Part-Time and Full-Time Employment: Cyclical Behavior and Policy Tradeoffs*

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Abstract

We extend a canonical equilibrium search model with endogenous separations to incorporate a choice between part-time and full-time employment. Aggregate productivity and idiosyncratic match quality determine when a worker-firm match separates and, if it continues, whether it operates as full-time or part-time. This simple extension is able to generate predictions consistent with the cyclical behavior of part-time employment in the US. In particular, it is consistent with the fact that part-time employment matches separate more often; that part-time employment is countercyclical, while full-time employment is pro-cyclical; and that the cyclical behavior of part-time employment is largely driven by movements in and out of part-time employment within a job spell. Using this framework, we evaluate and compare the effects of job subsidy and unemployment insurance schemes in response to economic downturns. Part-time job subsidies dampen the fall in total employment, but also distort the intensive-margin choice between full-time and part-time employment. The latter unintended effect is particularly important in long recessions, resulting in output and welfare losses when compared to unemployment insurance schemes.

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1 Introduction

A large part of fluctuations in aggregate working hours over the business cycle in the US are accounted for by the fluctuations in part-time employment for economic reasons (PTER), which is volatile and countercyclical. Moreover, as shown by a growing empirical literature (Borowczyk-Martins and Lalé (2019), Mukoyama et al. (2021), Lariau (2018) and Warren (2017)), a large part of cyclical worker flows in and out of PTER is accounted for by cyclical movements between full-time and part-time employment within the same employment spell. These observations suggest that the choice of part-time versus full-time is an important margin of adjustment when responding to shocks. This, in turn, raises important questions about policies that can affect the transmission of economic shocks through this margin, such as cyclical part-time subsidies (see e.g. Giupponi et al. (2022) for a recent discussion). The previous empirical facts suggest that such policies affect not only the adjustment of aggregate employment over the business cycle, but also the choice between part-time and full-time employment, with potentially important productivity implications.

Evaluating the tradeoffs involved in the design of such policies as well as their welfare consequences requires a framework that can account, among other things, for the cyclical behavior of part-time employment and of the flows in and out of it. In this paper, we make two contributions to this line of research. First, we develop and quantitatively validate an equilibrium search model that incorporates a choice between part-time and full-time employment. We show that a natural extension of the benchmark equilibrium search model can account well for the key facts pertaining to the cyclicality of PTER. Second, we use the model to study the effect of policies, such as part-time subsidies and unemployment insurance, in response to an aggregate downturn. We show that the model yields new insights with regard to the effects of these policies, highlighting tradeoffs that have been previously overlooked.

The starting point of our analysis is the equilibrium search framework with endogenous separations of Mortensen and Pissarides (1994) and Fujita and Ramey (2012). Our extension of this model is a deliberately minimal departure from the standard framework, suitably augmented to allow for part-time and full-time employment choices. Firms post costly job openings and match bilaterally with workers. The productivity of a match depends on both aggregate and idiosyncratic components, which are both subject to shocks. A match forms if a worker-firm meeting draws a high enough combination of aggregate and idiosyncratic productivities. Existing matches separate after drawing a sufficiently low combination of aggregate and idiosyncratic productivity. We augment this classic framework by incorporating an intensive-margin choice between part-time and full-time employment. An employment match decides, every period, whether to operate part-time or full-time. Full-time matches produce higher output per worker, scaled by aggregate and idiosyncratic productivity, but also face a higher cost. The additional cost of operating full-time can represent either disutility of work on the part of the worker, or costs to the employer, e.g. in the form of additional training or employer-provided benefits. This cost is independent of aggregate and idiosyncratic productivity. The result of this assumption is that, at any point in time, more productive matches will choose to operate full-time, while less productive matches will choose to operate part-time.

Our modeling choice is motivated not only by the desire to keep as close as possible to the benchmark equilibrium search model, but also by the salient observations on the behavior of PTER in the data. PTER is a transitory state as documented by Warren (2017), among others. Moreover, there are large flows between full-time and part-time employment *within* a job. This motivates us to model the distinction between full and part-time employment as a flexibly-adjusted choice of hours, rather than having separate firms or separate labor markets. Doing so also facilitates comparison to the standard model with endogenous separations. Finally, we find it useful to consider an environment in which separations are bilaterally efficient. This provides an important benchmark and a useful complement to existing studies of job subsidy schemes. These studies often feature market imperfections and human capital accumulation but do not account for the cyclicality of part-time employment.

To study the business cycle properties of our framework, we calibrate the model parameters to match several moments pertaining to labor market flows. We find that the model performs well in matching important non-targeted moments. First, the model, calibrated to target part-time employment and separation rates for part-time workers, matches the corresponding (non-targeted) stocks and flow rates for full-time workers. In particular, the model correctly matches the fact that separation probabilities in the data are substantially higher for part-time workers than for full-time workers. It does so despite the fact that there is no causal mechanism between the type of employment and the separation probability in the model, i.e. part-time workers face the same process for idiosyncratic match quality shocks as full-time workers. They also face the same exogenous destruction rates. Instead, the model matches this fact through a selection effect. Idiosyncratic match quality in the calibrated model is very persistent. Since part-time matches are of lower quality on average than full-time matches, they are also more likely to have low match quality in the future. Hence they are more likely to separate when faced with a negative aggregate shock. Second, the model is consistent with the fact that separations from both part-time and full-time employment into unemployment are countercyclical. Third, the model correctly predicts that — even though separations from part-time employment are countercyclical — the stock of part-time employment is countercyclical. Theoretically, this is not obvious since countercyclical separations, on their own, would lead to pro-cyclical employment. Instead, the countercyclical behavior of part-time employment is driven by countercyclical flows from full-time to part-time and procyclical flows from part-time to full-time. In other words, flows in and out of part-time employment within job spells drive the cyclicality of part-time employment. These features are consistent with the data.

Having verified that the model is a good quantitative laboratory, we then use it to evaluate the effects of two prominent policies commonly used in response to negative shocks: (i) part-time job subsidies; and (ii) unemployment insurance schemes. Specifically, similarly to Garcia-Cabo et al. (2023), we simulate recessions of different lengths and compare the effect of enacting a part-time job subsidy with that of a cost-equivalent unemployment insurance expansion. The direct tradeoff involved in comparing these policies concerns the classic productivity-employment tradeoff identified in the literature. Unemployment insurance schemes, by raising the value of non-market activity, lowers employment by inducing low-quality matches to forego operation. This amplifies the fall in employment while dampening the fall in output per worker. Part-time subsidies do the opposite. They preserve low-quality matches that would have otherwise separated, incentivizing them to operate part-time instead. The relative desirability of the two policy options turns out to depend on the length of the recession. This is the case as the advantage of the part-time subsidy — the preservation of employment matches — materializes primarily once the economy's productivity recovers. In this sense, our results indeed reflect the logic that the ability to operate part-time acts as a stabilizing device, which dampens the fall in aggregate employment. This is particularly useful as a response to a short-lasting recession, where the ability to temporarily switch to part-time enables matches to weather the temporary downturn. As as a result, firms and workers avoid having to destroy the match and search for a new one in the future.

However, our results also highlight a novel tradeoff when implementing part-time subsidies, which has been largely overlooked in the literature. A subsidy to part-time jobs incentivizes more matches to remain in operation rather than dissolving, but simultaneously it also incentivizes some *full-time* employment matches to switch to part-time. The latter effect may offset the productivity gains of the policy and is especially costly during long recessions. This is the case as full-time matches would have otherwise remained in operation. Taken together, our results point to a nuanced effect of part-time subsidies and highlight that the gains and losses from these subsidies can vary depending on the length and severity of recessions.

2 Related literature

This paper contributes to two strands of the literature. The first explores the behavior of part-time and full-time employment over the business cycle. The second studies the consequences of enacting job subsidy schemes in response to economic downturns. Our paper links these two strands of literature and provides new insights.

Part-time employment over the business cycle. An important body of empirical research has documented the importance of part-time versus full-time adjustments in accounting for the behavior of aggregate hours. Motivated by these facts, a growing literature incorporates the choice between part-time and full-time employment into structural models of the labor market. Borowczyk-Martins and Lalé (2018) study the welfare effects of involuntary part-time work in a model with incomplete insurance. Closer to our paper, Lariau (2018) considers a search model in which part-time and full-time workers are imperfect substitutes and separate from employment at different rates. Warren (2017) considers a heterogeneous-firm model with decreasing returns to scale and a flexible choice between part-time and full-time employment. Mukoyama et al. (2021) incorporate part-time employment into a New Keynesian model, by assuming that search for full-time and part-time jobs takes place in separate labor markets but reallocation from part-time to full-time is possible.

Our work is complementary to this active literature. The difference relative to these papers is two-fold. First, we deliberately try to keep the model as close as possible to the benchmark equilibrium search model with endogenous separations, as developed and evaluated in Mortensen and Pissarides (1994) and Fujita and Ramey (2012). Part-time and full-time production is perfectly substitutable, differing only in production per-period. Adjustment between part-time and full-time is flexible, wages are Nash-bargained, and separations into unemployment, as well as adjustments between part-time and full-time, are bilaterally efficient. In doing so, we can evaluate to what extent such a minimal departure from the standard framework can capture the key features of the cyclicality of PTER, while still matching existing facts emphasized by the literature, such as countercyclical separations into unemployment. We find that the model performs well on the former margin without sacrificing (e.g. relative to Fujita and Ramey (2012)) on the latter. The second difference is the emphasis on the policy implications. We find that the ability to flexibly adjust between part-time and full-time employment is a double-edged sword. It provides an additional tool to stabilize total employment against negative shocks, but at the same time leads to an additional intensive-margin distortion from part-time subsidies.

Job subsidy policies. Our paper also contributes to an active literature that studies the consequences of enacting job subsidy policies, particularly in response to economic downturns. An early theoretical literature demonstrates that job subsidy schemes may distort both hours and the allocation of workers across firms, thus reducing output. For instance, Burdett and Wright (1989) and Van Audenrode (1994) argue that short-time work is favorable to employment at the cost of distorting downwards the number of hours worked per employee. Our paper echoes that theoretical insight. Using a random search and matching model with multi-worker firms, Cooper et al. (2017) analyze short-time work and show that this policy distorts the allocative efficiency of the labor market. Similarly, Cahuc et al. (2021) introduce between-firm and within-firm job heterogeneity, showing that the impact of short-time work differs across firms. Within the COVID-19 context, Birinci et al. (2021) also study the positive and normative implications of labor market policies that counteract the economic losses from the pandemic, comparing wage subsidies to unemployment insurance. The paper incorporates a standard epidemiological model into an equilibrium search model of the labor market, with essential and non-essential firms, to compare unemployment insurance expansions and payroll subsidies. Our paper is also close in its spirit and objective to Garcia-Cabo et al. (2023), who compare the effects of unemployment insurance and wage subsidies for recessions of different length, focusing on costly sectoral reallocation. The tradeoff considered in our paper is different. While Garcia-Cabo et al. (2023) emphasize the tradeoff between preservation of human capital and efficient sectoral reallocation, we focus on the tradeoff between stabilizing total employment and efficient choice of labor utilization. More generally, our work complements the recent literature by considering a simple framework with endogenous separations, where the stabilizing effect of job subsidy programs on the extensive margin and their distortionary effect on the intensive margin can be easily evaluated and compared.[1]

[1] Because our paper's focus is not specifically on COVID-19, we abstract from temporary layoffs, considered in Birinci et al. (2021), and sectoral reallocation, highlighted in Garcia-Cabo et al. (2023). Instead, the focus is on bridging the literature on the cyclical behavior of part-time employment with the literature on its policy

3 Model

The model is a natural extension of the Mortensen and Pissarides (1994) equilibrium search model with endogenous separations, closely following Fujita and Ramey (2012). The main modification is that an employment match has a choice of operating full-time or part-time at each point in time. Full-time matches have higher productivity as well as higher cost. This can be interpreted as either a higher operating cost to the firm or a disutility of work to the worker. The higher productivity is scaled up by aggregate productivity and idiosyncratic match quality, while the cost is not. As a result, worker-firm pairs are more likely to choose to operate full-time when aggregate and idiosyncratic productivity are high.

Demographics. Time is discrete, and the time horizon is infinite. The economy is populated by a unit measure of workers and a larger measure of firms, both of whom are risk-neutral and discount the future at a rate β.

Matching. Workers may be either employed or unemployed. Firms post vacancies, v_t, at cost κ and are matched with unemployed workers, u_t, according to a constant-returns to scale matching function $M(u_t, v_t)$. A firm with a vacancy meets a worker at rate given by

$$\frac{M(u_t, v_t)}{v_t} = M\left(\frac{u_t}{v_t}, 1\right) = q(\theta_t),$$

and an unemployed worker meets a firm at rate equal to

$$\frac{M(u_t, v_t)}{u_t} = M\left(1, \frac{v_t}{u_t}\right) = p(\theta_t) = \theta q(\theta_t),$$

where $\theta_t = \frac{v_t}{u_t}$ represents the labor market tightness. Once employed workers can not search on the job.

implications.

Productivity shocks. The productivity of a worker-firm match depends on aggregate productivity, idiosyncratic match quality, and whether the match operates full-time or part-time. The aggregate productivity z evolves according to a Markov process. Idiosyncratic match quality ϵ is independent across matches, is drawn upon matching from a distribution $F(\epsilon)$, and subsequently evolves according to a Markov process. Specifically, we assume that every period, with probability $1 - \lambda$, the match retains its previous match quality so that $\epsilon' = \epsilon$. With probability λ, a new match quality is drawn i.i.d. from the distribution $F(\cdot)$. The worker and firm observe ϵ when meeting before deciding whether to form the match. Finally, unemployed workers receive a fixed value of unemployment benefits equal to b.

Part-time versus full-time. A worker-firm match decides, at each point, whether to operate full-time or part-time ($i \in \{F, P\}$). The output of a match when aggregate productivity is z, idiosyncratic productivity is ϵ, and mode of operation is $i \in \{F, P\}$ is then given by

$$z\epsilon Y_i - \tau_i,$$

where $Y_F > Y_P$ and $\tau_F > \tau_P$. In other words, a full-time match produces more efficiency units of labor, which are scaled by aggregate and idiosyncratic productivity, and also incurs a higher cost, which is not scaled by productivity.

Separations. An employment match separates every period with exogenous probability δ. If a match did not separate exogenously, it may choose to separate endogenously based on the realization of z and ϵ.

Wages. Wages are negotiated every period through Nash bargaining. We denote the worker's bargaining weight by $\alpha \in (0, 1)$.

3.1 Discussion of modeling choices

We conceptualize part-time employment as a choice of hours, rather than a distinct type of job or a separate labor market. In doing so, we are motivated by empirical observations. Part-time employment is a transitory state, and there are large flows between full and part-time employment within a job. This suggests modeling part-time employment as a flexible intensive margin of adjustment within a match. This modeling choice also allows us to stay close to the conventional equilibrium search model, facilitating comparison to the previous literature on cyclical fluctuations in unemployment and labor market flows, as in Fujita and Ramey (2012). Moreover, we consider asymmetric costs across jobs. In particular, the cost difference $\tau_F - \tau_P$ of full-time employment can be thought of as a cost to the worker, in terms of increased work disutility, or a cost to the firm, e.g. additional training or benefits. The key implication is that the benefit of full-time relative to part-time in terms of increased output is scaled by aggregate and match-specific productivity, while the relative cost of full-time employment is not. This assumption will imply that there will be a cutoff for idiosyncratic productivity above which matches will operate full-time.

In keeping with the equilibrium search literature, we also assume that allocations are Nash-bargained and so the separation choice is bilaterally efficient, as is the choice of hours. While recent papers (e.g. Blanco et al. (2023)) have put forth alternative theories, the assumption of bilateral efficiency is a useful benchmark and, furthermore, treats part-time employment symmetrically with unemployment. This is the case as both the separation and labor utilization choices are made jointly by the worker and firm.[2]

[2] We believe that this modeling choice is also in the spirit of the definition of part-time for economic reasons, since matches are downgraded to part-time based on the realization of aggregate and idiosyncratic productivity, as opposed to the worker's value of leisure.

4 Equilibrium

We formulate the equilibrium recursively. From now on, $U(z)$ represents the value of an unemployed worker, when the aggregate state is z. We denote by $V(z)$ the value of a vacancy, and $J(z,\epsilon)$ represents the value of a match with idiosyncratic match quality ϵ when the aggregate state is z. Because of Nash bargaining, matching and separations will be bilaterally efficient. Thus, we can describe the equilibrium in terms of the joint value $J(z,\epsilon)$ in everything that follows.

4.1 Value functions

The value of unemployment is given by

$$U(z) = b + \beta \mathbb{E}_{z'|z}\left[U(z') + \alpha p(\theta(z')) \int \max\{J(z',x) - U(z') - V(z'), 0\}\, dF(x)\right], \tag{4.1}$$

where an unemployed worker receives unemployment benefits, b. This agent meets a firm with state-dependent probability $p(\theta(z'))$, and the match is accepted if and only if the surplus from the match is non-negative. If the match is successful, the worker gets fraction α of the match surplus.

Symmetrically, the value of a vacancy satisfies the following

$$V(z) = -\kappa + \beta \mathbb{E}_{z'|z}\left[V(z') + (1-\alpha) q(\theta(z')) \int \max\{J(z',x) - U(z') - V(z'), 0\}\, dF(x)\right], \tag{4.2}$$

where the firm suffers vacancy cost equal to κ. After posting the vacancy, the firm then meets a worker with state-dependent probability $q(\theta(z'))$, and the match is accepted if and only if the surplus from the match is non-negative. If forming the match, the firm gets fraction $1-\alpha$ of the match surplus.

The value of a match with idiosyncratic match quality ϵ, when the aggregate state is z, is given by

$$
\begin{aligned}
J(z,\epsilon) =& \max\{z\epsilon Y_F - \tau_F, z\epsilon Y_P - \tau_P\} \\
&+ \beta \mathbb{E}_{z'|z}\Bigg[\delta[U(z')+V(z')] + (1-\delta)(1-\lambda)\max\{J(z',\epsilon), U(z')+V(z')\} \\
&+(1-\delta)\lambda \int \max\{J(z',x), U(z')+V(z')\} dF(x)\Bigg].
\end{aligned} \tag{4.3}
$$

A worker-firm match decides, based on aggregate and idiosyncratic productivity realizations, whether to operate full-time or part-time. It then separates exogenously with probability δ. If it does not separate exogenously, a new idiosyncratic match quality is drawn, and a decision is made whether to separate endogenously. Note that both the decision on the mode of operation (part-time vs. full-time) and the separation decision are bilaterally efficient. Furthermore, the decision on the type of employment is essentially a static choice.

Finally, because there is free entry of vacancies, we have the following equilibrium condition

$$V(z) = 0, \tag{4.4}$$

which holds at every point in time. This free-entry condition pins down the labor market tightness, $\theta(z)$, for a given aggregate state.

Equilibrium in this environment then consists of a function $\theta(z)$ as well as decision rules for matching/separations and mode of operation, together with value functions $U(z)$, $V(z)$, and $J(z,\epsilon)$ satisfying equations (1)-(4).

4.2 Separation and production choices

We next discuss the decision to separate and the decision on the mode of operation conditional on not separating. This discussion will be useful for interpreting the subsequent quantitative results. First, it is important to note that the choice between part-time and full-time is static. In particular, the worker-firm pair chooses full-time over part-time work if and only if

$z\epsilon Y_F - \tau_F \geq z\epsilon Y_P - \tau_P$. This is equivalent to the following condition

$$\epsilon \geq \epsilon_F(z),$$

where the critical threshold, $\epsilon_F(z)$, is given by

$$\epsilon_F(z) = \frac{\tau_F - \tau_P}{z(Y_F - Y_P)}. \tag{4.5}$$

Thus, at any point in time, matches with idiosyncratic productivity above the previous cutoff will operate full-time, whereas matches with productivity below it, if any, will operate part-time. Furthermore, the above expression shows that the cutoff for full-time work is decreasing in z. This implies that - conditional on remaining in operation - matches are more likely to switch to part-time in recessions than in booms. The intuition is straightforward. The benefit of working full-time relative to part-time is proportional to aggregate productivity, whereas the relative cost is not.

We next examine the decision to continue a match (and, likewise, to a form a new one), based on the realization of z and ϵ. From equations (1)-(4) we see that the net surplus from a match can be written as $S(z, \epsilon) = J(z, \epsilon) - U(z)$. Because this surplus is increasing in ϵ, it is optimal to continue a match (and, similarly, to form a new one) if and only if the following condition is satisfied

$$\epsilon \geq \epsilon^*(z),$$

where the critical threshold, $\epsilon^*(z)$, solves the following condition

$$S(\epsilon^*(z), z) = 0. \tag{4.6}$$

This has two implications. First, for a given z, part-time matches exist if and only if $\epsilon_F(z) > \epsilon^*(z)$. Second, if both cutoffs are decreasing in z – as will be the case in our quantitative analysis[3] – the effect of a shock to z on part-time employment is ambiguous. When z falls, more part-time matches separate, but at the same time some full-time matches switch to part-time. Because of these opposing forces, the net effect on part-time employment is therefore a quantitative matter. Its evaluation will serve as a measure of the model's performance.

4.3 Labor market stocks and flows

Let us denote the measure of workers employed in period t by N_t, and $u_t = 1-N_t$ represent the measure of unemployed workers. Further, let N_t^P be the period-t measure of workers employed part-time, and $N_t^F = N_t - N_t^P$ denote the period-t measure of workers employed full-time. In what follows we describe the laws of motion for these stocks and provide expressions for flows in and out of these states.

A match whose period-$(t+1)$ idiosyncratic productivity realization is equal to x separates into unemployment if and only if $x \leq \epsilon_{t+1}^*$. Let $N_t(x)$ be the period-t measure of employed workers whose idiosyncratic match quality is less than or equal to x. This measure is given by

$$\begin{aligned} N_{t+1}(x) =& f(\theta_t)[F(x) - F(\epsilon_{t+1}^*)]u_t \\ &+ (1-\delta)\left\{\lambda[F(x) - F(\epsilon_{t+1}^*)]N_t + (1-\lambda)[N_t(x) - N_t(\epsilon_{t+1}^*)]\right\}, \end{aligned} \tag{4.7}$$

for all $x > \epsilon_{t+1}^*$, and equals zero otherwise. The total employment stock N_t similarly evolves according to the following law of motion

$$\begin{aligned} N_{t+1} =& f(\theta_t)[1 - F(\epsilon_{t+1}^*)]u_t \\ &+ (1-\delta)\left\{\lambda[1 - F(\epsilon_{t+1}^*)]N_t + (1-\lambda)[N_t - N_t(\epsilon_{t+1}^*)]\right\}. \end{aligned} \tag{4.8}$$

We can then express the measure of workers employed part-time as follows

$$N_t^P = N_t(\epsilon_t^F), \tag{4.9}$$

[3]The cutoff $\epsilon^*(z)$ is decreasing in z as long as the match surplus $S(z,\epsilon)$ is increasing in both z and ϵ, a conclusion that holds given plausible assumptions on both shock processes.

and the measure of workers employed full-time is given by

$$N_t^F = N_t - N_t(\epsilon_t^F). \tag{4.10}$$

We can now turn to the characterization of the various flows. The flow rate from unemployment to employment is given by

$$\phi_{t+1}^{UE} = f(\theta_t)[1 - F(\epsilon_{t+1}^*)]. \tag{4.11}$$

The flow rates from unemployment to part-time employment and full-time employment, respectively, are given by

$$\phi_{t+1}^{UP} = f(\theta_t)\max\{0, [F(\epsilon_{t+1}^F) - F(\epsilon_{t+1}^*)]\}, \tag{4.12}$$

$$\phi_{t+1}^{UF} = f(\theta_t)[1 - F(\max\{\epsilon_{t+1}^F, \epsilon_{t+1}^*\})]. \tag{4.13}$$

Next, we consider the flows into unemployment. Total separations into unemployment are given by

$$\Phi_{t+1}^{EU} = \delta N_t + (1-\delta)[\lambda F(\epsilon_{t+1}^*)N_t + (1-\lambda)N_t(\epsilon_{t+1}^*)], \tag{4.14}$$

while separations from part-time employment into unemployment are given by

$$\Phi_{t+1}^{PU} = \delta N_t^P + (1-\delta)[\lambda F(\epsilon_{t+1}^*)N_t^P + (1-\lambda)N_t(\min\{\epsilon_t^F, \epsilon_{t+1}^*\})]. \tag{4.15}$$

As we can see, separations from part-time employment are the sum of three terms. The first term is part-time workers who separate exogenously. The second component is the measure of part-time workers who separate endogenously because they drew a new idiosyncratic match quality below ϵ_{t+1}^*. The third term captures the part-time workers who separate endogenously because their previous-period match quality is below ϵ_{t+1}^*. Note that if $\epsilon_t^F < \epsilon_{t+1}^*$, all the matches who were part-time in t and retain their match quality separate in $t+1$; otherwise, only part of those matches separate. Similarly, separations from full-time employment into unemployment are given by

$$\Phi_{t+1}^{FU} = \delta N_t^F + (1-\delta)[\lambda F(\epsilon_{t+1}^*)N_t^F + (1-\lambda)\min\{0, N_t(\epsilon_{t+1}^*) - N_t(\epsilon_t^F)\}]. \tag{4.16}$$

The first term is full-time workers who separate exogenously. The second one is the full-time workers who separate endogenously because they drew a new idiosyncratic match quality below ϵ_{t+1}^*. The third term is full-time workers who separate endogenously because their previous-period match quality is below ϵ_{t+1}^*. If $\epsilon_t^F < \epsilon_{t+1}^*$, some of the matches who were full-time in t and retain their match quality separate in $t+1$; otherwise, none of those matches separate. From equations (4.14), (4.15), and (4.16), we can derive the following flow rates

$$\phi_{t+1}^{EU} = \frac{\Phi_{t+1}^{EU}}{N_t}, \quad \phi_{t+1}^{PU} = \frac{\Phi_{t+1}^{PU}}{N_t^P}, \quad \phi_{t+1}^{FU} = \frac{\Phi_{t+1}^{FU}}{N_t^F}. \tag{4.17}$$

Finally, we consider flows between full-time and part-time employment. The flows from part-time to full-time employment are given by

$$\begin{aligned}\Phi_{t+1}^{PF} =& (1-\delta)\lambda[1 - F(\max\{\epsilon_{t+1}^F, \epsilon_{t+1}^*\})]N_t^P \\ &+ (1-\delta)(1-\lambda)\min\left\{0, N_t(\epsilon_t^F) - N_t\left(\max\{\epsilon_{t+1}^F, \epsilon_{t+1}^*\}\right)\right\},\end{aligned} \tag{4.18}$$

where the first term represents part-time matches who drew a new productivity that makes them full-time (this needs to be above ϵ_{t+1}^* for the match to remain in operation, and above ϵ_{t+1}^F for full-time to be preferred to part-time). The second term represents part-time matches who retained their previous match quality, which now makes it optimal to operate full-time (this occurs if and only if the match quality is both below ϵ_t^F and above both ϵ_{t+1}^* and ϵ_{t+1}^F). Similarly, the flows from full-time to part-time employment are given by

$$\begin{aligned}\Phi_{t+1}^{FP} =& (1-\delta)\lambda\max\{0, [F(\epsilon_{t+1}^F) - F(\epsilon_{t+1}^*)]\}N_t^F \\ &+ (1-\delta)(1-\lambda)\min\{0, N_t(\epsilon_{t+1}^F) - N_t(\max\{\epsilon_t^F, \epsilon_{t+1}^*\})\}.\end{aligned} \tag{4.19}$$

It is important to note that the first term represents full-time matches who draw a new match quality that renders them part-time. The second term captures full-time matches who retain their previous-period match quality, which now makes it optimal to operate part-time. The corresponding flow rates are calculated as follows

$$\phi_{t+1}^{PF} = \frac{\Phi_{t+1}^{PF}}{N_t^P}, \quad \phi_{t+1}^{FP} = \frac{\Phi_{t+1}^{FP}}{N_t^F}. \tag{4.20}$$

5 Calibration

We calibrate the model to US data, targeting selected features regarding stocks and flows of the labor market. We then assess how well the model performs in matching non-targeted moments describing labor market stocks and flows. We do so both on average and with regard to their volatility and co-movement over the business cycle.

Data. To calibrate our model, we use data from the Current Population Survey (CPS), between 1994 and 2019. Like much of the literature, we choose 1994 because this aligns with a large redesign of the CPS, which includes more detailed questions on part-time employment. We stop in 2019 to avoid distortions in part-time employment created by the COVID-19 pandemic. We restrict our sample to white working-age (25-54 years when they were first interviewed) males. This sample offers two crucial advantages. First, it is a cohort traditionally characterized by stable labor force attachment, thereby allowing us to examine macro-labor trends without the confounding influence of volatile labor force participation. Second, this choice also helps reduce heterogeneity in our sample, making our findings more robust. We correct for seasonality using the Census Bureau's X-13 ARIMA-SEATS software. We follow Shimer (2012)'s approach and correct for time-aggregation biases that arise in discrete time flows. Finally, all series are logged and detrended to assure stationarity and enhance interpretive coherence with the related literature. Throughout our calibration, any reference to part-time employment denotes survey respondents who report working part-time for economic reasons.

Functional forms and shock processes. We assume a Cobb-Douglas matching function, which is given by

$$M(u, v) = Au^{\eta}v^{1-\eta},$$

where $A > 0$ and $0 < \eta < 1$. Aggregate productivity z evolves according to an AR(1) process given by

$$\ln z_t = \rho_z \ln z_{t-1} + \sigma_z \nu_t, \tag{5.1}$$

where ρ_z and σ_z are parameters and $\nu_t \sim N(0, 1)$.

Finally, idiosyncratic match evolves according to the a Markov process. More precisely, the initial match quality is drawn from a distribution $F(\cdot)$. Subsequently, every period, the match retains its prior productivity with probability $1 - \lambda$. With probability λ a new match quality is drawn i.i.d. from the same distribution $F(\cdot)$. Throughout our quantitative analysis, we assume that $F(\cdot)$ is a log-normal distribution with mean 0 and standard deviation σ_ϵ. The average values of both aggregate and idiosyncratic match quality processes are thus normalized to one.

Externally set parameters. A subset of the parameters are calibrated externally. Specifically, following Shimer (2005), we set the matching function elasticity to $\eta = 0.7$. We also make the common assumption that the Hosios Condition holds, i.e., the bargaining power of a worker equals the elasticity of the matching function, so $\alpha = \eta = 0.7$. We impose two restrictions on the productivity parameters corresponding to part and full-time employment. We assume that $\frac{Y_F}{Y_P}$ equals the ratio of average hours worked of a full-time worker and a worker employed part-time for economic reasons. We normalize the average productivity to 1, so that $e^F Y_F + e^P Y_P = 1$, where $e^F = \frac{\bar{N^F}}{1-u}$ and $e^P = \frac{\bar{N^P}}{1-u}$ are the average fractions of employment that are full-time and part-time, respectively. These are taken from the data. This procedure yields $Y_F = 1.098$, and $Y_P = 0.5491$. We follow Fujita and Ramey (2012) and set vacancy creation cost, κ, so that the productivity cost is 6.7 hours of work. We assume the work is part-time; this yields $\kappa = 0.2939$ by taking 6.7 hours divided by an average of 22.8 hours per week for part-time work in our sample. With regard to the value of non-market activity, we follow Shimer (2005) and set $b = 0.4$, i.e. 40% of average output per worker. This amounts to approximately 70% of part-time output per worker. We consider an annual interest rate of 4%, which yields a weekly interest rate of $r = 0.0012$ and hence a discount factor $\beta = \frac{1}{1+r} = 0.9992$. The externally calibrated values are reported in Table 1.

Parameter	Value	Description
Y_F	1.0988	Full-time productivity
Y_P	0.5491	Part-time productivity
b	0.4	Value of non-market activity
η	0.7	Matching function elasticity
α	0.7	Worker bargaining weight
β	0.9992	Discount factor
κ	0.2939	Vacancy creation cost

Table 1: Externally calibrated parameters.

Jointly calibrated parameters. Given our previous parametrization, we are left with 8 parameters to estimate. More precisely, we need to determine the parameters of the aggregate shock process ρ_z and σ_z; the parameters of the idiosyncratic shock process, λ and σ_ϵ; the disutility or costs of full-time and part-time employment, τ_F, τ_P; the exogenous separation rate, δ; and matching efficiency, A. We calibrate these parameters jointly to match the 9 moments which are described in Table 3. In particular, we target the standard deviation and persistence of average output per worker, which we denote by y_t below. These statistics are clearly informative about ρ_z and σ_z.[4] We target the average fraction of workers employed part-time; intuitively, this is informative of the relative cost of full-time employment, τ_F. We also target the levels and cyclicality (i.e. correlation with output per worker) of the flows from part-time employment for economic reasons to full-time employment (ϕ^{FP}); the flows from full-time employment to part-time employment for economic reasons (ϕ^{PF}); and the flows from

[4]Because of idiosyncratic match quality, average output per worker in our model is endogenous, and so we cannot estimate ρ_z and σ_z directly from the data as done e.g. in Hagedorn and Manovskii (2008).

part-time employment for economic reasons to unemployment (ϕ^{PU}). Intuitively, the level and cyclicality of separations into unemployment are informative about the opportunity cost of employment, τ_P, the exogenous separation rate, δ, and the parameters of the idiosyncratic shock process, λ and σ_ϵ. The flows between part-time and full-time employment are likewise informative about the parameters of the idiosyncratic shock process. The model is clearly over-identified.

Parameter	Value	Description
ρ_Z	0.9955	Persistence of aggregate shocks
σ_Z	0.0056	Standard deviation of aggregate shocks
τ_P	0.1	Part-time cost
τ_F	0.475	Full-time cost
λ	0.08	Arrival rate of idiosyncratic shocks
σ_ϵ	0.22	Standard deviation of idiosyncratic shocks
A	0.0983	Matching efficiency
δ	0.0035	Exogenous separation rate

Table 2: Jointly calibrated parameters.

Table 2 reports the estimated parameter values, whereas Table 3 illustrates that the model is able to match the targeted moments well.

Moment	Data	Model
Autocorrelation of output per worker	0.765	0.738
Standard deviation of output per worker	0.013	0.016
Average part-time employment level	0.0147	0.0138
Correlation of ϕ_{FP} with output per worker	-0.4454	-0.4471
Correlation of ϕ_{PF} with output per worker	0.2022	0.2243
Correlation of ϕ_{PU} with output per worker	-0.2585	-0.2081
Average ϕ^{FP}	0.0046	0.0058
Average ϕ^{PF}	0.3153	0.3343
Average ϕ^{PU}	0.0692	0.067

Table 3: Moments targeted in the estimation.

Several findings emerge from the estimation. First, as $Y_F - \tau_F > Y_P - \tau_P$, a match with an average aggregate and idiosyncratic productivity would choose to operate full-time. Moreover, since $Y_P - \tau_P = 0.4358$, at the average aggregate and idiosyncratic productivity, the net value of part-time output is close to the value of home production. This suggests that the surplus from part-time matches on average will be small and will contribute to high volatility of part-time employment. Second, a small estimated value of λ implies that match quality is rather persistent. Intuitively, this results in low-quality matches created in times of high aggregate productivity, which then either separate or get downgraded to part-time in recessions. This mechanism contributes to generating both significant endogenous separations and dynamics of part-time employment.

6 Findings

6.1 Model validation

We assess how well the model can capture features of the US labor market by evaluating its ability to match non-targeted statistics describing the dynamics of part-time and full-time employment. Table 4 reports summary statistics from the simulated model describing labor market stocks and flows. Specifically, we report the average level, standard deviation, correlation with output per worker and standard deviation relative to output per worker.

	Level	SD(x)	Corr(x,y)	SD(x)/SD(y)
Unemployment	0.0914	0.1018	-0.8784	6.3818
Part-Time Employment	0.0138	0.1053	-0.4273	6.6040
Full-Time Employment	0.8948	0.0136	0.8542	0.8502
$\phi_{E,U}$	0.0263	0.1399	-0.8809	8.7703
$\phi_{F,U}$	0.0253	0.1086	-0.9209	6.8081
$\phi_{P,U}$	0.0670	0.0858	-0.2081	5.3788
$\phi_{F,P}$	0.0058	0.0408	-0.4207	2.5577
$\phi_{P,F}$	0.3343	0.0201	0.2121	1.2601
$\phi_{U,E}$	0.2661	0.0326	0.9432	2.0437
$\phi_{U,F}$	0.2539	0.0323	0.9550	2.0249
$\phi_{U,P}$	0.0122	0.0144	-0.4637	0.9027

Table 4: Model moments: average level, standard deviation, correlation with output per worker, and standard deviation relative to output per worker. All second moments are reported as deviations from HP filtered trend with HP parameter 1600.

To compare the performance of our model, Table 5 reports the corresponding statistics that describe the US labor market.

As we can see, the model, calibrated to target part-time employment and separation rates for part-time workers, matches the corresponding (non-targeted) stocks and flow rates for

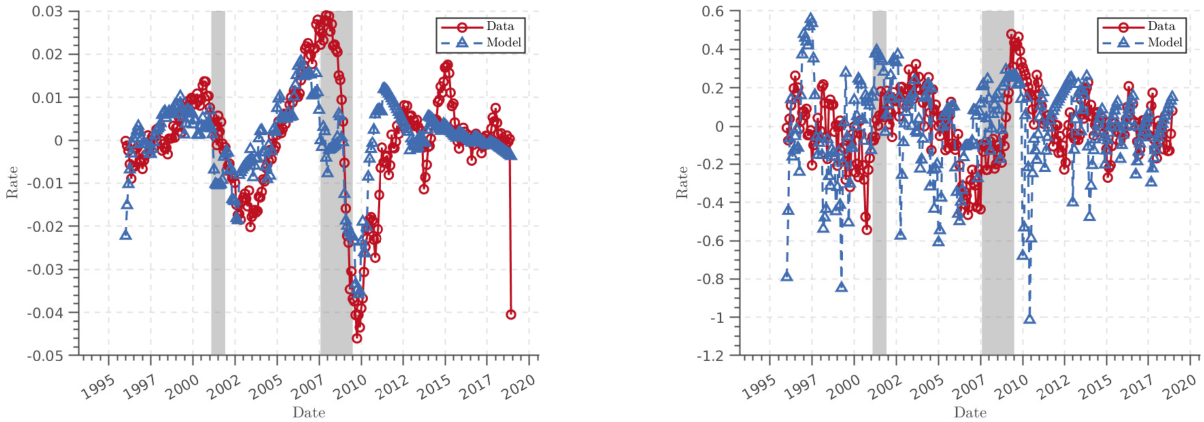
	Level	SD	Corr(x,y)	SD(X)/SD(y)
Unemployment	0.0471	0.0992	-0.5866	7.6308
Part-Time Employment	0.0147	0.1555	-0.5377	11.9596
Full-Time Employment	0.9382	0.0143	0.4859	1.0988
$\phi_{E,U}$	0.0123	0.1540	-0.5846	11.8462
$\phi_{F,U}$	0.0113	0.1782	-0.4914	13.7110
$\phi_{P,U}$	0.0697	0.1989	-0.2582	15.2970
$\phi_{F,P}$	0.0046	0.2411	-0.4546	18.5462
$\phi_{P,F}$	0.3159	0.0904	0.2114	6.9542
$\phi_{U,E}$	0.2475	0.1201	0.4746	9.2385
$\phi_{U,F}$	0.2154	0.1406	0.4515	10.8154
$\phi_{U,P}$	0.0294	0.3860	0.0381	29.6923

Table 5: Data moments: average level, standard deviation, correlation with output per worker, and standard deviation relative to output per worker. All second moments are reported as deviations from HP filtered trend with HP parameter 1600.

full-time workers. In particular, the model is consistent with the fact that separations are higher for part-time matches than for full-time matches. The feature that allows the model to achieve this is the persistence of idiosyncratic match quality. Part-time matches are, on average, of lower quality. Note that since match quality is persistent, part-time matches are likely to be of lower quality in the future as well. Hence, they are more likely to separate if a negative aggregate shock hits the economy.

It is also worth pointing out that the model is also consistent with the fact that separations from both part-time and full-time employment are counter-cyclical. The model also matches the salient data fact that part-time employment is counter-cyclical, while full-time employment is pro-cyclical. The former is not generally obvious. This is the case as separations from part-time employment to unemployment are counter-cyclical. Note that this channel on its own would lead to a fall in part-time employment during recessions. On the other hand, net flows from full-time to part-time employment are counter-cyclical. Quantitatively, the model correctly predicts that the second channel dominates the first one.

To further validate our model, we estimate the sequence of aggregate shocks (z_t) needed to match average output per worker for our subset of interest. We do this by employing a Kalman Filter, which allows for dependence between observations across time. After matching this series, we initialize our model by simulating it until it reaches a steady-state and then subject it to our sequence of estimated shocks. We present the deviations from steady-state for both full and part-time employment in Figure 6.1.



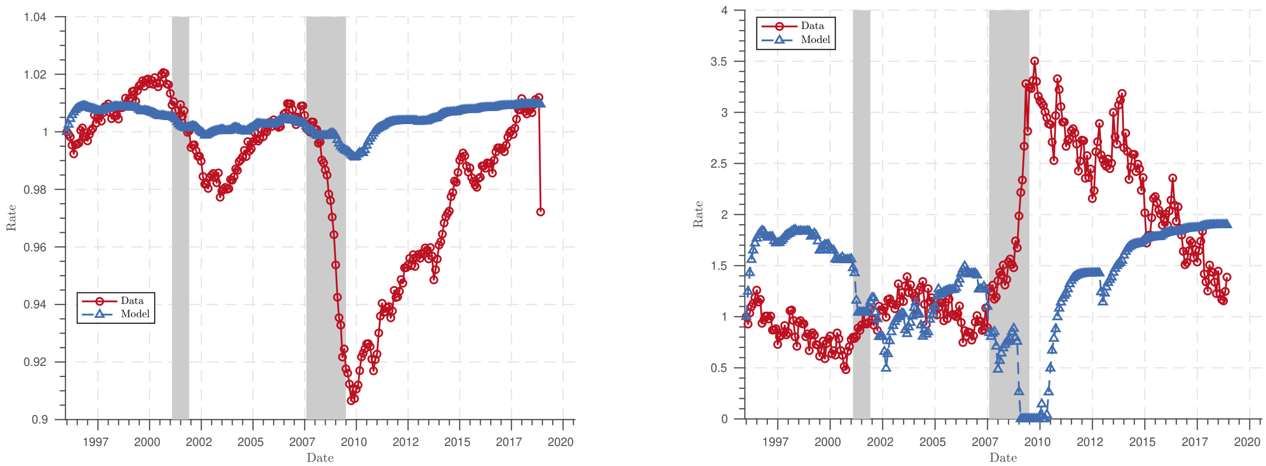
(a) Full-Time (b) Part-Time

Figure 6.1: Full and part-time employment generated by a sequence of aggregate shocks that replicate average output in the data. The data is corrected using the procedure described in Section 5, then log the resulting series and use a Hodrick-Prescott filter with penalty parameter $\lambda = 1600$.

In summary, the model is able to successfully account for key observations describing the behavior of part-time and full-time employment in the US. As expected with frameworks based on Mortensen and Pissarides (1994), its main limitation is that it underpredicts the volatility of the job-finding rate, as is also the case in Shimer (2005) and Fujita and Ramey (2012). We discuss possible extensions of the model in the conclusion.

6.2 The importance of intensive-margin adjustments

Our findings in the previous section demonstrate that our model does a good job capturing many of the key dynamics of part-time employment as well as the dynamics of full-time employment. Next, we explore the role of the intensive-margin adjustment between part-time and full-time employment in generating these dynamics. We do this by simulating a counterfactual model in which $\epsilon^*(z)$ fluctuates with the aggregate shock as before (as do vacancy posting choices), but ϵ^F is fixed at its steady-state value. This counterfactual policy function eliminates the cyclical adjustment between full and part-time employment within a



(a) Counterfactual full-time (b) Counterfactual part-time

Figure 6.2: Full and part-time employment generated by a sequence of aggregate shocks that replicate average output in the data discussed in Section 6.1. The model is a counterfactual where we fix $\epsilon^F(z_t) = \epsilon^F(\bar{z})$. The data is corrected using the procedure described in Section 5, and each series is normalized by the first observation.

job. We then subject our economy to the sequence of shocks estimated in Section 6.1 and examine the resulting employment series.

Figure 6.2 compares the predictions of our counterfactual ($\epsilon^F(z_t) = \epsilon^F(\bar{z})$) to the data. The left panel plots full-time employment. The red line labeled "Data" plots the normalized full-time employment series in the data;[5] the blue line plots the normalized full-time employment for the $\epsilon^F(z_t) = \epsilon^F(\bar{z})$ economy. We repeat the exercise for part-time employment in the right panel.

The simulations depicted in Figure 6.2 highlight the importance of utilization adjustment over the business cycle for understanding the dynamics of part-time employment and, perhaps surprisingly, full-time employment. The baseline (which, by construction, is identical to the simulation in Section 6.1), illustrates that full-time employment is pro-cyclical while part-time employment is countercyclical, consistent with the data. On the other hand, in the counterfactual with a fixed ϵ^F, full-time employment is still pro-cyclical but a lot less volatile, while part-time employment is pro-cyclical rather than counter-cyclical. The reason for the

[5]Because part-time employment falls to 0 during large recessions in our counterfactual, we present each series normalized by the first observation, rather than an HP-filtered series as we use in the rest of the paper. The qualitative pattern we highlight here, namely the fact that the model with a fixed part-time threshold fails to capture the cyclicality of part-time employment, is the same regardless of how the data is displayed.

reversal of the cyclicality of part-time employment is the following. In a recession, more part-time workers separate into unemployment, but simultaneously more full-time workers switch into being part-time. These two adjustment margins drive part-time employment in opposite directions. Our counterfactual shuts down the second source of adjustment, leading part-time employment to be pro-cyclical, contrary to the data. Turning to full-time employment, its pro-cyclicality is driven not only by a pro-cyclical job-finding rate and counter-cyclical separations into unemployment, but also by counter-cyclical net flows from full-time into part-time. Our counterfactual shuts down the latter source of adjustment. The left panel demonstrates that this substantially dampens the fall in full-time employment during a recession.

6.3 The stabilizing role of part-time employment

We next conduct a counterfactual in which the option to work part-time is eliminated. The purpose is to shed light on the economic forces differentiating our model from the classic Mortensen and Pissarides (1994) framework and, in the process, to facilitate the interpretation of the policy experiments in the next section. Table 6 presents the results of the counterfactual experiment.

Means			
	Baseline	No Part-Time	Pct. Diff.
Employment	0.9418	0.9377	-0.434%
Full-Time Employment	0.9333	0.9377	+0.47%
Average output per worker	1.218	1.223	+0.44%
Total output	1.148	1.148	+0.003%
Volatility (SD)			
Employment	0.0080	0.0086	+7.79%
Full-Time Employment	0.0088	0.0086	-1.89%
Average output per worker	0.0187	0.0181	-3.44%
Total output	0.0256	0.0257	+0.33%

Table 6: Comparison of the baseline model with a counterfactual in which the part-time option is eliminated.

As we can see, shutting down part-time employment raises the volatility of aggregate employment. The reason is that, in response to a negative aggregate shock, some matches that would have otherwise being downgraded to part-time are now induced to separate. At the same time, the volatility of full-time employment goes down slightly, because the margin of adjustment between part-time and full-time is eliminated.

7 Policy experiments

In this section we compare the effects of two prominent labor market policy measures commonly enacted in response to economic downturns: (i) part-time job subsidies; and (ii) unemployment insurance. The focus on these two policies is the fact they are commonly enacted in practice. As discussed in Giupponi et al. (2022), the US policy response to recessions, including COVID-19, has mainly focused on insuring the income of workers against the cost of job losses. This was done by aggressively increasing the generosity of unemployment insurance. European policy responses, on the other hand, primarily focused on preserving the relationships between workers and firms. This was achieved through subsidies for hours reductions and temporary layoffs through job subsidy schemes. Intuitively, in the context of our environment, both policies have theoretically ambiguous effects on aggregate output and welfare. Unemployment insurance causes low-quality matches to separate, raising average output per worker, but amplifying the rise in unemployment. Part-time subsidies do the opposite. They dampen the rise in unemployment in response to a negative shock, at the cost of preserving low-quality matches in operation.

In this section we ask whether this intuition is confirmed in quantitative analysis and how the two policies compare to one another. In all the policy experiments we conduct, we assume that the economy is initially in a stochastic steady state and consider the effect of a sequence of negative shocks, after which the aggregate productivity shock returns to the steady-state exponentially over the same duration as the sequence of negative shocks. For example, our benchmark experiment will feature a 4-quarter drop in aggregate productivity followed by a 4-quarter recovery of aggregate productivity.

To frame our discussion, we focus on the components of welfare accrued to agents firms and workers in the economy. The present value of economic welfare (with equal weights given to all agents) is given by

$$W = \int_0^\infty \beta^t [bu_t + z_t Y_F \int_{\epsilon_F}^{\bar{\epsilon}} \epsilon dN_t(\epsilon) + z_t Y_P \int_{\epsilon_P}^{\epsilon_F} \epsilon dN_t(\epsilon) - \tau_F N_t^F - \tau_P N_t^P - \kappa v_t] dt$$
$$= \int_0^\infty \beta^t [bu_t + (z_t Y_F \bar{\epsilon}_t^F - \tau_F) N_t^F + (z_t Y_P \bar{\epsilon}_t^P - \tau_P) N_t^P - \kappa v_t] dt \quad (7.1)$$

where N_t denotes the period-t distribution of match qualities among the employed, and $\bar{\epsilon}_t^F$ and $\bar{\epsilon}_t^P$ denote the period-t average match qualities among the full-time and part-time employed, respectively. We will implement increases in unemployment insurance and part-time subsidies as increases in b and decreases in τ_P, respectively. Throughout, $\tilde{b}$ and $\tilde{\tau}_P$ will refer to to baseline value plus the addition of any policy to unemployment insurance and part-time subsidies.

In the previous section, we argued that within-job adjustments play an important role in the dynamics of both part and full-time employment. Here, we highlight why that is crucial for understanding policy. A part-time job subsidy may dampen the destruction of matches during a recession. This option keeps these matches producing and saves the economy the future cost of rebuilding these jobs through costly vacancy posting. However, the part-time job subsidy also distorts the utilization choice between part and full-time employment. As we show in our policy experiments, this can have adverse consequences for the economy by causing many full-time jobs, which would not have been destroyed during the recession, to operate as part-time. We also show that even with an appropriately-sized policy, the duration of the recession also affects the impact of job subsidies. The adverse effects of part-time subsidies are especially harmful during long recessions, where the intensive-margin distortion persists for a long time.

7.1 Magnitude of interventions

We first compare policy interventions of different magnitudes, in response to a severe but medium-duration recession. We allow for a 4-quarter drop of 9% in aggregate productivity (z_t), before returning exponentially to the steady-state over the following four quarters. We compare the impact of two policies — unemployment insurance and part-time employment subsidies — and vary both by the size of the designed intervention. For the part-time subsidy, the "small subsidy" policy experiment provides subsidy equal to roughly 2.5% of average part-time job output, which amounts to a 10% decrease in τ_P, and keeps this subsidy in place for the duration of the productivity drop (until the aggregate productivity shock comes back to the steady state). The "large" subsidy involves a more aggressive 100% reduction in fixed costs paid by the firm, i.e. setting $\tilde{\tau}_P = 0$. In each case, the counterfactual unemployment insurance (UI) increase is picked to be cost-equivalent to the corresponding part-time subsidy.

We present out findings in Table 7. In the first three columns, we focus on the 10% reduction in part-time operating costs and a cost-equivalent UI policy. In the last three columns, we focus on a policy in which the fixed cost of operating part-time is eliminated $\tilde{\tau}_P = 0$ and a cost-equivalent UI expansion. The bottom two rows repeat the baseline values of these parameters and then give the values for our policy experiments. When reporting employment and output, we average the employment level over the duration of the recession episode.

Variable	Small Subsidy			Large Subsidy		
	PT	UI	Pct. Diff.	PT	UI	Pct. Diff.
Employment	0.923610	0.921823	0.1939%	0.928216	0.918504	1.0574%
Part-Time Emp.	0.016609	0.014303	16.1225%	0.038969	0.014951	160.6448%
Full-Time Emp.	0.907001	0.907521	-0.0573%	0.889247	0.904656	-1.7033%
Ave. Flow Welfare	0.631310	0.631300	0.0016%	0.630113	0.631207	-0.1733%
Total Welfare	268.277943	268.273508	0.0017%	267.675391	268.228922	-0.2064%
Weekly						
Total Output	1.040630	1.040052	0.0556%	1.034758	1.037388	-0.2535%
Average Output (per worker)	1.126479	1.128029	-0.1374%	1.114986	1.129183	-1.2573%
$\phi_{E,U}$	0.005670	0.005798	-2.2077%	0.005350	0.006016	-11.0705%
$\phi_{F,P}$	0.001542	0.001262	22.1870%	0.003969	0.001189	233.8099%
$\phi_{P,F}$	0.080050	0.083415	-4.0340%	0.076863	0.076475	0.5074%
$\phi_{U,E}$	0.068785	0.068688	0.1412%	0.069147	0.068410	1.0773%
Policy						
Baseline	$\tau_P = 0.1$	$b = 0.4$	-	$\tau_P = 0.1$	$b = 0.4$	-
Subsidy	$\tilde{\tau}_P = 0.09$	$\tilde{b} = 0.4030$	-	$\tilde{\tau}_P = 0.0$	$\tilde{b} = 0.4244$	-

Table 7: Policy comparison, part-time versus UI subsidy. Both subsidies are set to ensure that costs are equal across the policies. The size of the policies varies from small, which subsidizes part-time employment with $\tilde{\tau}_P = 0.9\tau_P$, with an equally costly expansion of UI. For the "large" subsidy, we consider $\tilde{\tau}_P = 0$, i.e., firms no longer pay flow cost of part-time employment.

As expected, under both subsidy experiments, the part-time subsidy results in larger employment and smaller output per worker. Both of these effects are more pronounced when the amount of the subsidy is larger. Turning to welfare, we observe that a small part-time subsidy yields slightly higher welfare than an equal-cost UI increase. However, a large part-time subsidy results in lower welfare than an equal-cost UI increase. Intuitively, a UI increase destroys marginal matches, whereas a part-time subsidy preserves them. For a small subsidy, there is not much of a difference, as those matches are close to indifferent over separation. However, a part-time subsidy has an additional distortionary effect that is more pronounced when the subsidy is large. In particular, it incentivizes some full-time matches to become part-time. This effect, which is larger for a large subsidy, leads to welfare losses. This is also evidenced by the fact that full-time employment is lower under a large part-time subsidy than under a cost-equivalent UI increase.

7.2 Length of recessions

Next, we explore how recessions of different lengths affect the effectiveness of the part-time subsidy and UI schemes. The purpose of these experiments is to show that the ranking between a UI expansion and a part-time subsidy can be reversed depending on the duration of the recession. The reason is that the welfare gain from a part-time subsidy comes from the preservation of job matches, but the welfare gain from doing so realizes once the economy recovers. On the other hand, the distortion that such policy creates when choosing between part-time and full-time employment is present throughout the recession.

Short recession. We consider a 2-quarter 9% productivity drop, followed by a 2 quarter recovery, approximately mimicking the duration of the 2001 recession. However, the magnitude of the negative shock is larger. In response to these adverse shocks, we consider one scenario where the government implements a 10% reduction in the cost of operating part-time, $\tilde{\tau}_P = 0.9 \times \tau_P$, at which it remains until the economy has fully recovered (4 quarters total). We compare this scheme with a corresponding increase in unemployment benefits b, for an

Variable	Short Recession			Long Recession		
	PT	UI	Pct. Diff.	PT	UI	Pct. Diff.
Employment	0.922612	0.920338	0.2471%	0.917197	0.912134	0.5551%
Part-Time Emp.	0.017246	0.014088	22.4162%	0.0795	0.0119	568.0672%
Full-Time Emp.	0.9054	0.9063	-0.0993%	0.851262	0.895138	-4.902%
Ave. Welfare	0.62960	0.62959	0.0016%	0.62006	0.620104	-0.0071%
PV Welfare	267.431093	267.430139	0.0004%	262.841564	262.860436	-0.0072%
Total Output	1.037823	1.037175	0.0625%	1.022180%	1.021182	0.0977%
Average Output per worker	1.124569	1.126631	-0.1830%	1.113762	1.118808	-0.4510%

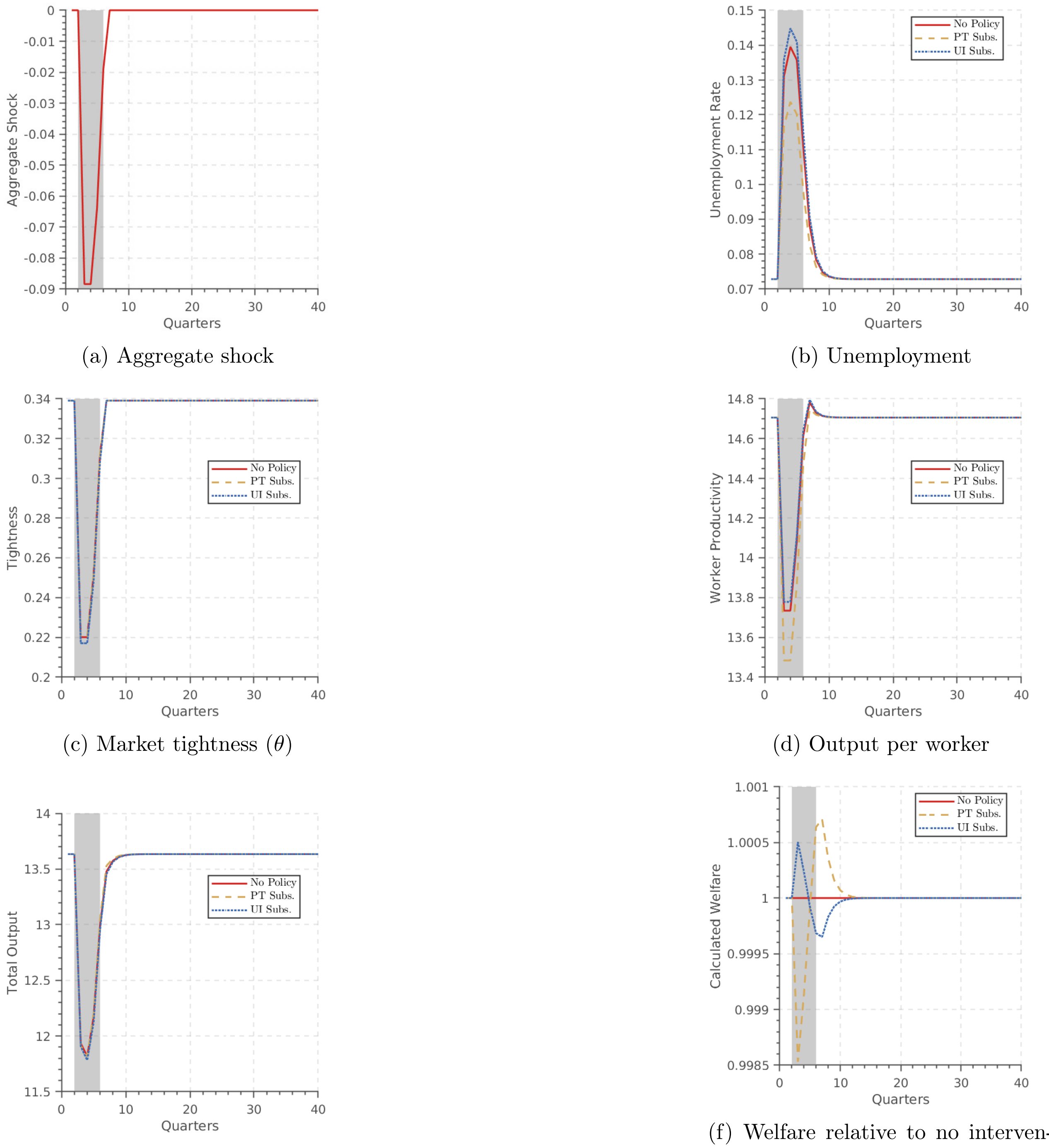
Table 8: Policy comparison: part-time subsidies vs. UI expansions, for short vs. long recessions.

equivalent duration.[6] The effects of the policy are shown in Figure 7.1 and the first three columns of Table 8.

The first three columns of Table 8 compare the effects of the two policies on employment and average welfare. As already explained, the part-time subsidy serves to preserve employment matches, while UI destroys them, hence employment is higher under the part-time subsidy. The part-time subsidy also results in higher part-time employment and lower full-time employment than the UI subsidy. This is both because the marginal matches preserved by the part-time subsidy are part-time, and because it induces some full-time matches to switch into operating part-time. Overall, welfare is higher under a part-time subsidy than under a UI expansion. This finding suggests that the job preservation benefit is more significant than the intensive-margin distortion.

As expected, panel 7.1b of Figure 7.1 shows that an increase in unemployment insurance raises unemployment, while a part-time subsidy lowers it. On the other hand, as illustrated in panel 7.1d, the two policies have the opposite effects on output per worker. An increase in unemployment benefits raises average output per worker, while a part-time subsidy lowers it. Unemployment insurance makes workers more selective regarding which matches are acceptable. As a result, matches that survive the shock are more productive. In contrast, the part-time job subsidy dampens the fall in output by incentivizing more employment matches

[6] Another alternative is a flat subsidy offered to all employment matches. While such a subsidy may seem a natural alternative to consider, it is much more costly because it is offered to all employed; as a result, a flat subsidy *cost-equivalent* to the part-time subsidy considered here would have barely any impact. This result is available upon request. Any alternative in which the subsidy is disproportionately offered to the part-time employed faces a similar utilization distortion as in our baseline model.



(a) Aggregate shock

(b) Unemployment

(c) Market tightness (θ)

(d) Output per worker

(e) Total output

(f) Welfare relative to no intervention.

Figure 7.1: Response to a 9% productivity shock that lasts for 2 quarters: unemployment insurance vs. cost-equivalent part-time subsidy.

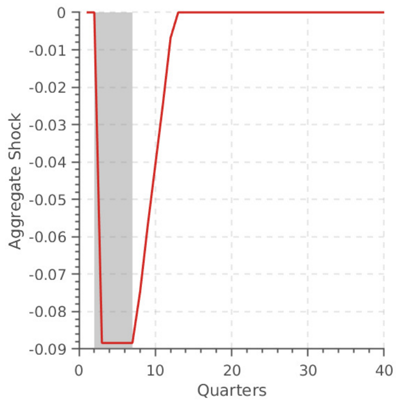
to stay in operation. However, it amplifies the fall in output per worker, both by incentivizing low-quality matches to stay in operation, and by incentivizing some medium-quality matches to switch from full-time to part-time — a channel to which we return below. Panel 7.1f illustrates the flow welfare gains and losses from each policy relative to the no-intervention case. A subsidy to unemployment insurance yields welfare gains immediately, in the form of direct payments to unemployed individuals, but results in future welfare losses stemming from destroyed jobs. Because these jobs were temporarily unproductive, the welfare losses manifest themselves when the economy recovers. The relative welfare effects of the part-time subsidy have the opposite shape. In particular, it is disadvantageous at first due to the reduced output per worker, but beneficial when the economy recovers, due to cost savings on rebuilding job matches.

Long recession. Next, we consider a more protracted economic downturn, akin to one that occurred in the Great Recession. To do so, we subject the economy to an 8-quarter drop in productivity, followed by an 8-quarter recovery to the steady-state. The last three columns of Table 8 and Figure 7.2 illustrate the responses of unemployment, output per worker, vacancies, and the dynamics of welfare to the same set of policies that we considered in the previous section ($\tilde{\tau}_P = 0.9 \times \tau_P, \tilde{b} = 0.4025$).

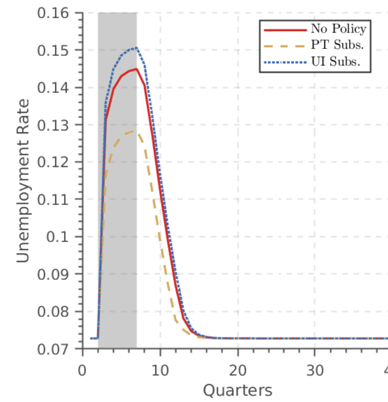
As we can see, the last three columns in Table 8 shows that, welfare is *lower* under the part-time job subsidy than under the UI expansion. In particular, the part-time subsidy now results in a much larger drop in full-time employment. Note that despite dampening the fall in total employment, and the underutilization of productive matches is costly because this underutilization persists for a long time.

While the dynamics are similar to a shorter recession, the larger duration of the recession changes the relative magnitudes. In particular, the output losses from converting matches from full-time to part-time persist for a longer period of time, as shown in Panel 7.2f.

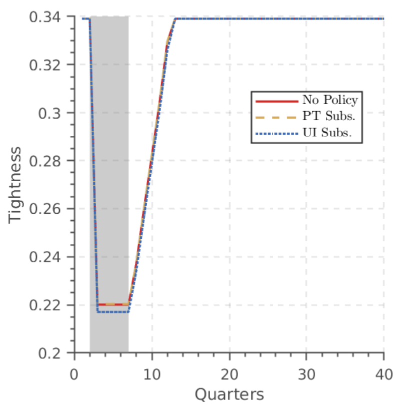
Summary. The previous experiments illustrate that the tradeoffs involved in policy design and the relative virtues of the various policies depend on characteristics of the recession; i.e, size and duration. This emphasizes the need to go beyond the steady-state perspective of



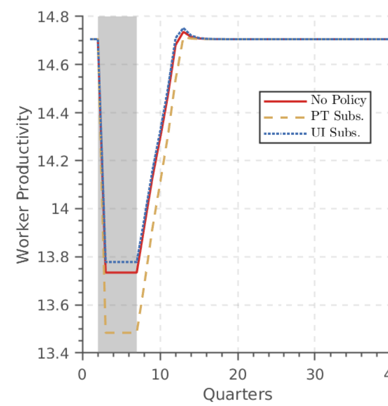
(a) Aggregate shock



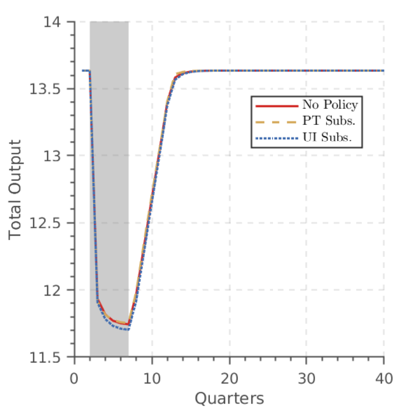
(b) Unemployment



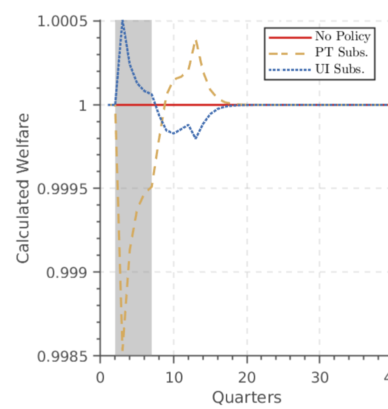
(c) Market tightness (θ)



(d) Output per worker



(e) Total output



(f) Welfare relative to no intervention.

Figure 7.2: Response to a 9% productivity shock that lasts for 8 quarters: unemployment insurance vs. cost-equivalent part-time subsidy.

trading off match quality and unemployment when analyzing the impact of labor policies.[7] In

[7]Such a steady-state tradeoff is highlighted, e.g. in Marimon and Zilibotti (1999), Lagos (2006), and Griffy and Rabinovich (2023).

particular, implementing a part-time subsidy in response to a negative aggregate shock entails a short-run cost in exchange for a longer-run benefit. The short-run cost consists not only of preserving relatively low-productivity marginal matches, but also — and more importantly — incentivizing productive matches to switch from full-time to part-time operation. The longer-run benefit consists of saving on the cost of rebuilding job matches once the economy recovers. In the case of a short recession, a part-time subsidy may be desirable because it avoids shutting down matches and rebuilding them. The underutilization cost is transitory, while the employment preservation benefit is long-lasting. In the case of a long recession, the cost is relatively higher because it is borne for a long time. In contrast the benefit is relatively lower because it realizes farther in the future. Our results therefore serve as a cautionary note when using part-time subsidies for employment stabilization. Our findings also imply that the duration of the downturn is an important determinant of the relative costs and benefits when implementing part-time subsidies.

8 Conclusion

This paper extends a canonical equilibrium search model to incorporate a flexible choice between part-time and full-time employment, showing that such a model accounts well for the cyclicality of flows in and out of part-time employment for economic reasons. We argue that the ability to flexibly adjust between part-time and full-time employment is a double-edged sword. It allows for stabilizing the fall in total employment in response to negative shocks. However, it also introduces an additional distortion from part-time job subsidies. In particular, full-time jobs are converted into part-time ones. The net output and welfare effects of such policies are therefore ambiguous and depend, among other things, on the duration of the recession.

The paper deliberately uses a parsimonious model of worker flows, which abstracts from worker heterogeneity. We do so to examine how far such a natural framework can go in capturing the cyclicality of worker flows. The conclusion is that it can account for this cyclicality quite well, though it inherits the challenges faced by the standard equilibrium search model in matching the volatility of unemployment (see e.g. Fujita and Ramey (2012) for comparison). Further research should incorporate worker heterogeneity together with the choice of part-time versus full-time employment. As argued by Hall and Kudlyak (2019), Gregory et al. (2021), and Ahn et al. (2023), workers are heterogeneous in terms of their labor market transition behavior. In particular, Ahn et al. (2023) show that this heterogeneity is important for transitions in and out of part-time employment. Incorporating multiple worker types into a structural model of part-time and full-time employment is a challenging, but promising research avenue. This has the potential to both improve further the model's fit and provide new insights into the effects of policies, such as the ones analyzed here. This is the case gains and losses from these policies are likely to differ significantly across workers. We leave this for future research.

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