Alternative Work Arrangements: Business and Life Cycle Implications*

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Abstract

Many countries have employment protections that create two-tiered labor markets in which some jobs are more secure than others. Those in less secure jobs tend to be younger and to experience more frequent unemployment spells. This paper examines the effects on output, unemployment, wages, and total welfare of eliminating differential employment protections and quantifies the effects of such a policy change on the amplitude and persistence of aggregate shocks. By including human capital accumulation in employment, and unemployment spells that can lead to human capital losses, the effects of eliminating employment protections differ qualitatively from previous work. I find that completely eliminating employment protections reduces output and average income while increasing unemployment. This result is driven entirely by lower average human capital in the economy without employment protections. I also consider the effects of changes to limitations on the length of time workers can be employed in less secure contracts and find consistent results.

1 Introduction

Throughout the world, employment protections are applied differentially to certain work arrangements. Common examples of these more flexible alternative arrangements

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include independent contract work, employment through a staffing agency, and employment through contract firms. Firms are more likely to use alternative arrangements in states or regions with stronger employment protections (Surfield, 2014 and Sapkal, 2016, among others). Incentives for firms to change the fraction of their workforce employed in alternative arrangements can affect both how the economy responds to shocks and the productivity and earnings of individuals over their life cycle. Data shows that alternative arrangements[1] are disproportionately held by younger workers and contribute to labor force flexibility over the business cycle. Views differ on the merits of applying employment protections to create a two-tiered labor market, with Blanchard & Landier (2002) and Cahuc & Postel-Vinay (2002) arguing employment protections may be inefficient, although supported by those benefiting from the protections. Their results are consistent with earlier work by Hopenhayn and Rogerson (1993), which found that a tax on firing decreases job destruction but has a more significant impact on reducing job creation, resulting in lower steady state employment.

Previous work considering the impact of job separation frictions has excluded a key channel: human capital accumulation. In this paper, I examine the effects on output, unemployment, income, and total welfare of eliminating differential employment protections and quantify the effects of such a policy change on the amplitude and persistence of aggregate shocks. I also consider the effects of different limitations on the length of time firms can employ workers in alternative contracts. To evaluate the effects of these policy changes, I develop a directed search model with overlapping generations and aggregate uncertainty. The model includes two job types, alternative and traditional arrangements. Workers accumulate human capital on the job, and unemployment spells may lead to human capital losses. The key distinction between job types in the model is that firms employing workers in traditional jobs must pay a firing cost to separate from a worker, while firms employing workers in alternative jobs may separate from workers without cost. I also allow the human capital accumulation rate to differ by job type to match differences in wage growth by job type observed in the data. Workers may search when unemployed and employed for a new job type that is optimal for them.

Workers who enjoy employment protections experience fewer unemployment spells and, on average, accumulate more human capital over their careers. Lower average human capital in the economy without employment protections is the reason this policy change results in lower output, average income, and average welfare. Considering the same policy change of eliminating firing costs with the same distribution of workers as in the original

[1]The terminology used to refer to this class of jobs often varies from source to source, with them sometimes being called "fixed-term" or "temporary" jobs. However, the term "temporary" job is often used to refer exclusively to jobs where workers are hired through temporary staffing agencies. Additionally, "fixed-term" might imply that these workers are employed only for a fixed period of time, which is not the case for many. I use the terminology "alternative" and "traditional" arrangements following the Bureau of Labor Statistics Contingent Worker Survey measuring these types of work arrangements in the United States. A "traditional" job refers to any job that is not an alternative arrangement.

economy has the opposite effect. If the effects of the policy change on worker productivity are ignored, eliminating the job separation friction is beneficial on average. Interestingly, although eliminating firing costs improves the average welfare of workers in the original steady state of the economy, only 36.1% of workers would vote for the policy change. Those in favor are younger on average, are more likely to be unemployed or experience unemployment, and benefit from an increased job finding rate. In contrast, older workers in the original steady state of the economy are more likely to be in jobs with employment protections and do not benefit from their removal.

Eliminating employment protections increases job creation and job destruction, so the overall effect on unemployment may be initially unclear. Holding human capital and other worker characteristics constant, the effect of increased job creation is more significant, so eliminating employment protections reduces overall unemployment. However, workers moving through the economy without employment protections will not be identical to those who spend time in the economy with these protections. Once the effects on worker characteristics are considered, eliminating employment protections increases overall unemployment by resulting in lower average worker human capital. While the policy change makes it easier for the unemployed to find jobs, workers experience more frequent costly unemployment spells over their lifetime.

This paper also contributes to the existing literature regarding alternative arrangements by allowing workers to direct their search towards whichever job type is best for them, contrary to previous work, which has imposed exogenous restrictions on the job type available to the unemployed. The model allows the job type choices of workers who differ in terms of age and human capital to be studied. The sorting patterns generated by the model establish a distribution of workers across job types by age that is consistent with the data. This contribution is essential when considering the effect of policy changes, to which the fraction of workers searching for each job type is likely to respond.

Finally, this paper estimates the economy's response to aggregate shocks before and after the implementation of each policy change of interest. These results highlight the importance of considering the effects of each policy change on the distributional characteristics of workers. Because workers have lower average human capital after employment protections are eliminated, two competing effects influence the economy's recovery. First, when firms do not need to worry about firing costs, they are willing to rehire workers more quickly following a negative shock. However, employing low human capital workers is less profitable, and low human capital workers are not as quickly rehired after entering unemployment. The reduction in human capital is significant enough following the policy change that the second effect is dominant, and the economy takes at least slightly longer to recover from a negative aggregate shock.

The remainder of the paper is outlined as follows: Section 2 discusses the relevant literature, Section 3 presents empirical evidence regarding the impact of alternative ar-

rangements on workforce flexibility and individual income as well as income growth, Section 4 presents a directed search model with aggregate productivity shocks, human capital accumulation, and endogenous separations where both alternative and traditional work arrangements can exist, Section 5 discusses results from the model, and Section 6 concludes.

2 Related Literature

2.1 Institutional Context

The paper examines the impact of differentiated employment protections on unemployment, output, total welfare, and economic responses to aggregate shocks. Jobs with differentiated employment protections exist in many contexts. In the United States, alternative work arrangements, including work through a temporary staffing agency and contract work, provide employers with means to avoid government-mandated employment protections. Surfield (2014) finds that right-to-work (RTW) states see a lower prevalence of these forms of arrangements. RTW states differ from non-RTW states because new hires are not obligated to join any existing labor union, which a collective bargaining agreement might mandate. RTW advocates claim non-RTW legislation places unnecessary constraints on firms' ability to dismiss new employees who turn out to be poor matches because new hires are automatically included in existing unions. Given the less flexible labor market of non-RTW states, Surfield (2014) finds employers resort to using more alternative arrangements to find flexibility. Alternative arrangements offering differentiated employment protection exist in many other settings throughout the world, including in Australia (Laß and Wooden, 2020), India (Sapkal, 2016), Japan (Yu, 2012), and South Korea (Baek and Park, 2018).

Jobs with lesser employment protections are easily observed in data from European countries.[2] A significant difference between employment in Europe compared to employment in the United States is that written employment contracts, often called statements of employment particulars, are legally required in most European countries.[3] The employment contracts must be in writing, cannot be changed without the employer and employee's agreement, and cover a list of topics like the pay rate, hours worked, and more. In many cases, these employment contracts serve to protect the employer, who usually has the burden of proof in dismissal claims (Bruce, 2013).

[2]Data from the European Union Labour Force Survey is available at a quarterly frequency, while data from the Bureau of Labor Statistics Contingent Worker Survey currently offers single observations only in the years 1997, 1999, 2001, 2005, and 2017.

[3]Due to this, European data is arguably more accurate than data from the U.S. which relies on workers accurately self reporting their employment type. See Katz and Krueger (2019) for a discussion of the particular challenges related to using self-reported data to measure employment in alternative arrangements.

While specific employment protection legislation varies by country, several features apply generally across the European Union. In most places, a probationary period is allowed, during which both employer and employee can choose to terminate the employment relationship without cost. Legislation often defines a maximum length for probationary periods. The maximum length set by EU countries ranges from one to twelve months, but it is between three to six months in most countries. The employer is usually required to justify their reasons for dismissing an employee, and an employer could validate dismissal on either disciplinary or economic grounds. Dismissal for disciplinary reasons does not involve any severance payment to the worker, but in most countries, dismissal on economic grounds does require compensation be paid to the worker. Some countries, including Finland and Sweden, do not require employers to pay severance, but the notice period for dismissal is quite long. When an employer simultaneously dismisses a sizeable number of employees for reasons not connected with individual workers involved, collective redundancy procedures are triggered. In most cases, employers still must make severance payments for individual economic dismissal in the case of collective redundancy. The employer may also have to provide additional monetary compensation (e.g., co-financing unemployment benefits) (Koukiadaki and Katsaroumpas, 2017).

With these employment protections in place, employers in the EU may use alternative employment arrangements to avoid the impact of such regulations. de la Porte and Emmenegger (2017) argue that alternative arrangements are precarious because they are characterized by low or nonexistent dismissal protections. Alternative jobs in the European data include all arrangements not based on an open-ended and continuous contract.[4] (The main types of these arrangements are fixed-term contracts, temporary agency work, and seasonal work.) Employees in these arrangements can be terminated without cost, as specified in their contract, after a certain length of time, after a project is complete, or when circumstances outlined in their contract are met. Although workers in fixed-term jobs generally receive similar protections as workers in traditional arrangements during their specified contract period, they generally receive less in cases of unjust dismissal. In some countries, unjust dismissal does not apply to them at all. Other alternative jobs without fixed-term contracts, such as employment through staffing agencies, have little or no protection because the employment is based directly on completing a project or providing a service. Employers often may end these employment relationships without any period of notice (Koukiadaki and Katsaroumpas, 2017).

[4]The European Union Labor Force Survey data refers to these jobs as "temporary" jobs. However, the term "temporary" job is often used to refer exclusively to jobs where workers are hired through temporary staffing agencies. To avoid confusion, I use the term "alternative" job following the BLS Contingent Worker Survey.

2.2 Contributions to Existing Literature

This paper contributes to the literature on the lasting impact of alternative work arrangements on lifetime employment and earnings, as well as the literature studying these arrangements and their role over the business cycle. The main contribution of the paper is to add human capital accumulation on the job and directed search for alternative or traditional arrangements to a model that includes both job types in the presence of aggregate shocks. While previous papers have considered the use of both job types in the presence of aggregate shocks, they did not consider each arrangement's role in promoting human capital accumulation over the life cycle. Additionally, all previous models featured random search and imposed assumptions that generated equilibrium employment in both alternative and traditional jobs. In this paper, workers direct their search towards either job type, and I am able to study sorting into both job types over the life cycle and business cycle.

Among the first papers to quantify the impacts of employment protections, Hopenhayn and Rogerson (1993) pointed out that taxes on job destruction also impact job creation. Using a model without labor search frictions or aggregate fluctuations and a single job type, they found that introducing a firing tax decreases job destruction but has a more significant impact on lowering job creation, resulting in lower steady-state employment. Blanchard and Landier (2002) and Cahuc and Postel-Vinay (2002) later weighed the steady-state impacts of a firing tax in the presence of labor search frictions. They introduced a separate flexible job type where the firing tax could at least temporarily be avoided. I build on this strand of literature by including human capital accumulation on the job, where employment protections play a role in avoiding human capital loss during unemployment. The model adds overlapping generations and directed search, allowing me to study the effect of employment protections on workers over their life cycle and consider their choice of job type.

Few papers have aimed to quantify alternative work arrangements' role when the economy is responding to aggregate shocks. Of these papers, the focus has been exclusively on labor market flexibility. The first among these papers was Bentolila and Saint-Paul (1992), which found that the existence of a more flexible contract type increases the size of employment's response to aggregate shocks while decreasing its persistence. Later, Costain, Jimeno, and Thomas (2010) and Sala, Silvia, and Toledo (2012) showed, using models in the spirit of Mortensen and Pisserides (1994), that labor markets with alternative jobs are more volatile than labor markets in an otherwise identical environment without alternative jobs. The model in this paper also includes aggregate shocks, but allows for the consideration of the lasting impacts that aggregate shocks have on the human capital and earnings of workers at different stages in their life cycle. Younger workers are more likely to be employed in alternative jobs and thus are more likely to

experience unemployment and human capital losses when a recession occurs.

Finally, this paper contributes to the existing literature on the lasting impact of alternative arrangements on lifetime employment and earnings. Work in this area has been purely empirical, while this paper introduces a structural model to match key data observations and consider the effects of policy changes. This literature is relatively small and focuses mainly on low-skilled workers. Autor and Houseman (2010) take advantage of data tracking individuals in Detroit's welfare-to-work program. In this program, individuals are assigned to contractors that place individuals in temporary-help or direct-hire jobs at different rates. They find that placement in a temporary-help job does not make an individual any more likely to be employed in the future than those who received no job placement at all through the program, and may actually slightly reduce future earnings. García-Pérez et al. (2019) track cohorts in Spain who entered the labor market before and after a 1984 reform that considerably liberalized the use of alternative arrangements.[5] They found that the reform raised the likelihood of working before age 19 but increased the number of employment spells and resulted in an estimated 7.3% yearly earnings loss. Similarly, Fauser (2020) uses data from the German Socio-Economic Panel (SOEP) and finds that an increasing cumulative wage gap persists between alternative and traditional workers even after transitions to traditional jobs take place. In addition to empirically investigating the impact of employment in an alternative job on current income and income growth using the Netherlands Longitudinal Internet studies for the Social Sciences (LISS) data, I develop a structural model that matches the empirical observations. I then use the structural model to consider the impact of both aggregate shocks and policy changes.

To study the role of alternative arrangements over the life cycle and business cycle, I extend the model of Menzio and Shi (2011) to include overlapping generations, human capital accumulation on the job, and two distinct job types. Idiosyncratic shocks occur throughout each employment relationship in this model to induce endogenous separations. This model is in some ways similar to Menzio, Telyukova, and Visschers (2016) but includes aggregate shocks and two job types: alternative and traditional arrangements. There are also notable differences in the human capital accumulation process including allowing for human capital deprecation in unemployment to match observed wage losses following unemployment spells in the data.[6] The following section provides empirical motivation for this model.

[5]The analysis of García-Pérez et al. (2019) is limited only to male high-school dropouts.

[6]Additionally, in Menzio, Telyukova, and Visschers (2016) idiosyncratic productivity is fixed for the duration of each match while it evolves over time for each match in my model and plays a role in inducing endogenous separations.

3 Empirical Evidence

In this section, I first investigate the magnitude to which alternative employment responds more strongly to GDP shocks than does traditional employment. I then show that employment in an alternative job is associated with lower earnings after controlling for key observables. Finally, I show that the mean growth rate of income for those who remain in alternative arrangements is consistently lower than the growth rate for those who remain in traditional arrangements. These empirical observations motivate the model I construct in Section 4.

3.1 Business Cycle Response of Alternative and Traditional Employment

I obtain quarterly data on employment in alternative and traditional jobs from the European Union Labour Force Survey. This data shows that the fraction of all workers employed in alternative jobs drops during recessions, consistent with the hypothesis that alternative arrangements play an oversized role in labor force adjustments. The role of alternative jobs becomes most apparent when considering how much losses in these jobs contributed to total net employment losses during the 2008 and 2020 recessions. Following the 2008 recession, total employment in the EU declined by 3.9% while employment in alternative jobs declined by 14.3% (traditional employment declined 2.4%). Although alternative arrangements accounted for 12.2% of all employment in the EU preceding the 2008 recession, losses in these jobs accounted for 45.8% of all net employment losses during this recession.[7] More recently, alternative arrangements accounted for 14.8% of all jobs in the EU in the fourth quarter of 2019, while losses in these jobs accounted for 68.4% of all net employment losses during the 2020 recession.[8]

To quantify the difference in the relation between alternative and traditional employment to changes in GDP, I use quarterly data spanning from the first quarter of 1998 to the fourth quarter of 2020 from the European Union Labour Force Survey along with Eurostat National Accounts data. I run a panel regression with country fixed-effects of GDP growth on both alternative and traditional employment growth. The following table displays these results.[9]

[7]These results use employment data which includes all workers age 15 and older. *Appendix A* provides these same statistics when the data is restricted to ages 15-64, 20-64, 25-64, and 25-54. The statistics provided in this section do not significantly change when restricting the data to these age groups.

[8]This much larger response of alternative employment in 2020 could be explained in part by the fact that these jobs are more common in the accommodation and food service sector, which was harder hit by the 2020 recession. The regression results displayed in *Table 1* explicitly control for growth in service sectors.

[9]Employment data used in this regression includes all workers age 15 and older. *Appendix A* provides the same regression results where the data is restricted to include only those aged 25-64. The results do not notably differ.

Table 1: Panel Regression with Country Fixed-Effects

	Alternative Employment Growth	**Traditional Employment Growth**
GDP Growth	**0.413****	**0.094*****
	(0.129)	(0.012)
GDP Growth (t-1)	**0.330**	**0.143*****
	(0.173)	(0.017)
Change Inventory as % GDP	-0.099	0.081***
	(0.163)	(0.016)
Percent in Service Growth	0.159**	-0.002
	(0.047)	(0.004)
Labor Cost Index Growth	-0.295	0.065***
	(0.157)	(0.018)
Labor Cost Index Growth (t-1)	-0.247	0.044**
	(0.159)	(0.015)
Observations	1,862	1,862
R^2	0.0301	0.1806

$^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$

These results show that changes in GDP growth are associated with a change in alternative employment growth that is more than four times greater than the change traditional employment growth.

3.2 Job Type Relation to Income and Income Growth

Next, I empirically investigate the relationship between employment in an alternative job and income as well as income growth. I use data from the LISS (Longitudinal Internet studies for the Social Sciences) panel administered by CentERdata (Tilburg University, The Netherlands). The LISS panel is based on a true probability sample of households drawn from the population register[10]. Every year, a longitudinal survey is fielded in the panel, covering various topics, including work, education, and income. The relevant data is available at an annual frequency, from 2008 to the present.

After restricting the data to full-time workers, I run a panel regression with sector fixed-effects that controls for relevant observables and measures the relation between job type and the log of net income. The results are displayed in *Table 2*. These results show that, after controlling for other relevant worker and job characteristics, employment in an alternative arrangement is associated with roughly 6% lower net income.

[10]CentERdata conducts the survey via monthly Internet surveys, and households that could not otherwise participate receive a computer and Internet connection.

Table 2: Panel Regression with Sector Fixed-Effects

	Log Net Income
Currently in Alternative Arrangement	**-0.0590*****
	(0.0053)
Postsecondary Education	0.0436***
	(0.0124)
Log Job Tenure	0.0050*
	(0.0022)
Log Age	0.6264***
	(0.0128)
Supervisor Role	0.0440***
	(0.0039)
Manual Occupation	-0.1542^{***}
	(0.0081)
Male	0.1307***
	(0.0097)
Dutch	0.0283***
	(0.0030)
Observations	16,920
R^2	0.2736

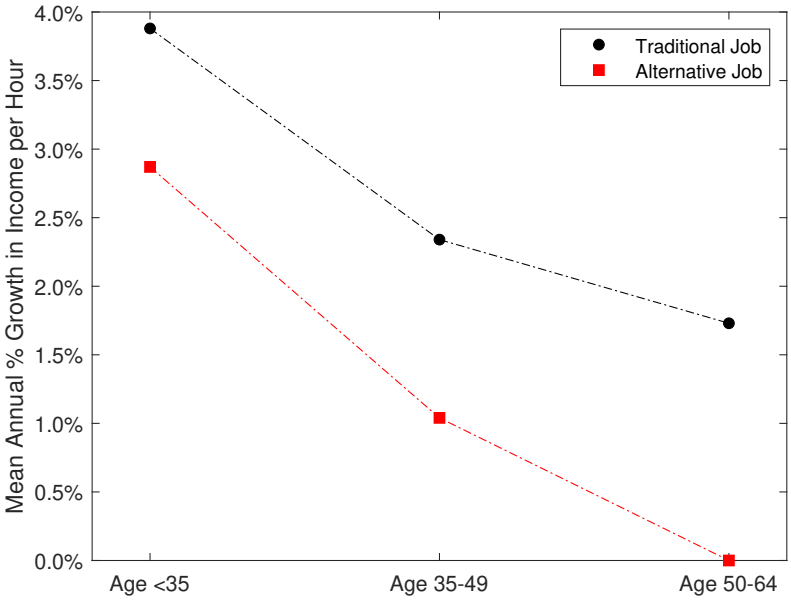
$^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$

Employment in an alternative job is not only associated with lower current income; the mean annual growth rate of income per hour is also lower for those who remain in this type of job.

When comparing the income growth rates between alternative and traditional jobs, it is vital to also account for the age of the workers. Younger workers are more likely to be employed in alternative arrangements than older workers, and they, on average, experience faster income growth. When not accounting for the age group of the worker, it appears that those in alternative arrangements experience a slightly higher rate of income growth. However, after breaking the workers into three different age categories, it becomes clear that after accounting for the age group of the worker, those in alternative arrangements experience a consistently lower mean annual growth rate of income per hour.[11] *Figure 1* plots the mean annual growth rate of income per hour for those employed in either job type by age group. On average, the annual income growth rate is roughly 1.35% lower in alternative arrangements.

[11] *Appendix B* reports the mean and median reported hours worked by the worker in their primary job depending on whether the primary job was an alternative or a traditional arrangement. The mean and median reported by those whose primary job was an alternative arrangement was about 2 hours per week less than those whose primary job was a traditional arrangement.

Figure 1: Mean Annual % Growth in Income per Hour by Job Type



4 Model

To investigate how alternative arrangements affect the amplitude and persistence of aggregate shocks, as well as employment and income over the life-cycle, I introduce a directed search model with overlapping generations and aggregate uncertainty. The model is similar to that of Menzio, Telyukova, and Visschers (2016), but includes aggregate shocks and two job types: alternative and traditional arrangements. The key distinction between job types in the model is that firms employing workers in traditional jobs must pay a firing cost to separate from a worker, while firms employing workers in alternative jobs may separate from workers without cost. Additionally, the growth rate of human capital is allowed to differ in either job type to match the difference in income growth observed in the data.

4.1 Model Environment

4.1.1 Setting

Time is discrete and continues forever. Agents participate in the model for $\overline{a}$ periods, where each period represents a quarter and $\overline{a} = 180$ represents participation from 20 to 65 years of age. Each period a unit mass of age 20 workers enter the model into unemployment, and a unit mass of age 65 workers exit the model. Workers are heterogeneous both in terms of their a and human capital h. In any period, a worker can be in one of three states: unemployment, employment in an alternative arrangement, or employment

in a traditional arrangement.

4.1.2 Production and Endogenous Separations

At the beginning of period t, the productivity of all workers is affected by the state of aggregate productivity Z_t, which evolves according to $\ln Z_t = \rho \ln Z_{t-1} + \epsilon_t$ for $\epsilon_t \sim \mathcal{N}(0, \sigma_\epsilon^2)$. The idiosyncratic productivity specific to an individual worker at time t, z_t is drawn from a distribution with CDF $F(z_t|z_{t-1})$. Given aggregate productivity Z_t, idiosyncratic productivity z_t, and human capital h_t, an employed worker at time t produces $g(Z_t, h_t, z_t)$. If a worker is unemployed they receive leisure benefit b.

Worker human capital lies on equispaced grid $\mathcal{H}$ with lower and upper bounds h_{lb} and h_{ub} respectively.[12] New entrants to the model drawn their initial human capital value from a distribution with CDF H. While employed in a job of type $G \in \{A, T\}$, a worker's human capital increases by amount $\Delta_{\mathcal{H}}$ with probability π_G each period.[13] The human capital accumulation probability in traditional jobs, π_T, may differ from the probability in alternative jobs, π_A. The difference in human capital accumulation probabilities between each job type captures the observed difference in wage growth between the two arrangements.

While unemployed, workers face a human capital depreciating shock with probability η. When a worker faces a human capital depreciating shock, they draw a new human capital value h_0 from distribution H_0 constructed from the original distribution H, such that the lower bound of distribution H_0 is h_{lb} while the upper bound is the worker's previous human capital value h.[14] Therefore, after a depreciation shock, an unemployed worker must redraw their human capital value from the initial distribution H, but cannot benefit from the shock by drawing a higher human capital value than they had previously. This shock represents depreciation and obsolescence of human capital in unemployment. It allows the model to capture the observation that those in longer unemployment spells tend to experience a lower quarterly job-finding probability and are more likely to see wage losses compared to their previous job when re-entering employment.

The human capital evolution process can be summarized as follows. For employed workers in a job of type $G \in \{A, T\}$:

$$h' = \begin{cases} h & \text{with probability } 1 - \pi_G \\ h + \Delta_{\mathcal{H}} & \text{with probability } \pi_G \end{cases}$$

[12] The human capital accumulation process and the notation used to describe it is similar to and follows from Huckfeldt (2021).

[13] I allow $h_{lb} = 0.2$, $h_{ub} = 5.6$, and $\mathcal{H}$ to be composed of 130 equispaced values so that $\Delta_{\mathcal{H}} = 0.04186$. Note that the parameter estimates π_T and π_A respond to the choice of $\Delta_{\mathcal{H}}$.

[14] Specifically, $H_0(h_0; h) = \frac{1}{H(h)} \int_{h_lb}^{h} dH(h')dh'$.

For unemployed workers, human capital evolves according to:

$$h' = \begin{cases} h & \text{with probability } (1-\eta) \\ h_0 & \text{with probability } \eta \end{cases}$$

After observing workers' idiosyncratic productivity, human capital, and the aggregate state of the economy, firms and workers mutually decide on whether to separate. These endogenous separations occur when a worker's idiosyncratic productivity z_t falls below a cutoff value $\tilde{z}_t$. In traditional jobs, the firm must pay a firing cost $f > 0$ to separate from the worker, while there is no cost to fire a worker from an alternative job. Therefore, given the age of the worker a, human capital h, and aggregate state Z, alternative and traditional jobs will have a different idiosyncratic productivity cutoff value $\tilde{z}_t$ below which firms and workers separate. Firms pay a firing cost f when separating from a worker in a traditional job, fraction φ of the firing cost is paid directly to the worker in the form of a severance payment, while fraction $(1-\varphi)$ represents administrative fees and the cost associated with other frictions related to firing. .

Alternative contracts expire each period with probability κ. If this occurs, the job may continue as a traditional arrangement, or the firm and worker may separate costlessly. The expiration of alternative contracts, as in Blanchard and Landier (2002) and Sala et al. (2012), mimics the policies in place by many countries that limit the length of time a firm can employ a worker in an alternative contract.[15] When an alternative contract expires, whether to continue employing the worker in a traditional job or to costlessly separate requires considering the continuation value of a traditional job and the outside option, which does not involve paying firing cost f.

4.1.3 Search

After workers and firms observe all economic shocks and separations occur, workers who remain employed may search for a new position on the job with probability λ, and any unemployed worker may always search. Workers direct their search to a submarket offering them an expected future value x. This expected future value x includes the present value of employment as well as there future expected lifetime utility. Value x is given to the worker in through a contract that is bilaterally efficient, so that both the worker and firm are incentivized to maximize the joint value of a match. All bilaterally efficient contracts will result in the same efficient separations and movements into and between jobs; the specification of a particular contract only affects wages. *Section 4.2.2* will establish bilaterally efficient contracts offering value x to workers after additional notation and details of the model are introduced.

[15] These policies vary by country. For example, France and Germany limit employment in an alternative job to 18 months while this limit is three years in Spain and two years in Italy, with certain exceptions.

Firms may post a vacancy at cost c. Vacancies are one-firm one-worker offers that offer expected value x to the worker each period. Firms post vacancies in one of two job categories, alternative or traditional, which differ in terms of the firing cost. Although firms can commit providing value to the worker during an employment relationship, they may not be able to commit to making payments after an employment relationship ends. The firing cost is therefore viewed as being imposed by the government.

Define a submarket as a collection of vacancies that all offer the same job type and value x. Additionally, define submarket tightness as $\theta \equiv \frac{v}{\psi}$, where v is the mass of vacancies in the submarket while ψ is the mass of workers searching in the submarket. In any submarket, free entry of firms will determine submarket tightness. The total number of meetings between workers and firms in each submarket is determined by a constant returns to scale function, $M(\psi, v)$. Define the probability that a worker meets a firm $\frac{M(\psi,v)}{\psi} \equiv p(\theta)$, and define the probability that a firm meets a worker $\frac{M(\psi,v)}{v} \equiv q(\theta)$.

All newly formed matches start with idiosyncratic productivity value z_0. Whether or not a worker who searches and meets a firm while employed will stay with their current employer or leave their job to work with the new firm depends on the idiosyncratic productivity value z_t of their current job. If z_t at the worker's current job is below job switching cutoff $\widehat{z}_t$, the worker will optimally leave their current job to work for the new firm that they have met, otherwise the worker will stay with their current firm.

4.2 Equilibrium

4.2.1 Value Functions

To formally define an equilibrium, a few additional pieces of notation need to be introduced. Let $U_a(Z, h)$ denote the value of unemployment to an age a worker with human capital h given the aggregate state Z. For brevity, let S denote state variables (a, Z, h), and let S' denote the value of S one period in the future.

The following equation specifies the value of unemployment.

$$U(S) = b + \max_x \left\{ p(\theta^U(x, S))\beta x + (1 - p(\theta^U(x, S)))\beta \mathbb{E}[U(S')] \right\} \tag{1}$$

Each period, an unemployed worker receives the benefit of leisure b. The unemployed worker chooses a submarket offering value x to search in. Let $\theta^U(x, S)$ denote the equilibrium tightness of the submarket offering x to an unemployed worker given S. The worker meets a firm with probability $p(\theta^U(x, S))$. Note the trade-off faced by both unemployed and employed workers when choosing value x for a given job. Searching for a higher x will bring the worker greater value if they meet a firm, but the probability of meeting a firm declines as x increases. Because the value of posting a vacancy declines when firms offer workers higher x values, fewer vacancies are posted in submarkets offering higher

values of x. After any shocks to S are observed at the beginning of the next period, the worker becomes employed with and receives value x if they met a firm, otherwise the worker remains in unemployment.

The equilibrium tightness of each submarket posting vacancies for unemployed workers is such that the following inequality holds.

$$c \geq q(\theta^U(x,S))\beta\mathbb{E}\left[V^G(S',z_0) - x\right] \tag{2}$$

The benefit of posting a vacancy is the discounted value that the firm receives if matched with probability $q(\theta^U(x,S))$. The value that the firm receives from the match equals the joint value of the match (the combined value to the worker and firm), $V^G(S',z_0)$, minus the value received by the worker x. In equilibrium, free entry of firms implies that the value of posting a vacancy for an unemployed worker in any submarket is always greater than or equal to the cost c of posting the vacancy.

The inequalities describing the equilibrium tightness of each submarket posting vacancies for workers currently employed differ only slightly from (4). The key difference is that for employed workers, the probability that a worker will actually join the new firm if matched must be considered. Let $\widehat{z}^{TG}(S')$ denote the equilibrium cutoff value such that if realized idiosyncratic productivity z' in the worker's current traditional job is below $\widehat{z}^{TG}(S')$, the worker will optimally join the new firm if matched. Otherwise, if the workers current job is productive enough so that $z' > \widehat{z}^{TG}(S')$, the worker will stay at their current job and will not join the new firm. The equilibrium tightness of each submarket posting vacancies for workers currently employed in a traditional job with idiosyncratic productivity z is such that the following inequality holds.

$$c \geq q(\theta^T(x,S,z))\beta F(\widehat{z}^{TG}(S')|z)\mathbb{E}\left[V^G(S',z_0) - x\right] \tag{3}$$

Here $\theta^T(x,S,z)$ denotes the equilibrium tightness of the submarket offering μ in a job of type $G \in A,T$ to a worker currently employed in a traditional job with current idiosyncratic productivity value z. Notice that the key difference from (4) is the term $F(\widehat{z}^{TG}(S')|z)$, which is the probability that the worker will draw an idiosyncratic productivity value at their current job which is below the cutoff $\widehat{z}^{TG}(S')$ so that the worker will join the new firm when matched.[16]. Letting $\widehat{z}^{AG}(S')$ denote the equilibrium cutoff value below which a worker in an alternative job will optimally join the new firm if matched, the inequality describing the equilibrium tightness of each submarket posting vacancies for workers currently employed in alternative jobs differs trivially from (5).[17]

[16]Due to persistence in the process governing idiosyncratic productivity, this probability depends on the employed workers current idiosyncratic productivity value

[17]Specifically, the inequality describing the equilibrium tightness of each submarket posting vacancies for workers currently employed in alternative jobs is:
$c \geq q(\theta^A(x,S,z))\beta F(\widehat{z}^{AG}(S')|z)\mathbb{E}\left[V^G(S',z_0) - x\right]$.

The following equation characterizes the joint value of a traditional arrangement.

$$
\begin{aligned}
V^T(S,z) = g(S,z) \qquad (4)\\
+ \max_x \Bigg\{ \lambda p(\theta^T(x,S,z))\beta \mathbb{E}\left[\int_{\tilde{z}^{TG}(S')}^{\infty} V^T(S',z')dF(z'|z) + F(\widehat{z}^{TG}(S')|z)x\right]\\
+(1-\lambda p(\theta^T(x,S,z)))\beta \mathbb{E}\left[\int_{\tilde{z}^{T}(S')}^{\infty} V^T(S',z')dF(z'|z) + F(\tilde{z}^{T}|z)\left[U(S')-(1-\varphi)f\right]\right]\Bigg\}
\end{aligned}
$$

A worker and firm paired together produce $g(S,z)$. The worker chooses a submarket offering value μ and job type G to search in, and may search on the job with probability λ. If able to search, a worker who meets a firm while employed will only optimally leave their current employer if the realized next period value of idiosyncratic productivity z' with their current traditional job is below equilibrium cutoff $\widehat{z}^{TG}(S')$. If not matched with an outside firm, the worker and their current firm will remain together as long as their realized next period value of idiosyncratic productivity z' is above separation equilibrium cutoff $\tilde{z}^T(S')$. If z' is below the separation cutoff, the firm and worker will separate. Upon separation, the firm must pay the firing cost f, and the worker will receive a fraction φ of f as a severance payment in addition to the value of unemployment.

The following equation specifies the joint value of an alternative match.

$$
\begin{aligned}
V^A(S,z) = g(S,z) \qquad (5)\\
+ \max_x \Bigg\{ \lambda p(\theta^A(x,S,z))\beta\kappa \mathbb{E}\left[\int_{\tilde{z}^{TG}(S')}^{\infty} V^T(S',z')dF(z'|z) + F(\widehat{z}^{TG}(S')|z)x\right]\\
+ \lambda p(\theta^A(x,S,z))\beta(1-\kappa) \mathbb{E}\left[\int_{\tilde{z}^{AG}(S')}^{\infty} V^A(S',z')dF(z'|z) + F(\widehat{z}^{AG}_{a+1}(S')|z)x\right]\\
+ (1-\lambda p(\theta^A(x,S,z)))\beta\kappa \mathbb{E}\left[\int_{\tilde{z}^{\kappa}(S')}^{\infty} V^T(S',z')dF(z'|z) + F(\tilde{z}^{\kappa}(S')|z)U(S')\right]\\
+(1-\lambda p(\theta^A(x,S,z)))\beta(1-\kappa) \mathbb{E}\left[\int_{\tilde{z}^{A}(S')}^{\infty} V^A(S',z')dF(z'|z) + F(\tilde{z}^{A}(S')|z)U(S')\right]\Bigg\}
\end{aligned}
$$

This equation differs from (6) in two key respects. First, each period there is a probability κ that the alternative contract will expire. Second, if the worker and firm separate from an alternative job and the worker enters unemployment, there is no firing cost paid or severance payment received. In an alternative job the worker and firm produce value $g(S,h)$, and the worker chooses to search in a submarket offering x. The worker can only search on the job with probability λ and, conditional on searching, meets a firm with probability $p(\theta^A(x,S))$. In the next period, the alternative contract expires with probability κ. If this occurs, and the worker met with a new firm, the worker will join the new firm if the realized idiosyncratic productivity of their current job is below cutoff $\widehat{z}^{TG}(S')$. If the flexible contract does not expire and the worker met with a new firm, the

worker will go with the new firm if the realized idiosyncratic productivity of their current job is below cutoff $\widehat{z}^{AG}(S')$. Now suppose the worker in a flexible contract does not meet a new firm. If their contract does not expire in the next period, the worker and firm will stay together as long as the realized idiosyncratic productivity z' of the match is above separation cutoff $\tilde{z}^{A}(S')$; otherwise the match will dissolve, and the firm receives their outside option of zero while the worker enters unemployment. If instead, their flexible contract expires, the match will continue as a non-flexible job if the realized idiosyncratic productivity is above cutoff $\tilde{z}^{\kappa}(S')$; otherwise, the firm and worker will costlessly separate.

4.2.2 Bilaterally Efficient Contracts

Contracts offer value x to workers by providing them with a constant fraction μ of match surplus. More specifically, the gain of employment to the worker, equal to the value offered in employment x minus the value of their outside option of unemployment is a constant fraction μ of match surplus. For workers in alternative jobs the following equation holds.

$$x - U_a(S,z) = \mu(V_a^A(S,z) - U_a(S,z)) \tag{6}$$

Refer to μ as the "surplus rate". The value gained by the worker from employment, $x - U_a(S,z)$, equals μ multiplied by match surplus. Match surplus equals the joint value of the match minus the value of the outside options of both the worker and firm. For alternative matches, the value the worker receives from separation is just the value of unemployment, and the firm's outside option value is zero.

In traditional matches the value received by the worker in the case of separation is the value of unemployment plus any severance payment that they receive, equal to φf. The value of separation for firms in traditional matches is their outside option value of zero minus the firing cost f that must be paid upon separation. Therefore, the following equation holds for traditional jobs.

$$x - U_a(S,z) = \mu(V_a^T(S,z) - U_a(S,z) - \varphi f + f) \tag{7}$$

Note that because contracts are defined to offer value x to workers in this way, both workers and firms are incentivized to make decision that maximize the joint value of a match as well as match surplus.

When workers choose a submarket offering an optimal value x^*, they implicitly choose an optimal job type G^*. In submarkets were workers choose to search, the following equation holds.

$$c = q(\theta^U(x^*,S))\beta\mathbb{E}\left[V^{G^*}(S',z_0) - x^*\right]$$

Firms post vacancies in the submarket until the value of value of posting a vacancy equals the cost c.

In the equivalent submarket for the non-optimal job type $\neg G^*$, the following strict inequality holds.

$$c > q(\theta^U(x^*, S))\beta\mathbb{E}\left[V^{\neg G^*}(S', z_0) - x^*\right]$$

In equilibrium no vacancies are posted in these submarkets because the value of posting a vacancy is less than the cost c.

4.2.3 Equilibrium Policy Functions

In equilibrium, cutoff values $\tilde{z}^T(S)$, $\tilde{z}^A(S)$, $\tilde{z}^\kappa(S)$ will be such that when idiosyncratic productivity is at these values, the firm and worker are indifferent between continuing the match and separating. In any case, the firm and worker separate when the value of the match equals the combined value of outside options of both worker and firm. In a traditional job, the value of the worker's outside options is the value of unemployment plus the severance payment the worker receives. The firm's outside value is zero minus the firing cost they must pay. Therefore, $\tilde{z}^T(S)$ satisfies the following equation.

$$V^T(S, \tilde{z}^T(S)) = U(S) + \varphi f - f \tag{8}$$

In alternative jobs, the outside option value equals the value of unemployment. There is no firing cost or severance payment, and the value to the firm of separation equals zero. Therefore, the following equation determines the value of $\tilde{z}^A(S)$.

$$V^A(S, \tilde{z}^A(S)) = U(S) \tag{9}$$

Finally, when an alternative contract ends the firm and worker may stay together in a traditional job or separate costlessly. The idiosyncratic productivity cutoff $\tilde{z}^\kappa(S)$ in this case is such that the value of continuing in a traditional match equals the value obtained from costless separation. $\tilde{z}^\kappa(S)$ satisfies the following equation.

$$V^T(S, \tilde{z}^\kappa(S)) = U(S) \tag{10}$$

In equilibrium, cutoffs $\widehat{z}^{AG}(S)$ and $\widehat{z}^{TG}(S)$ will be such that if idiosyncratic productivity at the worker's current job is at these values, the value of staying in the current match will equal the value of forming a new match with the firm the worker met. Job-to-job transition cutoff $\widehat{z}^{TG}(S)$ will satisfy the following equation.

$$V^T(S, \widehat{z}^{TG}(S)) = V^G(S, z_0) \tag{11}$$

At the cutoff, the joint value of the current match equals the joint value of forming a new match. Similarly, job-to-job transition cutoff $\widehat{z}^{AG}(S)$ will satisfy the following equation.

$$V^A(S, \widehat{z}^{AG}(S)) = V^G(S, z_0) \tag{12}$$

Finally, let $\theta^{U^*}(S)$, $\theta^{T^*}(S, z)$, and $\theta^{A^*}(S, z)$ denote equilibrium market functions given the optimal values of x that solve (1), (4), and (5) respectively . We are now able to define a Recursive Equilibrium.

4.2.4 Definition of Equilibrium

Definition 1: *A Recursive Equilibrium (RE) is given by the following.*

1. *Value functions* $\{U_a(S), V_a^T(S, z), V_a^A(S, z)\}$
2. *Equilibrium optimal market tightness functions* $\{\theta_a^{UG^*}(S), \theta_a^{TG^*}(S, z), \theta_a^{AG^*}(S, z)\}$
3. *Separation cutoffs* $\{\tilde{z}_a^T(S), \tilde{z}_a^A(S), \tilde{z}_a^\kappa(S)\}$ *that satisfy (8), (9), and (10) respectively*
4. *Job-to-job transition cutoffs* $\{\widehat{z}_a^{TG}(S), \widehat{z}_a^{A,G}(S)\}$ *that satisfy (11) and (12) respectively*
5. *A transition probability function for the aggregate state of the economy that is consistent with the equilibrium optimal market tightness functions, separation cutoffs, job-to-job transition cutoffs, and the stochastic process governing aggregate productivity* Z*.*

We can also define a Block Recursive Equilibrium.

Definition 2: *A Block Recursive Equilibrium (BRE) is a Recursive Equilibrium where the value and policy functions depend on the aggregate state of the economy only through the exogenous state of aggregate productivity* Z*. Value and policy functions do not depend on the endogenous distribution of workers of different types across employment states.*

Menzio and Shi (2011) prove that a unique BRE exists, and that there is no other RE. Additionally, the BRE is efficient in the sense that it decentralizes the solution of a utilitarian social planner.

5 Results

5.1 Calibration

When solving the model outlined in the previous section, I approximate the AR(1) process determining the aggregate productivity values (Z) as a finite-state Markov chain,

following Tauchen (1986).[18] Additionally, I assume the following functional form for the matching function: $M(\psi, v) = \frac{\psi v}{(\psi^\ell + v^\ell)^{1/\ell}}$, as in den Haan, Ramey, and Watson (2000). The initial distribution of human capital for workers entering the labor force is drawn Normal(μ_h, σ_h^2), while the idiosyncratic productivity for employed workers is redrawn with probability γ each period from Lognormal(μ_z, σ_z^2). *Table 3* lists calibrated parameter values along with their empirical targets.

Table 3: Calibrated Parameter Values and Empirical Targets

Parameter	Parameter Estimate	Targeted Moment	Data	Model
λ	0.076	Quarterly job-to-job transition probability	2.826	2.795
κ	0.062	Quarterly alt. to non-alt. conversion rate	6.250	6.174
π_N	0.262	Age <30 to >50 wage ratio	0.665	0.766
π_A	0.253	Avg wage growth difference: traditional - alternative	1.350	1.427
η	0.148	Mean wage % change following displacement	-8.000	-8.218
b	1.148	Total unemployment rate	6.498	5.875
α	0.347	Alternative to traditional wage ratio	0.727	0.877
f	0.145	Percent of all employed workers in alternative jobs	13.944	13.780
μ_h	0.885	Ratio of % in alt jobs if 20-34 to if 35-64	2.824	2.818
σ_h	0.053	Unemployment rate ratio: avg for age 20-34 to age 35-64	1.864	1.685
z_0	1.230	Quarterly UU rate	0.559	0.662
γ	0.532	Quarterly EU Rate	0.037	0.022
μ_z	-0.058	Job Vacancy Rate	2.250	3.561
σ_z	0.395	Wage dispersion: 90 percentile/median	2.198	1.500

Parameters listed in the table above are calibrated to match fourteen relevant labor market moments. All moments except for the wage ratios, the difference in wage growth between alternative and traditional jobs, the mean wage change following displacement, and wage dispersion are computed using European Union Labour Force Survey data for all 27 EU countries in 2019.[19,20] The wage ratios and wage dispersion are computed from the European Union Structure of Earnings Survey (SES) using the most recent data recorded in 2018 for all 27 EU countries. The mean percentage wage change following job displacement an average of reported values in the OECD Back to Work Report.[21] Finally, estimating the difference in average wage growth for those who stay in traditional rather than alternative jobs requires detailed panel data and is computed from the LISS Netherlands data.

In addition to the calibrated parameters, the parameters listed in *Table 4* are taken from the literature.

[18] In all results presented, a 21-state Markov chain is used to approximate the AR(1) process of aggregate productivity shocks.

[19] Data used to compute the quarterly job-to-job transition rate did not include observations for Germany and Luxembourg.

[20] I compute these moments using 2019 data rather than the more recent 2020 data because the recession that occurred in 2020 notably altered many of these moments from their typical values observed in non-recession years.

[21] This report includes 2013 data from Sweden, Finland, Germany, Denmark, and Portugal

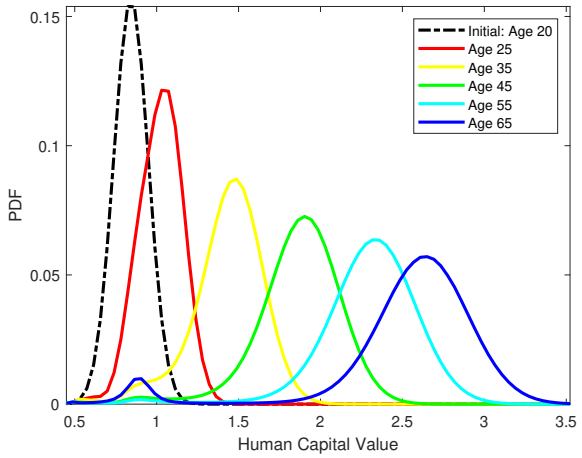
Table 4: Assigned Parameters

Parameter	Description	Value/Source
β	Discount factor	0.99 (corresponds to 4% annual interest rate)
φ	Severance fraction of firing cost	0 (Blanchard & Landier (2020) & Cahuc & Postel-Vinay (2002))
ℓ	Matching function parameter	1.27 (den Haan et al., 2000)
c	Vacancy posting cost	0.201 (den Haan et al., 2000)
ρ	Autocorrelation of aggregate shocks	0.95 (den Haan et al., 2000 & Hansen and Wright (1992))
σ_ϵ	Standard deviation of aggregate shocks	0.007(den Haan et al., 2000 & Hansen and Wright (1992))

5.2 Model Dynamics

A key characteristic of the model is that workers accumulate human capital over their lives. *Figure 2* illustrates human capital dynamics in the model and shows that both the mean and variance of the human capital distribution increase as workers age. Because there is a probability η that workers redraw a lower human capital value from the initial distribution of human capital when unemployed, there is a mass of workers at all ages near the mean of the initial human capital distribution. This mass near the mean of the initial human capital distribution is larger for workers close to age 65 compared to those age 35-55. This is because when workers near the end of their working years, it is difficult for them to regain employment, as the continuation value of employing them is relatively smaller. Holding human capital fixed, older workers spend more time in unemployment after a job loss where they can face human capital depreciating shocks.

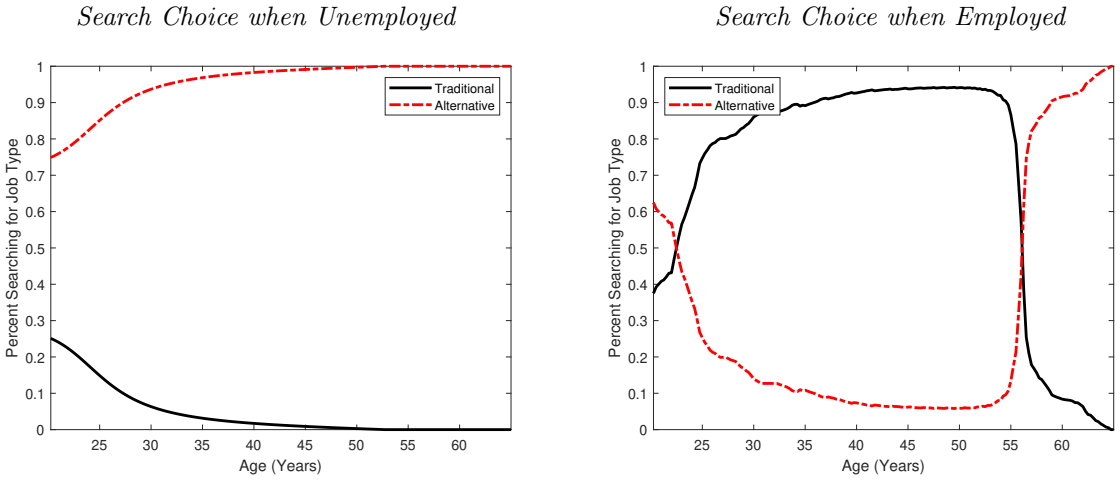
Figure 2: Human Capital Dynamics



Human capital plays an important role in the job search decision of workers. *Figure 3* illustrates how heterogeneous workers in the economy direct their search for either traditional or alternative jobs. Most unemployed workers choose to search for alternative jobs. Given the same surplus rate μ, a worker can find an alternative job more quickly than a traditional job. This is because the value of posting a vacancy for an alternative job, given the same μ value, will be higher for firms than posting a traditional vacancy. More alternative vacancies means that a worker can be matched more quickly with an

alternative job. In general, unemployed workers tend favor quicker matches that will bring them out of unemployment. However, younger workers have a greater incentive to be matched with traditional jobs compared to older workers, as these jobs offer them a higher human capital accumulation rate that they will enjoy the benefits of for a longer period of time. After finding employment, most workers are much more likely to search for traditional arrangements that take longer to find but offer them greater security and a higher human capital accumulation rate. Older workers are the exception to this trend. Older workers on average have higher human capital, making them unlikely to be fired, so they benefit less from employment protections. Additionally, older workers benefit less from the faster human capital growth offered by traditional jobs as they have fewer periods left to enjoy the wage benefits.

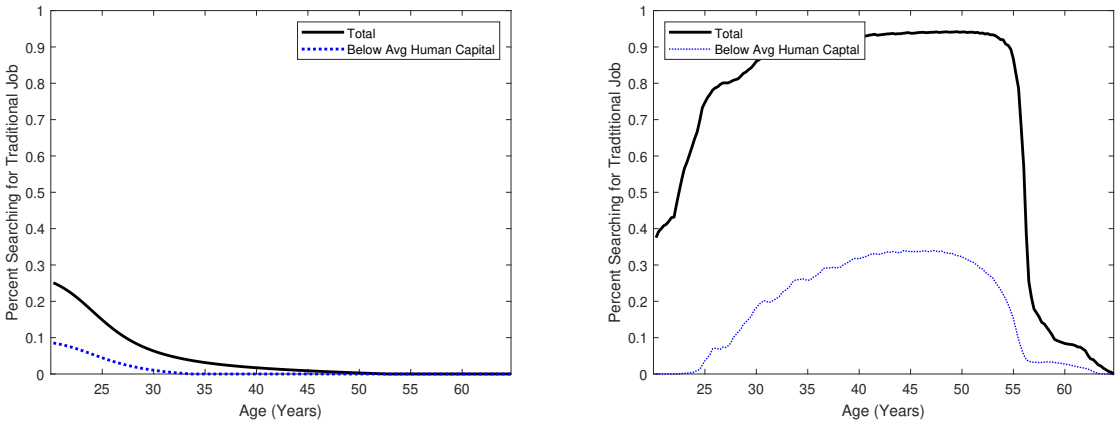
Figure 3: Job Choice by Age and Employment Status



Workers sort into either job type based on age and also based on human capital. Workers with below average human capital are less likely to direct their search towards a traditional job, as shown in *Figure 4*. Traditional jobs take longer to find for workers with low human capital, as the value of opening such a vacancy for a low human capital worker accounts for the fact that this type of worker is likelier to be fired.

Figure 4: Search for Traditional Job by Employment Status and Human Capital

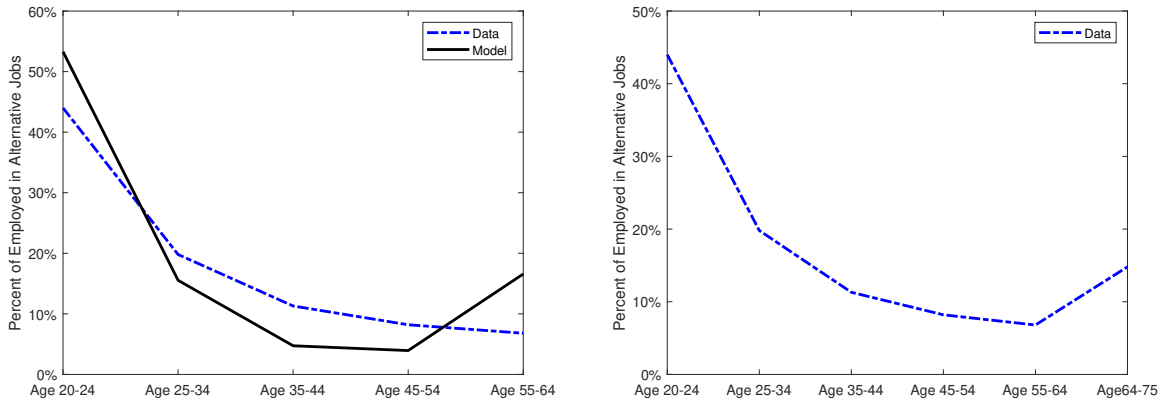
Search for Traditional Job when Unemployed *Search for Traditional Job when Employed*



The sorting patterns generated by the model establish a distribution of workers across job types by age that is consistent with the data. *Figure 5* displays how the percent of employed workers in alternative arrangements evolves as workers age. The figure shows that both in the model and in the data, young workers are much more likely to work in alternative jobs compared to older workers. There is an uptick in the percentage of employed workers in alternative jobs in the 55-64 age group in the model. This trend is due to older workers not finding much value in the faster wage growth or job security offered in traditional jobs. An uptick in alternative work among older workers is also observed in the data, but for ages 65-74.[22]

Figure 5: Percent in Alternative Jobs by Age Group

Comparison of Data and Model *Extended Data Results*

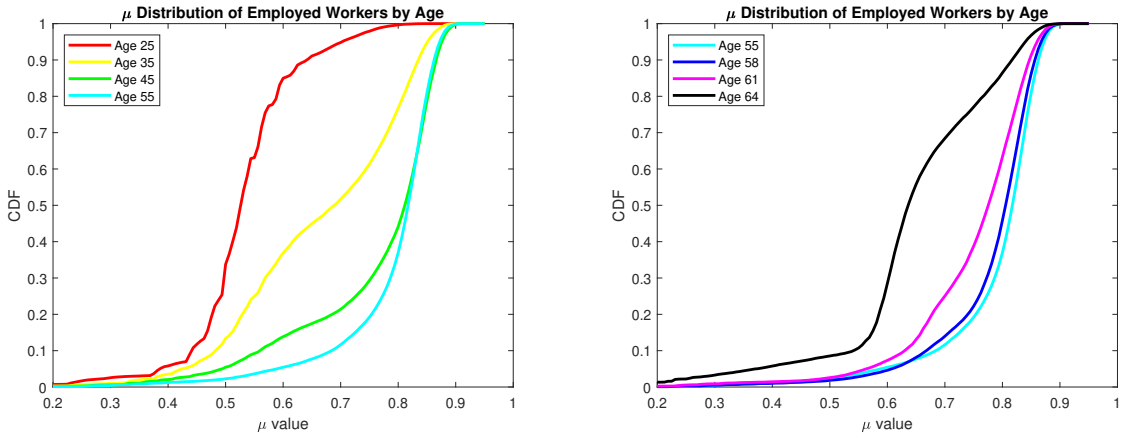


Another key feature of the model is that workers are able to search for better employment while on the job. On the job, workers can search for a different job type and/or a

[22]The 65-74 age group is not included in the model as only 13.4% of workers age 65-69 and 5.5% of workers age 70-74 in the data participate in the labor force. Labor force participation rates for all ages in the data can be found in *Appendix B*. These participation rates inform the choice to model participation from age 20 to 65.

job offering a more desirable surplus rate μ than what they are currently employed at. Holding everything else constant, a higher surplus rate dictates a higher wage. Workers can move up the wage ladder and generally find jobs offering more desirable surplus rates the longer that they are employed. The left panel of *Figure 6* shows that for most of their working lives workers on average obtain a more favorable surplus rate μ, as they age. Holding other state variables constant, a higher μ translates into a higher wage. The right panel of *Figure 6* shows that after around age 55, the opposite trend occurs. After age 55 the dropping continuation value to a firm of employing the worker plays a role in making high paying jobs harder to find for workers who enter unemployment.

Figure 6: Average μ by Age: Moving Up the Job Ladder



The last feature of the model that will be discussed is its responsiveness to aggregate fluctuations. The response of the model economy to aggregate shocks can be compared to the response observed in the data, previously reported in *Table 1*. The results from the panel regression with country fixed-effects of GDP growth on alternative and traditional employment growth are summarized in *Table 5*.

Table 5: Summary of Data Estimates

	Alternative Employment Growth	Traditional Employment Growth
GDP Growth	0.413	0.095
GDP Growth (t-1)	0.330	0.143

Using 1,000 quarters of simulated data from the original model economy, I compute the estimated coefficients of the same regression. These estimates are shown in *Table 6*. Notice that, as in the data, alternative employment is much more responsive to changes in GDP than is traditional employment.

Table 6: Model Estimates (Untargeted)

	Alternative Employment Growth	Traditional Employment Growth
GDP Growth	0.339	0.079
GDP Growth (t-1)	0.168	0.039

5.3 Counterfactual - Eliminate Firing costs

Now consider how the elimination of firing costs affects the economy. This policy change is considered in two scenarios. The first assumes that the elimination of firing costs does nothing to affect the rates of human capital accumulation, so that the human capital accumulation rate in traditional jobs, π_T, is unchanged. The second scenario assumes that firing costs play a role in human capital accumulation by providing incentives for firms to invest in workers' skills, and that without these incentives the rate of human capital accumulation in traditional jobs (π_T) drops to the rate in alternative jobs (π_A). Considering the policy change under these two differing assumptions regarding the effect of the policy change on human capital accumulation rates provides an upper and lower bound for the estimated policy change effects. The case where π_T is unchanged assumes that employment protections do nothing to generate the observed difference in wage growth between the two job types, and represents a lower bound for the estimated effect of the policy change. The case where π_T falls to π_A after firing costs are eliminated assumes that employment protections generate all of the observed difference in wage growth between the two job types, and represents an upper bound for the estimated policy effect.

Table 7 summarizes the estimated steady state effects of eliminating firing costs for all jobs. The key element driving these results is the lower average human capital in the new steady state where firing costs are eliminated, even in the case where the growth rate of wages in traditional jobs is unaffected. Average human capital decreases because without firing costs, workers face more frequent unemployment spells where they can lose human capital. The reduction in average human capital results in lower gross output, lower output net of search costs, and lower average welfare at the new steady state. The unemployment rate also rises even though vacancies rise.

It becomes clear that changes in human capital at the new steady state play a crucial role in determining the effects of the policy change after when considering how the impacts on welfare at the new steady state the impacts if worker characteristics were unchanged.

If firing costs do not affect wage growth, then their removal increases the welfare of workers who have the same characteristics as workers before the policy change.[23] However, the policy change does influence worker characteristics. After considering these effects, it is found that the policy change results in lower average welfare at the new steady state. It is essential to consider the effects of job separation frictions on long-run worker characteristics. This element is missing from the work previous by Hopenhayn and Rogerson (1993), Blanchard and Landier (2002), and Cahuc and Postel-Vinay (2002) and the omission of any effects of less job security on long-run worker productivity biases their results.

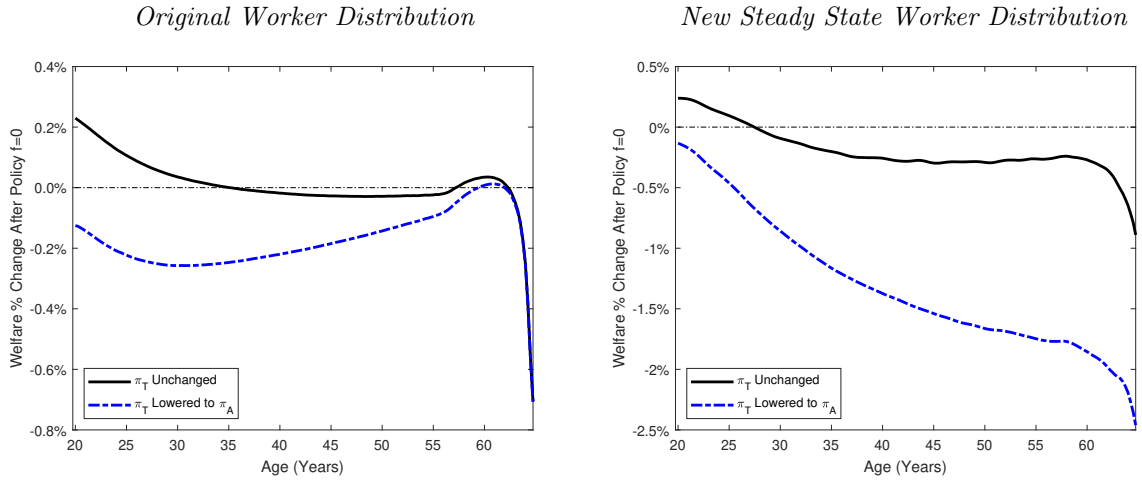
[23]These worker characteristics refer are given by the distribution of workers in the original steady state of the model across human capital, employment status, and idiosyncratic productivity.

Table 7: Estimated Effects of Eliminating Firing Costs for all Jobs

	π_T Unchanged	π_T Lowered to π_A
Average Human Capital	-0.69%	-3.72%
Gross Output	-0.21%	-2.46%
Output Net of Search Cost	-0.34%	-2.68%
Unemployment	+0.28	+1.95
Total Vacancies	+7.56%	+10.73%
Average Welfare at new SS	-0.14%	-1.12%
Welfare of New (Age 20) Entrant	+0.23%	-0.13%
Average Welfare: Original Worker Characteristics	+0.03%	-0.19%

Table 7 also displays welfare changes from eliminating firing costs if this policy change also reduces the growth rate of wages in all jobs to the growth rate observed in alternative jobs. In this case average welfare decreases at the new steady state, the welfare of new entrants to the model (at age 20) decreases, and the welfare of workers with the same characteristics as workers in the original steady state also decreases. *Figure 7* displays the average welfare effects of eliminating firing costs for workers of different ages. The left panel of *Figure 7* shows the effect of the policy change on the distribution of workers arising before the policy change. The right panel shows the effect of the policy change on the distribution of workers that arises in the new steady state after the policy change, where workers on average have lower human capital. The left panel shows that for the distribution of workers arising before the policy change, the elimination of firing costs when the growth rate of wages in traditional jobs (π_T) is unaffected benefits the young and generally hurts the old. Younger workers are benefit from the policy change which increases vacancies and makes job finding easier, but many older workers benefited from employment in secure jobs and do not favor the elimination of firing costs.

Figure 7: Welfare Effects of Eliminating Firing Costs



In understanding the left panel of *Figure 7*, it is informative to compute the percentage

of workers who would vote in favor of eliminating firing costs, assuming that this policy change would leave π_T unchanged. The assumption is that workers vote only to improve their own discounted expected value of future wages and leisure. Although *Table 7* shows that eliminating firing costs would increase the average welfare of workers in the original steady state, only 36.1% would vote for the change. The average age of those in favor of the policy change is 38.0, compared 44.8 for those against it.[24] Generally, workers with lower human capital have a more challenging time entering employment and are more likely to be in favor of eliminating firing costs (assuming no effect on π_T). Average human capital of workers in favor of this policy change is 22.1% lower than those against it.

The left panel of *Figure 7* shows that if eliminating firing costs also reduces the wage growth in traditional jobs (π_T) to the growth rate estimated for alternative jobs (π_A), much fewer workers would be in favor of the change. Only 14.6% would vote for the policy change in this case. The average age of those in favor of the change is 48.0, while the average age of those against it is 41.4. Age is the most essential characteristic determining support for this policy, the average human capital of those in favor of the change is only 0.6% higher than those against it.

The right panel of *Figure 7* shows that when the effects of eliminating firing costs on worker characteristics are considered, the average welfare for workers of almost all ages is lower in the new steady state. If eliminating firing costs does not affect π_T, young workers age 20 to around 27 are the only to benefit on average. If eliminating firing costs also lowers π_T, then no age group benefits on average. These results are consistent with the average human capital and income effects of the policy displayed in *Figure 8*. When eliminating firing costs lowers π_T average human capital immediately begins to decline after workers age after the policy change. However, if there is no change to π_T, the human capital of young workers to around age 23 increases slightly compared to before the policy change. Without firing costs, it is easier for these workers to gain employment and experience human capital growth. In both scenarios, workers face more frequent unemployment spells as they age, resulting in lower average human capital. After age 57, average human capital experiences a more significant decline after the policy change. An unemployment spell that the presence of firing costs may have prevented results in typically significant human capital losses for these workers who find it very difficult to reenter employment due to the low continuation value of employing them.

The elimination of firing costs has the effect of lowering average wages for almost all workers. Much of this is because wages decline when human capital declines, but some of this is also due to the effect that firing costs have on increasing wages holding all else constant. This effect can be observed in equation (12), where holding all else constant, an increase in the firing cost f increases the value to the worker x (when $\varphi < 1$). When

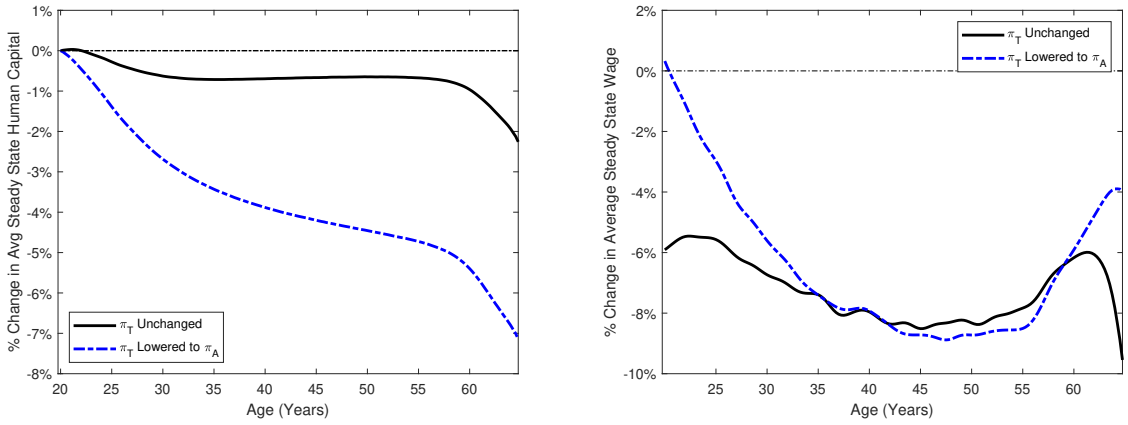
[24] *Appendix E* provides plots of the percentage of workers of each age in favor of this policy change as well as for other policy changes considered.

a firm's value from separation involves paying a firing cost, they are willing to offer a greater value to the worker to avoid separation. In other words, firing costs give workers greater leverage when wages are determined.

The right panel of *Figure 8* shows that for many ages, the estimated average wage when the policy change leaves π_T unchanged experiences a greater decline than if the policy change resulted in π_T falling. On average, when π_T is unchanged, wages are 7.23% lower after the policy change, while when $\pi_T = \pi_A$ wages are 6.43% lower. This difference in wages between the case when π_T is unchanged and $\pi_T = \pi_A$ is likely due to greater selection into employment, especially for older and younger workers when π_T falls after the policy change. Because workers experience less wage growth in employment when π_T falls, workers who find employment and stay employed must be more competitive in terms of their human capital and idiosyncratic productivity.

Figure 8: Human Capital and Wage Effects of Eliminating Firing Costs

Effect on Average Human Capital *Effect on Average Wage*

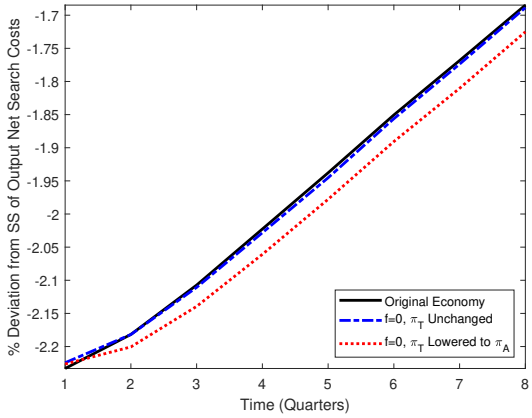


Finally, the response to a one standard deviation negative shock is considered for the original economy as well as for the economy after firing costs are eliminated.[25] *Figure 9* displays these responses. The shock amplitude does not notably differ after the policy change, regardless of whether π_T is affected. The amplitude is effectively the same in each case. Although the half-life of the shock is unchanged from the original economy in the case where π_T is unchanged, the half-life is two-quarters longer if π_T falls due to the policy change. This result highlights the importance of considering the effects of a policy change on the distributional characteristics of workers. If worker characteristics are unchanged, eliminating firing costs may be expected to decrease the persistence of aggregate shocks. However, because workers have lower average human capital after the policy change, there are competing effects. Firms do not need to worry about firing costs in the counterfactual economies, which quickens the rate at which they rehire workers. However, employing low human capital workers is less profitable, and low human capital

[25]This shock lowers the value of aggregate productivity Z from 1 to 0.97783.

workers spend more time in unemployment on average. In the case where π_T is unaffected by the policy change, these two effects seem to almost exactly cancel each other out, as the persistence of the shock is not notably longer. However, when π_T falls after the policy change, the reduction in human capital is large enough that the second effect is dominant so that the economy takes longer to recover from the shock.

Figure 9: Response to A Negative Aggregate Shock



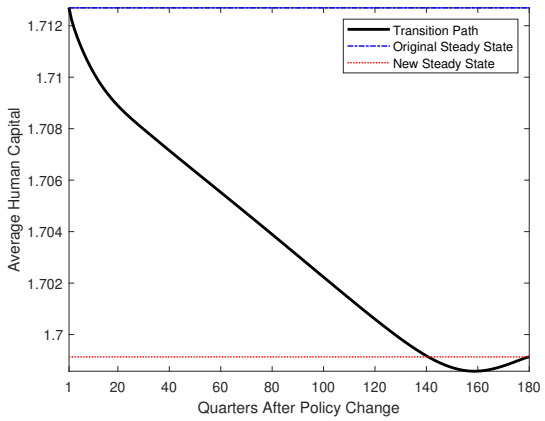
5.3.1 Transition Path to New Steady State

Now consider the economy's path in transitioning to its new steady state after employment protections are eliminated. *Figure 10* plots the transition paths for the case where eliminating firing costs does not effect the growth rate of wages in alternative jobs (π_T). *Appendix F* includes the transition paths for the case where eliminating firing costs lowers π_T. *Figure 10* shows that after the policy change, average human capital in the economy gradually decreases towards its new lower steady state value. In comparison to average human capital, the transition path of net output is less smooth. After the elimination of firing costs, some matches with low idiosyncratic productivity are immediately destroyed. These immediately destroyed matches only prevailed due to the presence of the firing cost and are optimally eliminated after its removal. After the initial drop, net output rises above the new steady state due to average human capital being above its new steady state. Net output then mirrors average human capital's decline towards its steady state.

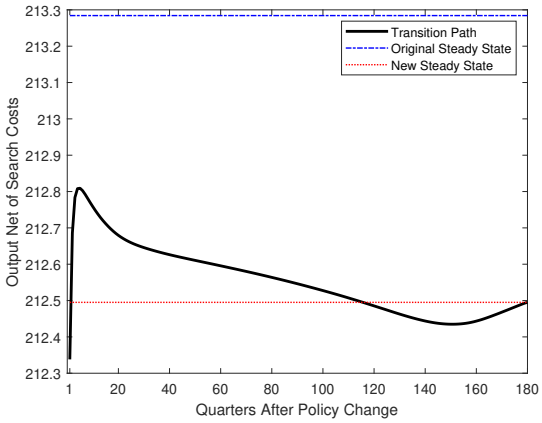
Unemployment also experiences an initial jump after implementation of the policy change. Unemployment immediately jumps above the new steady state value as matches with relatively low idiosyncratic productivity that remained in tact only because of the firing cost are destroyed. After this initial shock to unemployment, it declines relatively smoothly towards its new steady state. After firing costs are eliminated, newly created matches are all in traditional jobs which offer a more favorable human capital growth rate. There is no longer an incentive to form alternative matches to avoid firing costs, and so the percent of workers employed in alternative matches declines to zero.

Figure 10: Transition Paths After Policy Change

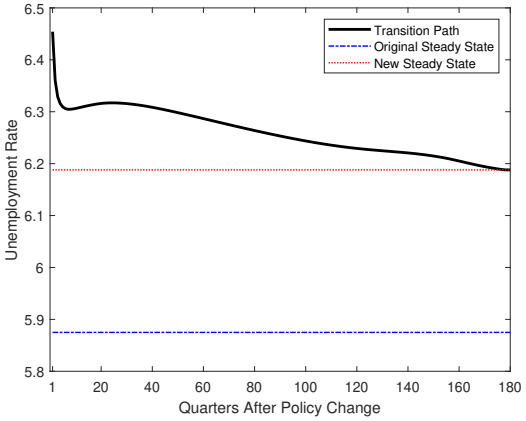
Transition Path of Average Human Capital



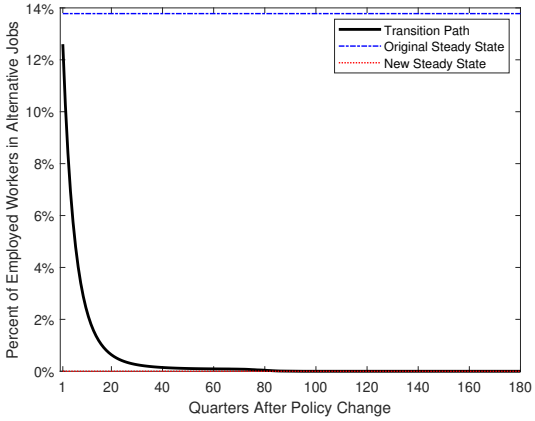
Transition Path of Output Net Search Costs



Transition Path of Unemployment



Transition Path of Alternative Employment



5.4 Counterfactual - Alter Alternative Contract Expiration Rate

Rather than eliminating firing costs, consider now the effects of a policy to increase significantly the percentage of workers enjoying employment protections. Specifically, consider the effects of limiting alternative contracts to one quarter. After one quarter, a firm employing a worker in an alternative contract must decide whether to costlessly fire the worker or employ them in a traditional arrangement. I evaluate the effects of this policy alongside the effects of two less extreme policy changes. The effects of shortening the average length of time before an alternative contract expires from around 3 years to 1.5 years and lengthening it to 4.5 years are considered.[26] Considering differences in the alternative contract expiration rate is particularly compelling because many countries differ in the length of time a firm can employ a worker in an alternative contract. *Table 9* displays the estimated effects of these policy changes.

[26]Lowering κ to 0.04 achieves the average alternative contract expiration rate of around 1.5 years while raising κ to 0.13 achieves the average rate of around 4.5 years.

Table 9: Effects of Changing Average Alternative Contract Expiration Rate

	1 Quarter	1.5 Years	4.5 Years
Average Human Capital	+1.89%	+0.50%	-0.24%
Gross Output	+1.21%	+0.31%	-0.16%
Output Net of Search Cost	+1.38%	+0.37%	-0.18%
Unemployment	-1.13%	-0.29%	+0.14%
Total Vacancies	- 9.47%	-2.83%	+1.38%
Average Wage	+0.73%	+0.29%	-0.22%
Average Welfare at New SS	+0.56%	+0.12%	-0.05%
Welfare of New (Age 20) Entrant	-0.12%	-0.02%	+0.01%
Average Welfare: Original Worker Characteristics	-0.09%	-0.02%	+0.01%

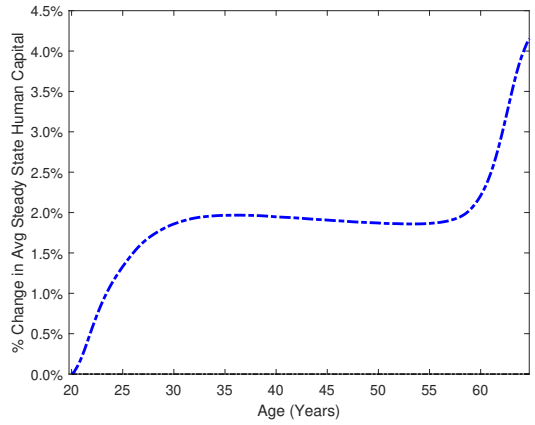
The average expiration rate of alternative contracts is around 3 years in the original economy. Lowering this rate has the long-run effect of increasing average human capital, gross output, and output net of search costs. Because average human capital increases after the expiration rate decrease, unemployment falls even while total vacancies decline. Higher human capital results in increased average welfare in the new steady state, even though the welfare of a new entrant into the economy (at age 20) decreases. When the alternative contract expiration rate is lowered from around 3 years, it is more difficult for worker to initially find jobs as firms cannot avoid the burden of firing costs for long. When the effects of lowering this expiration rate on the distributional characteristics of workers is ignored, the policy change slightly decreases average welfare due to the decline in vacancies.

The effects of extending the average alternative contract expiration rate are just the opposite. Because extending this rate decreases average human capital, output and average welfare in the new steady state fall. If the effects of this policy change on worker characteristics were ignored, the change would slightly increase welfare by increasing vacancies.

Figure 10 displays the effects of limiting alternative contracts to one quarter on human capital and average welfare. *Appendix C* provides addition results from this policy change as well as for the cases where the average alternative contract expires after 1.5 and 4.5 years. The left panel of *Figure 10* shows that the policy change has the effect of increasing human capital particularly over the younger and older years of labor force participation. Younger workers, who become more quickly employed in traditional contracts, experience a higher rate of wage growth in addition to fewer unemployment spells where their human capital could depreciate. When more older workers are in traditional contracts they are less likely to enter unemployment, which is particularly costly for them as they are less likely to regain employment due to the low continuation value for an employer.

Figure 10: Human Capital and Welfare Effects of Limiting Alternative Contracts to 1 Quarter

Effect on Average Human Capital



Effect on Average Welfare

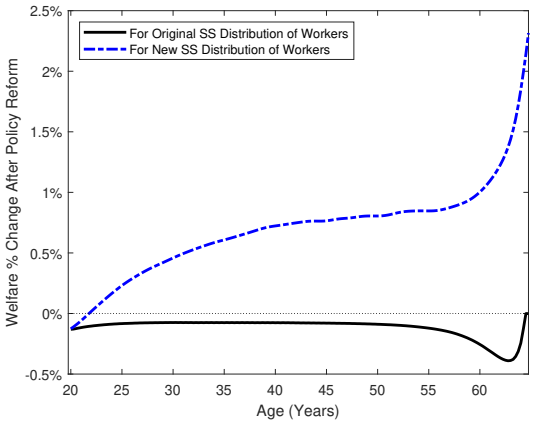
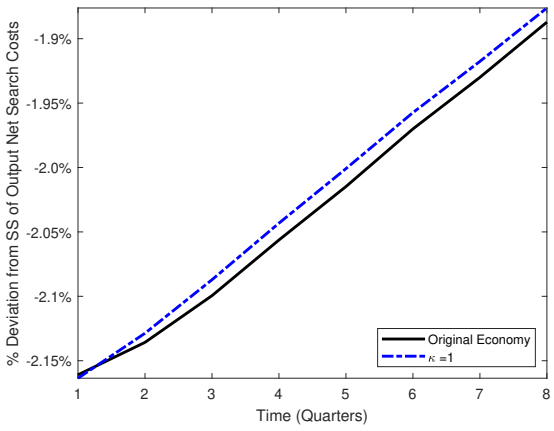


Figure 10 also shows that while the policy change is welfare improving by resulting in workers accumulating greater human capital, when this effect is ignored the change is welfare reducing. The policy change lowers vacancies, and when the benefit from increased human capital is ignored, the change lowers welfare for all ages.

Now consider the response to a one standard deviation negative shock in the original economy and in the economy where alternative contracts are limited to last only one quarter (by setting $\kappa = 1$). *Figure 11* displays the results, which are consistent with the previous results and discussion of *Figure 9*. The amplitude of the shock does not differ much in either case, but there is visibly less persistence in the case where $\kappa = 1$ so that alternative contracts expire after one quarter. The two competing effects influencing this result are fewer vacancies posted when firms cannot avoid firing costs for as long, and higher human capital workers providing greater productivity for firms and reentering employment more quickly. In this case the effect of higher human capital is greater and decreases the persistence of the shock.

Figure 11: Response to A Negative Aggregate Shock

New Steady State Worker Distribution



6 Conclusion

Views differ on the merits of applying employment protections so as to create a two-tiered labor market, with some speculating that eliminating employment protections altogether may be welfare improving. This paper contributes to the existing literature by modeling the sorting decision of heterogeneous workers into traditional arrangements that include employment protections and alternative arrangements that do not include protections. The paper also makes a key contribution by considering the effect of different arrangements on worker characteristics, namely their human capital accumulation. If the effect of differing contracts on worker characteristics is excluded, as in previous work, the estimated effects of many policy changes differ qualitatively. I find that workers who are able to enjoy employment protections experience fewer unemployment spells, and on average are able to accumulate more human capital over their careers. If all firing costs are eliminated, the resulting lower average human capital prompts lower output, average income, and average welfare. Considering the same policy change the same distribution of worker characteristics results in the the opposite conclusion. If the effects of the policy change on worker productivity are not considered, eliminating the job separation friction is beneficial on average. This paper also considers the effects of changes to the average length of time before alternative contracts expire, and compares the response of the economy to aggregate shocks before and after policy changes are made.

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Appendix A: Age Restricted Business Cycle Results

In the fourth quarter of 2019, 14.8% of all EU jobs were alternative arrangements, while losses in these jobs accounted for 68.4% of all net employment losses during the 2020 recession. However, one may wonder how much of this result is driven by workers within a particular age group. *Table 10* reports the percent of all employed individuals in alternative jobs as well as the percent of net employment losses attributed to these jobs during the 2020 recession. When the sample is restricted to exclude workers aged 15-19, the percent of net employment losses attributed to losses in alternative jobs slightly increases to 71.5%. After dropping workers aged 20-25 and 55-64 from the sample, this percentage decreases but remains above 60%.

Table 10: Contribution of Alternative Jobs to 2020 Net Employment Losses by Age Group

Ages Included	% in Alternative Jobs	% of Net Job Losses Due to Lost Alt. Jobs
Ages 15-64	12.6%	68.4%
Ages 20-64	11.7%	71.5%
Ages 25-64	9.7%	62.1%
Ages 25-54	10.7%	60.5%

To further investigate whether any results regarding the responsiveness of alternative employment to aggregate changes are driven primarily by younger workers, I rerun the regression reported in *Table 1* after eliminating workers aged 15-24 from the sample. *Table 11* reports the results of the restricted sample regression, which do not notably differ from the original results.

Table 11: Panel Regression with Country Fixed-Effects Restricted to Ages 25-65

	Alternative Employment Growth	**Traditional Employment Growth**
GDP Growth	**0.445****	**0.076*****
	(0.156)	(0.012)
GDP Growth (t-1)	**0.026**	**0.126*****
	(0.209)	(0.016)
Change Inventory as % GDP	0.074	0.067***
	(0.199)	(0.015)
Percent in Service Growth	0.085	0.008
	(0.057)	(0.004)
Labor Cost Index Growth	-0.373*	0.053***
	(0.187)	(0.014)
Labor Cost Index Growth (t-1)	-0.202	0.029*
	(0.191)	(0.015)
Observations	1,795	1,795
R^2	0.0266	0.1651

$^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$

Appendix B: Additional Empirical Details

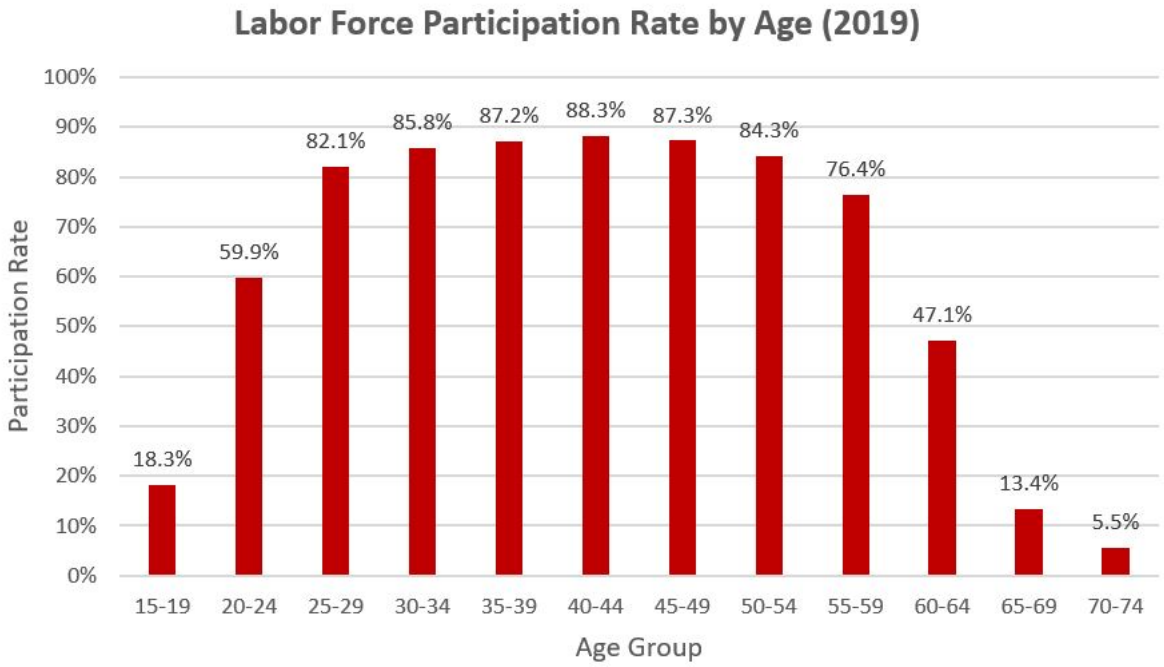
The following table documents the mean and median reported hours worked by individuals in their primary job depending on whether the primary job was an alternative or a traditional arrangement in the LISS Netherlands data. The mean and median reported by those whose primary job was an alternative arrangement was about 2 hours per week less than those whose primary job was a traditional arrangement.

Table 12: LISS Netherlands Data: Reported Hours Worked in Primary Job

Main Job Type	Mean Hours	Median Hours
Traditional Arrangement	34.8	36.0
Alternative Arrangement	32.3	34.0

Figure 12 presents the labor force participation rate in the EU as of 2019 for different age groups. Most individuals outside of ages 20-64 do not participate in the labor market. It is for this reason that the model includes only workers age 20 to 64.75 years of age.

Figure 12: Labor Force Participation Rate By Age Group



Appendix C: Additional Results from Modifying Alternative Contract Expiration Rate

The following figure plots the percentage change in average welfare for each age when the average length of time before an alternative contract expires changes from around 3 years to 1.5 years and to 4.5 years. The left panel shows that deceasing the average length of time before expiration shows that while the policy change is welfare improving by resulting in workers accumulating greater human capital, when this effect is ignored the change is welfare reducing. The policy change lowers vacancies, and when the benefit from increased human capital is ignored, the change lowers welfare for all ages. The results are the opposite when the average length of time before an alternative contract expires is extended. This change is welfare improving because it leads to an increase average human capital, but the welfare gain is completely missed if ignoring its effect on the distributional characteristics of workers.

Figure 15: Effects on Welfare of Modifying Alternative Contract Expiration Rate

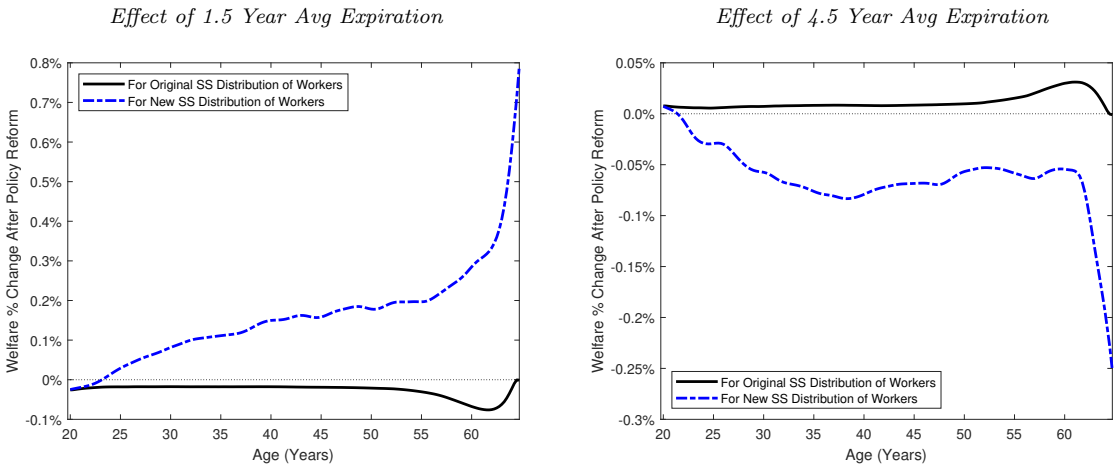
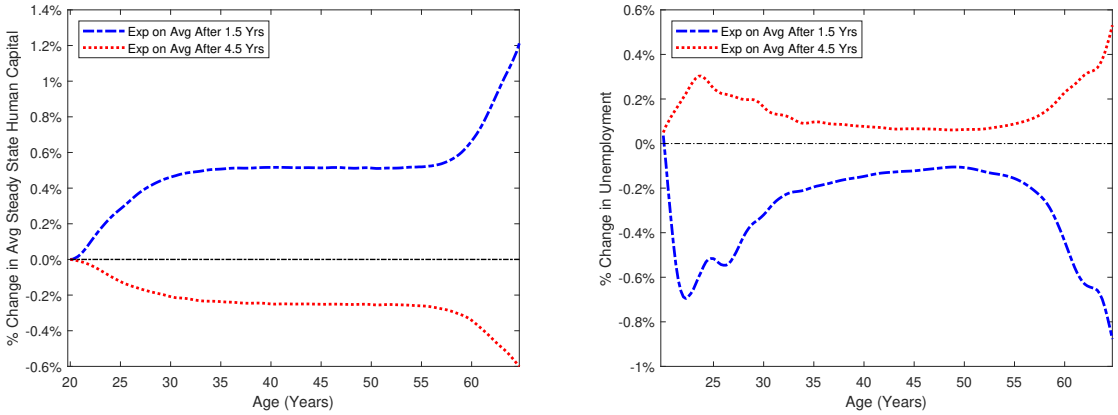


Figure 16: Effects on Average Human Capital and Unemployment of Modifying Alternative Contract Expiration Rate

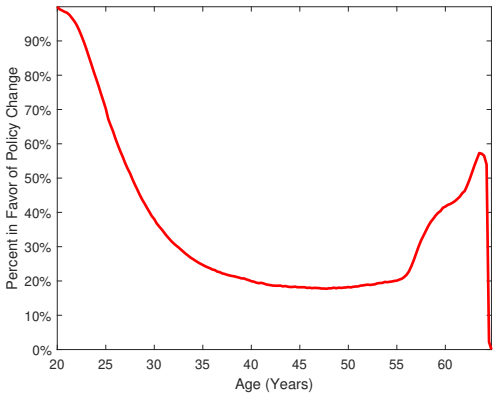


Appendix E: Voter Details

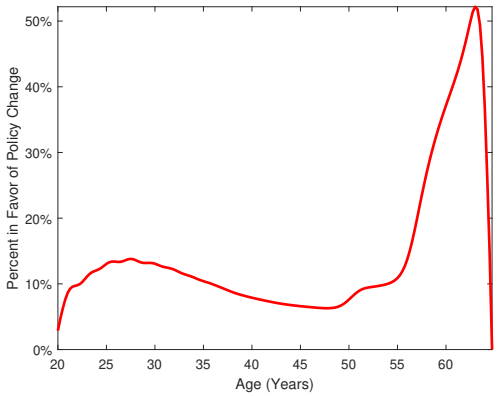
The percentage of workers of each age who would be in favor of eliminating firing costs is illustrated by the following figure. The results are consistent with the welfare results displayed in the left panel of *Figure 7*. Younger workers are much more likely to vote to eliminate employment protections if this policy change does not affect the wage growth rate that they are able to enjoy. Workers towards the end of their careers are also more likely to vote for the elimination of firing costs as they do not value job security as much and benefit from quicker transitions.

Figure 16: Voters In Favor of Eliminating Firing Costs by Age

Assuming π_T is Unchanged



Assuming $\pi_T = \pi_A$ After Policy Change



Appendix F: Transition Paths

Model Transition Paths After Eliminating Firing Costs, Assuming Wage Growth is Affected

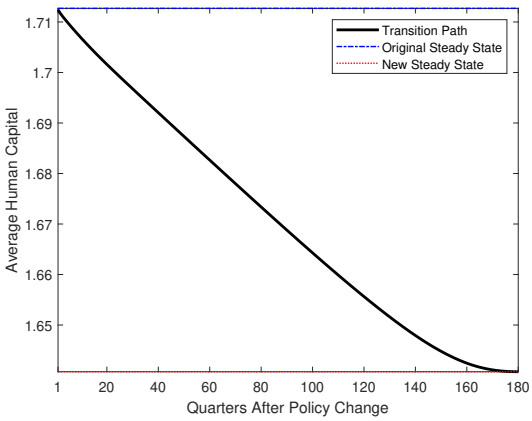
Consider how the economy responds to the elimination of firing costs and evolves towards its new steady state. The response when the elimination of firing costs has no effect on the growth rate of human capital for employed workers is reported in the main text. Here the response of the policy change is considered under the assumption that the elimination of firing costs reduces the growth rate of human capital for all employed workers to the growth rate estimated for alternative jobs. *Figure 18* shows that after the policy change, average human capital in the economy smoothly falls to its new steady state level. The time required for the economy to fully adjust to the new steady state is 180 quarters, or 45 years, as this is the time needed for the economy to become populated only with workers experiencing the new policy for the duration of their working lives.

The right-hand side of *Figure 18* shows that output net of search costs immediately drops following the policy change. This is because after firing costs are eliminated, matches with low idiosyncratic productivity that only remained intact to avoid the pay-

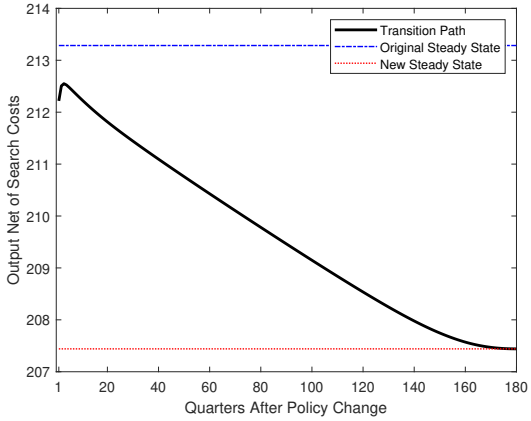
ment of firing costs are destroyed. Net output then moves gradually towards its new lower steady state. The bottom panel of the figure show a path of unemployment that mirrors the path of net output in reverse. Unemployment immediately increases from its steady state as low productivity matches that only remained due to the firing cost are destroyed. After this unemployment moves relatively smoothly upward towards its new higher steady state level.

Figure 18: Transition Paths After Policy Change: $f = 0$ and $\pi_T = \pi_T$

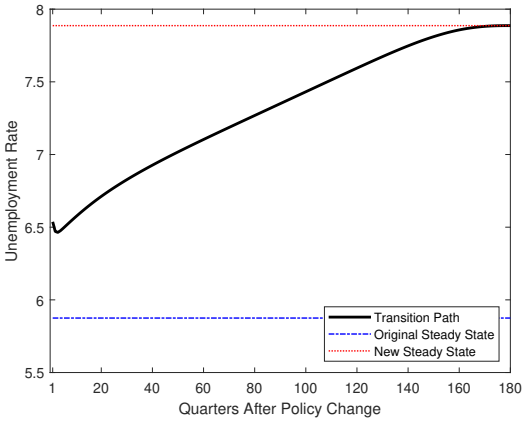
Transition Path of Average Human Capital



Transition Path of Output Net Search Costs



Transition Path of Unemployment

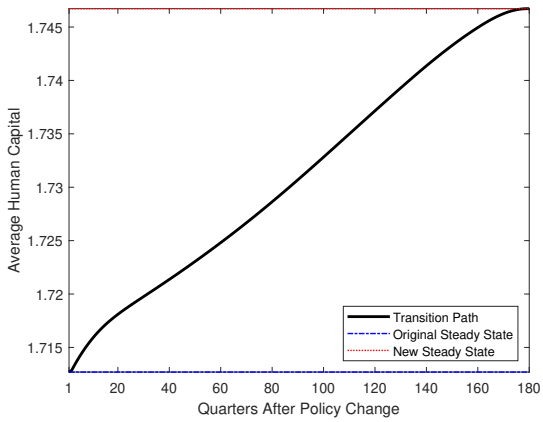


Model Transition Paths after Limiting Alternative Contracts to 1 Quarter

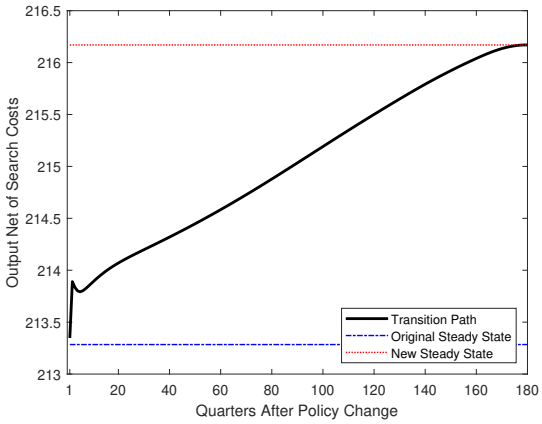
Now consider the transition path of the economy after alternative contracts are limited to last only one quarter. This policy change gradually increases average human capital in the economy to its new higher steady state. Unemployment quickly drops following this change as many alternative arrangements are converted to traditional jobs where workers are less likely to be fired. This sharp initial drop in unemployment is mirrored in the sharp initial increase in output. After their sharp initial responses, output moves gradually up towards its new higher steady state while unemployment declines to its new lower steady state.

Figure 19: Transition Paths After Policy Change: Limit Alternative Contracts to 1 Quarter

Transition Path of Average Human Capital



Transition Path of Output Net Search Costs



Transition Path of Unemployment