Searching Under Pressure: Minimum Effort vs. Benefit Cuts from the Worker's View

MMMoLM report

by

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Abstract

This paper examines whether a minimum search effort requirement can achieve the same reduction in expected unemployment for low-productivity workers as an aggressive benefit cut, but at a lower utility cost to the individual. Using an extended McCall model with endogenous search effort, time dependency and worker heterogeneity, I compare the two policies, calibrated to yield identical unemployment exit probabilities. The results show that a search requirement imposes a smaller utility loss. This highlights the potential of non-monetary active labor market policies to support active job search in a system of generous benefits and thus strong insurance value.

Contents

1 Introduction

Striking the right balance between insurance and incentives is an important aspect of designing unemployment insurance (UI) policies. Offering financial support in the case of unemployment tends to make unemployment more attractive, and thus the incentive to actively search for a job during unemployment tends to decrease in the extend of the UI. This is studied in e.g. Van Doornik, Schoenherr, and Skrastins 2023 who shows that access to UI eligibility increases layoffs, based on a reform of the UI system in Brazil. Lalive 2008 also studies a large extension of the possible benefit duration (PBD) in Austria using a regression discontinuity design. He find, that this extension increases the length of unemployment durations by 0.9 weeks for men and 0.32 weeks for women per additional week of benefits.

In reality, individuals are heterogeneous and therefore differ in their motivation to actively search for a job when unemployed. Even with generous unemployment insurance, some people are still motivated to actively search for a job while others are less motivated. The aim of a UI system is thus to provide a financial insurance while ensuring the least motivated still actively search for a job. This leaves policy makers with a trade-off: how can a UI scheme be implemented while still maintaining a high incentive to find a job? A straightforward policy would be to financially worsen the UI-scheme by e.g. lowering the benefit itself or the PBD. These sorts of policies often achieve the goal of increasing incentives, but implies a worse financial situation in the case of unemployment. This hurts risk-averse individuals through two effects, namely the direct effect of lower consumption, but also the threat-effect that is effective for risk-averse individuals. Another way to induce work incentives without financially worsening the UI, is through active labor market policies (ALMP), such as minimum search effort requirements, workfare, education, etc., which can be more or less productivity-enhancing depending on the specific policy.

Such policies have become more and more popular in the last decades, and so has the research interest in them. With a purely empirical, IV-approach, Arni and Schiprowski 2019 studies search requirements in Germany, and finds a decrease in unemployment duration of 2-4% when imposing a requirement of an extra job application per month. Likewise, Maibom, Rosholm, and Svarer 2017, also using a pure empirical approach, studies the effect of 3 different ALMP's: group meetings, individual meetings and an activation wall (threat of workfare). They only find statistically significant results for the individual meetings, which have a 5% positive effect on employment. With a more theoretical approach, Fredriksson and Holmlund 2006 compares 3 different policies of a lower benefit duration, workfare requirements and monitoring-and-punishment in a search-and-matching model calibrated to fit US-data on wage replacement rate. They find the monitoring-and-punishment policy to be the most effective, and workfare to be inferior to the other two policies. Andersen and Svarer 2014 studies the effect of workfare requirements in a search-and-matching model similar to the one in Fredriksson and Holmlund 2006, calibrated on Danish data. They find that workfare requirements, even when unproductive, increases the search effort and lead to an actual welfare improvement.

The aim of this paper is to make a theoretical analysis of the effects on labor market outcomes arising from a minimum search effort requirement compared to an aggressive cut in benefits, and thus to examine whether it is possible to ensure a level of search effort from the less motivated without imposing a harsh punishment on the already motivated.

Hence, in this paper, I compare the consequences of imposing a minimum search effort requirement with the alternative of an aggressive cut in benefits, where benefits are reduced to 10% of the average wage. This is studied in a McCall model extended to include endogenous search effort and time dependency. In addition, heterogeneous workers in the form of a low (unproductive = high search costs) type and a high (productive = low search costs) type are implemented and the models are run side by side to compare the policy implications for both types. The environment is set up to mimic a very stylized version of the UK UI system, where wages have been calibrated to UK data, and the benefit paths have been set in accordance with UK rules. To ensure maximum comparability, the maximum search effort has been calibrated to yield the same probability of having exited unemployment after 2 years for the low type. The policies can now be compared as both are calibrated to the same policy benchmark.

The McCall model is well-suited for this analysis, as it captures individual decision-making under uncertainty about future job offers. It is flexible and can be extended to include worker heterogeneity, time-varying benefits, and minimum effort requirements, as I do in this paper. As the decision-making of the worker is based on maximizing utility, it provides a solid foundation for examining exactly how utility evolves under the different UI policies. With this setup, I find that the minimum search effort requirement imposes a smaller utility loss compared to the aggressive cut in benefits over the entire, indefinite horizon of the individual. Further, I find that the aggressive cut in benefits has smaller short-run effects on probability of exit, but larger long-run effects after 2 years. This result - that the search effort requirement entails lower utility costs - is robust to increased search costs, but if the worker becomes sufficiently myopic, she may initially prefer the aggressive cut, as she discounts the future cut heavily.

2 Model

In the following section, the McCall model used to perform the analysis is developed theoretically. The model largely follows the model and logic developed in section 2.2 of Le Barbanchon, Schmieder, and Weber 2024, written for the Handbook of Labor Economics. The specific implementation of the model is described in section 3.

2.1 The McCall job search model

Time is discrete, the time horizon of the individual is infinite and the world consists initially of a single, unemployed worker. Each period, if unemployed, the worker has a probability of getting a job offer, associated with a wage drawn from a distribution known to the individual. The probability of getting a job offer is dependent on the level of search effort, costly to the worker. When unemployed, the worker receives an unconditional, monetary benefit from the public sector of a known size. This setup leaves the agent with a choice on both the intensive and extensive margins. That is, the agent chooses how much search effort to exert (intensive margin) and if a job offer arrives, whether to accept it or not (the extensive margin). If she chooses to accept the job, she holds this job with the associated wage indefinitely. If she chooses not to accept, she stays unemployed for another period, and waits to see if a job offer in a future period arrives with a high enough wage for the worker to find working worthwhile. If this is the case, then the worker opts out of unemployment. The worker is forward looking and discounts the expected value of the future. More discussion on the dynamics of the model follows below and in section 3.

The model is initialized with an unemployed worker in $t = 0$. In every period the worker chooses a level of search effort to exert, e_t, in the range $e_t \in [0, 1]$. The level of effort determines the probability of receiving a job offer, p_t, via the search production function $f(e_t)$ such that

$$p_t = f(e_t) \tag{1}$$

in every period, the agent can only receive a maximum of one single job offer.

Exerting effort is costly to the worker and is determined by the cost function $c(e_t)$. The cost function is assumed to have the following properties: $c'(e_t) > 0$, $c(0) = 0$ (no fixed costs of searching) and $c(f^{-1}(.))$ is convex.

If the worker accepts a job offer, it comes with a wage, w, which is drawn from a known wage offer distribution, with PDF $f(w)$ and CDF $F(w)$.

When not working, the worker receives a monetary benefit, b_t, of a known size from the public sector. Note that this benefit is time dependent to allow for changing benefits. The agent discounts the future at a constant rate determined by the discount factor β.
Flow utility from consumption is determined by the utility function, $u(.)$, when receiving both the unemployment benefit and the labor market income. Hence, the agent is indifferent between income from working and income from public benefits: [1]

$$u(b_t) = u(w) \quad \forall \quad b_t = w$$

When a job is accepted, the worker has that particular job indefinitely. The value of accepting the job in period $t+1$ that pays a wage, w, is thus given as

$$U^E_{t+1}(w) = u(w) + \beta U^E_{t+2}(w)$$

Where superscript E denotes "Employment". The interpretation is clear; the value of employment today is given as the utility derived from the wage today, $u(w)$, plus the future, discounted value of employment, $\beta U^E_{t+2}(w)$. This equation is dynamic, with $U^E_{t+2}(w)$ containing $U^E_{t+3}(w)$ and so on. Since the environment is constant after accepting the job, $u^E_{t+1}(w) = u^E_{t+2}(w)$, as the job with the specific wage is held forever, we can simplify the value of employment to

$$U^E_{t+1}(w) = \frac{u(w)}{1-\beta} \tag{2}$$

On the other hand, the value of *unemployment* is given as:

$$U^U_t = \max_{e_t}(u(b_t) - c(e_t) + \beta \left(f(e_t) \int \max\left(U^E_{t+1}(w), U^U_{t+1}\right) dF(w) + (1 - f(e_t))\, U^U_{t+1} \right)$$

Where superscript U denotes unemployment. That is, the value of unemployment is the

[1]The model could easily be extended to include different utilities from labor market income and public benefits, but as it is irrelevant for the scope of this particular paper, it is not modeled for simplification.

flow utility from UI benefits, $u(b_t)$, minus the costs of searching for a job, $c(e_t)$, plus the discounted expected value of a future potential job offer. The first part of the large parenthesis is the value of a job offer that comes with probability, $f(e_t)$. Here the agent chooses whether to accept or not based on the future value of both options. The second part is simply the value of unemployment that arises if a job offer does not arrive, with probability $(1 - f(e_t))$. The agent chooses his search effort to maximize this value of unemployment..

Under the assumption that $p_t = f(e_t)$ is monotonic, we can rewrite the value function in terms of p_t as:

$$U_t^U = \max_{p_t} \left(u(b_t) - \tilde{c}(e_t) + \beta \left(p_t \int \max \left(U_{t+1}^E(w), U_{t+1}^U \right) dF_t(w) + (1 - p_t)\, U_{t+1}^U \right) \right)$$

Where $\tilde{c}(p_t)$ is the composite of the search costs and the inverse of the search production function $\tilde{c}\,(p_t) = c\,(f^{-1}\,(p_t))$. This reformulation implies that the problem can be solved by choosing the probability of exiting unemployment, p_t, instead of the effort chosen (functional form is discussed in 3.2.2). As the value of employment is strictly increasing in the wage, w, there is a unique wage which will make the worker indifferent between staying unemployed for another period and take the job. This wage is labeled the "reservation wage" and is denoted w_{t+1}^* for wages starting in period $t + 1$. Using the reservation wage and some algebraic manipulation, the value of unemployment can now be written as:

$$U_t^U = \max_{p_t,\, w_{t+1}^*} u\,(b_t) - \tilde{c}\,(p_t) + \beta \left(p_t \int_{w_{t+1}^*}^{\infty} U_{t+1}^E(w) - U_{t+1}^U dF(w) + U_{t+1}^U \right) \tag{3}$$

Where the part $U_{t+1}^E(w) - U_{t+1}^U$ is the net gain from taking the job, taking into account the foregone utility from unemployment. The integral has lower support in w_{t+1}^* as the net benefit-part only becomes relevant for jobs with wage offers above the reservation wage (those the worker accepts).

Any wage such that $U_{t+1}^E(w) \geq U_{t+1}^U$ is accepted, implying that the reservation wage must satisfy the condition $U_{t+1}^E(w_{t+1}^*) = U_{t+1}^U$, meaning that the reservation wage is the exact wage that makes the worker indifferent between unemployment and employment. Using equation (2) we get:

$$u(w_{t+1}^*) = (1 - \beta) U_{t+1}^U \tag{4}$$

Given the reservation wage, we can write the first order conditions that determine optimal search effort by taking the derivative wrt. p_t

$$\tilde{c}'\left(p_t^*\right) = \beta\left(\int_{w_{t+1}^*}^{\infty} U_{t+1}^E(w) - U_{t+1}^U dF(w)\right)$$

or by multiplying with the inverse of $\tilde{c}$:

$$p_t^*\prime = \tilde{c}'^{-1}\left(\beta\left(\int_{w_{t+1}^*}^{\infty} U_{t+1}^E(w) - U_{t+1}^U dF(w)\right)\right)$$

Using that $u(w) = (1-\beta)U_{t+1}^E$ and $u\left(w_{t+1}^*\right) = (1-\beta)U_{t+1}^U$ we can write the optimal probability of exiting unemployment as

$$p_t^* = \tilde{c}'^{-1}\left(\frac{\beta}{1-\beta}\left(\int_{w_{t+1}^*}^{\infty} u(w) - u\left(w_{t+1}^*\right) dF(w)\right)\right)$$

Given the optimal search effort, this will pin down the reservation wage in period t. By combining equation (3) and (4), we arrive at an expression for the utility of the reservation wage, w_t^*, in period t as a function of the given optimal probability of exiting unemployment (determined by search effort) in t, p_t^*, and the reservation wage in the next period, w_{t+1}^*:

$$u\left(w_t^*\right) = (1-\beta)\left(u\left(b_t\right) - \tilde{c}\left(p_t^*\right) + \beta\left(p_t^* \int_{w_{t+1}^*}^{\infty} U_{t+1}^E(w) - U_{t+1}^U dF(w) + V_{t+1}^U\right)\right)$$

Finally, using (2) and (4), we can rewrite this to:

$$u\left(w_t^*\right) = (1-\beta)\left(u\left(b_t\right) - \tilde{c}\left(p_t^*\right)\right) + \beta u\left(w_{t+1}^*\right) + \beta\left(p_t \int_{w_{t+1}^*}^{\infty} u(w) - u\left(w_{t+1}^*\right) dF(w)\right)$$

2.2 Steady state

We have now developed the model over the period where policies can affect the different parameters of the model, and thus where the outcomes are time dependent. Suppose that at some point, T, the model reaches a steady state environment where all parameters remain constant for all future periods, $t \geq T$. In this specific analysis, this means that neither the benefit nor the search effort floor change beyond this time, T (see section 3). When the environment becomes completely stationary, it must be the case, that the reservation wage stays constant: $w_T^* = w_{T+1}^* = w_{T+k}^* \quad \forall \quad k \geq 0$. Using the steady state, we can write the FOC's of the steady state as:

$$p_T^* = \tilde{c}'^{-1}\left(\frac{\beta}{1-\beta}\left(\int_{w_T^*}^{\infty} u(w) - u\left(w_T^*\right) dF(w)\right)\right) \tag{5}$$

and the reservation wage in steady state as:

$$u\left(w_T^*\right) = (1-\beta)\left(u\left(b_T\right) - \tilde{c}\left(p_T^*\right)\right) + \beta u\left(w_T^*\right) + \beta\left(p_T^* \int_{w_T^*}^{\infty} u(w) - u\left(w_T^*\right) dF(w)\right)$$

Which can be rearranged to

$$u\left(w_T^*\right) = u\left(b_T\right) - \tilde{c}\left(p_T^*\right) + \frac{\beta}{1-\beta}\left(p_T^* \int_{w_T^*}^{\infty} u(w) - u\left(w_T^*\right) dF(w)\right) \tag{6}$$

Equation (5) and (6) form a system of 2 equations with the two unknowns, w_T^* and p_T^*. To completely solve the model for both the steady state and all periods from $0 \leq t < T$, one first solves the steady state values. Given these, one can use backward induction and recursively calculate all prior periods down to $t = 0$ with each period taking into account the next period.

2.3 Hazard rates and survival functions

It is possible to calculate the probability each period of the worker finding a job that she accepts - the hazard rate. This depends on both the probability of receiving a job offer, $p_t(e)$, and the distribution of wages, $F(w^*)$. The probability of exiting unemployment at time t can thus be calculated as:

$$h_t = p_t\left(1 - F_t\left(w_{t+1}^*\right)\right)$$

Directly related to the hazard rate is the survival function, that calculates the cumulated probability of having 'survived' unemployment until a given point in time i.e. to have remained unemployed to this time. With a positive hazard rate, the survival function is decreasing in time, as it becomes increasingly unlikely that the worker has not been offered a job above the reservation wage in any of the prior periods. This survival function can be calculated as:

$$S_t = \prod_{k=1}^{t} (1 - h_k) \tag{7}$$

3 Implementation

In the following section, the implementation of the model developed in section 2 will be laid out in detail. The different policies, along the choices for functional forms, worker heterogeneity and parameter values will be described.

3.1 Policies

As laid out in section 1, this paper analyzes 3 different UI schemes which differ in their way of sanctioning the unemployed. The aim is to study how a minimum search effort requirement affects labor market outcomes, and how this compares to a more traditional cut of the public UI benefits. To do this, 3 different policy schemes are set up to enable comparison. These are laid out below:

"Policy 1 - The baseline model" is characterized by a benefit of size b, which is then later reduced to $b_{cutoff} < b$, which is then the size of the benefit indefinitely. Other than this benefit cut, no policies are implemented. This set-up act as the baseline for the model, to which the two policies of a minimum search requirement (search effort floor) and an aggressive benefit cut is compared to.

"Policy 2 - Search effort floor" is characterized by having a minimum search requirement of e_{min} implemented, such that the individual cannot exert search effort below this level. This particular policy is meant to mimic various active labor market policies, that require benefit claimants to actively search for a job to stay eligible for the benefit. Such non-monetary requirements could be a minimum of job applications per month, mandatory meetings with caseworkers, etc. See e.g. Maibom, Rosholm, and Svarer 2017 for examples of such. Note, that the benefit cut in the baseline model from b to b_{cutoff} in $t = 52$ is still effective in this policy.

"Policy 3 - Aggressive benefit cut" is similar to the baseline model, but with a very aggressive benefit cut, where the benefit is cut to $b_{cutoff,aggresive}$ set at 10% of the average wage corresponding to an 80% decrease from the initial level, b. In this scheme, there is no effort floor, and the aggressive cut is thus the only policy.

3.2 Functional forms

As described in section 2, there are multiple choices to be made when aiming to perform actual analysis in a theoretical model like the McCall model. Specifically, one has to settle on a functional form for the benefit scheme, cost of search effort, the probability of receiving a job offer as a function of exerted effort and the distribution of wage offers.

3.2.1 Cost of effort and worker heterogeneity

The cost of exerted effort follows the form:

$$c(e_t) = k\frac{e_t^{1+\kappa}}{1+\kappa}$$

where e_t is the exerted effort in period t

This functional form is convex and is determined by the two parameters k and κ. k acts simply as a scaling parameter whilst κ determines the convexity of the costs. Note that a higher κ implies a lower cost of search effort. The convex form of the cost function implies that a marginal increase in effort comes at a lower cost when exerting low efforts compared to high efforts. This functional form is chosen to reflect diminishing returns to scale from searching, like in Le Barbanchon, Schmieder, and Weber 2024. In other words, the worker has small utility costs from writing the first job application, but when she has written many, it becomes increasingly more costly for her to write an extra one. This assumption does not seem unreasonable, if one believes that the opportunity cost of foregone leisure is increasing, meaning that leisure is more valuable when having little of it.

However, this effect is not necessarily dominating other, potential, opposite effects. it could also be the case, that it becomes 'easier' to write job application number 10 compared to number 1, as the applicant has attained some particular skills in job searching, that makes her more efficient and thus lowers the marginal cost. In practice, either effect — or a combination of both — may be at work.

The source for worker heterogeneity is implemented in the cost functions as different sizes of the scale parameter, k. Specifically a productive "high type" and an unproductive "low type" is introduced. They differ in k, where the "high type" has $k_{high} = 10$ and $\kappa_{high} = 4$ while the "low type" has $k_{low} = 100$ and $\kappa_{low} = 4$.

$$c(e_t)_{high} = k_{high} \frac{e_t^{1+\kappa_{high}}}{1+\kappa_{high}} = 10 \frac{e_t^{1+4}}{1+4}$$

$$c(e_t)_{low} = k_{low} \frac{e_t^{1+\kappa_{low}}}{1+\kappa_{low}} = 100 \frac{e_t^{1+4}}{1+4}$$

The specific values of k and κ are chosen arbitrarily to suit the analysis in a way, such that visible outcomes arise given the scaling of wages, benefits, search effort, etc. If one wanted to ensure externally valid results from the analysis, these parameters should naturally be calibrated to fit empirical moments.

Furthermore, the aim to model an "unproductive" and a "productive" type could also have been modeled in different ways than high and low costs of searching. E.g., different returns to the probability of getting job offers from exerting search effort is an opportunity, which could be resembling professional network effects. It could also have been modeled as different discounting rates, different wage offer distributions, etc.

Both the assumption of only two worker types, in addition to the policy maker being able to perfectly observe their heterogeneity, is very unrealistic. However, as register data becomes better and more detailed, individual or group heterogeneity becomes easier to observe, and hence targeting specific groups with tailored policies becomes more realistic. The cost functions for the two worker types in this 'world' are illustrated below:

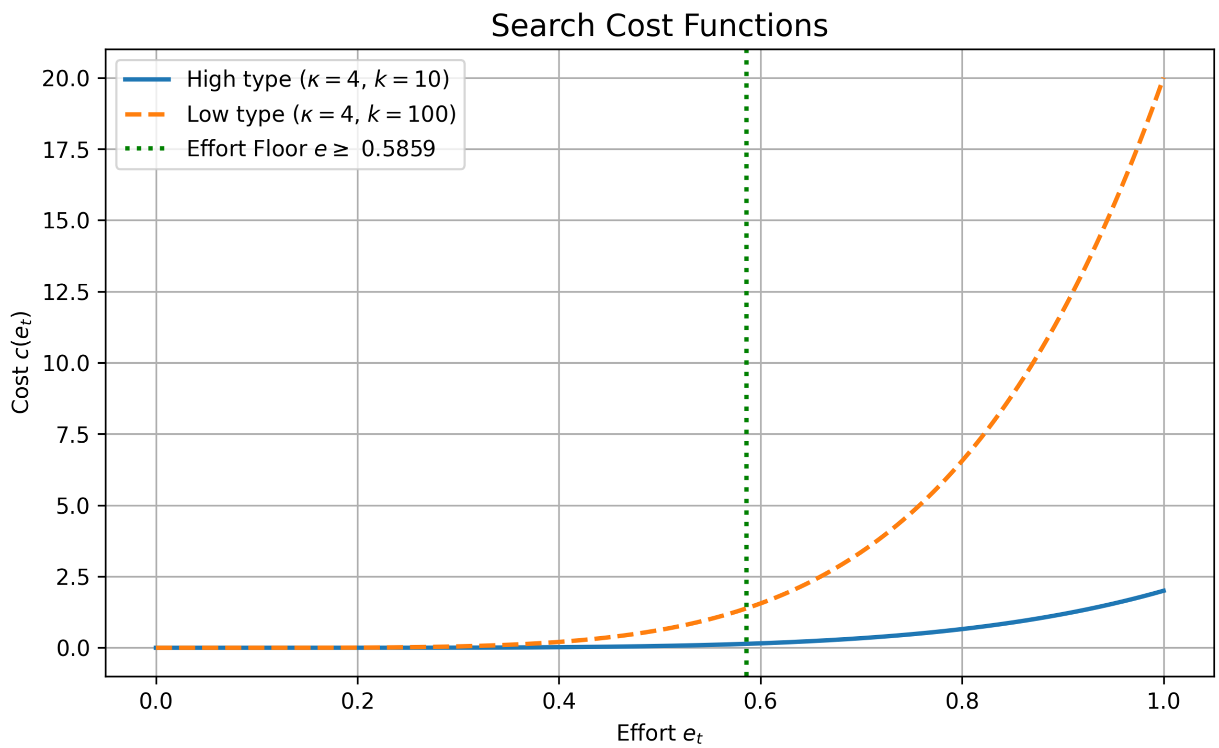

Figure 1: Search cost functions

3.2.2 Probability of job offer

Job offers arrive with a probability according to equation (1):

$$p_t = f(e_t) = e_t, \quad e_t \in [0, 1]$$

This functional form of the probability function sets the probability of finding a job equal to the search effort. Essentially, the functional form implies that the agent has the same marginal return from putting effort in job searching, no matter the level of effort. This ensures that $p_t \in [0, 1]$ as effort takes values in the domain of $e_t \in [0, 1]$.

Similar to the discussion of the search effort costs, this functional form is probably a strong simplification of reality, as one could easily argue that there could be decreasing returns to effort, if e.g. there are some low hanging fruits to collect when initializing job search. However, implementing marginally decreasing returns to job search has the equivalent effect on the worker's effort decision as increasing marginal costs.

3.3 Distribution of wages

In this paper the wage offers are assumed to follow a log-normal distribution with standard PDF and CDF:

$$f(w) = \frac{1}{w\sigma\sqrt{2\pi}} \cdot e^{\left(-\frac{(\ln x-\mu)^2}{2\sigma^2}\right)} (PDF)$$

$$F(w) = \frac{1}{2}\left[1 + \operatorname{erf}\left(\frac{\ln w - \mu}{\sigma\sqrt{2}}\right)\right] = \Phi\left(\frac{\ln w - \mu}{\sigma}\right) (CDF)$$

The wages have been scaled to $w \in [0, 40]$ for simplicity. As the log normal distribution has probability mass farther out than 40, the distribution has been normalized to ensure, that integrating over the set of possible wage values, returns ≈ 1.[2] In addition, the distribution is fitted on actual income data from the "Understanding Society (USoc)" project where researchers have been collecting longitudinal micro data from a large group of individuals in the UK - including data on income, unemployment spell durations, etc. First, the raw data from USoc is scaled such that the 99th percentile maps to $w = 40$, aligning the data with the range selected. A log normal PDF is then fitted to the data, which yields the following parameters:

$$\mu = 2.1107 \quad \text{and} \quad \sigma = 0.6784$$

This implies that the average wage is given by:

$$\begin{aligned} E[w] &= e^{\mu + \frac{1}{2}\sigma^2} \\ &= e^{2.1107 + \frac{1}{2}0.6784^2} \\ &= 10.3897 \end{aligned}$$

The fit is illustrated in figure 2 below:

[2] Before normalizing, it integrated to 0.989. After normalizing it integrates to 0.999(...) .

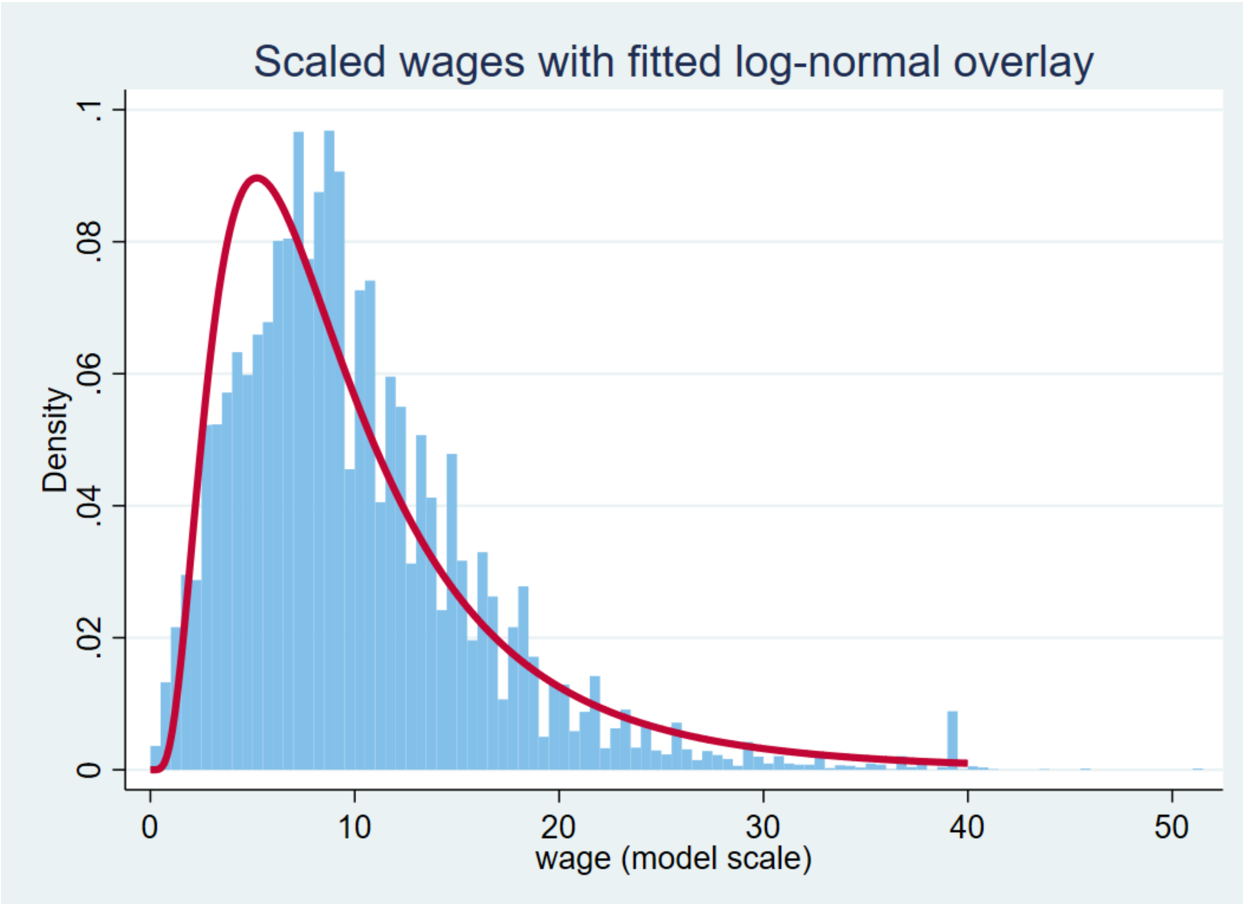

Figure 2: Log normal fit

The implications of this form are that jobs of lower wages are assumed to be more frequent than jobs of higher wages. Combined with the assumption that the workers are not able to search for specific job types, but only exert general search effort, this implies that in order to get offered a high-paying job, the worker must, in expectation, search more for a high-paying job than a low-paying job. This is regardless of her type, as the two worker types only differ in their costs of exerting effort.

3.4 Parameter values

In this section, I list the parameter values used in the project, and comment on the choices of those not already discussed in previous sections. Below is a complete table of the parameters:

Parameter	Value	Description
Wage distribution and utility		
$u(\cdot)$	$log(\cdot)$	Utility function is log
μ	2.1107	Median of $\log(w)$
σ	0.6784	Standard deviation of $\log(w)$
`wage grid`	$[0, 40]$	Wage grid supports
Unemployment and discounting		
β	0.97	Yearly discount factor
b	$0.7 \cdot e^{\mu+\frac{1}{2}\sigma}$	Initial UI benefit
b_{cutoff}	$0.4 \cdot e^{\mu+\frac{1}{2}\sigma}$	Reduced benefit after cutoff
$b_{\text{cutoff, aggressive}}$	$0.1 \cdot e^{\mu+\frac{1}{2}\sigma}$	Aggressive benefit drop
Cost functions		
k_{high}	10	Level shifter in high-type cost function
k_{low}	100	Level shifter in low-type cost function
κ_{high}	4	Convexity of high-type cost
κ_{low}	4	Convexity of low-type cost
Time and policy parameters		
T	104	Model duration (e.g., weeks)
UI duration	$T/2 = 52$	Duration of full UI benefits
e_{min}	0.5859	Policy-imposed effort floor

Table 1: Overview of model parameters

3.4.1 Log-utility, $u(\cdot) = \log(\cdot)$

Workers have log utility of consumption. This is to acknowledge the fact that people in general tend to be risk-averse, which the log utility form captures. In the setting of this model, it lowers the reservation wage, as they are less willing to take the risk of forgoing an offer in the hope of a better one in the future. An increasing and concave utility specification (as e.g. log utility) is also used in Fredriksson and Holmlund 2001, Fredriksson and Holmlund 2006 and Andersen and Svarer 2014. Further, the individual has log utility from consumption, regardless of its origin, and thus she is indifferent between receiving monetary benefits from the public sector or receiving a wage. The analysis could have included different utility from different income types to account for disutility from working or on the other hand, some shame / psychological costs of being provided for by the public sector. Although such points may be valid, it has been left out for simplification.

3.4.2 Discount parameter, β

The choice of the yearly discount factor, $\beta = 0.97$ (i.e. a discount rate of 3%) is chosen in accordance with often chosen values in the literature. E.g. Maibom, Rosholm, and Svarer 2017 uses a discount rate of 3% while also testing 2% and 4% for robustness without their conclusions changing. Further, DellaVigna and Paserman 2005 assumes a discount rate of 5%. A 97% yearly discount factor corresponds to a weekly discount factor of:

$$\begin{aligned}\beta_{weekly} &= (1 - \beta_{yearly})^{\frac{1}{52}} \\ &= (1 - 0.97)^{\frac{1}{52}} \\ &= 0.999414...\end{aligned}$$

It should be noted that using exponential discounting as is the case in this paper is not necessarily the most realistic assumption of individual discounting behavior. Exponential discounting essentially makes future gains exponentially decreasing in present value terms. However, in the literature, a lot of evidence has been found of other forms of discounting such as hyperbolic discounting that captures so-called present bias. Present bias is the phenomenon that individuals have more patience when it comes to long-run decisions compared to short-run decisions. See e.g. DellaVigna and Paserman 2005 for a discussion and study on this particular topic.

3.4.3 UI benefit, b

The benefit levels are set in order to mimic a heavily simplified version of the UK UI-system. In the UK, it is possible to take out a private unemployment insurance, which usually cover a maximum of $50\% - 70\%$ of the pre-unemployment income. Usually, these insurances cover income for a year (Gocompare 2024). Thus, the initial benefit is set to 70% of the average income in the sample.

Furthermore, there exists a general coverage system, "Universal Credit" in the UK provided by the government. The size of the payout from Universal Credit is dependent on the household type (Gov.UK 2024). In November 2023, the weighted average payout for singles with and without children from Universal Credit amounted to £865,70 (Department for Work and Pensions 2024). This corresponds to $\sim 40\%$ of the average wage in the USoc data, and thus, the benefit after 52 weeks, where the individual is dependent on only Universal Credit, is set to 40% of the mean income, implying a drop in income of 30%-points when going from the private insurance to Universal Credit, corresponding to a marginal drop of 42.6%. As the wage distribution is log-normal, and thus the average is skewed, it would be preferable to define benefits based on the median wage instead of the average wage, but the accessed data on benefit payouts from Universal Credit only provides the average payout.

The benefit paths are plotted below:

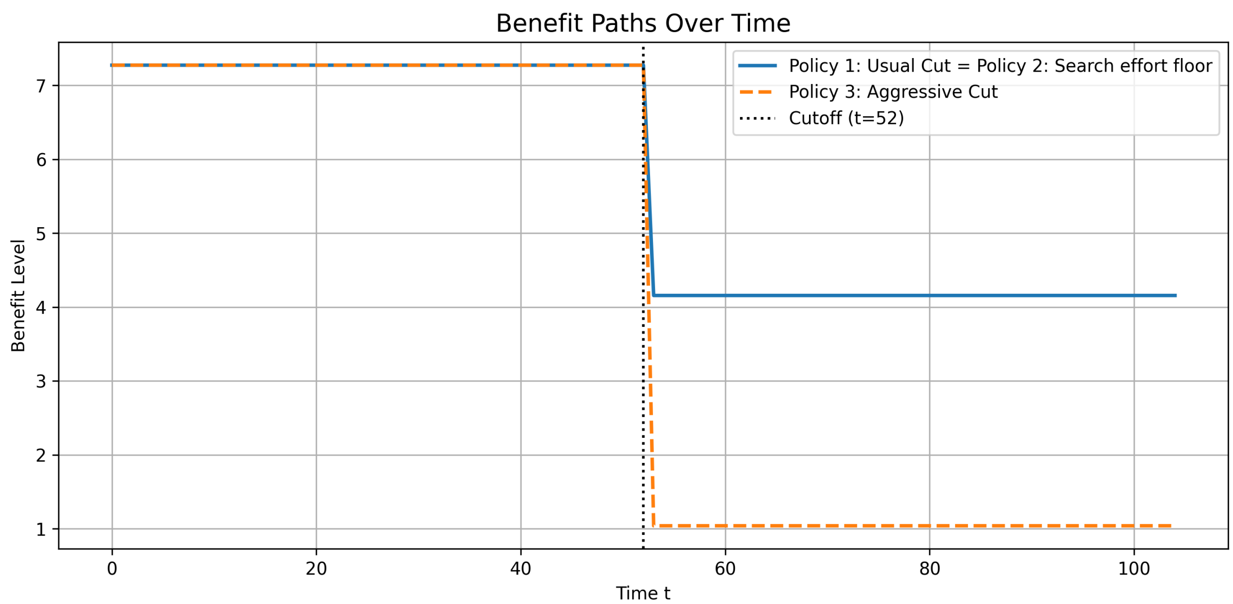

Figure 3: Benefit paths under different policies [3]

It should be noted that this is a very rough simplification of the UK unemployment insurance system. First of all, there exist other, smaller, public benefits that can be claimed alongside Universal Credit (such as JSA), even though Universal Credit has replaced many of these. Second, you can be eligible for Universal Credit alongside working, where the benefit drops by 55p for every pound earned from work. This mechanic of claiming benefit and working at the same time is not modeled in this paper. The simplification of the system obviously limits the external validity of the analysis, but as it is not the scope of this paper

[3] Recall that the baseline cut is still effective in policy 2, which is why policy 1 and policy 2 follow the same benefit path.

to provide numerical policy suggestions, it is deemed acceptable.

3.4.4 Minimum Search Effort, $e_{\min}$

The minimum search effort requirement implemented in policy 2 is set to $e_{\min} = 0.5859$. This particular level is a result of a calibration made of the requirement, such that the probability of the low type having exited unemployment after 2 years (in t=104) under Policy 2 is equal to that of Policy 3. In practice, a loss function of the below form is minimized:

$$loss = \left(S_{t=104,policy2} - S_{t=104,policy3}\right)^2$$

where S_t is the survival function calculated in accordance with equation (7). The idea stems from a policy evaluation perspective: if the policy maker wishes to evaluate the search effort floor against the aggressive cut in the benefits, it makes sense to compare these based on both fulfilling the same policy goal. In this case, by achieving a benchmark probability of continued unemployment after 2 years.

4 Results

In the following section, the results of the analysis will be presented. First, the outcomes from the baseline model will be presented, and afterwards, the outcomes of Policy 2 and Policy 3 will be studied in relation to each other, and the baseline of Policy 1.

4.1 Policy 1: Baseline model

Figure 4 illustrates the various outcomes of the model under the baseline policy described in section 3.1.

It is immediately seen that the value of unemployment is higher for the high type than for the low type, reflecting that the higher costs of searching has a cost to utility. Furthermore, we see that the value gradually declines towards the cutoff at $t = 52$, where the benefit drops to b_{cutoff}. This gradual decline reflects the foresight of the worker, as she sees the benefit drop getting closer and closer the longer she stays unemployed.

Turning to the search effort, the low type exerts a much lower search effort than the high type, reflecting that the low type has higher costs of doing so, and thus the optimizing level of the low type is lower than for the high type. In addition, the search effort is increasing as the agent approaches the cutoff. Again, this is a result of the agents foresight.

The reservation wage for the high type is higher than for the low type. This means that the high type is more 'picky' in his job choices than the low type, reflecting that the high type does not have as high costs of searching for another period than the low type. The reservation wage is decreasing as she approaches the cutoff, due to similar arguments as above.

The exit probability (hazard rate) reflects the probability of the worker exiting unemployment at each period. An interesting dynamic arises here. Even though the high type is more picky than the low type, her increased search effort offsets the pickiness and gives her a higher probability of exit (hazard rate) each period compared to the low type. I.e., the higher probability of receiving job offers implies a higher probability of getting a job offer above her reservation wage, which dominates the pickiness. The lower exit probability each period results in a higher cumulative probability of still being unemployed at each t (survival function). Hence, in expectation, the low type has longer unemployment spells than the high type. Note the slight curvature on the curve along the transitioning path for these curves as

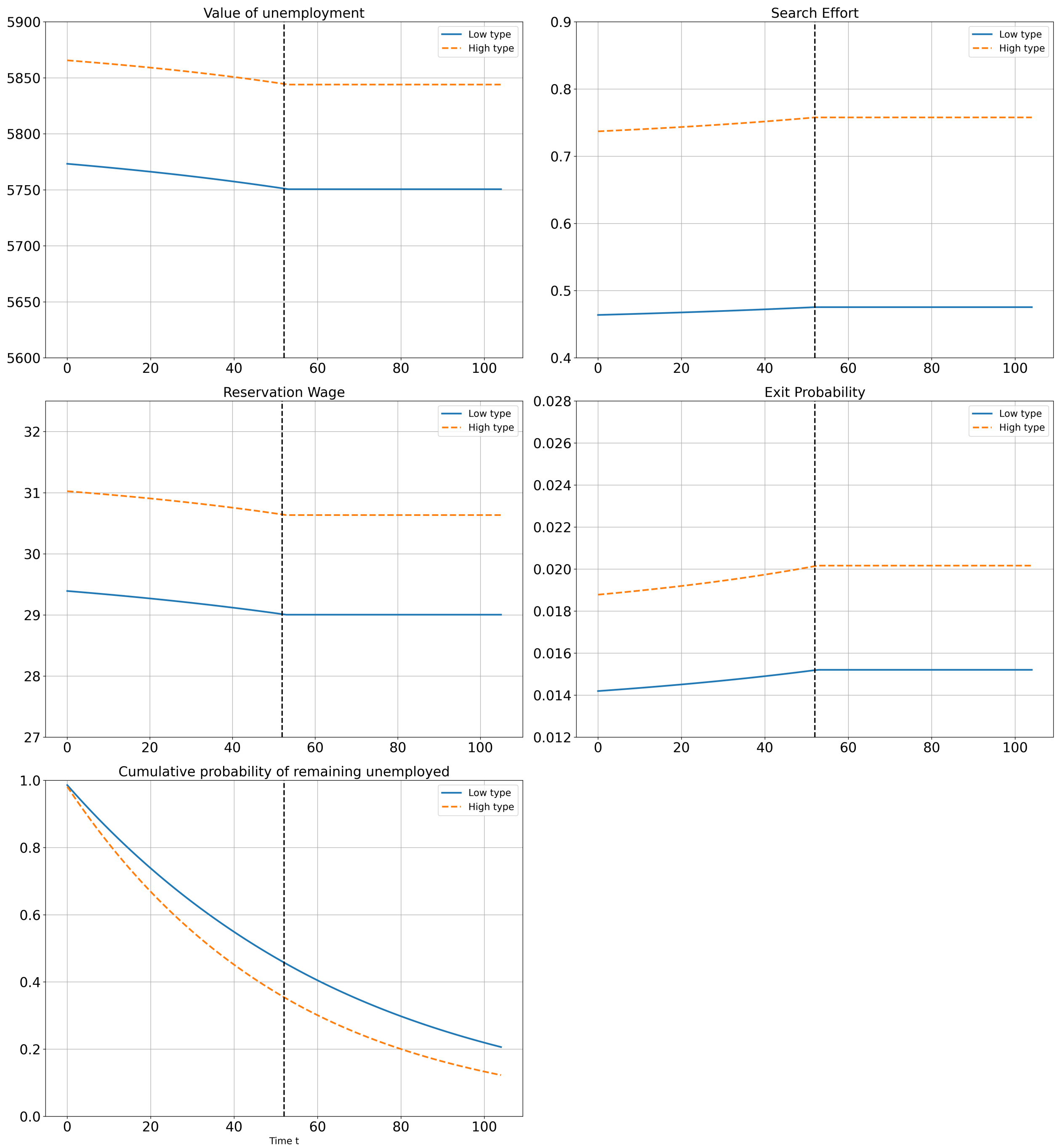

Figure 4: Outcomes of Policy 1

well as for the other outcomes, stems from the log-utility specification and the exponential discounting. See 3.4.1 and 3.4.2 for a discussion.

4.2 Comparison of policies

In figure 5, outcomes of all three models are plotted side by side to allow for visual comparison of the different outcomes. Each column represents a policy and each row represents a specific outcome. Before analyzing the outcomes, recall that the search effort requirement, e_{min}, has been calibrated such that the probability of remaining unemployed in period T=104 (after 2 years) has been equalized for Policy 2 and 3. Hence, Policy 2 and 3 should be compared with the fact in mind that the same policy outcome has been reached. [4]

Row 1 illustrates the value of unemployment. These outcomes show, that the search requirement leads to a decrease in utility only for the low type. This stems from the size of the search effort requirement that lies below the high type's optimal search effort, and hence only the low type is affected. Compared to Policy 3, we see that both the high and the low type's utility has decreased, and has a more aggressive dive towards the cutoff. The utility of the high and low type is plotted in 6 for easy comparison.

Row 2 illustrates the search effort. For policy 2, the search effort is placed above the low type's own optimal search effort, and hence, she is placed in a corner solution at the minimum requirement. Note that the high type's optimal search effort is unaffected by the requirement. Comparing with Policy 3, the aggressive benefit drop increases both type's optimal search effort compared to the baseline outcome of policy 1. An important point here is, that the aggressive benefit cut affects both the high type and the low type's search effort while Policy 2 only has an effect on the low type.

Row 3 illustrates the reservation wage. For Policy 2, opposing forces are at play. First, we see that the low type's reservation wage decreases in Policy 2. This is a consequence of her being forced to exert more effort, and thus take on higher total costs from searching than her optimal choice would have let her to. This lowers her pickiness. However, the increased search effort also increases the likelihood of receiving a job offer, and thus the probability of receiving a job offer above her reservation wage, which mitigates the fall in the reservation

[4] The probability of being unemployed after two years is 13.3%, which is a result of the arbitrarily chosen aggressive cut being 10% of the average wage.

wage. Comparing to Policy 3, we see that the reservation wage of both types have decreased as a result of the aggressive cut. Note that the reservation wage of the low type in Policy 3 falls to a point quite a bit below the reservation wage of the low type in Policy 2.

Row 4 illustrates the probability of exiting unemployment at time t (hazard rate). For Policy 2, it is seen, that the effort floor has increased the hazard rate of the low type so it now lies close to that of the high type. Further, we can see, that the high type has a steeper slope on the gradual increase towards the cutoff. This stems from the fact, that the low type now does not have an increasing optimal search effort path as she is forced in the corner solution of the minimal effort. The high type remains unaffected by the search effort floor, which drives the different steepness of the paths towards the cutoff. Comparing to Policy 3, the aggressive cut now affects both types. For the low type, the initial probability has not increased as much as in Policy 2, but the steady state is higher. I.e., the search effort requirement has larger immediate effects on exit probabilities, while the aggressive cut has larger, cumulated long-run effects (after 2+ years).

Row 5 illustrates the cumulative probability of having exited unemployment (survival function) that result from the probability of exiting each period. Starting with Policy 2, the survival function for the low and high type now follow almost the exact same path, which is a result of the hazard rate for the low type, in row 4, has been increased to almost the same level as the high type. Comparing to the aggressive cut, the survival function for both types have increased and have become steeper, implying that both types find jobs more quickly compared to the baseline model.

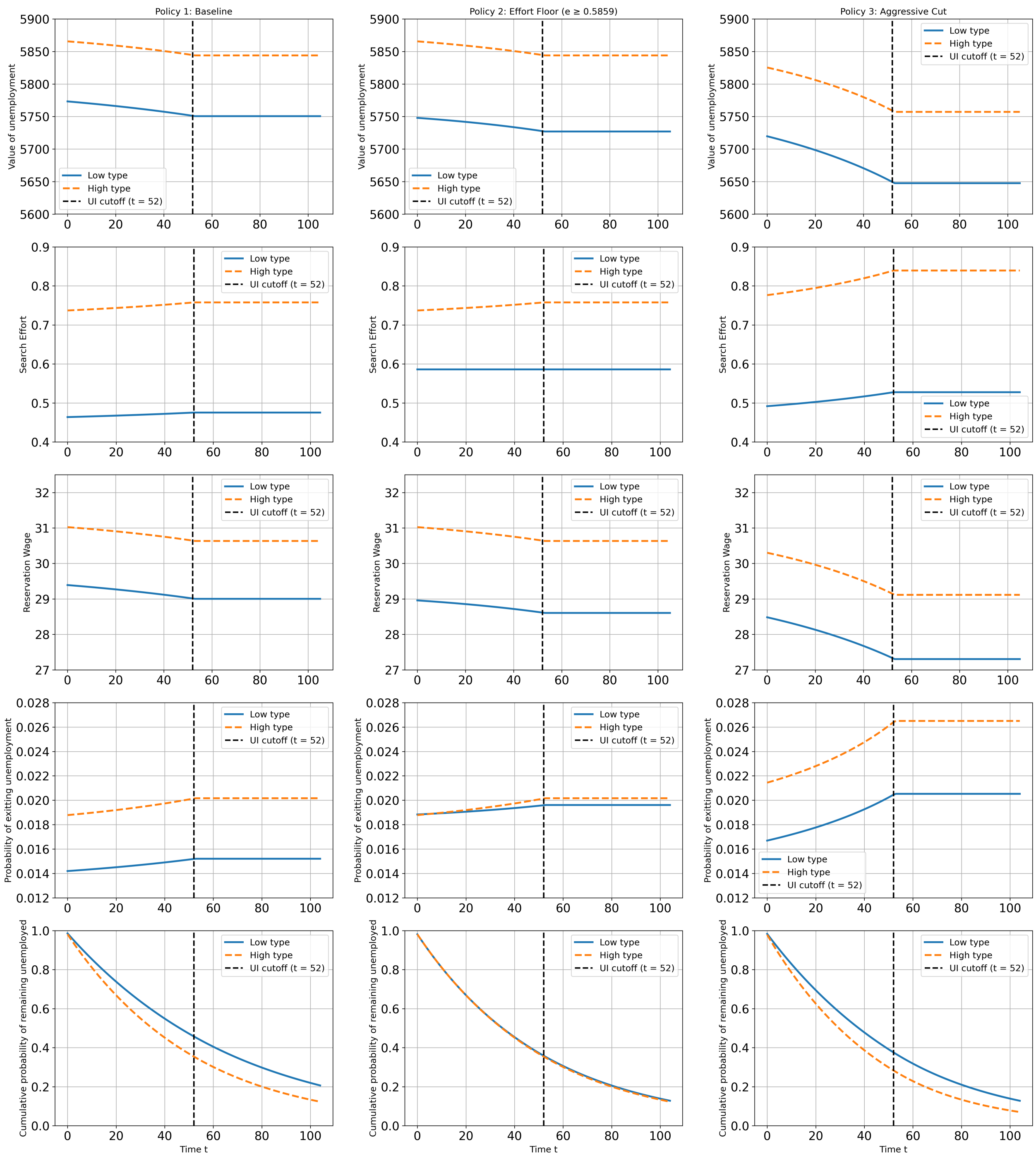

Figure 5: Outcomes of Policy 1, 2 and 3

To summarize the outcomes the two policies, these should be viewed in the light of both policies achieving the same cumulative probability of having exited after 2 years. Policy 2 has more immediate effects on exit-probabilities while Policy 3 has larger long run effects (after 2+ years). Lastly, Policy 3 also makes the transition path from the initial state to steady state more aggressive than in the baseline and in Policy 1. Another interesting point from the eyes of a benevolent policy maker is that the 'punishment' of Policy 3 hits both the high and the low type whereas Policy 2 hits the low type only.

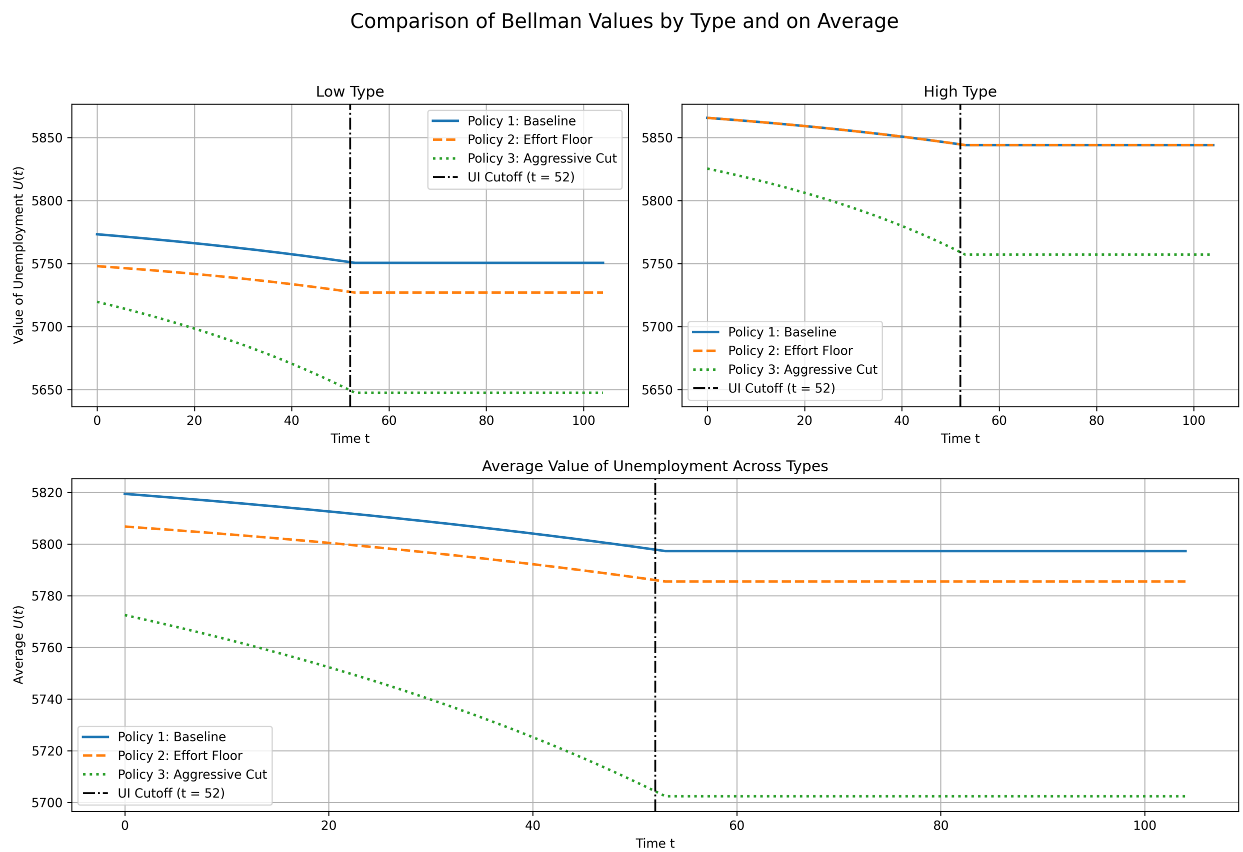

Figure 6: Welfare of the unemployed worker

Figure 6 displays the utility of both types under the different policies. The utility of unemployment is the measure of worker welfare in the McCall model, as it captures the future discounted value of both unemployment and possible employment. Thus, it is a highly relevant outcome for any policy maker that takes worker welfare into account when implementing policies.

The drop in utility is larger in Policy 3 compared to Policy 1 for the low type. Hence, implementing Policy 2 hurts the individuals less and achieves the same survival function value after 2 years for the low type. With the reservation of a lacking social welfare analysis, the results indeed show, that it is possible to decrease the low types expected unemployment duration in a way that hurts her less than a benefit cut, with the positive side effect, that the high types utility is not hurt either.[5] This manifests itself on the weighted average utility across the types, which is higher under Policy 2 than Policy 3.[6] The robustness of these results is discussed in 4.3.

4.3 Robustness

As many of the parameters have not been calibrated to real data, it is natural to question the robustness of the results derived in section 4. The key result showed that the effort floor comes with less utility costs to the individual compared to the aggressive benefit cut. To test this, the model has been rerun in two different ways. First, a version where the cost parameter of the low type has been scaled with a factor $k_{low} = 500$ instead of the original $k_{low} = 100$. Second, a version with a smaller, yearly discount factor of $\beta = 90\%$ instead of the original $\beta = 97\%$. When the models are run with the new parameters, the calibration of the minimum search requirement to satisfy the same survival function value after 2 years naturally changes.

The increased cost scale has unsurprisingly shifted the value of unemployment down in all three policies for the low type, shifted down the search effort in Policies 2 and 3 for both types, and the reservation wage for the high and low type in all 3 policies. However, the conclusions remain the same, namely that the drop in utility for the low type under Policy 2 is less than that of Policy 3 when accounting for the calibration of e_{min} to ensure similar policy outcomes. A plot can be found in appendix A1.

As described in the results, the utility drop is larger in Policy 3 for all periods t. Recall that the worker has an immediate drop in utility in the initial period from a lowered benefit in $t = 52$, as she is forward looking and discounts the future. Therefor it is an interesting angle to investigate if making the worker less forward looking, can make her better off under Policy 3 than Policy 2 in the starting periods (low t). Changing the yearly discounting to $\beta = 90\%$ interestingly show, that the agent is better of initially, as she in these early periods cares less about what happens to her benefit in the *far future* of period $t = 52$. This mechanism is illustrated in figure 7. $\beta = 80\%$ has also been tested, with the unsurprising result, that for

[5] Note that this is not a conclusion on social welfare, as no financing of the policies is taken into account. It could very well be the case that the social welfare is maximized in Policy 3.

[6] It should of course be mentioned, that the aggressive cut hurts the high type as well, but also decreases her expected unemployment duration. That is, the implied punishment on the high type from the aggressive cut is not pure dead weight loss. In addition, the aggressive cut could also have been designed in a way that only hurts the low type - see section 5.

a longer, initial period, the agent is better off under Policy 3 compared to Policy 2.[7] The takeaway is, that the patience of the unemployed worker has an influence on the utility costs of the individual, even to the extent where they can change preference for the one over the other based on this.

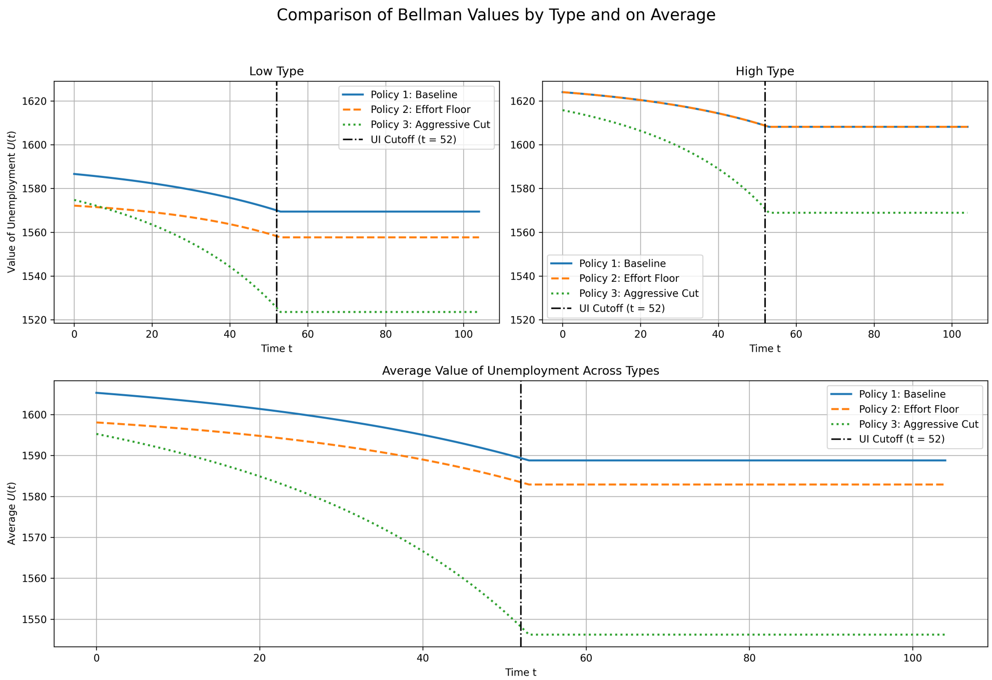

Figure 7: Welfare of the unemployed worker - robustness test for $\beta = 90\%$

[7]See appendix A2

5 Discussion

The analysis performed in this paper naturally has some limits that should be acknowledged. First, the implemented McCall model is highly stylized. It excludes important features such as job destruction, on-the-job search, ability to search for specific job types, representation of a financing side (public sector budget), etc.

In the model, it is also assumed that when the agent accepts a job offer, this job is held indefinitely without the possibility of changing job. Allowing for either job destruction or on-the-job search could have implications for the worker's pickiness, as the choice of accepting a job offer is no longer permanent in that case.

Also, allowing for the two types to search for jobs specifically above their reservation wage could affect the cost-effectiveness of the search and hence have implications for the minimum search effort requirement.

The model does not account for general equilibrium effects, as it only focuses on the behavior of a single individual. To capture many important and interesting aspects of a realistic job market setting it requires that the model accounts for things such as changing labor market tightness, consequences of wage offers from policies, etc.

In addition, while the model has loosely been structured to mimic a realistic setting of the UK UI system, it has not been calibrated on any empirical moments beyond the wage distribution. That is, if one wanted to answer questions with more external validity, the model should ideally have been calibrated on empirical moments such as hazard rates or measures of costs functions. Doing so could have improved the robustness and external validity of the conclusions.

Lastly, a relevant critique of the comparison of this model is that Policy 3 is designed in a way such that it lowers both type's benefits, while Policy 2 is designed with an effort level that only affects the low type. That is, if Policy 3 had an aggressive cut in only the low type's benefits, it would be a more 'fair' comparison on weighted utility. However, the aim is primarily to study the ability to target the low type, and type-discrimination in the benefit size can also lead to ethical and/or legal concerns. Even with these concerns, it should meanwhile be mentioned that many countries benefit discriminate on type in the form of providing different benefits for students, elderly, etc.

Naturally, these caveats limits the realism of the model. However, despite its limitations, the framework remains useful in answering some specific questions like the one posed in this paper - namely the potential harm of different ALMPs from the perspective of the worker. The results should be interpreted with these caveats in mind.

6 Conclusion

While the analysis has some natural weaknesses, which the results should be viewed in light of, this paper has contributed with a set of interesting insights. It has been shown, that it is theoretically possible to implement a search effort requirement that achieves the same goal on expected unemployment as a cut in benefit levels, but at a lower cost to the utility of the individual. Actually, the search effort requirement has lower utility costs over the entire span of the individual's horizon, implying that the worker is strictly better off under such a policy compared to an aggressive cut in the benefits.

Importantly, it is shown that the search effort requirement, that applies to both types, is able to target the low type's search effort only, if the requirement is designed appropriately. Thus it is ensured that the high type is not hurt from the policy which is a desirable feature, if this is the goal of the policy maker. This asymmetry is central to understanding the different welfare implications of the two policies.

The robustness of the results has been shown to be dependent on the discounting / foresight of the worker. If the worker is sufficiently myopic, she can, in the short-run, turn out to be better off under the aggressive cut in Policy 3 compared to the immediate search effort requirement of Policy 2. However, in the long run, when the cut is approached, the utility drops sharply to a point below the search effort requirement, which is the case for every larger value of the discount rate. However, at standard discount factor levels, the agent is better off under Policy 2.

With the mentioned limitations of the model, the natural suggestion for further research is to refine the model to account for some of the dynamics mentioned in section 5. In particular, the social welfare consequences of Policy 2 and Policy 3 would be an interesting angle to explore and a natural next step. Both to asses what policies are the most cost effective in terms of utility, but also whether the policies have any net positive effect on social welfare at all, as this would require that the saved public spending on UI should outweigh the costs to the unemployed worker's individual utility. This is note given. Once social welfare is considered, this also strengthens the motivation for a calibration of the model to match real empirical moments, such that the outcomes of the model possess greater external validity and can be used for actual policy suggestions.

A Appendix

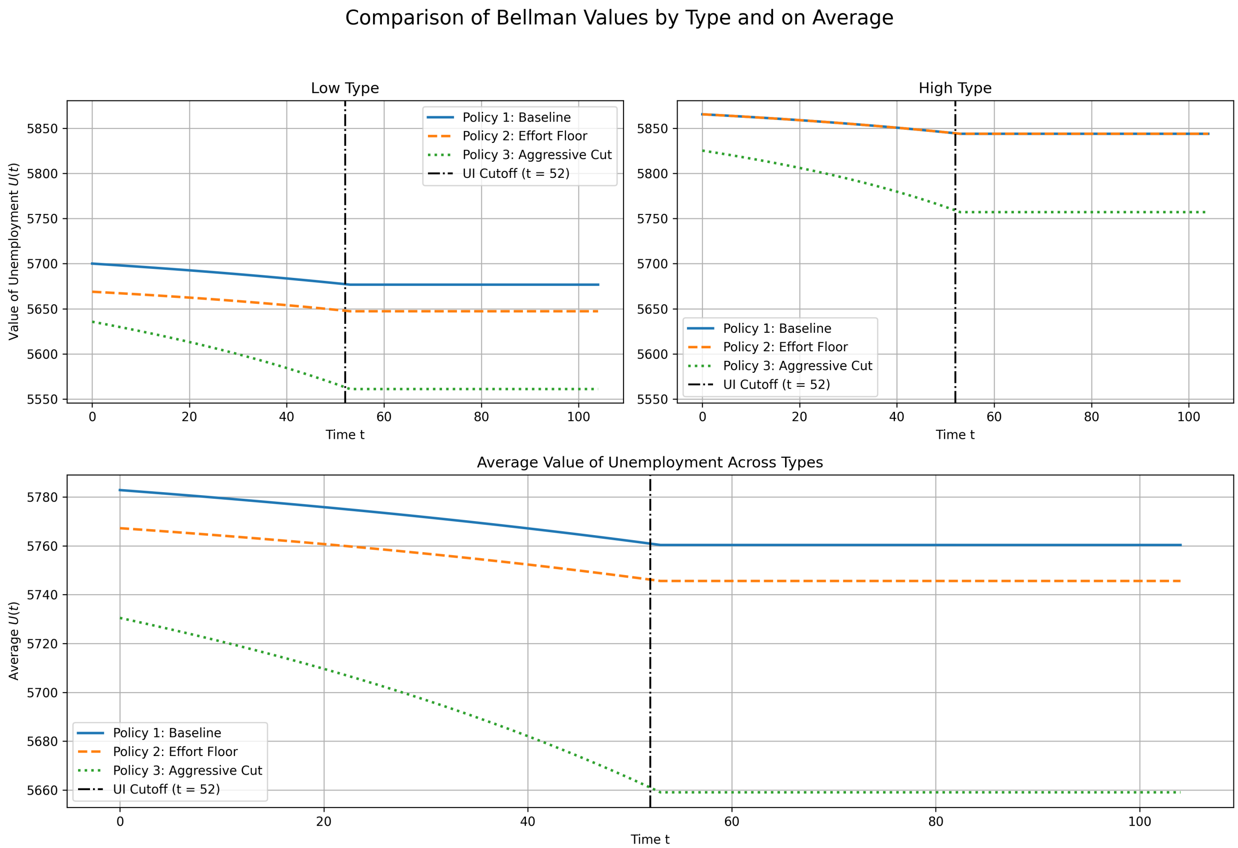

Figure A1: Welfare of the unemployed worker – robustness test for $k_{low} = 500$

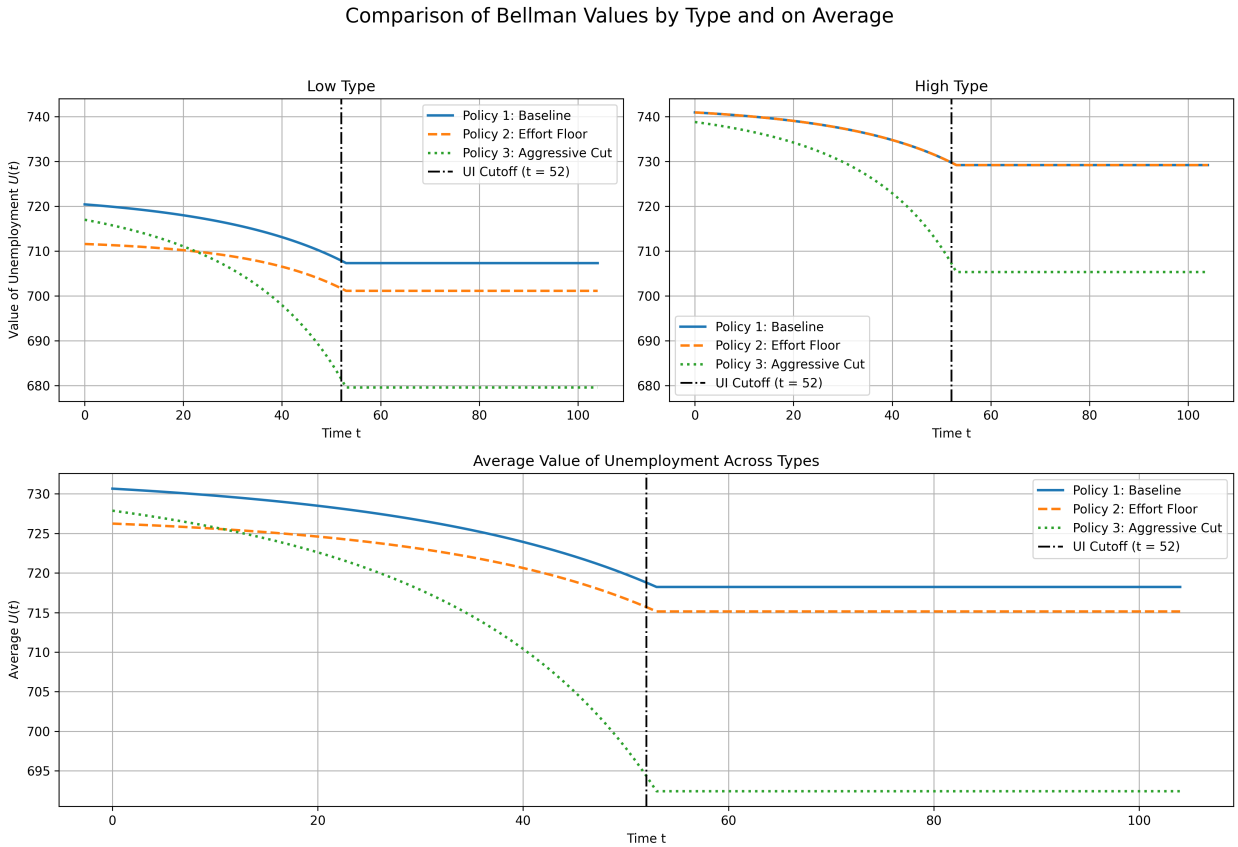

Figure A2: Welfare of the unemployed worker – robustness test for $\beta = 80\%$

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