Homework 3

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Part 1: Data

We apply the following filters to the PSID dataset:

1. We drop all individuals from the SEO oversample.
2. We consider only observations of individuals who are aged between 25 and 54.
3. Observations must be between years 1978 and 1997 of the PSID.

Consistent with last week, we define an individual to have worked full-time in a year if their annual hours was no less than 1850.

"Job-losers" (the treated) were classified as those whose working hours ever fell below 75% of their last year's working hours ("job-loss"), having worked full time for the three years prior.

"Job-stayers" (the control) were classified as those who never experienced job loss while observed in the PSID and had an employment spell lasting at least four consecutive years.

All workers who experienced an **increase** in their household size during the PSID were dropped from the sample. Instead dropping workers who experienced any change in household size (e.g. to account for household death shocks) did not lead to any qualitative difference in the final event-study plot, but dramatically reduced the sample size.

Effect of Layoff on Earnings

In Table 1 we report the coefficient estimates from estimating the following distributed lag specification.

$$N_{i,t} = \alpha_i + \gamma_t + \sum_{k=-3}^{10} \beta_k D_{i,k} + \epsilon_{i,t} \tag{1}$$

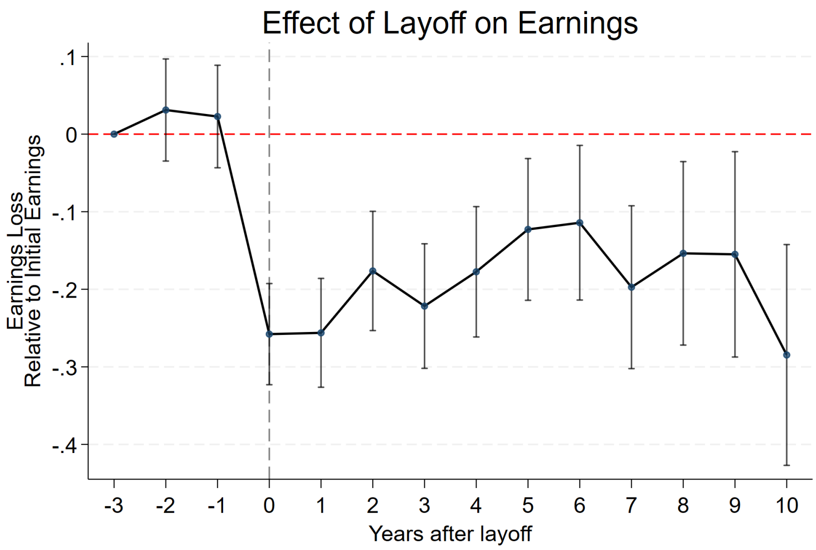
To compare our estimates to Davis and Von-Wachter (2011), we normalize real earnings relative to an initial year. $N_{i,t}$ denotes individual i's earnings loss as a fraction of their earnings three years prior to their first job-loss in the PSID dataset. For the control-population, initial earnings are the earnings they reported at the start of their first four-year employment spell. The dummy variable associated with $D_{i,-3}$ is dropped from the specification.

Table 1: Distributed Lag Regression
Earnings Loss Normalized by T-3 Earnings

	Coef.	Std. Err.	t	P> $\|t\|$	[95% Conf. Int.]
Treat & T - 3	0.00				
Treat & T - 2	0.040	0.034	1.150	0.250	[-0.028, 0.107]
Treat & T - 1	0.045	0.035	1.300	0.193	[-0.023, 0.113]
Treat & T + 0	-0.237	0.035	-6.780	0.000	[-0.305, -0.169]
Treat & T + 1	-0.238	0.036	-6.450	0.000	[-0.311, -0.166]
Treat & T + 2	-0.165	0.040	-4.160	0.000	[-0.243, -0.087]
Treat & T + 3	-0.206	0.042	-4.970	0.000	[-0.287, -0.124]
Treat & T + 4	-0.156	0.043	-3.600	0.000	[-0.241, -0.071]
Treat & T + 5	-0.100	0.047	-2.130	0.034	[-0.192, -0.007]
Treat & T + 6	-0.088	0.051	-1.720	0.085	[-0.189, 0.013]
Treat & T + 7	-0.180	0.054	-3.350	0.001	[-0.285, -0.075]
Treat & T + 8	-0.134	0.061	-2.210	0.027	[-0.253, -0.015]
Treat & T + 9	-0.137	0.068	-2.030	0.042	[-0.271, -0.005]
Treat & T + 10	-0.263	0.072	-3.610	0.000	[-0.405, -0.121]
Constant	1.148	0.006	208.760	0.000	[1.138, 1.159]

* Regression run on 228 identified Job-Losers & 984 Job-Stayers.

Figure 1.



Note: 95% confidence intervals shown
Normalized Earnings Winsorized at the 1% level

We see that the differential earnings growth between the treatment and control in the pre-period is statistically insignificant, while upon layoff, job-loser's earnings fall by around 24%. Job-loser's earnings recover in the years after job-loss, although this recover is statistically insignificant in our sample.

Our results are qualitatively similar to distributed lag findings in Davis & Von-Wachter (2011). The main difference is that our estimates of the effect of layoff tend to be larger - for instance our estimate of the immediate impact of layoff are around 8 - 12 percentage points higher than Davis & Von-Wachter's estimate.

Part 2: Model

Definition of equilibrium and block recursivity:

A recursive competitive equilibrium in this economy, given an initial distribution over employment/unemployment states e, debt b and human capital h:

$$\mu_0 = \{e_i, b_i, h_i\}_{i=0}^{i=1}$$

is a list of value functions and policy functions for the unemployed, employed, and firms:

$$U_t(b,h), \quad g_t^U(b,h), \quad W_t(b,w,h), \quad g_t^W(b,h), \quad J_t(w,h),$$

tightnesses for each submarket and period $\{\{\theta_t(h,w)\}_{w=\underline{w}}^{\bar{w}}\}_{t=1}^T$, and a distribution of individuals across states for each period $\{\mu_t = \{e_{i,t}, b_{i,t}, h_{i,t}, w_{i,t}\}_{i=0}^{i=1}\}_{t=1}^T$ and government policies (z, τ) such that:

1. All agents' policy functions and value functions jointly solve their problems given the initial state.
2. $\theta_t(w,h)$ and $J_t(w,h)$ are such that the free entry condition for firms is satisfied in each submarket in each period.
3. $\{\mu_t\}_{t=1}^T$ is consistent with the policy functions of individuals.
4. The tax rate τ balances the government budget.

Proof that the equilibrium is block recursive given τ:

The terminal value function for the firm is given by $J_T(w,h) = (1-w)h$. This does not depend on the distribution of individuals across states μ.

Note for $\zeta > 0$:

$$\begin{aligned} p_f(\cdot) &= \frac{M(u_T, v_T)}{v_T} \\ &= \frac{u_T v_T}{v_T(u_T^\zeta + v_T^\zeta)^{1/\zeta}} \\ &= \frac{1}{(1+\theta_T^\zeta)^{1/\zeta}} \end{aligned}$$

is monotonically falling in θ and hence permits an inverse.

Using free entry, $\frac{k}{J_T} = p_f(\theta_T)$. Inverting this implies θ_T is a function of objects that do not depend on μ, so it does not depend on μ either.

U_T & W_T depend only on benefits, wages and the tax rate, which are all independent of μ.

Similar steps show that the probability an unemployed worker who searches for a job in T-1 finds a match in T, $p(\cdot)$, depends only on θ_T. The law of motion for h does not depend on μ and z is pinned down by τ through the government budget constraint. Therefore, U_{T-1} depends only on W_T and objects which are independent of μ.

W_{T-1} depends only on U_T and objects which are independent of μ conditional on τ, which appears in the budget constraint.

Finally, because J_T, W_{T-1} and U_{T-1} are independent of μ, we can repeat the steps of this proof for all value functions for $T-1, \ldots, t=1$ to verify that the system / policy functions do not depend on μ.

Therefore the equilibrium is block recursive conditional on τ.

Baseline Model:

We faced an issue when solving and simulating the model under the baseline calibration where individuals start their lives unemployed at the lowest asset & human capital states. This was due to the combination of parameters $z = 0.4$, $\tau = 0.2$, $\kappa = 0.995$, human capital grid = [0.5, 1.5].

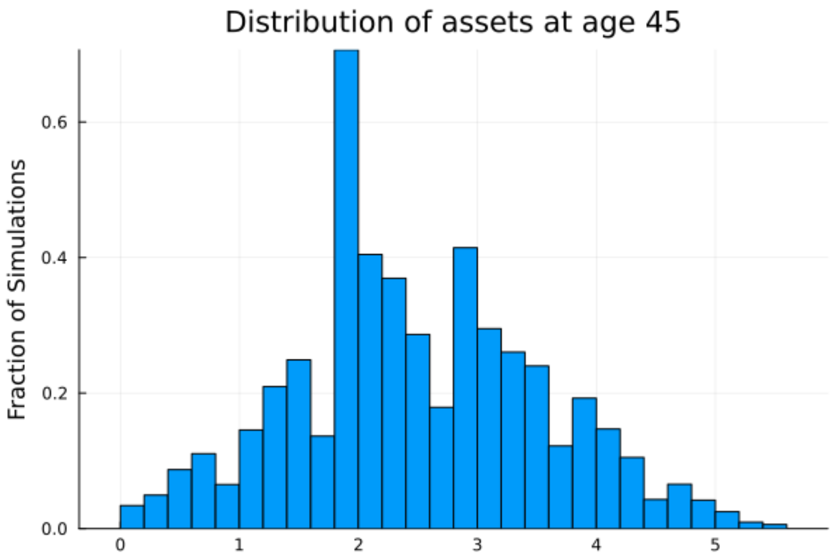
This is because when the unemployed solve the problem of which market to direct their search in, they only seek a market with some probability they will be employed if they are better off in employment than unemployment. This requires the after-tax consumption that the agent will receive after matching, $(1 - \tau)$wh to exceed z, the unemployment benefit. As individuals begin life with human capital h = 0.5, and z = 0.4, the only value of w within [0,1] acceptable to workers to search in is w = 1. However, firms clearly never post vacancies in this market. As time goes on, the value of a match to firms falls and they continue to be unwilling to post in $w = 1$ and the unemployed continue to be unwilling to search in any other market.

We dealt with this by reducing τ to 0.03, to match the amount of tax that typically funds UI. Additionally, because in practice reducing the tax rate is not enough to overcome the large posting costs in this economy, (firms only advertise for h = 0.5 workers in $w < 0.8$ submarkets, which workers will never search in even at $\tau = 0$), we shift the grid for human capital to h = [1,2].

3 a)

To solve the model, we used 25 gridpoints for human capital, 200 grid points for wages from 0.0 to 1.0 and 50 grid points for savings from 0.001 to 5.5. All figures are from 20,000 lifecycle simulations.

Figure 2.



In Figure 2., we see that that this upper bound on assets is appropriate as agents almost never accumulate savings above 5. near the peak of their lifecycle savings profile.

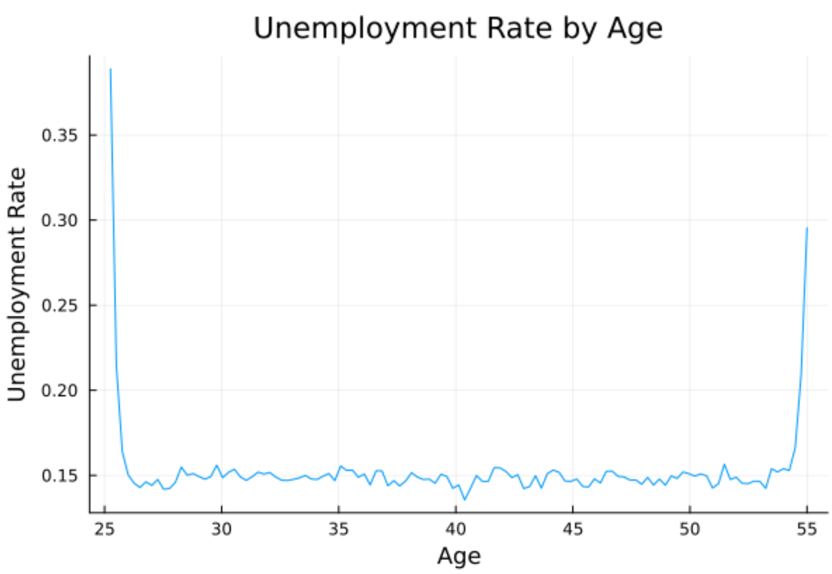
3 b)

Figure 3.

In general, unemployed agent's wage search behavior in our economy is extremely concentrated. They tend to search in high w submarkets, no matter their human capital level - with the exception of the very end of life where individuals will search in lower submarkets.

3 c)

Figure 4.

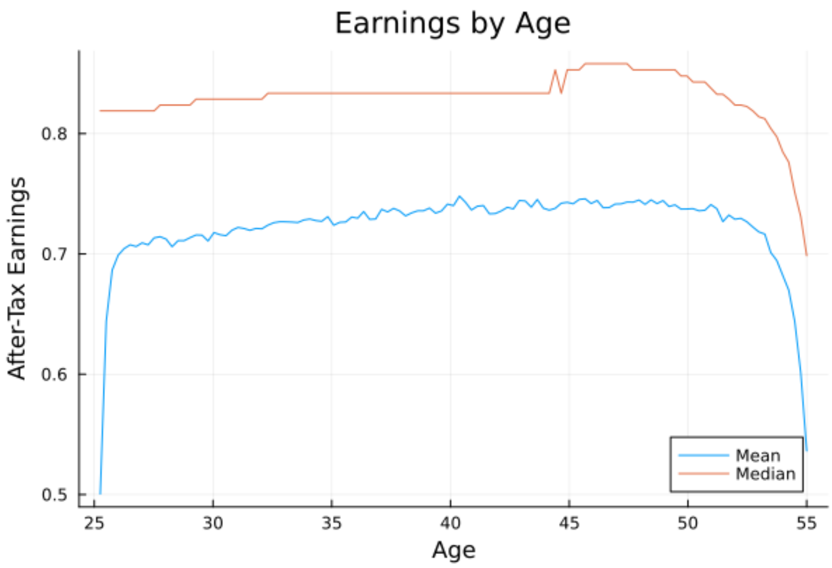


The unemployment rate over the lifecycle is 15.3%.

3 d)

Figure 5.

Unlike the hump-shaped lifecycle earnings profile we observed in Homework 1, we see here that earnings by age is roughly constant outside of job-market entry and retirement. This may be due to individuals staying at a low human capital level across their lives - we can see this in the graph of human capital at age 45 in Figure 6.



As the median individual is employed in our economy, median earnings exceed the mean. As indicated by Figure 3., most individuals search in the w = 0.85 submarket, so this suggests that individuals are typically near the lower bound of their human capital throughout their lives.

Figure 6.

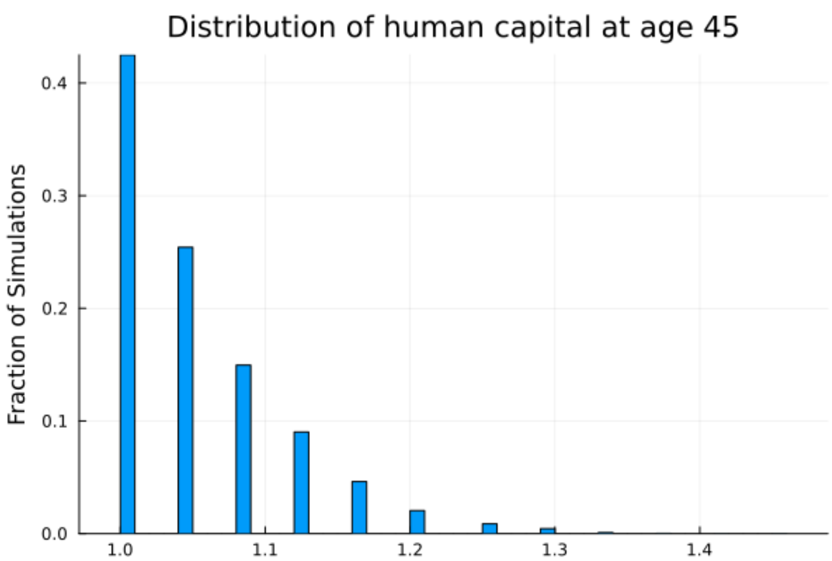
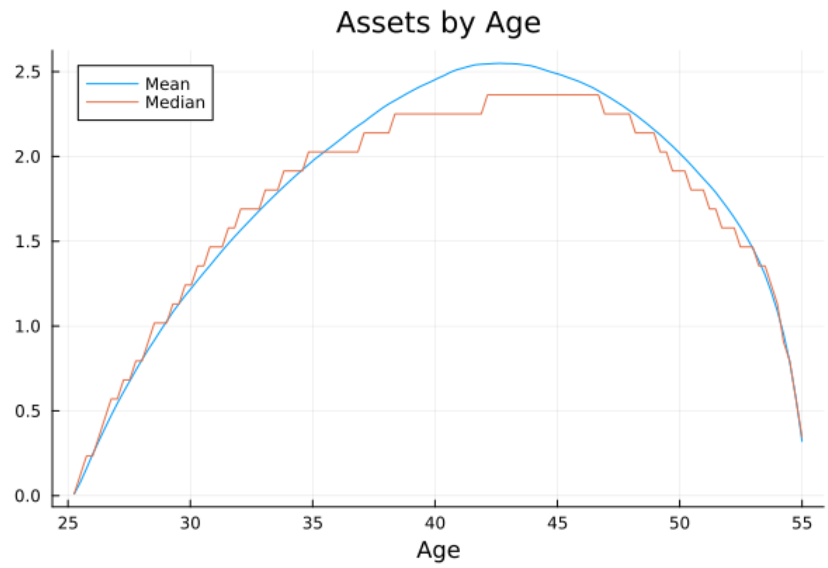


Figure 7.



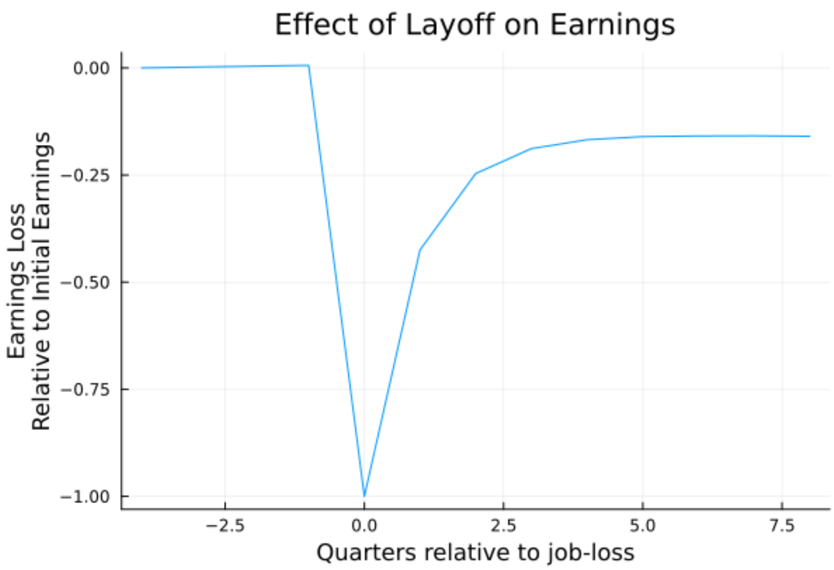
Individuals follow a hump-shaped savings path in the directed search bewley economy, similar to standard bewley economy. There is less skewness in wealth in our calibration.

3 e)

The average quarterly gain in earnings when employed in the model economy is about 0.2% - in the range of 0.8% annually. This is considerably smaller than what we found in the PSID, where the average annual increase in earnings was around 3-4%.

3 f)

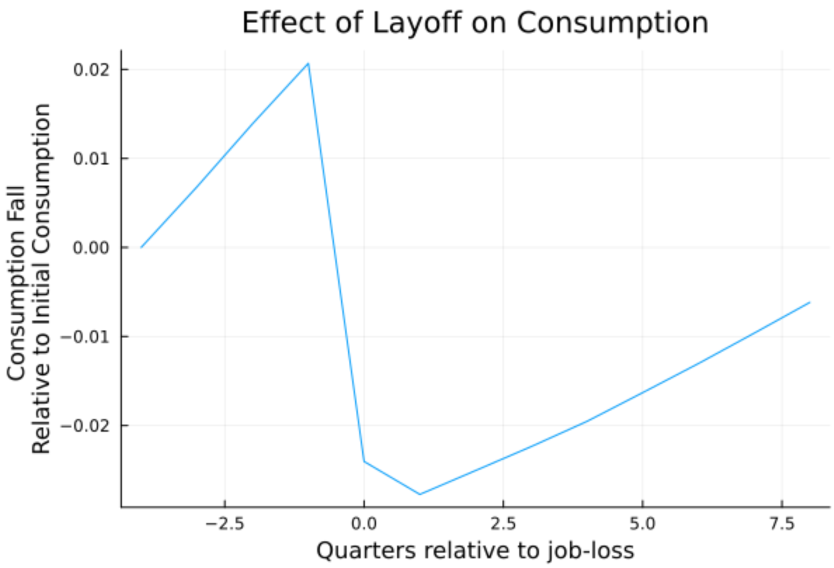
Figure 8.



Other than at time = 0, we see that the earnings loss patterns look a lot like in Davis & Watcher and our event study. The magnitudes, excluding t= 0, are also similar.

3 g)

Figure 8.

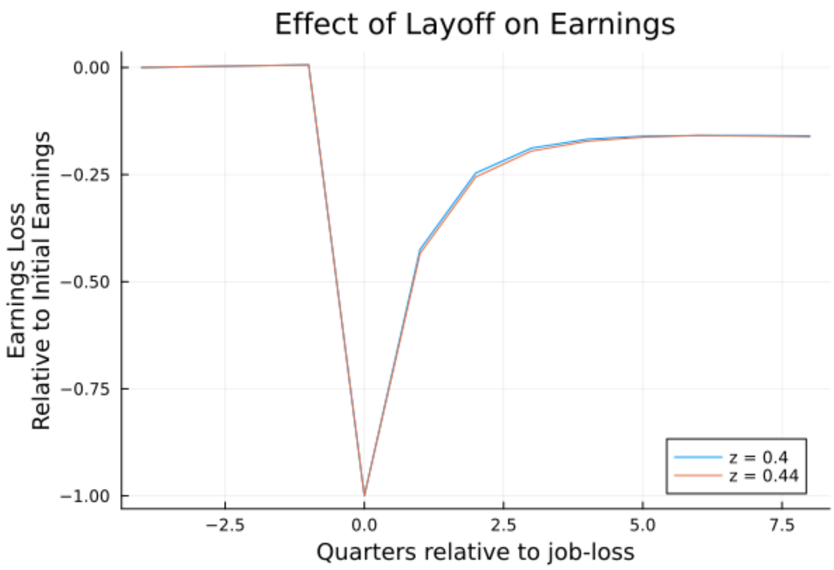


We see that the pass through of the earnings shock into consumption (less than 5%) as individuals are able to smooth using savings and unemployment benefits.

3 h)

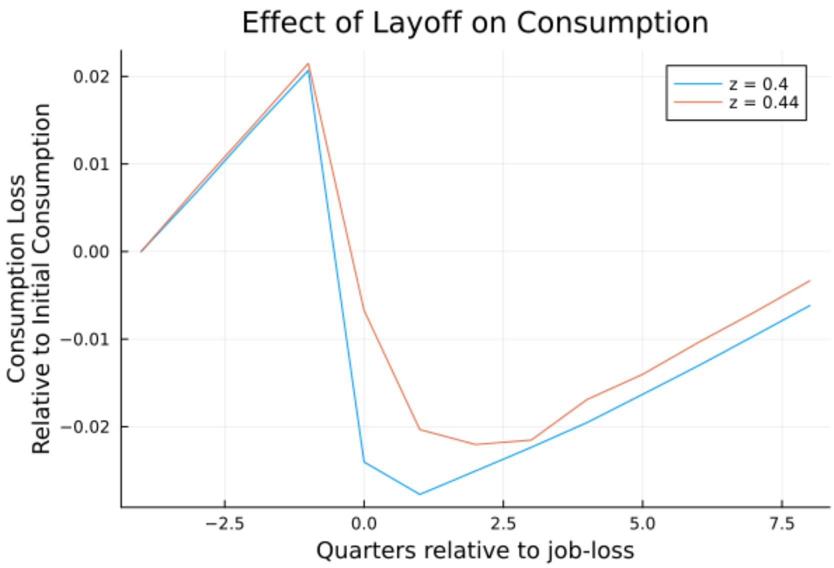
Increasing the UI benefit to z = 0.44 leads to a small fall in earnings, as some individuals who lose their job do not re-enter the labor market as quickly.

Figure 10.



It leads to a noticeable increase in consumption smoothing around job loss.

Figure 11.



The unemployment rate across all S = 20,000 simulated lifecycles was 15.6%, higher than 15.3% previously. The unemployment rate is somewhat higher as individuals have a lower incentive to find work: