# Aging, Retirement, and High-Skill Work Performance: The Case of State Supreme Court Judges

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**Abstract**

The goal of this paper is to document how high-skill work performance changes in response to biological aging, and the implications of this has for employment policy. Our data set is constructed from the work product of all state supreme court judges for the years 1947 through 1994. Older judges have the same work output as younger judges but write lower-quality opinions. Older judges use a different writing style, with shorter words but longer sentences. Conditional on current age, judges who retire later in life write write higher-quality opinions than judges who retire earlier in life. Mandatory retirement policies have a demotivating effect on judge work output, but not on work quality.

## 1 Introduction

The increase in both the quality and length of the human lifespan poses an important public polity issue, namely what is the appropriate employment contract as people age? Under the Age Discrimination Act passed by the US Congress in 1966 it is illegal to use age as a criteria

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for employment. Rather, as a matter of law employers can only use on the job performance as a criteria for employment. The challenge is that human performance, particularly for complex tasks, is very difficult to measure, yet also correlated with age. The question then is how should employment contracts be designed to deal with aging employees?

In some occupations there are clear preformance measures. For example, the performance of atheletes is measured in competitive tournaments. There is a large body of evidence that documents the decline in performance over time, and hence not surprisingly most professional atheletes are young. However, given the ability to measure performance accurately, highly skilled athelets can continue to perform to middle age. Even if there is a decline in their personal performance with age, their high skill level can allow to continue to make a contribution even when they are older than the average athelete in their sport.

This heterogeneity in the age at which an athelete retires from competitive sports is very much consistent with the goals of the age discrimination act - employees should be continued to be employed as long as they are productive. For this reason mandatory retirements rules, with some exceptions, have become illegal in the United States. Title IX in the uniThe purpose of this paper is to compare the effect of the two main employment policies that are used in practice. One is the use of mandatory retirement under which an individuals is required to leave employment at a pre-specified age. The second is a policy of no fixed retirement dates, with individuals continuing to work as long as their performance is satisfactory.

In this paper we compare the effects of these two policies using a unique dataset that follows the employment patterns of state appellate court judges. We exploit the fact that over our time period a number of states implemented changes to their employment policies, and introduced mandatory retirment ages for these judges (either 70 or 75 years of age). The reason such policies are implemented is because of the perception that older judges may not be able to carry out their work effectively.

An unusual feature of judging, relative to most other jobs today, is that the nature of the work has remained essentially unchanged for decades. This allows use build meaningful measures of the both the output (number of cases) and the quality (case citations) that allows us to document the variation in performance over time, and as a function of the retirement rules.

We address the following questions. First, in states with no manadatory retirement judges voluntarily choose to leave the bench. We explore two questions. First, how does the performance of a judge vary over time? Second, is there a relationship between the performance of a judge, and their voluntary decision to leave the bench?

Next, we consider the effect of introducing a manadatory retirement rule. This has two effects. First, for judges currently on the bench, the introduction of the rule changes their ex-

pectations regarding their future work career. In theory there are two countervailing effects. Judges facing retirment might work harder in order to secure a new job upon retirement. It is very common for retiring judges to enter into private work, such as judging arbitration cases or mediation work. Alternatively, finding such work may require search, in which case performance might decling with the introduction of a manadatory retirment rule.

Finally, we can ask if the performance of the court as a whole improves with the introduction of mandatory retirement. Here we exploit the fact that some states did not introduction such a change, and we can ask how the rule affect relative influence of the courts.

Appellate judges review decisions made by lower courts and then explain, through published opinions, why these decisions should be affirmed, modified, or reversed. Researching for and writing these opinions is the appellate judge's primary professional concern. As discussed at length in Choi et al. (2008) and Ash and MacLeod (2016), opinions provide relatively clean measures of quantity and quality of work output.

The first goal of this paper is to provide descriptive statistics on the performance of state appellate judges over the life cycle. Previous work by (e.g. Posner, 1995; Smyth and Bhattacharya, 2003; Choi et al., 2013) is limited to looking at the effect of age in the cross-section. Our data is from 1947 until 1994, and hence we are able to follow many judges through out their career. This, combined with the fact that the job has not changed much in the last 200 years provides a unique opportunity to explore the effect of age upon performance of a complex task.

The second goal is to analyze the effects on performance of judge mandatory retirement policies. Mandatory retirement could improve court performance by removing older, low-performance judges. It may also have a demotivating effect on judges who must seek alternative careers.

Our results can be summarized as follows. Relative to their younger colleagues, older judges have about the same level of work output, but write lower-quality decisions that are cited less often by future judges. Older judges use a different writing style, using shorter words and longer sentences. Conditional on current age, judges who retire later in life write write higher-quality opinions than judges who retire earlier in life. Mandatory retirement policies have a demotivating effect on sitting judges.

The rest of the paper unfolds as follows. Section 2 reviews the literature. Section 3 examines the mechanisms relating aging and performance. Section 4 characterizes the institutional setting, while Section 5 describes the data. Section 6 provides some descriptive evidence about aging and retirement among state supreme court judges. Section 6 estimates the impacts of mandatory retirement policies on judge performance. Section 7 concludes.

# 2 Literature Background

Desjardins and Warnke (2012) review the large literature on how aging affects cognitive skills. The evidence is generally consistent with the view that while pattern recognition and logic skills (fluid intelligence) begin diminishing at a young age, verbal skills (i.e. writing skills) and knowledge (crystallized intelligence) improve into relatively advanced ages. Importantly, within-person and between-person studies have found very different age-skill profiles. For example, Small et al. (2011) report a within-person study where episodic/semantic memory demonstrated no decline before the age of 75. The articles reviewed in Lindenberger (2014) suggest that an "intellectually challenging" and "socially engaged" life – such as judging – may itself mitigate cognitive decline.

A smaller literature has investigated aging effects on "wisdom" – that is, reasoning about and resolving social conflicts. Grossmann et al. (2010) show that when thinking about social dilemmas and inter-group conflict, "older people make more use of higher-order reasoning schemes that emphasize the need for multiple perspectives, allow for compromise, and recognize the limits of knowledge." These are all attractive qualities in a judge.

The approach in labor economics is to abstract away from different types of cognitive decline and focus on the age-skill profile. The standard model features a concave relationship between age and productivity, where younger individuals invest in human capital that depreciates over the lifespan (e.g., Blundell and Macurdy, 1999). Empirical papers consistent with this pattern include Levin and Stephan (1991) (academic scientists) and Oster and Hamermesh (1998) (academic economists). In a review of age-performance trends among physicians, Choudhry et al. (2005) conclude that "older physicians possess less factual knowledge, are less likely to adhere to appropriate standards of care, and may also have poorer patient outcomes."

An important reason to study judge performance in this context is that the knowledge and skills relevant to good judging evolve much more slowly than those relevant to good science and good medical care. In Posner's (1995) sample of federal appellate judges, opinion quality (citations per opinion) is maintained into advanced age – into the 80s. Older judges produce fewer opinions, however. Posner argues that this is consistent with the idea that older people tend to be more reflective, less career-oriented, and less progressive. More recent studies are generally consistent with Posner's findings. These include Smyth and Bhattacharya (2003) (Australia High Court), Teitelbaum (2006) (U.S. Supreme Court), and Dimitrova-Grajzl et al. (2012) (Slovenian trial courts).

The key policy relevance of age-performance elasticities is in the design of pension benefits and other age-related policies (Gruber and Wise, 2008). In particular, there is a large and

active literature on the economics of retirement choices (Lumsdaine and Mitchell, 1999). For example, Ashenfelter and Card (2002) find that a mandatory retirement age of 70 is binding on many academic faculty, meaning that imposing this requirement significantly reduces the number of older academics.

In a study of retirement among federal appellate judges, Posner (1995) notes that many judges take senior status, which allows for a reduced caseload while retaining full salary. However, only 16 percent of judges take senior status when immediately available. This suggests that there are significant non-pecuniary benefits to remaining a full-time active judge.

The political science literature has focused on how judges may strategically retire to influence the political ideology of their successor (e.g. Nixon and Haskin, 2000). Other papers have used retirement for identification, since judges planning to retire do not face the same retention-related incentives as judges who intend to stay in office (Gordon and Huber, 2007; Shepherd, 2009a,b).

The fruitful structural literature on retirement choice has not yet been applied to judges. This literature, beginning with Gustman and Steinmeier (1986) and Stock and Wise (1990), applies structural estimation methods from the industrial organization literature to predict worker responses to changes in pensions and other retirement incentives. Gustman and Steinmeier (1991) apply these methods to retirement choices for academic faculty, with comparable results to Ashenfelter and Card (2002). In political economy, Diermeier et al. (2005) and Keane and Merlo (2010) derive structural estimates of the parameters underlying retirement choices of U.S. Congressmen.

# 3 The Retirement Mechanisms

The purpose of this section is to discuss the incentives that are implicit in any retirement system. The economic problem. When Edward Lazear (1979) wrote his classic paper on mandatory retirement, the age of mandatory retirement in the US was raised from 65 to 70. Since then mandatory retirement has been eliminated except in a few cases where physical performance is important, such as police, firemen, pilots and airline controllers.

He show that if individual productivity is falling for all workers at a similar rate, then it may be optimal to have all workers retire at same fixed age. The reason that retirement may not be voluntarily is because workers may be on long term wage contracts under which wages are above a workers current marginal productivity.[1] This problem is solved by a manatory retirement rule that has all workers retiring at the same time.

[1]See for example MacLeod and Malcomson (1993).

The Age Discrimination Act of 1966 recognized that in general this is not true. There is a great deal of heterogeniety in worker performance. Moreover, declines in productivity with age can vary greatly between workers. Hence, congress required that for most workers there should be no age discrimination, and workers should be evaluated based upon their performance alone. In practice measuring performance is very difficult, particularly in the case of high skilled workers. As a consequence, a number of systems have been adopted to encourage efficient retirement. It should be noted that even in cases where mandatory retirement is illegal, employers can achieve essentially the same allocation by offereing generour retirement packages that are linked to a persons age. These are legal because the choice to retire is voluntary.

This section briefly discusses the implications of these different decisions for the retirement decision by a skilled worker. Our data is for state supreme court judges, and thus our empoyeed is call a "judge", though the model is applicable to any case of a skilled worker where output is difficult to measure. We are interested in the behavior of judge $j$ at time $t$. The judge $j$ is described by a vector of characteristics at time $t$, $X_{jt}$, which include age, ability, reputation, health status, etc. Some factors, such as health, are not observed directly.

At any period $t$, the judge chooses an effort level $e_t \in \mathbb{R}$, quality level $q_t \in \mathbb{R}$, and whether to continue working $r_t \in \{0, 1\}$.

The judge faces the following dynamic programming problem:

$$V\left(X_{jt}\right) = \max_{e_t, q_t, r_t} E\left\{r_t\{u(e_t, q_t, X_{jt}) + \delta V(X_{jt+1})\} + \left(1 - r_t\right)\delta V^R\left(X_{jt+1}\right)|X_{jt}, r_t, q_t, e_t\right\}$$

where $u(\cdot)$ is the value of working as a judge and $V^R$ is the present discounted value from retirement. If the judge does not retire, then effort and quality are choosen to solve:

$$\frac{\partial u}{\partial e_t} + \delta \frac{\partial E\left\{V\left(X_{jt+1}\right)|X_{jt}, r_t = 1, q_t, e_t\right\}}{\partial e_t} = 0, \tag{1}$$

$$\frac{\partial u}{\partial q_t} + \delta \frac{\partial E\left\{V\left(X_{jt+1}\right)|X_{jt}, r_t = 1, q_t, e_t\right\}}{\partial q_t} = 0. \tag{2}$$

Let $\{e_t^*, q_t^*\}$ be the optimal solution to this problem. From Ash-Macleod (2015) we know that Judges have an intrinsic preference for quality:

$$\frac{\partial u\left(e_t, 0, X_{jt}\right)}{\partial q_t} > 0,$$

and hence even in the absence of future rewards ($\frac{\partial V(X_{jt+1})}{\partial q_t} = \frac{\partial V(X_{jt+1})}{\partial e_t} = 0$), they still choose

positive effort and quality. If mandatory retirement is introduced at date $t+1$, then we have

$$V\left(X_{jt+1}\right) = V^{R}\left(X_{jt+1}\right),$$

and thus we can compare the returns to performance on and off the bench at date $t+1$ since we have at date $t$:

$$\frac{\partial u}{\partial e_t} + \delta \frac{\partial E\left\{V^{R}\left(X_{jt+1}\right)|X_{jt}, r_t = 1, q_t, e_t\right\}}{\partial e_t} = 0 \tag{3}$$

$$\frac{\partial u}{\partial q_t} + \delta \frac{\partial E\left\{V^{R}\left(X_{jt+1}\right)|X_{jt}, r_t = 1, q_t, e_t\right\}}{\partial q_t} = 0 \tag{4}$$

In this case let $\left\{e_t^{R*}, q_t^{R*}\right\}$ be the optimal solution.

In the absence of mandatory retirement, we observe individuals retire at all ages. This will occur at date $t$ if and only if

$$E\left\{V^{R}\left(X_{jt+1}\right)|X_{jt}, r_t = 0, q_t^{R*}, e_t^{R*}\right\} > E\left\{V\left(X_{jt+1}\right)|X_{jt}, r_t = 1, q_t^{*}, e_t^{*}\right\},$$

at the optimal choice for output and quality.

Judges are plaid set salaries with no explicit performance pay. The main rewards in mid-life are election pressure and intrinsic incentives. In our previous work we found evidence of both and hence we know that Judges can and do adjust their performance choices.

In this paper we are concerned with two questions. The first is how age affects performance over time. Are there systematic patterns. As judges age both death and illness are random events that can cause them to leave their position. While there are many judges who die on the job, on average they are a long lived group of individuals. The central question we wish to address is the variation in performance over time, and how this is related to the retirement decision.

Consider first the case with no mandatory retirement. In that case, older judges face three options. The first is to retire completely from the bench and not work. Let us call this option RR (real retirement) This is the option that for example an ill judge would take. Judges have high retirement incomes and hence the only reason not to retire is because they gain some intrinsic reward from judging. If that is the case, then the future is not relvant, and performance is given by:

$$\frac{\partial u\left(e^{RR}\left(X_{jt}\right), q^{RR}\left(X_{jt}\right), X_{jt}\right)}{\partial q_t} = \frac{\partial u\left(e^{RR}\left(X_{jt}\right), q^{RR}\left(X_{jt}\right), X_{jt}\right)}{\partial e_t} = 0.$$

What is interesting here is that their performance is affected only by their current character-

istics, $X_{jt}$. For such a judge, the question for the court is whether or not performance falls with time, and if it does at what point should the judge be replaced by a younger judge. Unless the judge internalizes the value of work for the court, judges such as these may stay on longer than is optimal.

A second case allows for "senior status". In that case the judge retires, but continues to work with a lower work load. Senior status can be applied in regimes with both with and without mandatory retirement. If there is not mandatory retirement, then senior status can be used to increase exit from the court. In other words, introducing senior status should increase exit, with an ambiguous effect upon court performance.

When there is mandatory retirement, then it is typically up to the chief justice to decide who can be put on senior status. The consequence is that before retirement the potential to have senior status creates an incentive effect, and we should see it increase pre-retirement performance.

Finally there is the potential for outside work. In this case, the effect depends upon what signals are available to the market. Since on the job performance is difficult to measure, but finding another job is costly, we should expect that it has a negative effect upon job performance, In particular, if retirement is imminent, then we might expect performance to fall as judges begin their job search.

The implicaton is that the effect of manadatory retirement on judge performance just before the mandatory retirement date is ambiguous, and hence is an empirical question!

# 4 Institutional Context

While state supreme court systems vary from state to state, they also share important characteristics and structures across state lines. The fundamental role of a state judge is to rule on questions of state law (rather than federal law). These questions arise in cases appealed from lower state courts. A case begins when a plaintiff files a lawsuit or a prosecutor indicts a criminal. At trial, facts are litigated and a judge/jury gives a verdict, which the losing party can appeal. If the state has an intermediate appeals court, they will then take the case and may affirm, reverse, or modify the trial verdict. After this intermediate court's decision (or after the trial decision when the state does not have an intermediate appellate court), the ruling can be appealed to the state supreme court.

If the supreme court accepts a case for review, the judges will rehear the case at oral argument and review the submitted briefs for legal error. Each judge votes whether to affirm or reverse the lower decision. One of the majority judges writes an opinion explaining the decision. In rare cases, the state supreme court ruling is appealed to the U.S. Supreme

Court.

This is the institutional context in which we study judicial incentives. Importantly, the job of a supreme court judge does not change much over the course of the career. A judge in his first year of work has essentially the same task as a judge in his last. Because the nature of the work remains constant throughout a judge's career, we can analyze the effects of aging on work performance over time.

Moreover, age-related effects may vary depending on judicial characteristics, which depend in part on how they are selected. There are three key judicial selection systems. In partisan elections, judges are selected through a partisan political process with party-specific primaries. In nonpartisan elections, party affiliations are not on the ballot and political parties are not allowed to get involved in the election process. In merit selection, judges are appointed by the governor from a list of nominees chosen by a merit commission.

# 5 Data

The data-set used for the empirical analysis is an extension of that used in Ash and MacLeod (2015) and Ash and MacLeod (2016). It merges information on judge biographies, state-level court institutions, and published judicial opinions. These data allow panel estimates on the effects of judge and court characteristics on performance. For this paper, we have supplemented the dataset in that paper with comprehensive data on judge birthdates and deathdates, how judgeships ended, and judge retirement policies.

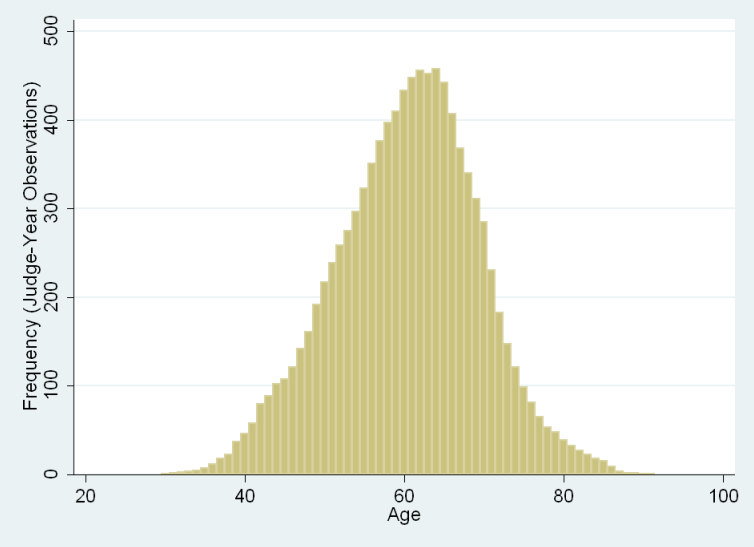
First we have data on the characteristics of individual judges. A team of research assistants collected these data from a range of sources and built biographies for each judge in the sample. The key sources include state court web sites, judge obituaries, and Marquis Who's Who. Items that were unavailable from these sources were obtained through records requests or interviews of state court administration staff.

The key data point for this study is the judge's birthday. For most of the judges in our data set, we were able to find their precise birthday. For almost all of the rest, we were able to find their birth year. The handful of judges for which we could not find birth year information are not included in the analysis.

Our performance data are constructed from the text and citations for opinions, as described in Ash and MacLeod (2016). Here we focus on quality, output, sentence length, and word length.

Our institutional treatment variables are changes in state court policies affecting the judge retirement decision. These are described in more detail in Section 7.

Figure 1: Age Distribution of Working State Supreme Court Judges




# 6 Descriptive Statistics on Aging and Retirement in States with No Mandatory Retirement

This section provides a series of descriptive statistics on the age and retirement decisions of state supreme court judges in the absence of mandatory retirement rules.

Figure 1 shows the age distribution for all state supreme court judges working between 1947 and 1994. Figure 2 shows the distribution of the starting age. Figure 4 shows the distribution of the ending age. Figure 5 shows the distribution of the age of death. Figure 6 shows the distribution of the number of years between termination and death.

The figures show that there is a wide range of ages of active working state supreme court judges. Judges tend to start in their position late in life (in their 50s) and work late as well (into their 70s). These individuals are relatively healthy, many living into their 80s and 90s. Many judges die on the job, but those that do not live for a long time afterward.

Next we provide descriptive statistics on how differences in ages affect performance. The empirical strategy for examining the effects of aging on judicial behavior is to exploit differences in performance between judges working in the same court at the same time, controlling for time-invariant judge-specific effects. We look at differences in output and quality by the age of a judge, $A_{ist}$, controlling for other judge and court-level characteristics.

One possible source of bias in this analysis comes from time-invariant characteristics of individual judges. Some judges may have higher or lower performance than others on average due to unobservable characteristics, and they may have relatively higher or lower age due

Figure 2: Starting-Age Distribution of State Supreme Court Judges

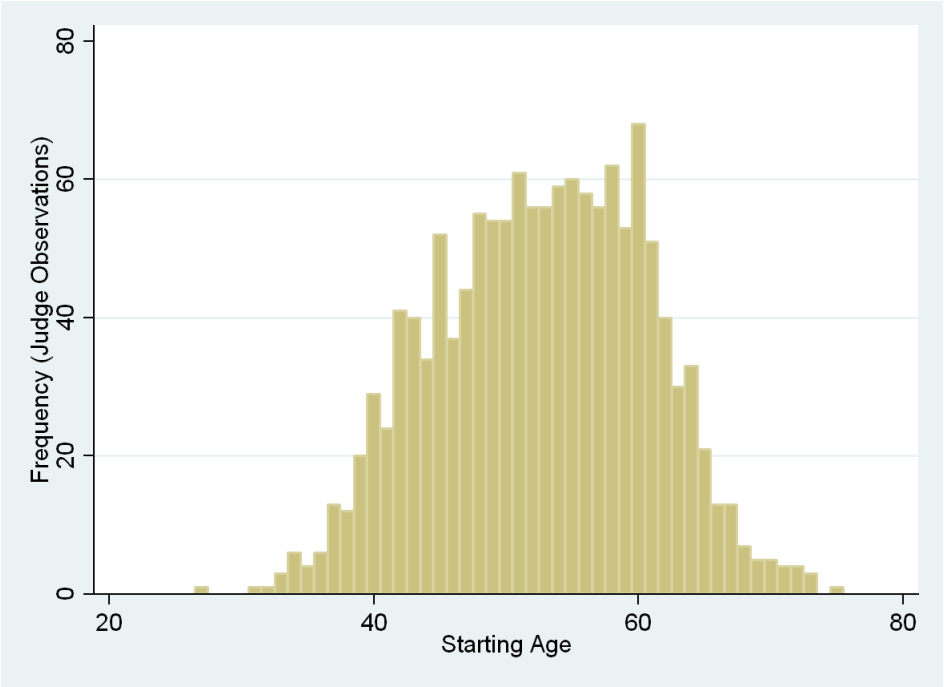



Figure 3: Ending-Age Distribution of State Supreme Court Judges

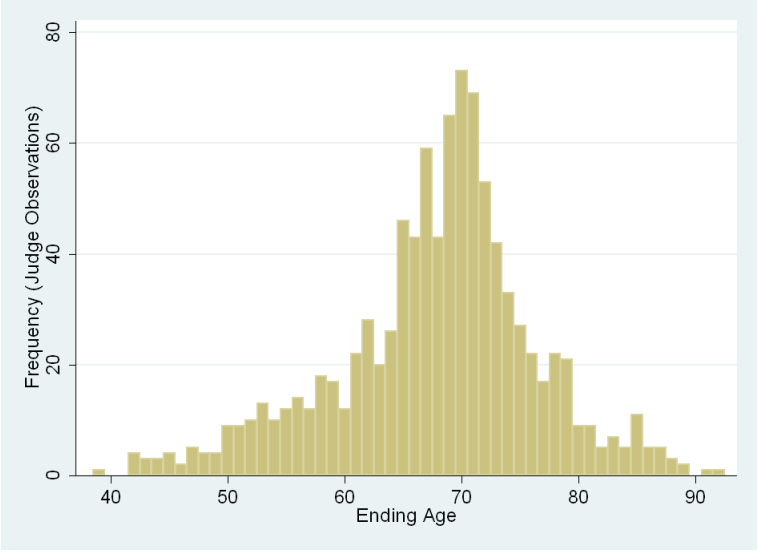
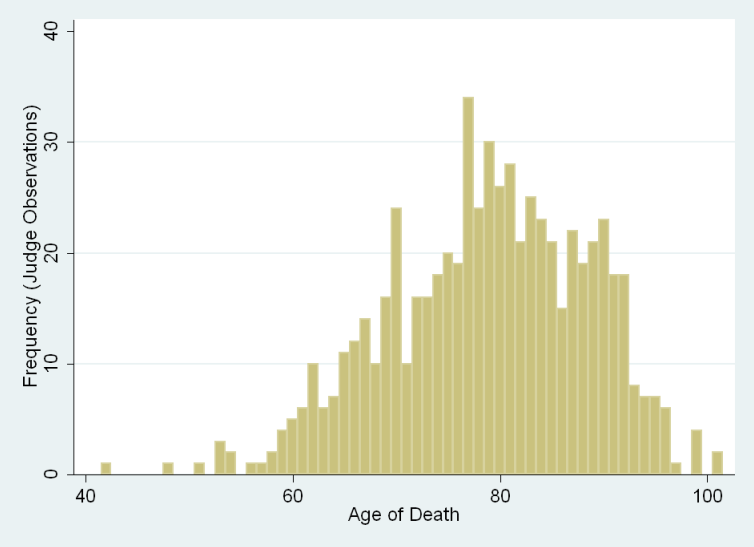


Figure 4: Age-of-Death Distribution of State Supreme Court Judges




to cohort effects. To deal with this possibility, we include a full set of judge-specific fixed effects. Therefore any estimated age coefficients are relative to a judge's personal average.

A second major source of bias comes from the time-varying changes in the court work environment which may be correlated with age. To deal with this possibility, we include a full set of state-year fixed effects. Therefore any estimated coefficients are also relative to the court average in each year. This means they effectively compare judges sitting on the same court, working at the same time, but who are of different ages.

The first specification is

$$y_{ist} = \text{State}_s \times \text{Year}_t + \beta \text{Age}_{ist} + \epsilon_{ist} \tag{5}$$

where $\text{State}_s \times \text{Year}_t$ is a fully saturated set of interacted state-year fixed effect for each $s$ and $t$, and $\text{Age}_{ist}$ is the age for judge $i$ at $t$. The estimate for $\beta$ will give the average difference in the outcome variable for each additional year of age, relative to other judges on the same court at time $t$.

We run OLS to obtain coefficient estimates from Equation 5. These estimates are reported in Table 1.

Next, we estimate Equation 5 without the age term, and obtain the residuals. We then plot the mean residualized performance variables, binned by the residualized age variable. These are reported in Figure 5. The regression table and the figure indicate the following. There is not much difference across ages for number of opinions written or total work output. However, there is a large and significant decrease with age in the quality of decisions, as

Table 1: Regression Estimates of Age-Performance Relationship

| | (1) Log Opinions Written | (3) Work Output | (5) Work Quality | (7) Word Length | (9) Sentence Length |
|---|---|---|---|---|---|
| Age | -0.0284 | 0.0000623 | -0.00742** | -0.0178+ | 0.850** |
| | (0.0257) | (0.00181) | (0.000961) | (0.00893) | (0.250) |
| N | 14968 | 14968 | 14968 | 14968 | 14968 |
| adj. R-sq | 0.441 | 0.519 | 0.786 | 0.625 | 0.462 |

measured by citations from later judges. In addition, there are differences in writing style. Older judges use shorter words and longer sentences.

Some other results of interest are that judges write fewer concurrences as they age, but not fewer dissents. Vocabulary size (unique words used) does not decrease appreciably. A text-based entropy measure increases with age. The number of previous cases cited (table of cases length) decreases. Publication delay (between submission of the case and publication) increases, but not significantly.

Figure 7 shows the major trends in output, quality, and readability by age for a balanced panel of judges. We plot the metrics separately by when the judges retired from their job. There is a clear selection effect, in the sense that the judges who last longer on the job tend to be better than judges who retire earlier.

Next we look at how judge performance related to the retirement choice. A basic question is whether judges tend to be better or worse than their colleages at the time they retire. Therefore we estimate a Cox survival regression, where the implicit outcome is retirement. We construct a dummy variable $GoodHalf_{it}$ equaling one when a judge is above the median decision quality in a court-year, and zero otherwise.

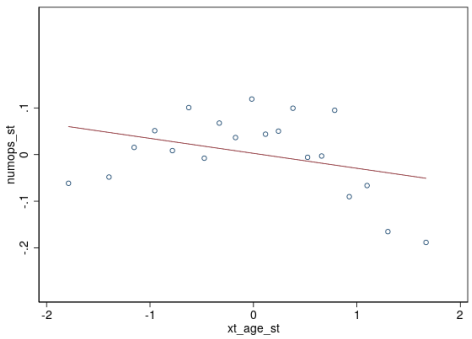
We plot survival estimates for supreme court judges, split by $GoodHalf_{it}$, in Figure 8. This graph shows that when judges retire, they tend to be better than their colleagues, conditional on age. This is consistent with better judges leaving earlier in order to pursue other career opportunities. Also consistent with this is that judges who get other jobs also retire earlier.

# 7 Effect of Mandatory Retirement Policies

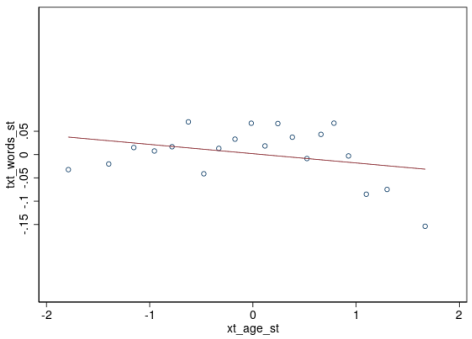
This section provides estimates of the effects of mandatory retirement policies on judge performance.

Table 3 lists the set of mandatory retirement rules for the state supreme courts in the

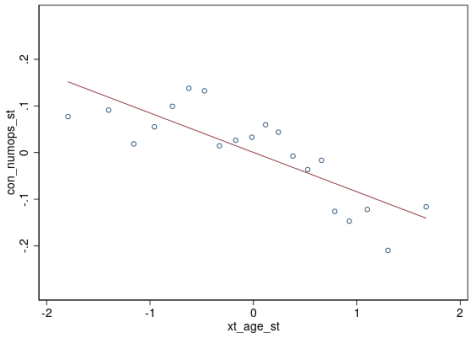
Figure 5: Performance-Age Profile, Residualized on State-Year Interacted Fixed Effects



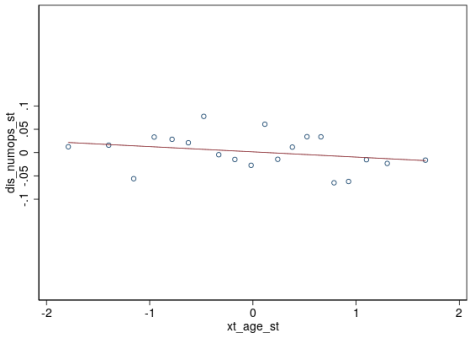

(a) Opinions Written



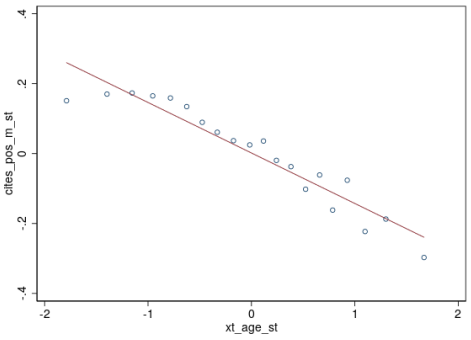

(b) Work Output



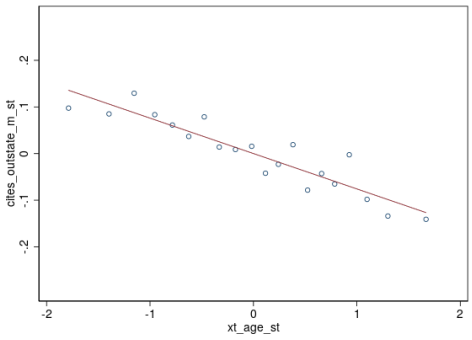

(c) Concurrences Written




(d) Dissents Written

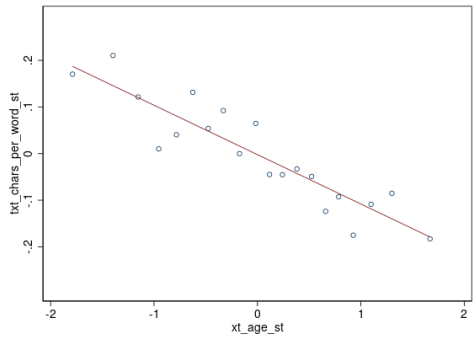



(e) Work Quality

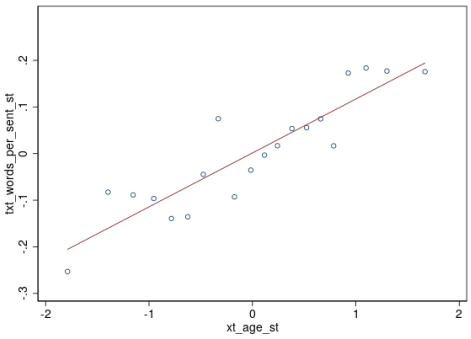



(f) Work Quality (Out-of-State Cites)

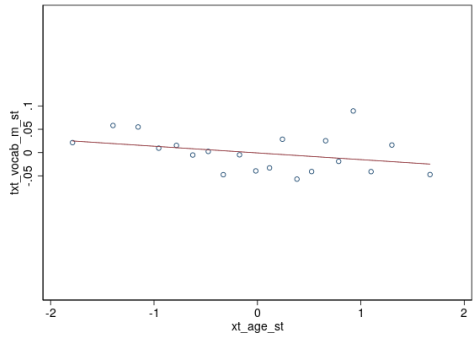
Figure 6: Performance-Age Profile (2), Residualized on State-Year Interacted Fixed Effects



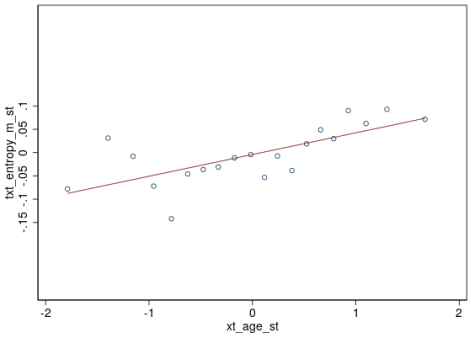

(a) Style: Word Length



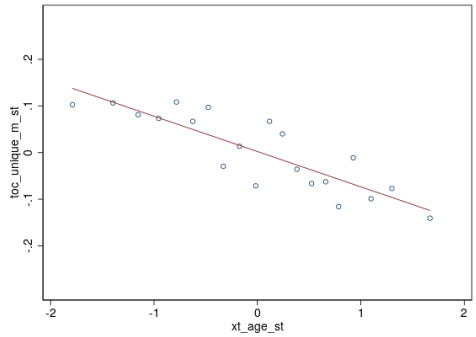

(b) Style: Sentence Length



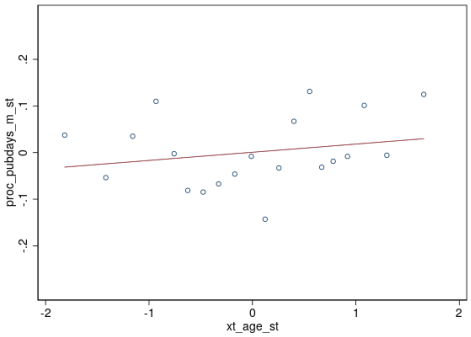

(c) Style: Vocabulary Size




(d) Style: Text Entropy



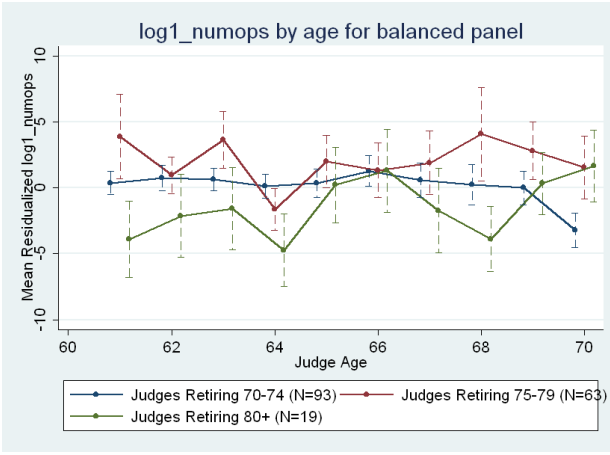

(e) Research: Table of Cases Length



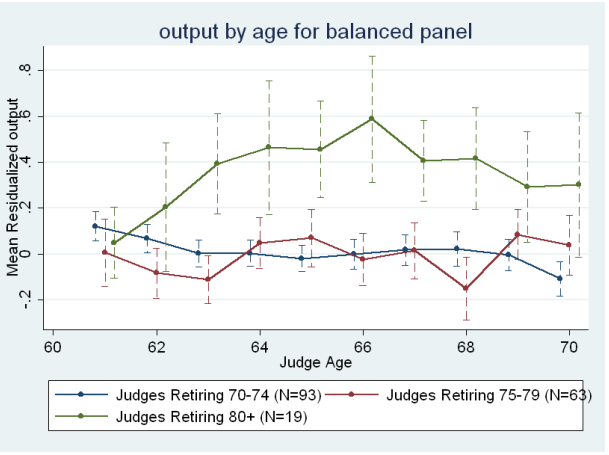

(f) Efficiency: Publication Delay

Figure 7: Judge Performance, 61-69, By Leaving Cohort

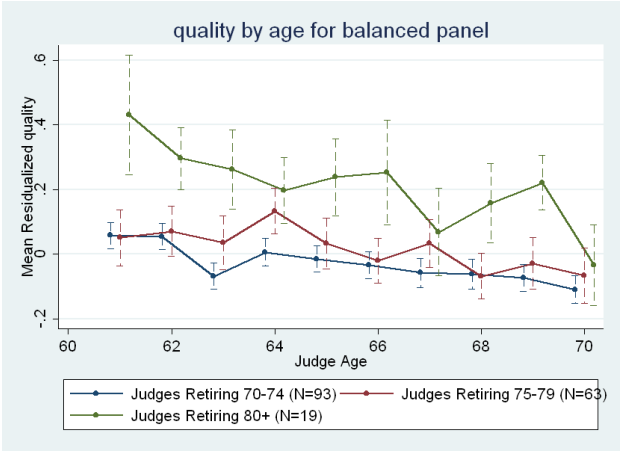
(a) Log Opinions Written



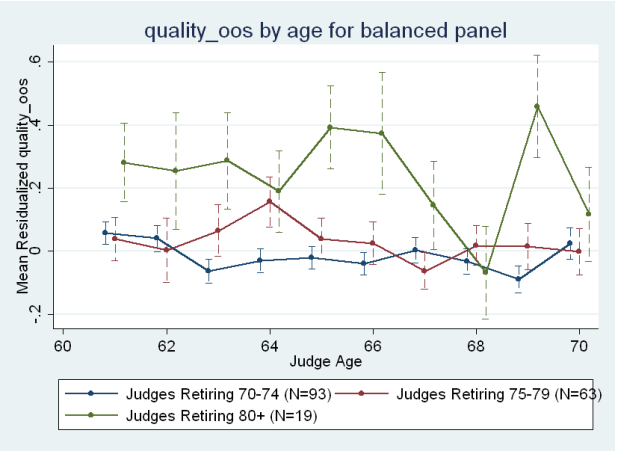

(b) Work Output



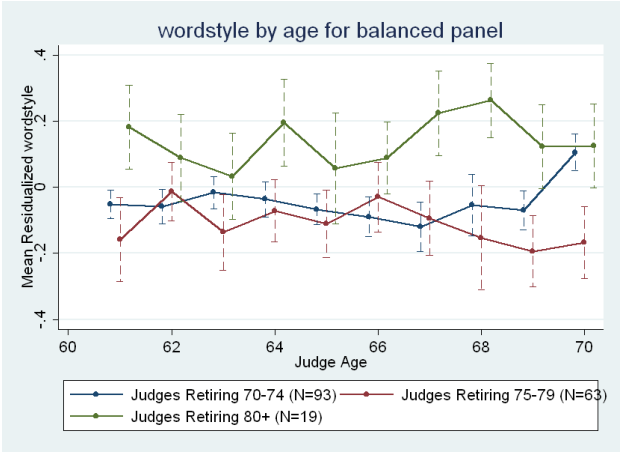

(c) Work Quality




(d) Work Quality (Out-of-State Cites)




(e) Style: Word Length




(f) Style: Sentence Length

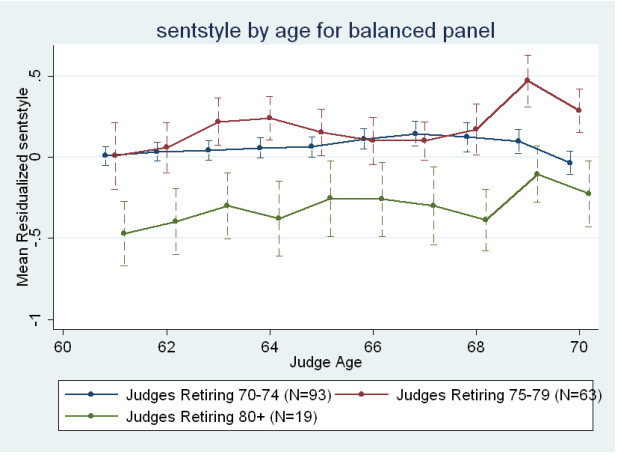
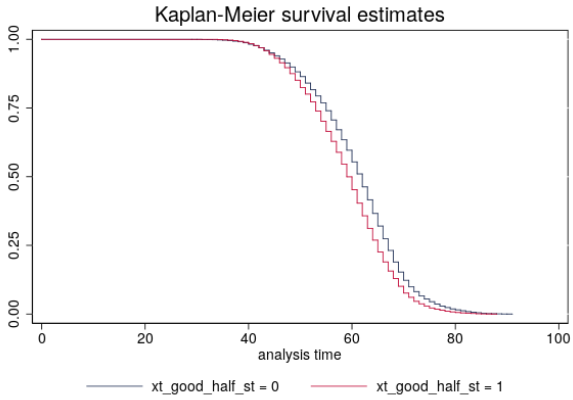


Figure 8: Retirement Hazards for State Supreme Court Judges

Judges Who Write Higher-Quality Decisions Tend To Retire




Judges With Outside Jobs Retire Earlier

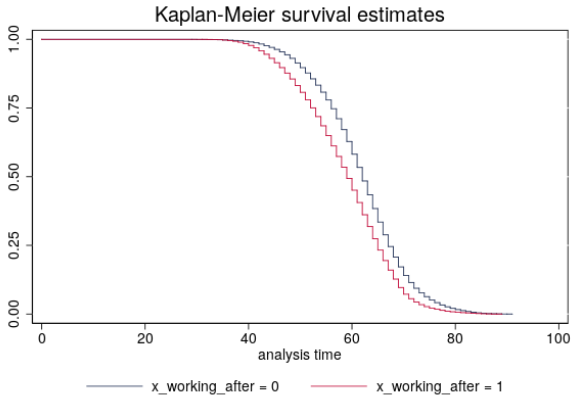



Table 2: Judge Retirement Rules By State in 1947

| Retirement Rule | List of States |
|---|---|
| No Mandatory Retirement | AR, CA, DE, GA, ID, KY, ME, MS, MT, ND, NE, NM, NV, OK, RI, TN, WI, WV, VT |
| Retirement at Age 70 | AK, HI, LA, MD, MA, MI,MO, NH, NJ, NY, OH |
| Retirement at Age 72 | NC, SC |
| Retirement at Age 75 | IL, IN, TX, UT |

Vermont (VT) has mandatory retirement at age 90; we classify it as no mandatory retirement since there are just 2 judges in our entire sample who live that long.

Table 3: Retirement Rule Changes, 1948-1993

| Mandatory Retirement Age | | List of States (with Year Enacted) |
|---|---|---|
| Before | After | |
| None | 70 | AL (1973), AZ (1992), CT (1974), FL (1972), MN (1973), PA (1968), VA (1970), WI (1955), WY (1972) |
| None | 72 | CO (1962), IA (1965), WA (1952) |
| None | 75 | KS (1993), OR (1960) |
| 70 | None | WI (1984) |

United States.

Figures 9 illustrates the impact of these mandatory retirement policies on the exit decision. The blue line, with no mandatory retirement, is relatively smooth, peaking in the early 70s. The red line, with mandatory retirement at age 70, shows big increases for ages 69 and 70. We see corresponding jumps for retirement at 72 (green line) and 75 (yellow line). The hazard plot in Figure 10 illustrates the same story, with judges more likely to leave under mandatory retirement under any given age. Figure 11 shows that without mandatory retirement (right panel), judges are much more likely to die within a year of leaving office. This again supports the idea that mandatory retirement is an impactful policy, as judges would tend to stay in their jobs until death otherwise.

## 7.1 Dynamic Effects of Existing Mandatory Retirement Rule

The empirical strategy for examining the effects of aging on judicial behavior is to exploit differences in performance between judges working in the same court at the same time, controlling for time-invariant judge-specific effects. We use the same specification as Equation 5, but we plot the residuals separately for (a) states with mandatory retirement at age 70, and (b) states without mandatory retirement.

Figure 12 shows the trends in output and quality by age for a balanced panel of judges between the ages of 50 and 70. The difference from Figure 7 is that the judges are plotted separately for states with mandatory retirement at age 70 (left panel), from states with no mandatory retirement (right panel).

In terms of case quality, there is no difference. However, for output, we see a steep

Figure 9: Retirement Rates by Age, by Mandatory Retirement Age

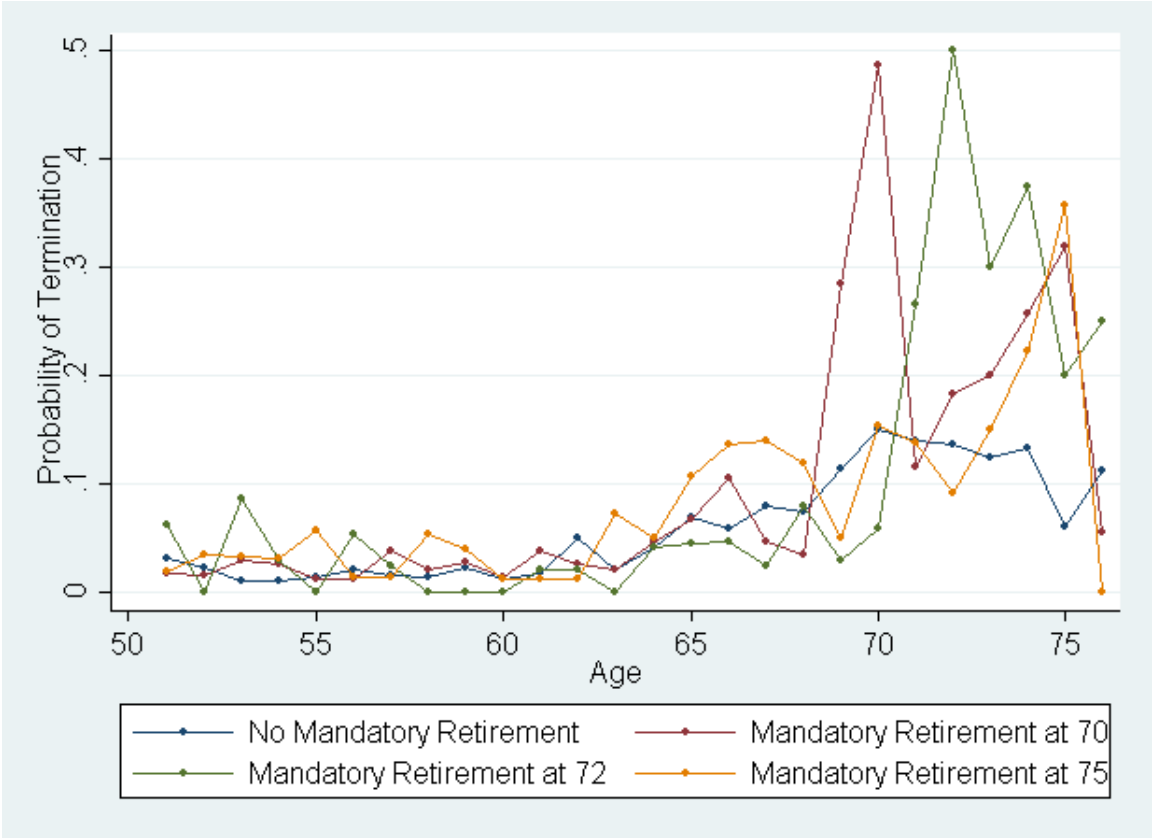



Figure 10: Age Distribution and Retirement Hazards,by Retirement Rule

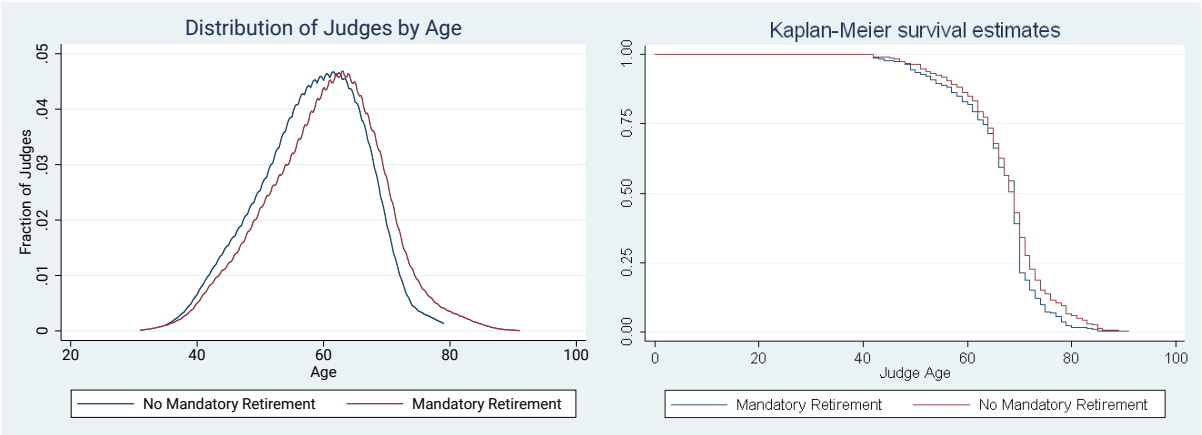


Figure 11: Distribution of Years Between Termination and Death, With and Without Mandatory Retirement

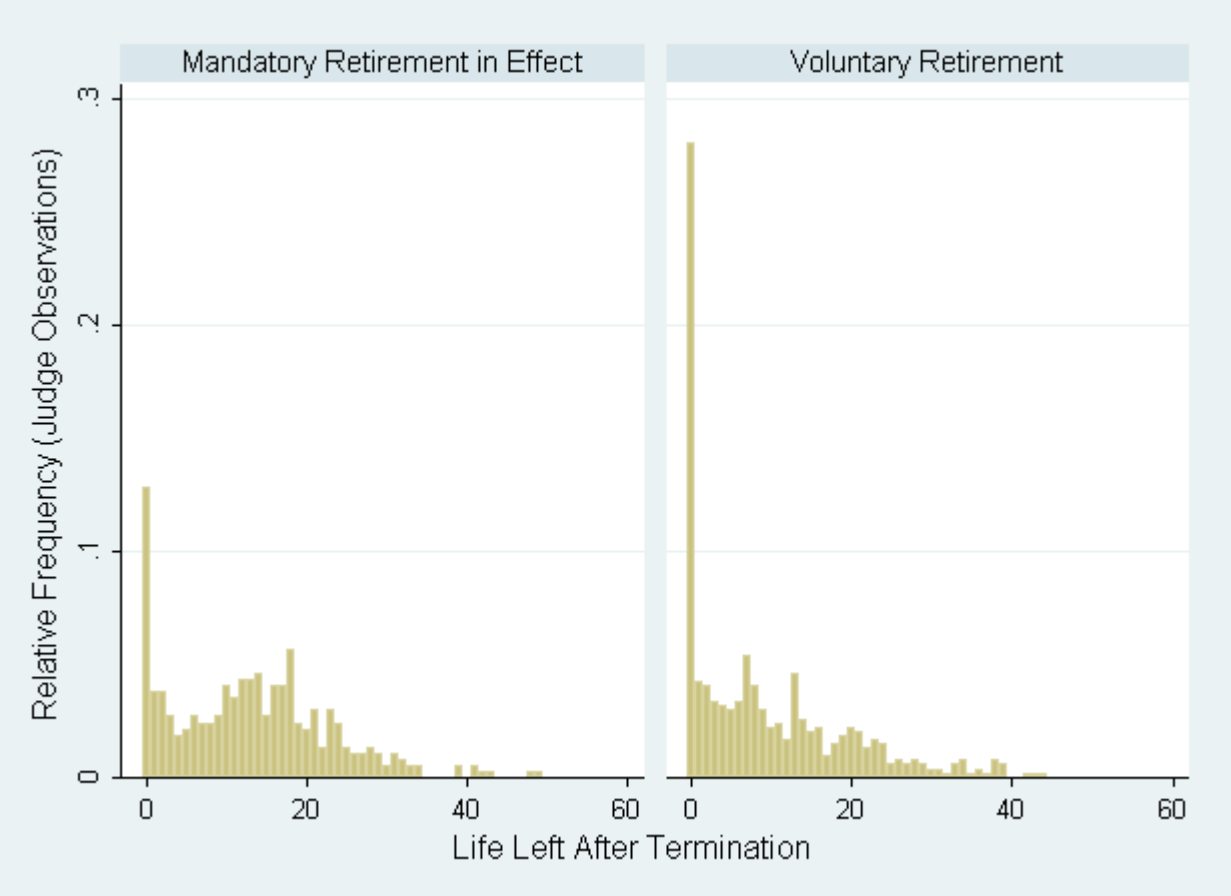
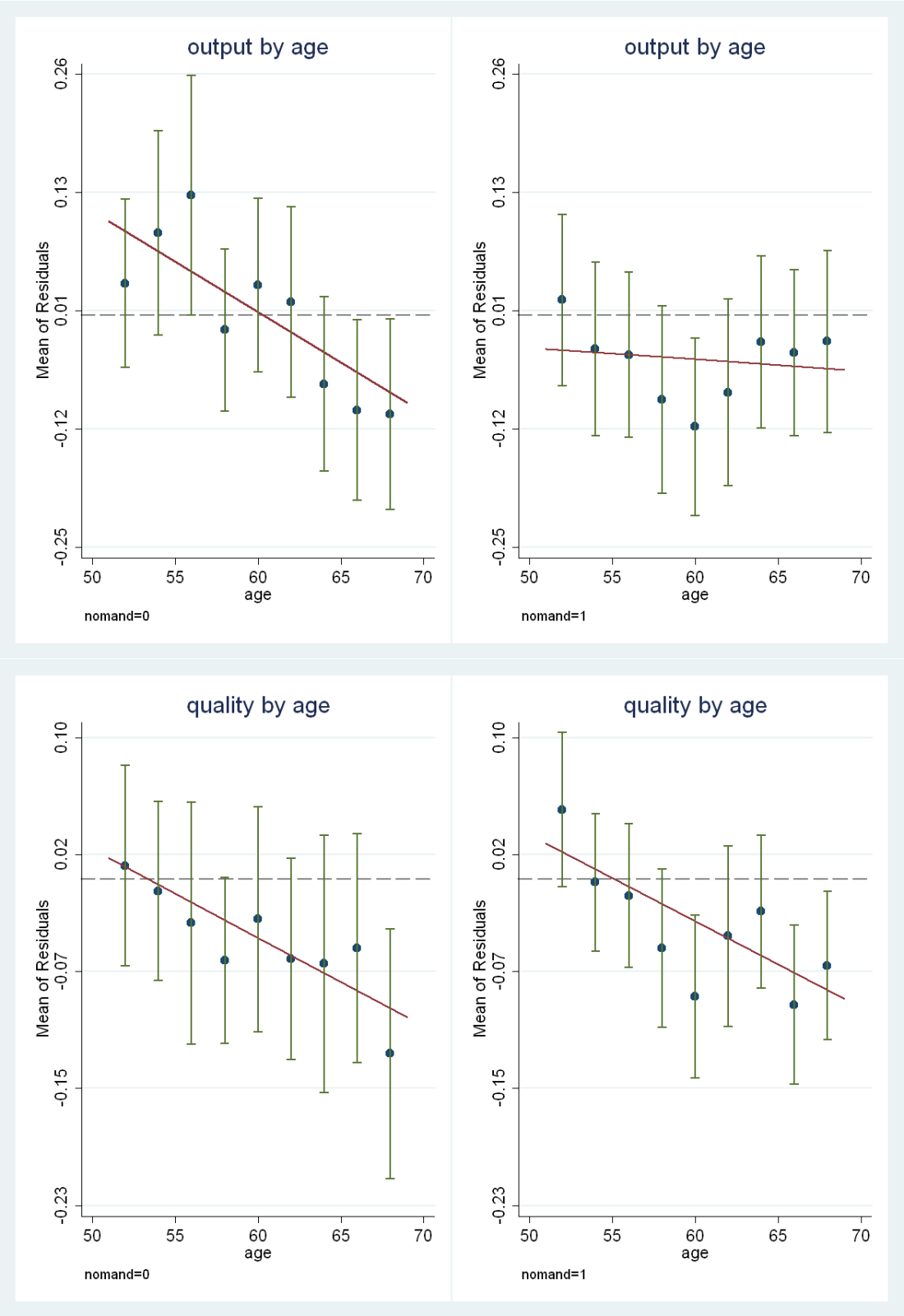


Figure 12: Judge Output and Quality, Age 50-70, With and Without Mandatory Retirement



decline for states with mandatory retirement. The curve is flat for states without mandatory retirement. This suggests that the mandatory retirement rule is resulting in a negative incentive effect on judge effort.

In Figure 13 we take a broader look at differences in our performance variables over the lifespan. First, we see that judges have similar trends in their workload (number of opinions) over the lifespan. In terms of output (words per year), however, there is a difference, with output increasing throughout life for mandatory retirement judges. Similarly, we see a decrease in quality for voluntary retirement judges, and increase in quality for mandatory retirement judges. This is likely due to selection, where under mandatory retirement only the best judges remain until advanced ages. This happens due to the senior judge system of active retirement, where the younger judges can choose to invite a judge back at a reduced caseload. These judges tend to have high performance. Under voluntary retirement, the lower-performance judges remain on the job longer.

We also see at the bottom of Figure 13 that language style (word length and sentence length) does not differ in its trend over the life cycle depending on the retirement rule. This suggests that these language variables capture a component of physiological aging and cognitive development that does not respond to incentives.

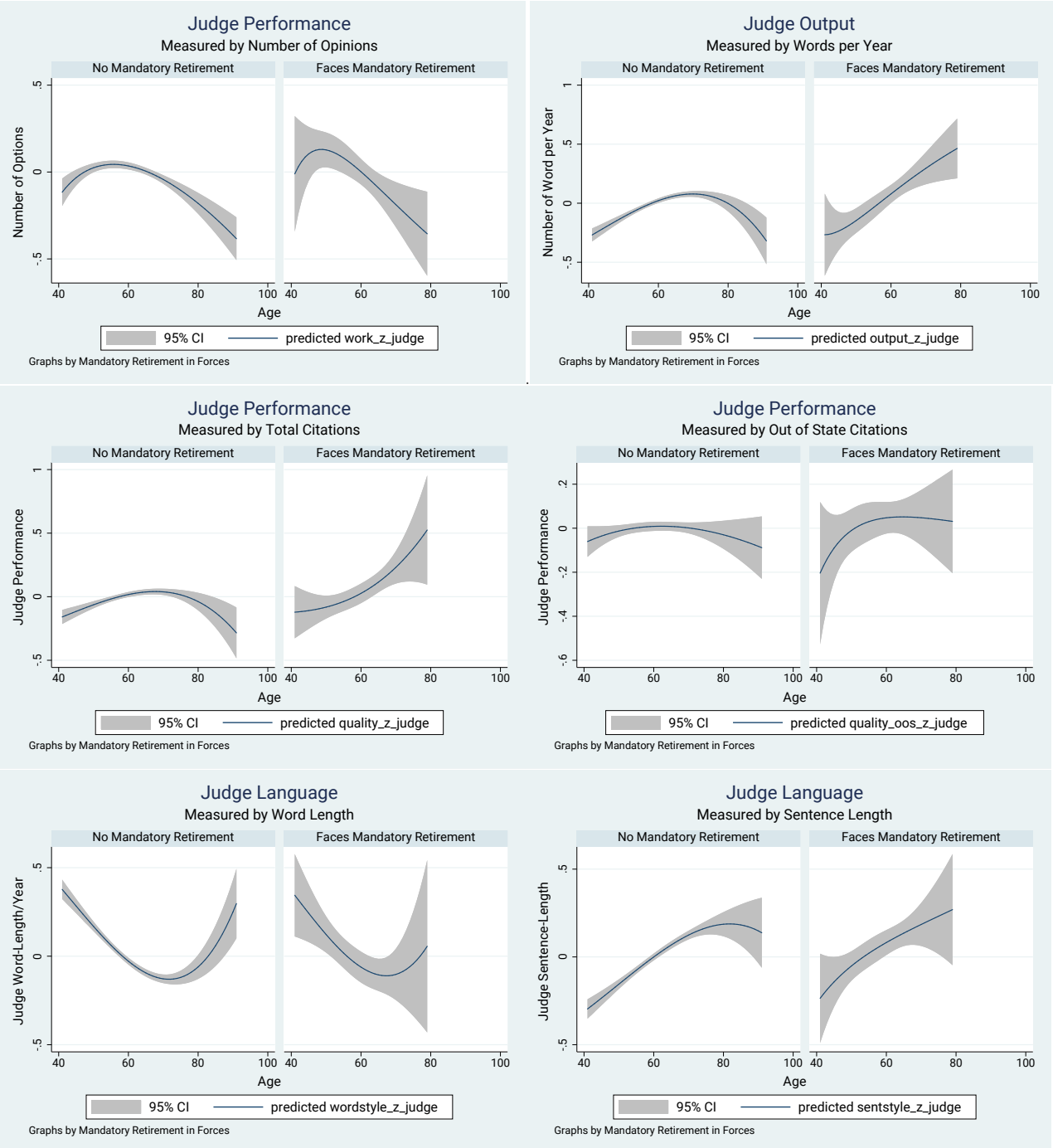
## 7.2 Effect of Introducing a Mandatory Retirement Age

Identification comes from discrete changes in the rules for mandatory retirement. Sixteen states introduced a mandatory retirement age during the time period of our data.

The regression framework is a standard differences-in-differences approach based on Bertrand et al. (2004). To control for time-invariant court characteristics that may be correlated with the retention system in various states, we include court fixed effects. To control for national trends in performance, we include year fixed effects. To control for pre-existing state trends in performance that may be confounded with the reforms, we include state-specific linear trends.

As in Ash and MacLeod (2015), we measure effects in a ten-year window around the reforms. The regressions include an indicator equaling one for the baseline time window of ten years before and ten years after a change to the retention system. The treatment variable is a dummy for the ten years after the change. Thus, with the inclusion of the court fixed effects, the estimates can be interpreted as the average difference in within-court performance for the ten years after the policy change relative to the ten years before the policy change. In a handful of states, we shrank the time window if the reform occurred

Figure 13: Judge Output and Quality over the Life Cycle With and Without Mandatory Retirement



close to the beginning or end of the sample.[2] In the appendix we include a table using other time windows.

Formally, we estimate

$$y_{ist} = \text{YEAR}_t + \text{STATE}_s + \text{STATE}_s \times t + \bar{\rho}\bar{R}_{st} + \rho R_{st} + X'_{ist}\beta + \epsilon_{ist} \tag{6}$$

where $\text{YEAR}_t$ is a fixed effect for the two-year period $t$, $\text{STATE}_s$ is a state fixed effect, and $\text{STATE}_s \times t$ is a state-level linear time trend for state $s$. The term $\bar{R}_{st}$ is a dummy variable equaling one for the baseline time window of ten years before and ten years after introduction of a mandatory retirement age. $R_{st}$ is a dummy variable for the ten years after the change (with $\rho$ measuring the corresponding causal effect of interest). $X_{ist}$ includes other state controls when relevant. Standard errors are clustered by state.

Figure 14 shows the trend in the output and quality of decision-making of a court before and after the introduction of a mandatory retirement age.In the top panel (work output), we see a drop in output after the introduction of a mandatory retirement age, which has returned to trend by 12 years after the reform. Interestingly, this only happens for the above-median-age judges. It is statistically significant in fixed-effects regressions. This is additional evidence of a demotivating effect of mandatory retirement policy. The older judges, now facing a retirement age, may be reducing judging effort to pursue outside options.

The post-reform effects on quality are not so dramatic. There may be some increase, but it is not statistically significant in our regressions. However, we do see an interesting pre-trend among the older judges. There seems to be a drop in quality in the years leading up to the reform. This is consistent with state lawmakers responding to low-quality older judges by enacting the reform.

# 8 Conclusion

The goal of this paper has been to measure the effects of aging on judicial behavior. Given that judges have low powered incentives that do not explicitly link pay to performance, these factors likely have a significant impact on judge behavior. Physical aging is associated with a reduction in quality over the lifespan. But the judges who work longer tend to be better than those who retire earlier. Mandatory retirement rules have a demotivating effect on judge performance. But this demotiving effect must be balanced against the secular decrease in

[2]These reforms are mostly enacted by voters through ballot referendums administered in November and officially going into effect the subsequent January. In these cases the dummy variable would turn on in the year following the vote. In cases where the policy is effective in the first half of the year, it is coded as turning on in that year.

Figure 14: Judge Output and Quality Before and After Introducing Mandatory Retirement



*Notes.* Work output and work quality before and after introduction of a mandatory retirement age. Spikes give 95% confidence intervals. Outcome variable residualized on judge fixed effect, year fixed effect, and state time trend.

decision quality due to aging. These results will be useful to policymakers seeking to design better retirement policies for judges and other high-skill jobs. In particular, the results are useful in an era where an aging workforce is resulting in large structural changes to the economy (Acemoglu and Restrepo, 2017).

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# A Appendix

## The Age Discrimination in Employment Act of 1967-Sec 621, section 2

The Congress hereby finds and declares that

1. in the face of rising productivity and affluence, older workers find themselves disadvantaged in their efforts to retain employment, and especially to regain employment when displaced from jobs;

   (a) the setting of arbitrary age limits regardless of potential for job performance has become a common practice, and certain otherwise desirable practices may work to the disadvantage of older persons;

   (b) the incidence of unemployment, especially long-term unemployment with resultant deterioration of skill, morale, and employer acceptability is, relative to the younger ages, high among older workers; their numbers are great and growing; and their employment problems grave;

(c) the existence in industries affecting commerce, of arbitrary discrimination in employment because of age, burdens commerce and the free flow of goods in commerce.

(d) It is therefore the purpose of this chapter to promote employment of older persons based on their ability rather than age; to prohibit arbitrary age discrimination in employment; to help employers and workers find ways of meeting problems arising from the impact of age on employment.