Name: Paulo Costa
NBER Pre-Doctoral Fellowship Program on the Economics of an Aging Workforce

Title: Does Workers' Saving Behavior Respond to Unanticipated Changes in Retirement Age? Evidence from a Retirement Reform in Denmark[1]

Introduction. In response to the projected insolvency of their public pension funds, countries are shifting from defined benefit (DB) to defined contribution (DC) retirement plans. One of the concerns of adopting DC plans is that individuals may not save enough to provide for themselves during retirement. This concern stresses the importance of studying the retirement saving behavior of workers because of its implications for optimal design of public pension policies. The goal of this project is to analyze how workers save for retirement by studying how their saving behavior responds to unanticipated changes in their retirement age. To do so, I will take advantage of a reform in Denmark that sharply changed the timing of retirement of some individuals. Two features of the retirement reform in Denmark make this an interesting policy variation to study the dynamics of workers' saving behavior. First, most of the workers in the sample hold DC plans, meaning that they are responsible for saving for retirement. Second, the reform was announced approximately ten years before the first cohort affected could retire early, which gives me enough time to evaluate how workers responded to the new saving incentives imposed by the reform.

Research Design. To investigate the dynamics of saving behavior of older workers, I exploit a policy variation in Denmark that affected the timing of retirement for individuals born just after July 1st, 1939. The reform had two major sets of changes. First, the reform sharply decreased the Old-Age Pension (OAP) retirement age from 67 to 65 of those born just after July 1st, 1939, which created a sharp discontinuity in the age for pension eligibility. Second, prior to the reform, it was possible to retire early at age 60 through the Voluntary Early Retirement Program (VERP). To be eligible for VERP, individuals had to contribute to an unemployment fund, which is voluntary in Denmark, for a number of years. The reform introduced financial incentives to postpone retirement beyond the age of 62 within the VERP scheme. Note that the requirement of participation in an unemployment fund enables us to study those who are and who are not eligible for early retirement pension separately. Therefore, I can observe two sets of control and treatment groups. The treated group composed of people who were eligible for OAP and were born after the reform cutoff will have an incentive to work two years less than previously anticipated. On the other hand, the treated group composed of workers who were eligible for VERP and were born after the cutoff will have an incentive to work for at least two years longer than they had previously anticipated.

My main research design is a Regression Discontinuity, which will essentially compare the saving behavior of people who were born just before and just after the July 1st, 1939 cutoff for pension eligibility. To validate my research methodology, I present preliminary figures of the first-stage, which show how the labor supply decision differed for cohorts near the birth-date cutoff. These figures show that the discontinuous change of the pension rules led to significant

[1] Access to administrative data in Denmark is regulated by Statistics Denmark, which grants access only to Danish research environments, allowing foreign researchers to again access through a collaboration with a Danish researcher. In accordance with these rules, this project is collaborated with Torben Heien Nielsen from the University of Copenhagen.

differences in the labor supply decisions of cohorts just around the cutoff. Figure 1 focuses on the workers who were not eligible for early retirement, and as such were expected to be affected by the reduction in the social security full retirement age from 67 to 65. As can be seen, their labor supply at age 66 drops by about 7.5 percentage points (pp) on a base of 37.3 percent (which implies that these workers are 20 percent more likely to retire at age 65 under the new regime). Similar figures[2] for VERP-eligible retirees were more complex and I divided this group into low- and high-income workers. The policy change decreased the labor supply of the low-income VERP-eligible workers (starting immediately after age 62 by about 26 percent – 7 pp on a base of 27 percent), while it increased participation rates before 62 (by about 9 percent – 5.5 pp on a base of 60 percent) and slightly decreased them thereafter for the high-income group.

Outcomes. The analysis of the outcomes resulting from the policy change will be divided in two main groups: savings and wealth accumulation. It is important to follow how much the saving level per se responds to the policy change but also to keep in mind that individuals may respond in other margins, such as getting an additional part-time job or accumulating other assets such as housing that can be later transformed in liquid assets. Our dataset allows me to evaluate the potential heterogeneity of these responses across several dimensions, such as occupation, education, baseline physical and mental[3] health status, and spouse's characteristics.

Hypotheses and Contributions. This project aims at making contributions to different strands of literature on savings and retirement. As shown in Card and Ransom (2011), individuals' saving decisions are sensitive to precise details of their pension plans. Thus, first, it is important to analyze whether the behavior of Danish workers who were affected by the retirement reform follows the predictions of Gourinchas and Parker (2002)'s model of life-cycle savings. Their model predicts that individuals who decided to retire earlier than at a previous reference age should have increased their savings rate since they were in the workforce for a shorter period than anticipated and lived a longer period of time dependent on their retirement savings[4]. At the same time, individuals who ended up working for longer should have decreased their rate of savings.

Second, it is widely known that financial literacy plays a big role in retirement saving behavior, as shown by Lusardi and Mitchell (2011) and Costa (2014) in the context of developed and developing countries respectively. Given the relationship between financial literacy and savings, I plan to answer the question about whether different levels of financial literacy can explain the differences in response of saving behavior after the retirement reform. One of my hypothesis is that there is inertia in response to active saving decisions, similar to what is observed in Madrian and Shea (2001) and Chetty et al. (2014), especially for financially illiterate individuals. In the case of the Danish retirement reform, however, the inertia could have led to lower savings for some workers and higher savings for others. If this is the case, it will be possible to do a back-of-the-envelope calculation showing how much the pension reform hurt

[2] The figures for VERP-eligible retirees were not included due to space constraint.

[3] I have data on all doctor's visits and medical prescriptions of patients in Denmark, including prescriptions of antidepressants.

[4] An implicit assumption here is that people who have birth dates around the reform cutoff will have the same longevity on average.

or benefitted people born after July 1st, 1939. An advantage of studying retirement behavior in Denmark is that it is possible to match surveys done in Denmark to the data registers provided by Statistics Denmark, so it will be possible to link financial-literacy measures gathered in surveys to the data on saving behavior.

Third, in an issue raised by Skinner (2007), I will be able to accurately compare retirement saving levels of similar individuals that ended up having different labor supply decisions. As shown by Poterba, Venti, and Wise (2011), it is important to not only know much individuals saved for retirement but also the dynamics of drawdown of savings and wealth. With our dataset, it will be possible to analyze how retirees are spending their assets.

Conclusion. As Rohwedder and Willis (2010) make clear, there are many issues of identification in studies of retirement research. The authors mention that it is hard to observe policy variation that affects the timing of retirement. In this project, previous identification issues are overcome and I hope to use the exogenous variation in retirement timing to understand the response of individuals' saving behavior.

References

Card, David, Michael Ransom. 2011. "Pension Plan Characteristics and Framing Effects in Employee Savings Behavior." Review of Economics and Statistics, vol. 93 (1): 228-243.

Chetty, Raj, John N. Friedman, Soren Leth-Petersen, Torben Heien Nielsen, Tore Olsen. 2014. "Active vs. Passive Decisions and Crowd-Out in Retirement Savings Account: Evidence from Denmark." Quarterly Journal of Economics, vol. 129 (3): 1141-1219.

Costa, Paulo. 2014. "The Relationship between Math and Financial Literacy: Evidence from a Survey and a Randomized Experiment in Brazil." Senior Essay at Yale University.

Gourinchas, Pierre-Olivier, Jonathan Parker. 2002. "Consumption Over the Life Cycle." Econometrica, vol. 70: 47–89.

Lusardi, Annamaria, Olivia S. Mitchell. 2011. "Financial literacy around the world: an overview." Journal of Pension Economics and Finance, vol. 10(04): 497-508.

Madrian, Brigitte, Dennis F. Shea. 2001. "The Power of Suggestion: Inertia in 401(k) Participation and Savings Behavior." Quarterly Journal of Economics, vol. 116 (4): 1149-1187.

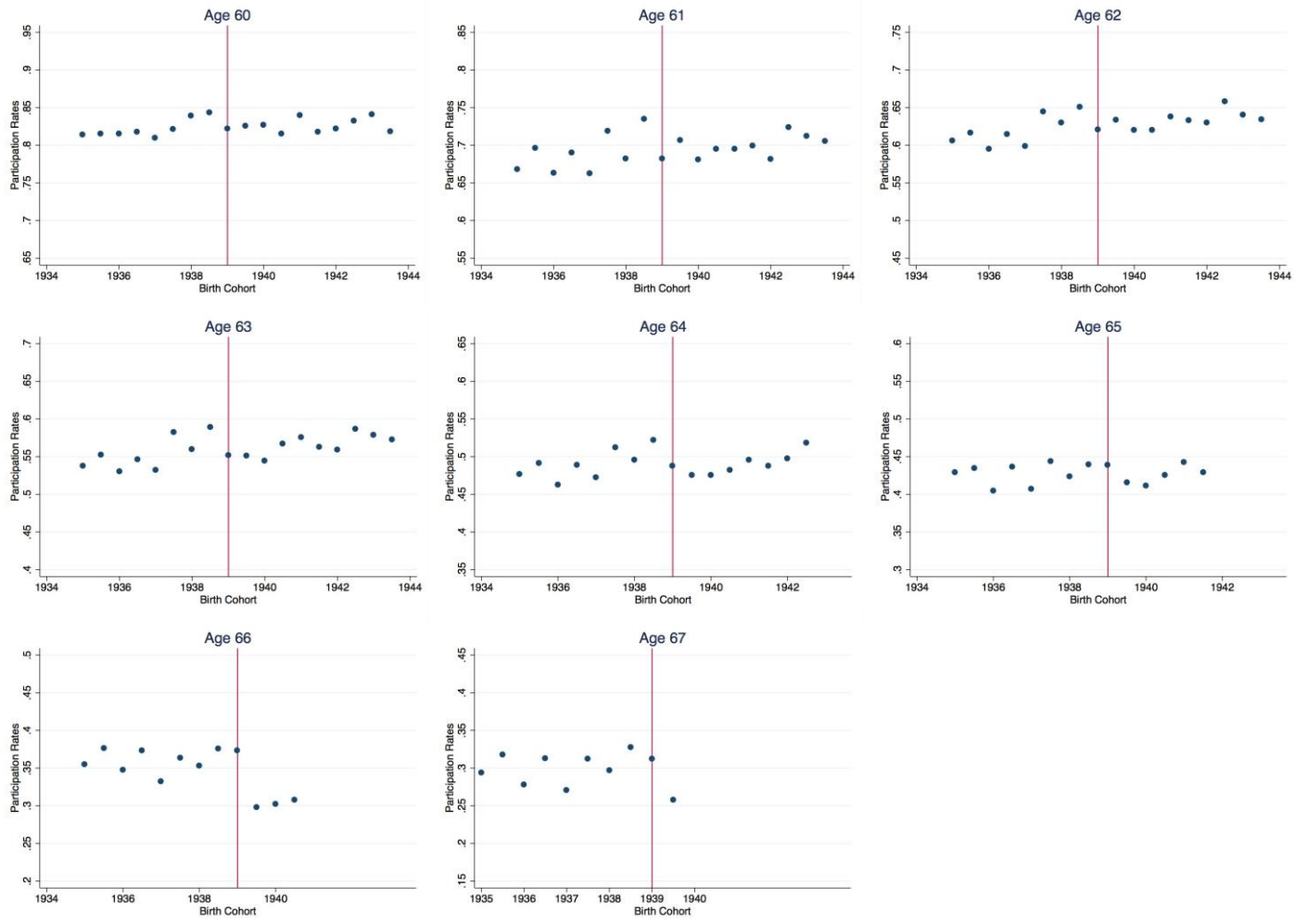
Poterba, James, Steven Venti, David Wise. 2011. "The Drawdown of Personal Retirement Assets," NBER Working Paper 16675.

Rohwedder, Susann, Robert J. Willis. 2010. "Mental Retirement." Journal of Economic Perspectives, vol. 24 (1): 119-138.

Skinner, Jonathan. 2007. "Are You Sure You're Saving Enough for Retirement?" Journal of Economic Perspectives, vol. 21(3) 59-80

FIGURE 1

Labor Force Participation Rates for Those Who Are Not Eligible for Early Retirement, By 6-Month Birth Cohorts



Notes: These figures display scatter plots of labor force participation rates by 6-month birth cohorts, for ages 60 to 67. Participation is defined by having more than DKK 10,000 in annual labor income (equivalent to about USD 1,800). Ineligibility for early retirement is defined by not having sufficient years of membership in the twelve-year window preceding a worker's 56th birthday. I focus on a sample of workers with greater attachment to the labor force – those for whom labor income is positive in ages 52 to 56. The last year in the data I currently have access to is 2006, and therefore for age 67 the last cohort I have data on is people born in 1939. Very soon I will have access to data until 2013.

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Personal Information: Date of birth: 03/04/1991

Undergraduate Studies:
Yale University, B.A. in Economics, 2010 to 2014
Student Marshal (Ezra Stiles College)

Thesis Title: "The Relationship between Math and Financial Literacy: Evidence from a Survey and a Randomized Experiment in Brazil"
Advisors: Gary Gorton and Dean Karlan

Coursework in Experimental Economics and Finance, University of Cambridge, 2011

Graduate Studies:
Harvard University, 2014 to present
Ph.D. Candidate in Economics
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Research Fields:

Research Interests: Household Finance, Behavioral Economics

Fields of Study: Labor Economics, Development Economics, Behavioral Economics, Public Economics

Work in Progress

"**Salience, Expectations, and Price Surprises**" (Status: Piloting the experiment in the Harvard Kennedy School Decision Lab in January)

This project studies the roles of expectations in the mental-accounting theory proposed by Thaler (1985). More specifically, I study consumers' responses to surprise increases in price in comparison to expected price increases. In the experimental setup I intend to evaluate how demand for certain goods change when increases in prices are not expected (i.e. a "price surprise" happens). For the control group, prices will increase in an expected way in small installments, in such fashion that the price increase will not be salient to consumers. For the treatment group, prices will remain constant until the last round of the experiment when the price of one of the goods will increase by a large margin, being equal to the price of the same good in the last round of the control group. The hypothesis behind the treatment intervention is to test whether the sudden price change will be salient to consumers, leading them to overreact to the price increase, following the prediction of Bordalo, Genaioli, and Shleifer (2013).

"**Effects of Retirement on Health and Health-Care Utilization**" (with Itzik Fadlon and Torben Nielsen)

Many countries are re-constructing the retirement incentives within their public pension schemes in an attempt to increase average retirement ages. This underscores the importance of studying the potential effects of working near retirement age on health – which is the goal of this project – due to their direct implications for the optimal design of public pension policies. In order to isolate potentially exogenous variation in the retirement decision, we will exploit a reform to the Danish public pension system. The

reform sharply decreased the Old-Age Pension (OAP) retirement age of those born just after July 1, 1939 as compared to those born before this date, motivating a promising Regression-Discontinuity research design. This quasi-experimental design will allow a comparison of health outcomes – both mental and physical - of otherwise similar individuals whose labor supply paths significantly differ because of the reform. As such, it has the potential of addressing the long-standing issue of the effects of retirement on health in a credible way and to overcome the identification shortcomings of the existing literature.

Research and Work Experience:

2014-2015: Research Assistant to Andrei Shleifer (Harvard Economics)
2012-2014: Research Assistant to Dean Karlan (Yale Economics)
2013: Research Assistant to Christopher Udry (Yale Economics)
2012-2013: Consultant, Brazilian Stock Exchange
2011-2013: Research Assistant to Gary Gorton (Yale School of Management)

Honors, Academic Fellowships, and Grants:

Bradley Foundation Fellowship (2016)
Paul M. Warburg Fund, Harvard Economics Department (2015)
Harvard Economics Department Research Grant (2015)
Harvard Institute for Quantitative Social Sciences Affiliate (2015 – Present)
Yale School of Management Behavioral Finance Summer Institute (2015)
Harvard Economics Research Bonus Award (2014)
Harvard University Graduate Fellowship (2014-2019)
Gates Cambridge Scholarship (2014; *respectfully declined to attend Harvard*)
Cambridge Trust Scholarship (2014; *respectfully declined to attend Harvard*)
Research Grant ($75,000 – as sole Principal Investigator) from the Brazilian Stock Exchange (2012 - 2013)
Yale College Public Service Research Prize (2013)
Yale College Dean's Research Fellowships in the Humanities & Social Sciences (2013)
Yale College Public Service Research Fellowship (2013)
Richter Summer Research Fellowship (2012; 2013)
Edward A. Bouchet Research Fellowship (2012-2014)
Gordon Grand Summer Fellowship (2011)
Perspectives on Science and Engineering Summer Fellowship (2011)
Aldo DeDominicis Scholarship (2010-2011; 2011-2012; 2012-2013, 2013-2014)
Fundação Estudar Scholarship (2010-2014)
United States Achievers Program Fellowship (2010)
Brazil's National Science Foundation Fellowship for the study of Advanced Math (2007; 2008; 2009)
Motion of Praise and Applause, State House of Representatives, Rio de Janeiro, Brazil (2006)

Computer Skills

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Beginner: Python and SQL

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To: Whom It May Concern

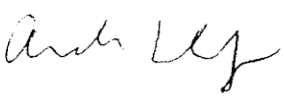
I am pleased to recommend Paulo Costa, a 2nd year Ph.D. student at the Harvard Economics Department, for the NBER pre-doctoral fellowship. Paulo came to Harvard from Yale undergraduate program very focused on research – he already wrote a substantial paper at Yale based on a field experiment in Brazil. At Harvard, he has hit the ground running, so to speak, and is already involved in several research projects – some empirical, some experimental. He sees his field as household finance, and is interested in issues in both wealthy and developing countries. I believe I will be one of Paulo's advisors, although these things are always a bit in flux. Paulo will not be on the market next year, but he definitely will be doing a great deal of research.

The project Paulo proposes is joint work with two other people, and deals with reforms of the Danish pension system. As I understand it, a fascinating feature of the Danish reform is that retirement age was changed, and the change was announced a decade in advance. It is possible, as a consequence, to trace out labor supply and more importantly savings behavior of individuals affected and not affected by the reform over several years after the announcement. Some very basic questions about the forward looking behavior of savings can be addressed with these data in a straightforward but potentially highly informative way.

Paulo is very qualified to do this work. He comes with very good training from Yale, and has two years of applied courses at Harvard. He is extremely energetic, but also careful and social, which means that he checks quite a bit to avoid making mistakes.

I also feel it is a very good project, although I do not know the literature that well. Judging by the potential upside, the evidence can really advance our understanding of the savings/retirement behavior.

Sincerely yours,



Andrei Shleifer