Welfare Gains of Automatic IRAs for Myopic Workers

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Abstract

Five U.S. states currently require employers who do not offer retirement benefits to automatically enroll employees in IRAs, and several other states are considering similar legislation. Using the short planning horizon behavioral life-cycle model, we show the welfare gain of this policy is positive in the absence of credit market constraints. The welfare gain of being enrolled in an IRA with a 3% contribution rate is in the range of 0.8% to 3.4% of life-time consumption for short-sighted households with planning horizons of 15 years or less in a world with social security. The welfare gains of automatic IRAs are larger for a 5% contribution rate and are larger in the absence of social security.

Keywords: Short planning horizons, Time-inconsistent preferences, Dynamic optimization, Life-cycle consumption, Dynamic welfare analysis

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1 Introduction

Automatic enrollment in Individual Retirement Accounts (IRAs) is gaining popularity in the United States. Several states require employers who do not offer retirement benefits to auto-enroll employees into IRAs. Many other states and local governments are considering similar legislation.[1]

Auto-enrollment in IRAs has the potential to increase an individual's welfare by increasing her lifetime savings. Preliminary data from the auto-enrollment program in Oregon show a majority of employees provided access to the program are participating and the average contribution rate is about 5% (Chalmers et al. (2019)). Empirical evidence from other settings suggests that many households respond to defaults in making savings decisions (Beshears et al. (2016) and Chetty et al. (2014)). Automatic enrollment could raise the overall saving rate of households—so long as households do not (fully) offset increased saving in IRAs with decreased saving or increased borrowing in other assets.

We calculate the welfare effect of auto-enrollment into an IRA in a model with short-sighted, or myopic, workers. We show the welfare gain of automatically contributing 3% to the IRA is equivalent to 2.3% of lifetime consumption for workers who use a five-year planning horizon. The welfare gain is larger for a 5% contribution rate and larger when workers use a shorter planning horizon. We calculate the welfare effect assuming that workers stay in the program after they are automatically enrolled. We focus on the role of automatic saving on life-cycle consumption while abstracting away from the decision to opt-out of the program.[2]

We use the short planning horizon model of Caliendo and Aadland (2007) to conduct our analysis.[3] The model is appealing because it generates a hump-shaped consumption profile with a drop in consumption at retirement that is consistent with observed behavior in the U.S. We choose a short-sighted model rather than a model of present-bias (such as hyperbolic or quasi-hyperbolic discounting) because Findley and Caliendo (2014) find that hyperbolic discounting does not affect consumption and savings allocations if the planning horizon is short and fixed. Additionally, survey evidence suggests that many households use a short-planning horizon when making financial decisions.[4]

[1] Programs in Oregon, California, Illinois, Maryland, and Connecticut are either already in operation or slated to begin later this year. See https://www.oregonsaves.com, https://www.calsavers.com, https://www.ilsecurechoice.com.

[2] See Bernheim et al. (2015) for theoretical consideration of the opt-out decision of 401(k) participants.

[3] See also Findley and Caliendo (2009) and (2010), and Cottle Hunt and Findley (2019).

[4] Over half of the respondents in the Health and Retirement survey chose the "next few years" or less in response to the question "In planning your family's saving and spending, which time period is most important to you?" The HRS is available at http://hrsonline.isr.umich.edu/data /index.html.

In many theoretical models, an automatic increase in IRA savings would be completely offset by decreases in other types of savings or increases in debt (in the absence of credit market imperfections).[5] Increased IRA savings are *not* offset by reduction in other savings in the short-planning horizon model because the worker is not aware of the assets that have accumulated in her IRA (and thus does not unwind them) until retirement enters her planning horizon. Thus, the welfare calculations in this paper might best be interpreted as an upper-bound for the ability of automatic enrollment in IRAs to change behavior. The true effect will depend on if workers opt-out of the IRA and if they unwind IRA savings. The new state programs provide an excellent opportunity to test how defaults affect life-cycle saving. This short paper illustrates that the welfare effects could be large and positive if the defaults increase savings.

2 Model

The short-planning horizon model used in this exercise closely follows that of Caliendo and Aadland (2007), and will only be described briefly. Age in continuous and indexed by t. The worker enters the labor force at age $t = 0$, retires at $t = T$, and dies at $t = \overline{T}$. She receives wage income $w(t) = wq(t)$ for $t \in [0, T]$ where w is the market wage and $q(t)$ is the longitudinal age-efficiency profile, modeled as a fourth order polynomial. She pays social security taxes at rate θ and receives pay-as-you-go benefits in retirement of $b = \int_0^T \theta w(t)dt/(\overline{T} - T)$.

The worker has two types of saving assets: an individual retirement account that is annuitized at retirement by the retirement plan provider, and private savings or borrowings, $k(t)$. Both earn interest at the real rate r. The individual contributes to the IRA at rate δ, up to a maximum contribution amount m.[6] The constant annuity that exhausts the IRA balance at the date of death is

$$A = \frac{\int_0^T IRA(t)e^{r(T-t)}dt}{\int_T^{\overline{T}} e^{r(T-t)}} \qquad \text{for } t \in [T, \overline{T}]. \tag{1}$$

where $IRA(t) = \min[\delta w(t), m]$. The private savings or borrowing account has boundary conditions $k(0) = 0$ and $k(\overline{T}) = 0$.

We assume the length of the agent's planning horizon, x, is less than or equal to the length of the retirement period to improve the tractability of the model. With this assumption, the life span of the worker can be partitioned into four phases:

- Phase I: working, not aware of retirement, $t \in [0, T - x]$
- Phase II: working, aware of retirement, $t \in [T - x, T]$

[5] See Findley and Cottle Hunt (2019) for a quasi-hyperbolic discounting example.

[6] Because the I.R.S. limits IRA contributions to $6,000 per year.

- Phase III: retired, not aware of death, $t \in [T, \overline{T} - x]$
- Phase IV: retired, aware of death, $t \in [\overline{T} - x, \overline{T}]$

The worker's saving and consumption problem can be solved for each phase, using the appropriate boundary conditions and laws of motion for the private savings account $k(t)$. The solution techniques for this type of model are explained in detail in Caliendo and Aadland (2007) and will not be covered in this short paper.[7]

2.1 Phase I

At vantage point $t_0 \in [0, T - x]$ the shortsighted worker solves

$$\max \int_{t_0}^{t_0+x} e^{-\rho(t-t_0)} \frac{c(t)^{1-\phi} - 1}{1-\phi} dt \tag{2}$$

subject to

$$\frac{dk(t)}{dt} = rk(t) + (1-\theta)w(t) - IRA(t) - c(t) \tag{3}$$

with $k(t_0)$ given and $k(t_0 + x) = 0$.

2.2 Phase II

At any point $t_0 \in [T - x, T]$ the individual solves

$$\max \int_{t_0}^{t_0+x} e^{-\rho(t-t_0)} \frac{c(t)^{1-\phi} - 1}{1-\phi} dt \tag{4}$$

subject to

$$\frac{dk(t)}{dt} = rk(t) + (1-\theta)w(t) - IRA(t) - c(t) \quad \text{for } t \in [t_0, T] \tag{5}$$

and

$$\frac{dk(t)}{dt} = rk(t) + A + b - c(t) \quad \text{for } t \in [T, t_0 + x] \tag{6}$$

with $k(t_0)$ given and $k(t_0 + x) = 0$.

[7] This problem can be solved analytically only when the contribution limit m does not bind. In cases where the contribution rate δ is high enough such that $\delta w(t) > m$, the problem can only be solved computationally.

2.3 Phase III

At any point $t_0 \in [T, \overline{T} - x]$ the individual solves

$$\max \int_{t_0}^{t_0+x} e^{-\rho(t-t_0)} \frac{c(t)^{1-\phi} - 1}{1-\phi} dt \tag{7}$$

subject to

$$\frac{dk(t)}{dt} = rk(t) + A + b - c(t) \quad \text{for } t \in [T, t_0 + x] \tag{8}$$

with $k(t_0)$ given and $k(t_0 + x) = 0$.

2.4 Phase IV

At any point $t_0 \in [\overline{T} - x, \overline{T}]$ the individual solves

$$\max \int_{t_0}^{t_0+x} e^{-\rho(t-t_0)} \frac{c(t)^{1-\phi} - 1}{1-\phi} dt \tag{9}$$

subject to

$$\frac{dk(t)}{dt} = rk(t) + A + b - c(t) \quad \text{for } t \in [T, t_0 + x] \tag{10}$$

with $k(t_0)$ given and $k(t_0 + x) = 0$.

3 Parameterization

Following Findley and Caliendo (2007), we set $T = 40$ and $\overline{T} = 55$ in order to model an individual who starts work at age twenty-five, retires at sixty-five, and dies at age eighty. We set the exogenous interest rate r and the discount rate ρ both equal to 3.5% and the inverse elasticity of inter-temporal substitution to $\phi = 1$.[8] The social security tax rate is set to match the old age portion of OASDI $\theta = 0.106$.

We model wage income as $w(t) = wq(t)$, where $q(t)$ is the longitudinal age-efficiency profile based on the calibration of Feigenbaum and Caliendo (2010)

$$w(t) = w[1 + 0.018095t + 0.000817t^2 - 5.1 \times 10^{-5}t^3 + 5.36 \times 10^{-7}t^4] \tag{11}$$

with w normalized to unity. The contribution limit m is set such that the ratio of m to the average wage over the life-cycle is equal to the ratio of the IRS contribution

[8] See also Gourinchas and Parker (2002), Bullard and Feigenbaum (2007), and Feigenbaum (2008).

limit \$6,000 to median income. Given this parameterization, the limit only binds for $\delta > 8.65\%$. Note that the limit need not bind for the entire life cycle, only when wage income is high enough that $\delta w(t) > m$.

4 Welfare Results

We compute the consumption equivalent variation (CEV) that shows how much consumption would have to added to an individual in the short-planning horizon model such that she would be indifferent between not having an IRA and having an IRA with contribution rate δ. A positive CEV indicates that the short-sighted worker would prefer an IRA with an automatic contribution rate of δ. The CEV is positive for the contribution rates being implemented in Illinois (3%) and California (5%) for all short-planning horizons considered in this model (horizons up to 15 years in length).

The welfare gains of the automatic enrollment in the IRA are large when the planning horizon is short. For a planning horizon of one year, the CEV is over 4% for any IRA contribution rates between 5% and 10%. This is because the short-sighted individual does not anticipate retirement until one year before the exogenous retirement date and thus has saved very little on her own. Her lifetime utility is improved when a fraction of her wages are automatically saved in an IRA. The welfare gains are smaller for longer planning horizons.The welfare gain of participating in an IRA with an automatic contribution of 5% is equal to 0.9% of lifetime consumption for a 15 year planning horizon. The model includes social security that is parameterized to match the U.S. system. If social security is removed from the model, the welfare gains are much larger, over 50% of lifetime consumption for workers with a one-year planning horizon. The welfare effects of automatic IRAs are depicted in Table 1 and graphically in Figure 1.

With social security

Planning horizon x	IRA contribution rate δ					
	0.01	0.03	0.05	0.07	0.1	0.2
1	0.016	0.034	0.043	0.046	0.042	-0.010
3	0.013	0.029	0.037	0.039	0.036	-0.013
5	0.010	0.023	0.030	0.032	0.029	-0.016
10	0.006	0.013	0.017	0.018	0.016	-0.021
15	0.003	0.008	0.011	0.011	0.009	-0.019

Without social security

Planning horizon x	IRA contribution rate δ					
	0.01	0.03	0.05	0.07	0.1	0.2
1	0.464	0.514	0.532	0.541	0.547	0.537
3	0.114	0.173	0.198	0.212	0.220	0.205
5	0.045	0.088	0.109	0.121	0.129	0.113
10	0.012	0.030	0.042	0.049	0.054	0.040
15	0.006	0.016	0.022	0.027	0.030	0.019

Table 1: Consumption equivalent variation that equates the utility of consumption of not having an IRA to having an IRA with a default contribution rate δ for short planning horizons x with social security (upper panel) and without social security (lower panel).

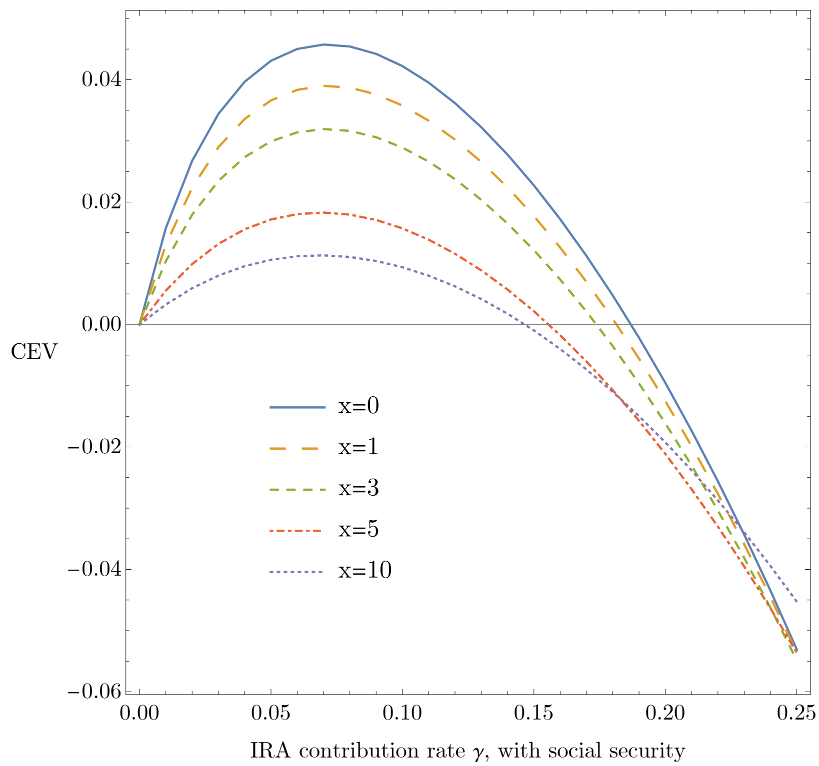

Figure 1: Consumption equivalent variation that equates the utility of consumption of not having an IRA to having an IRA with a default contribution rate δ for short planning horizons x in a world *with* social security.

As a robustness check, we consider different parameterizations than our baseline. The welfare effects are larger when the inverse elasticity of substitution is increased to $\phi = 2$. Similarly, the welfare gains are larger when the interest rate r is less than the discount rate ρ. The reverse is true when the discount rate is less than the interest rate.

5 Conclusion

The welfare gains of automatic enrollment in IRAs are potentially large if workers have short planning horizons. We calculate the consumption equivalent variation that makes a short-sighted worker indifferent between having an automatic IRA with contribution rate δ and not having an IRA and find positive values for all planning horizons considered (up to 15 years) for automatic contribution rates up to $\delta = 0.15$. One caveat to our analysis is that we have assumed workers save and borrow at the same interest rate. The welfare gains of automatic IRAs would be lower, and potentially even negative, if households offset retirement savings with high-interest rate debt (as in Harris et al. (2018)). The new programs in several states provide an excellent opportunity to test the implications of this model. If employees stay enrolled in the IRA and if they *do not* offset IRA savings by reducing other saving or increasing debt, these programs could increase consumption smoothing and life-time utility for short-sighted households.

References

Bernheim, B. D., Fradkin, A., and Popov, I. (2015). The welfare economics of default options in 401(k) plans. *American Economic Review*, 105(9):2798–2837.

Beshears, J., J.Choi, J., Laibson, D., Madrian, B. C., and Wang, S. Y. (2016). Who is easier to nudge?

Bullard, J. and Feigenbaum, J. (2007). A leisurely reading of the life-cycle consumption data. *Journal of Monetary Economics*, 54(8):2305 – 2320.

Caliendo, F. and Aadland, D. (2007). Short-term planning and the life-cycle consumption puzzle. *Journal of Economic dynamics & Control*, 31(4):1392–1415.

Chalmers, J., Mitchell, O. S., Reuter, J., Zhong, M., and Sanzenbacher, G. T. (2019). Auto-enrollment retirement plans for the people: Choices and outcomes in oregonsaves. Conference paper, Michigan Retirement and Disability Research Center.

Chetty, R., Friedman, J. N., Leth-Petersen, S., Nielsen, T. H., and Olsen, T. (2014). Active vs. passive decisions and crowd-out in retirement savings accounts: Evidence from denmark. *Quarterly Journal of Economics*, 129(3):1141 – 1219.

Cottle Hunt, E. and Findley, S. (2019). Short planning horizons and the save more tomorrow progam. *working paper*.

Feigenbaum, J. (2008). Can mortality risk explain the consumption hump?. *Journal of Macroeconomics*, 30(3):844 – 872.

Feigenbaum, J. and Caliendo, F. N. (2010). Optimal irrational behavior in continuous time. *Journal of Economic Dynamics and Control*, 34(10):1907 – 1922.

Findley, S. and Cottle Hunt, E. (2019). Quasi-hyperbolic discounting and the save more tomorrow program. *working paper*.

Findley, T. S. and Caliendo, F. (2007). Outsmarting the social security crisis. *Public Finance Review*, 35(6):647–668.

Findley, T. S. and Caliendo, F. N. (2009). Short horizons, time inconsistency, and optimal social security. *International Tax and Public Finance*, 16(4):487–513.

Findley, T. S. and Caliendo, F. N. (2010). Does it pay to be smart? *Journal of Pension Economics & Finance*, 9(3):321–344.

Findley, T. S. and Caliendo, F. N. (2014). Interacting mechanisms of time inconsistency. *Journal of Economic Psychology*, 41:68–76.

Gourinchas, P.-O. and Parker, J. A. (2002). Consumption over the life cycle. *Econometrica*, 70(1):47 – 89.

Harris, T. F., Troske, K., and Yelowitz, A. (2018). How will state-run auto-iras affect workers? *The Journal of Retirement*, 6(2):27–33.