce Medicare outlays. The Federal Accounting Standards Board (FASB) has ordered reporting of unfunded health-insurance liabilities starting in 1993. Several of these factors tend to add to the unit labor cost of employing older workers.

One effect of high pay due to implicit deferred-payment contracts, specific human capital, or legislative safeguards on a previous career job is that it may tend to leave an older worker with unrealistic wage expectations or reservation wages. These wage expectations may often considerably exceed an older worker's current or best-alternative marginal product. If workers are not fully

cognizant of their true alternative marginal product, then firms may believe that new older job searchers, in particular, will expect a higher wage than the firm is willing to pay. Following a period of learning or "realization" by the older worker through job search or inquiries, firms may be more willing to consider the older worker. This does not constitute age discrimination, but rather an efficient use by firms of scarce resources, including time, in their search for willing employees.

Other factors affect older workers displaced from career jobs or those who leave one career job before seeking or securing another. These include stigmas or adverse worker "tagging" that potential employers, and therefore workers themselves, may attach to unemployment and lower-level jobs. For all workers, adverse selection may tend to characterize job separations or difficulties in locating preferred work. Firms attempt to retain better workers (Greenwald 1979, 1986), while quickly hiring obvious "stars." Because a worker's skills, willingness to learn, and other productive attributes are generally uncertain *ex ante*, workers out of their field for any length of time may be treated with the same skepticism as used autos (Akerlof 1970). Why have they been let go? Why are they still looking for a new buyer? Adverse selection may be particularly troublesome for "young" older workers (50-59), since both younger and older cohorts should have more voluntary withdrawals from established career employers (younger cohorts tend to have better job alternatives, while older cohorts tend to have better retirement options).

Therefore, for signaling reasons, many older workers without a preferred job, but with some private or public income sources (e.g., a private pension), may opt for "early retirement," with a planned return to work later when a preferred job is offered. Older workers may view this as an optimal job-search strategy even if they cannot genuinely afford early retirement. Since superior workers often accumulate greater resources for retirement, retiring early, it is hoped, will be perceived as a positive signal.[44]

This strategy may ultimately disappoint many older workers. Viewed objectively, the signal

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[44] For some anecdotal examples, see Brudney and Scott (1987). Specific human capital might exacerbate the information asymmetry about a worker's abilities. Less is known about a specialized worker's ability in other areas. This creates what many workers perceive as glaring inequities in available bridge jobs. Refusal to accept an "unfair" offer can also be viewed as a behavioral signal (Frank 1988).

from separation and lengthy search for a preferred job may be less adverse for older workers than many workers believe. A relatively high frequency of layoffs affecting older workers stems from plant closings (Gibbons and Katz 1989) as the product or life cycle of firms or industries and occupations tends to match workers' careers, leaving more older workers in declining areas (Rhine 1978, Rones and Herz 1989). The whole set of life-cycle disadvantages -- and advantages -- of growing old may tend to lengthen a job search for most older workers (good workers and bad). If many older workers use the "early-retirement" strategy, firms should stop viewing it as a positive, or more neutral, signal.[45] Thus, if firms tend to be better or more quickly informed about group labor-market experiences, then the equilibrium may be inefficient in the sense that older workers who think they gain a significantly better productivity signal by "retiring early" and avoiding "lesser jobs" in fact gain little or nothing, or may even lose out on their best available bridge-job opportunity.

The result may be too many older workers waiting for a preferred job offer that, in reality, is often not about to arrive anytime soon. Depleting retirement resources for a year or two, or longer, these workers might take an intermittent or last-ditch "secondary" or bridge job only when necessary. If all could be informed or convinced that the favorable signaling lure of "early retirement" is more apparent than real, then quicker and more active search for, and commitment to, available bridge jobs might make both workers and firms better off. Individual processes of "facing up to the reality" of the demand for older workers appear chronicled in case after case in Brudney and Scott (1987).[46]

C. Technology, Fixed Costs, and Part-time Employment

Part-time work, when it is offered either in a career firm or outside, tends to be discouraged at all levels and ages of employment by relatively low rates of hourly pay. Because career retirees are typically forced to seek part-time work in another firm, they often find that they must join a pool of

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[45] The signal can also backfire, of course, if some firms view early retirees as "not really needing work" (therefore lacking in commitment or enthusiasm).

[46] A business-cycle downturn, for example, may give many an incentive to "wait it out." The empirical extent of the speculation involved is an unanswered question. The problem of over-investment in a behavioral signal again rests on uncertain productivity, and can again be overcome in at least some cases with a trial period of employment. For related discussion, see Spence (1973) and Cain (1986: 727-29). For a recent model of signaling, employment efficiency, and "stigmatised" jobs, see McCormick (1990).

entry-level or "trial" employees and unskilled, or semi-skilled workers, with a low wage that has become a stylized fact in the retirement modeling literature (e.g., Gustman and Steinmeier 1983, 1986; Sueyoshi 1989). Consequently, those workers actually observed in partial retirement are more likely to be "higher paid, white-collar workers in services and trade" (Reimers and Honig 1989: 126) -- the fortunate few, it seems, who are able to maintain career-field or preferred status through a career employer, another firm, or self-employment.

Low or non-existent wage offers for part-time work may also result from the technology and fixed costs of employment (Jondrow, Brechling and Marcus 1983a,b; Straka 1990a). The technology includes, for example, scheduling constraints. While a variable-demand firm (e.g., a fast-food outlet, restaurant, or hotel) may desire part-time workers for peak periods, most career-type firms want workers on call or working full time. Fixed costs include both some of the quasi-fixed (per worker) costs of employing a worker, which lower the wage offer to part-timers, and fixed commuting costs and so on for the worker, which lower the net compensation rate for shorter hours (Jondrow, et al., call these "nonremunerative" costs -- costs incurred by employers or employees but not received by the other partner to the bargain). These factors appear to generally create a discontinuous budget set with quite limited part-time opportunities. Together with pension and asset income, the technology and fixed costs of employment may provide a considerable disincentive for most partial-retirement work.

D. Sectoral and Occupational Segregation of Older Workers

The confluence of internal and external labor-market factors appears to give most older workers at the present time a choice between three post-career options: (1) lower-paying full-time jobs largely confined to unattractive (or at least less attractive) sectors or occupations, (2) low-paying part-time work, or (3) full retirement. New opportunities for older workers appear to be segregated into smaller-firm manufacturing, retailing, and semi-skilled or unskilled service jobs or occupations (Hutchens 1988; Doeringer and Terkla 1990). Doeringer and Terkla refer to these areas as the "youth sector" because potential employers there tend to serve as feeders for higher-paying and more selective firms and fields.

Because of their "feeder" role, employers in the "youth sector" often experience high turnover

and consequently tend to need workers -- any workers -- badly. It has recently been popular in certain parts of the press and lobbying communities, and even among some analysts, to tout an expansion of new opportunities for older workers due to the demographic shortfall of younger workers. More glowing renditions of this current or coming "labor shortage" can be doubted along a number of lines (e.g., increases in immigration and capital-labor substitution, discussed further in Part II of this study), but even the lesser claims commonly fail to notice that the very limited changes which appear to have occurred thus far remain largely confined to relatively unattractive youth-sector jobs and occupations. This situation, if it persists, is likely to continue to give most older workers a considerable incentive to opt out of further work and choose instead full retirement, although it is possible that higher-level opportunities in smaller firms may grow and should be encouraged (Doeringer and Terkla).

E. Japanese-style "Re-contracting," Wage Floors, and Institutional Innovation

Some observers believe that there is an alternative, privately efficient, equilibrium -- perhaps awaiting new knowledge, a growing demand for "contingent" workers (Belous 1990), or different statutory constraints -- that might employ more older workers in the U.S. economy as partial or phased retirees. Besides part-time work, this new equilibrium might involve improved full-time bridge jobs, job sharing, more flexible hours, advisory roles, and contracted temporary work. A commonly cited (though not yet thoroughly understood) case-in-point is Japan's traditional institutional arrangements, which have employed a significantly higher percentage of older workers than is observed in other industrialized nations (Schulz, et al, 1988; Davis 1988). Japanese older workers have worked both part time and full time. However, prevalent practice in Japan has relied on early "career retirement" at age 55, although the government has been encouraging later ages of retirement in recent years. Career retirement has typically involved a significant cut in pay and on-the-job prestige for a post-career Japanese worker (these losses of pay and status have been traditionally offset in Japan by cultural veneration of the older population). More pervasive changes in the current U.S. system of employing older workers, if desirable, may thus similarly require more re-assignments or channeled separations and age-related cutbacks in compensation.[47]

Unlike in Japan where age-related employment adjustment or re-contracting has been more

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common, older workers in the U.S. have been more apt to resist wage cuts and loss of work-related prestige. Besides greater association of elder prestige with career employment in the U.S., higher reservation wages among older workers in the U.S. may also be due, in part, to more generous private and public pension arrangements. Because accurate life-cycle forecasts for individuals are not feasible, Social Security, private pensions, and upward-sloping seniority wage profiles may all perform roles of social insurance for risk-averse younger workers against contingencies that may cause them to become less productive with advancing age or inadequately prepared for retirement via personal savings.[48] While similar institutions exist in Japan, one advantage of Japan's significantly higher personal savings rate may be that it facilitates a more easily acceptable, lengthy period of bridge-job employment, phased retirement, and partial retirement for the typical older worker.

The observed loss of pay in most Japanese (and U.S.) bridge jobs is consistent with arguments made above that pressure on pay among older workers, based on current productivity and other constraints (such as implicit-contractual constraints), tends to be downward and variance-increasing (across workers and perhaps also time). While the ADEA has combatted old-age prejudice in the U.S., it also might create a somewhat informal "wage floor" for older workers. This might further inhibit prevailing wages from falling to market clearing levels -- providing higher wages and encouraging longer careers or working lives for those lucky enough to find goods jobs or remain employed, but denying any employment to other older workers who might prefer to work. The symptoms of such a phenomenon can be either high unemployment rates (no longer found among older workers) or cautiously reluctant employers and extensive labor-force withdrawal.

There is much uncertainty over the future willingness or ability of higher-paying career firms or higher-level small firms to provide new roles for older workers with innovative partial- or phased-

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[47] Many U.S. workers might still not accept attractive partial-retirement jobs in lieu of pension income. Employer-provided pensions in Japan have traditionally been lump-sum. Some experiments in various countries have been surveyed by Morrison (1979).

[48] The social-insurance role of Social Security is well known. For theories which argue that private pensions and rising seniority wage profiles play very similar roles see, e.g., Bodie (1990), Smith (1977), and Harris and Holmstrom (1982). These arguments also suggest one reason why individual workers are commonly subjected, even by private-sector institutions, to the same set of rules.

retirement job offers. One thing does seem crucial if a new equilibrium employing significantly more older workers in the U.S. is desired or is to be reached. Because reduced pay is likely to be the norm, new opportunities for older workers may have to offset this loss with non-pecuniary benefits, principally work-hours flexibility and maintained status. The latter is easiest to provide through career-type employment -- either "re-contracting" with a career firm, starting a new role with some other firm in one's field of expertise (e.g., an advisory role with a smaller firm), or self employment. This type of change has already occurred for some older workers, but it is still far from the norm.

The observation that most firms have been slow or reluctant to embrace institutional changes that would offer better opportunities for older workers raises an important economic question: why would profit-maximizing firms pass up any significant and widespread set of profit opportunities to draw on valuable older human resources in innovative ways? It might be argued that an institutional innovation, such as the use of older workers in part-time advisory roles, generally produces non-appropriable information (e.g., because "methods of doing business" are not patentable). This might tend to imbue such innovation with the character of a public good, i.e., one employer bears the costs of discovering changes that may benefit many employers, so a socially suboptimal degree of experimentation may occur. However, the same argument might be made about almost any potential institutional change within firms. It might alternatively be suggested that employers are not so smart (or so driven by competitive forces) after all, and that their failure to develop the more flexible work arrangements that older workers require implies that they are missing an opportunity to increase profits. This is not the sort of argument that is likely to be well-received, or easily made, among economists. Absent some long lags or market failure, the longer that the current type of equilibrium persists, the more likely it is to be truly efficient.

IV. Conclusion

Considerable uncertainty remains about the true nature and social desirability of existing retirement patterns. As an adjunct to recent and proposed policy changes designed in part to stimulate greater work and later retirements (e.g., Social Security's increasing normal retirement age, or the

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proposed elimination of the retirement test), this paper has considered and developed a number of theories of the demand-side constraints faced by older workers. The extent of these constraints clearly suggests that the opportunity set of a typical older worker may be more complicated and limited than even careful analyses of retirement behavior have commonly assumed.

Prejudicial age discrimination, it was argued, likely persists to some extent even in a stable, privately efficient equilibrium. Even so, age discrimination may play a minor role in the differential treatment of older workers overall. It is not entirely clear whether this has always been so. The magnitude of the ADEA's marginal contribution is unclear. This issue remains a (difficult) empirical question, but the large number of alternative (non-discrimination) hypotheses is compelling. Many of the work-related problems faced by older workers may reflect largely stable internal- and external-labor-market and life-cycle features that lead to non-prejudicial and privately efficient economic outcomes which are nonetheless adverse for older workers.

These labor-market and life-cycle features, in no particular order of importance, were seen to include:

1. individual statistical discrimination, which may increase with age due to a relatively high risk of employing, or especially hiring, from the pool of older workers;
2. long-term implicit contracts that create valuable benefits, but also late-career costs, such as:
    a. a mandatory or induced retirement date,
    b. lost specific human capital upon separating from a career firm, and
    c. difficulties in "re-contracting" with career-field firms, even at reduced rates of pay;
3. reduced incentives, all around, for renewed human-capital formation with greater age;
4. technological skill obsolescence and certain physical limitations;
5. an optimal age structure within firms reflecting the career cycle of work and retirement incentives, long-term company finances, sequential job tasks, promotion prospects, and changing technologies;
6. the technology and fixed costs of employment, which limit the availability of part-time work and lower its compensation;
7. a reluctance of most older workers to accept a significant wage cut in conjunction with a sharp reduction in employment-related social status;

and many other constraints discussed further in the text. In view of these numerous labor-market constraints, any successful national policy to induce greater work and later retirements from older workers may have to give greater, more realistic attention to the structural limitations imposed on older workers from the employer or labor-demand side.

For legitimate economic reasons, career employers may at some point prefer to steer older

workers out the door. For these and other economic reasons, new post-career opportunities for older workers have been and may continue to be generally limited to relatively unattractive sectors and occupations (excepting more fortunate or higher-skilled older workers). Consequently, the engineering of longer working lives and later retirements, while still providing adequate social insurance and pension protection for the elderly poor or near-poor, may be a more difficult policy goal than some have claimed or imagined. The ADEA, touted demographic shortages of younger workers, and further supply-side policy changes in Social Security may be inadequate means, certainly by themselves at least, for attempting to employ significantly more of the older population while still safe-guarding the well-being of older individuals. Supplemental new or stronger age-work policies may be required, such as subsidies to re-training or to pilot experiments with advisory roles for older workers, greater counseling of older job searchers, a shoring up of resources for older workers at the Employment Service, and insurance of adequate compensation for those forced to work longer under arduous work conditions.[49] (The exact nature and balance of such policies should reflect improved empirical studies.)

Three general views of Social-Security and age-work policy choices can be evaluated in light of this paper (these views are commonly reflected in public debate over these issues). The first view tends to support the notion that old-age discrimination in labor markets is the major cause of limited work opportunities for older Americans. This view also tends to strongly support the ongoing need for Social Security programs and other protective benefits for older individuals. The arguments in this paper tend to undermine the age-discrimination side of this view, suggesting that government interventions against age discrimination appear to be growing against a much-exaggerated or misunderstood foe. However, the Social-Security side of this first view is by and large supported by this paper. Adverse labor-market outcomes for older individuals may tend to be privately efficient, but this appears to be the main reason why such outcomes persist, and it is therefore one of the main reasons why Social Security exists and is likely to also remain.[50]

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[49] Sum and Fogg (1991) recommend expansions in the Job Training Partnership Act and the Senior Community Service Employment Program targeted at (1) displaced older career workers, (2) older individuals outside the labor force who still express interest in immediate employment, (3) the older working poor and near poor, and (4) poor older married women and widows.

The second view usually tends to downplay the importance of age discrimination, but it also tends to downplay the social value of Social-Security programs, or to argue that these programs have become excessively generous or mis-structured. Gary Becker (1990) briefly frames this view of "what keeps older workers off the job rolls" by pitting the claim of widespread age discrimination against his claim of detrimental government interference from Social-Security rules and an intrusive and confusing ADEA. Becker argues that older workers' problems are often misunderstood, commonly placing employers, courts, regulators, and legislators, not to mention older workers themselves, in a quandary. In this "government-interference" view, the implication is drawn that if only the ADEA were scaled back or eliminated, while Social Security's retirement test is eliminated and other policy changes reducing government intrusion are perhaps made also, then all would be well for older workers, or at least as good as it can be. As noted, this paper's arguments have tended to concur that the labor-market problems of older workers have often been misunderstood through the misleading age-discrimination label. But because some age discrimination can and will persist, even in largely competitive markets, the need for the ADEA seems clear. It is the <u>direction</u> that age-discrimination laws have taken -- into mandatory retirement and other issues, and away from the basics of enforcement -- that may be misguided. Age-discrimination laws might better focus on improvements such as upgrading empirical or evidential methodologies, expanding where practical the scope of legal prejudice to clearly include erroneous stereotypes (Levine 1988), and establishing sufficiently high and certain penalties for real abuse.

This paper has perhaps most importantly demonstrated that there is a third view of Social-Security and age-work policy choices, which is also (like Becker's view) based mainly in economics. Once again, this view suggests that structural labor-market and life-cycle features tend to persistently

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[50] Akerlof and Dickens (1982: 317) suggest that cognitive dissonance makes the demand for older workers an uncomfortable subject for many: "If there are some persons who would simply prefer not to contemplate a time when their earning power is diminished, and if the very fact of saving for old age forces persons into such contemplations, there is an argument for compulsory old age insurance... persons may find it uncomfortable to contemplate their old age." This factor may help to explain not only the popularity of Social Security legislation, but also, through reluctance to contemplate difficult or unpleasant alternatives, the popularity of age-discrimination legislation, the support for outlawing mandatory retirement, and even some of the lack of study of the demand for older workers.

diminish work prospects for older workers in ways that may be more important than either the allegedly pervasive or pernicious effects of age discrimination or government interference. This third view, which might be called the "structural/life-cycle" or "age-correlation" view, implies that greater age *per se* is very often correlated with, but is seldom the direct or proximate cause of, labor market problems. Age simply tends to bring other disabling or limiting factors into play that are the direct causes of reduced work opportunities for older workers.

Variants of the three views offered here are certainly possible, of course. Supporters of the government-interference view seem more likely to point to the postwar trend toward earlier retirement with alarm (linking this to liberalization of Social-Security benefits, etc.), although this is not a defining trait. Structural/life-cycle views tend to be less concerned by retirement trends, noting, for example, that the secular trend toward earlier retirement may largely reflect individual preferences (Burtless and Munnell 1990). The more central, enduring problems, often too easily forgotten, appear to be structural segregation of most older workers away from relatively desirable job opportunities, and long-standing and continuing employer reluctance to institute a broader range of new opportunities for partial and flexible retirement. In working through a large number of rather austere economic arguments, this paper has tried to remain sensitive to the pain or stigma for many older workers that is induced by labor-market problems. Too often, it seems, in current policymaking, this pain or stigma tends to be merely placated by focusing on a straw-man or bogus villain. If work and retirement issues faced by older workers continue to be commonly debated in these terms, then older workers may be the major losers as more important structural/life-cycle causes of their labor market problems remain relatively neglected.

Appendix A. Potential Sources of Persistent Age Discrimination

Employers may have a "distaste" for older workers or, conversely, a "taste" for younger workers. Goldberg (1982) showed that "nepotism" or favoritism -- e.g., pro-youth attitudes -- can persist in a competitive equilibrium. However, because favoritism typically stems from close-knit groups (Cain 1986: 716), and because outside investors may care only about profit performance, it seems unlikely that older workers are victims of strong, persistent, and conspiratorial behavior that favors a large and diverse majority like younger workers.

Alternatively, labor unions and governments represent monopolies that can sustain prejudicial employment under certain conditions (Cain 1986: 719-22). But there is little or no evidence that unions (where older workers, because of seniority, are often given more clout) or governments have operated with any significant prejudice against older workers. Debatable exceptions might involve safety-regulated occupations, such as commercial pilots, or enforcement of advancement opportunities for younger union members.

Customer discrimination can also offset the potential profit gains from employing older workers more fairly and efficiently. However, evidence here is again scant. Customers may tend to favor older workers in some markets (especially those that attach a premium to experience), and customer dissatisfaction (e.g., with the speed of an older cashier) must not be confused with discrimination.

Imperfect competition is a commonly cited supporting factor for many social ills, including discrimination. Economic rents from any source may cushion the blow of lost profits from inefficiently employed resources. In a related vein, rent-seeking behavior may allow technical inefficiency to persist. Such arguments raise various *a priori* possibilities, but this remains one of the more poorly understood and contentious areas in economics. If firms are indeed able to promulgate various inefficiencies, even over the long haul, then it is not immediately obvious why one source of inefficiency -- the employment of older workers -- merits special interest; or why potential cost savings, and potential entrepreneurs, don't persist as well.

Appendix B. Dilemmas of Individual Statistical Discrimination

Individual statistical discrimination raises the moral dilemma of individual rights to "maximum equity" vs. group or societal rights to a "maximized size of the pie." This is more than just a political question when it involves the rights of currently identified individuals vs. those of unidentified or merely statistically identified individuals elsewhere or in the future. Our ethical and legal systems often put an exhaustive premium on individual justice, but productive and market efficiency, by balancing marginal benefits and costs, generally does not.

The text's assumption of unbiased forecasts or estimates, for example, does not assume the strong form of rational expectations -- i.e., that the firm has estimated or discovered (or acts as if it knows) the "true" or "best possible" model (encapsulated into α and y) to predict q. Rather, a weaker form of rational expectations is assumed: unbiasedness conditioned on an efficient, partial use of information. Competition acts to ensure that a surviving firm's subjective expectation of q, given y, is equal to the objective expectation of q, conditional on y. y and α summarize much information, but they are not the full information set. A profit maximizing forecast of q is thus partially informed; it is not the best (i.e., least-variance) unbiased forecast of q that would be possible in principle. If, from an initial equilibrium, the marginal cost of obtaining better information about individuals falls, and nothing else changes, then γ should rise, causing the Var(q|y) [$= (1 - \gamma)$ Var(q)] to fall.

It may be claimed that, regardless of what markets and efficient profit-maximizing behavior dictate, treatment of any individual on a set of categorical bases (like age), in disregard of individual merits, seems like the very essence of unfair stereotyping. Individual discrimination in this vein -- being rewarded less than one's true value (or potential value) in production, while others are rewarded their value (if not, indeed, more) -- is so morally repugnant to many that doing away with it entirely seems like the only worthy goal. Compelling as it seems, however, this argument has a couple of problems, as should be clear by now.

For one thing, as noted in the text, since all workers are susceptible to individual statistical discrimination and the ϵ's are random, there are undeniable symmetries in such individual

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discrimination. In an egregious case, for example, a poor (by any standard) younger worker may be mistakenly hired, promoted, or kept on over better older workers. But in another egregious case, some poor (by any standard) older worker may be mistakenly hired, promoted, or kept on over better younger workers. Since the equilibrium errors are random overall, neither group can be said to suffer relative to the other, which is small comfort to individual victims but relevant to our view of the firm's (and society's) fairness.

The other problem with the "morality" argument is its assumption that perfection is attainable. In most production settings, it is simply impossible to perfectly predict or even measure an individual's value in production. The more relevant question thus concerns the social optimality of the firm's use of information. Some authors in the area of statistical discrimination (e.g., Lundberg and Startz, Lundberg) have assumed that competition forces firms into the strong form of rational expectations (use of any and all available information to achieve the best possible measurements and predictions under current technology). Under this paper's lesser assumption, it is tempting but probably over-reaching to argue that society should force firms to spend more resources on reducing individual discrimination. As argued in the text (p. 9), some thorny problems of identification arise.

Regarding turnover and morale problems that may reduce the $\text{Var}(\epsilon)$, in the case of older workers turnover may be less potent, but morale problems may be more potent (e.g., through influences on younger workers and subordinates). The ADEA, which has encouraged firms to evaluate older individuals more carefully, can be thought of as raising still further the price of individual statistical discrimination against older workers. Private pensions, Social Security, and unemployment insurance offer at least a crude system of "compensations" for individual inequities.

Appendix C. Statistical Discrimination and the Risk of Employing Older Workers

From $Var(q_o) > Var(q_p)$, it is not obvious that $Var(q_o|y_o) > Var(q_p|y_p)$ because

$$\gamma = \frac{Var(q)}{Var(q) + Var(u)} .$$

(See equation [4] in the text.) Consider the relative uncertainty in evaluating older vs. prime-age individuals (u_o vs. u_p). If $Var(u_o) \leq Var(u_p)$, then $\gamma_o > \gamma_p$ (i.e., the y score is a <u>more</u> reliable indicator of q for older workers). Intuitively, this follows from

$$Var(y) = Var(q) + Var(u) .$$

An increasing $Var(q)$ alone with greater age implies that the "signal/noise" ratio in y -- $Var(q)/Var(u)$ -- grows. In this case, therefore, from equation (4) in the text, $Var(q_o|y_o)$ is greater than, less than, or equal to $Var(q_p|y_p)$ -- i.e., older workers are more or less risky -- depending on the magnitudes of parameters (the $Var(q)$'s vs. the γ's).

Given $Var(q_o) > Var(q_p)$, $Var(u_o) > Var(u_p)$ is required -- it is necessary, but not sufficient -- for a lower signal/noise ratio among older workers. Furthermore, $\gamma_o < (>) \gamma_p$ if the signal/noise ratio is lower (higher) for older workers: $Var(q_o)/Var(u_o) < (>) Var(q_p)/Var(u_p)$. Thus, in both cases for the relative magnitudes of $Var(u_o)$ vs. $Var(u_p)$, $Var(q_o) > Var(q_p)$ implies that older workers as a group <u>may</u> be considered more risky than prime-age workers, depending on parameters. Older workers are <u>definitely</u> more risky if their signal/noise ratio in y is lower.

Appendix D. Cash-Flow Risk from an Aging Work Force under Lazearian Contracts

The risk of cash-flow problems can be significant. Lazear (1988) shows that even relatively small implicit bonds (a 1/6th underpayment to young workers, for example) can lead to large obligations (8% of the wage bill) that must be covered by returns from the firm's long-term saving and investing strategies. Ironically, if steeper deferred-payment profiles shape greater work incentives and productivity, then some of the most productive firms may be at greatest risk because of larger deferred-payment obligations. Another problem is that some firms may have misinterpreted the baby-boom inflow of new younger workers (with their VMP - w surpluses) as a permanent change, while others might use the population bulge to justify later shortfalls. In cases like these, a firm may have already spent its boomer-bonding windfall when older-boomer liabilities come due.

Lazear suggests that lowering the average career-retirement age of future older workers through implicit pension buyouts and so on may be the most likely strategy of a firm attempting to stave off cash flow problems. By doing this, firms can, for example, replace high late-career real wage premiums and mounting real pension obligations with more downward-flexible (nonindexed) pension benefits. This improves a firm's real cash flow beyond the severance period.[51] A coinciding corporate strategy could seek to maintain or raise productivity in ways other than deferred-payment incentives, while cutting back on late- and post-career compensation promised to baby-boomers. Firms provide no guarantee that a worker's return will cover the value of his/her implicit-bond advance. Workers share some of the risk in firm and asset performance (unavoidably when contractual commitments are only implicit). Cuts may tend to be greater for those further from retirement age, however, since it is harder for these workers to claim a "breach" of implicit contracts. Risk sharing may be most acceptable to workers when it is made clear *ex ante*, and when risks are shared equitably across workers, managers, and owners. Reducing the steepness of compensation profiles may be facilitated through similar policies in other firms, efficiency wages, and/or "newer" methods of addressing the agency problem (e.g., worker participation in decision making).

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[51] Health insurance and its integration with Medicare may alter this to some degree.

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