Flexible Contracts, Macroeconomic Stabilization, and Welfare*

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Abstract

In this paper, I provide a novel insight for understanding the role of flexible contracts in the economy. I draw upon Dutch data to show that the availability of flexible jobs over the business cycle largely influences the unemployment risk of permanent workers. Motivated by the empirical evidence, I build a New Keynesian model in which permanent and flexible jobs coexist. I argue that the interaction between incomplete markets and the endogeneity of labor market transitions generates an important macroeconomic-stabilization hedging role for flexible contracts. However, this comes at a cost to flexible workers in terms of employment fluctuations, resulting in a non-monotonic relationship between welfare and the share of flexible contracts in the economy. My results have important policy implications for a wide range of developed countries that pursue flexicurity through dual labor markets.

Keywords: flexible contracts, unemployment risk, business cycle, welfare analysis, macroeconomic stabilizers
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1 Introduction

Over the last decade, most advanced economies have implemented contracts that offer little or no protection to workers in order to promote employment and productivity growth (Geronikolaou et al., 2016; Katz and Krueger, 2019).[1] These contracts are commonly referred to as flexible contracts, and they could involve workers hired under fixed-duration terms, flexible wages, or flexible schedules. It is not surprising, then, that the common assumption in the literature, in order to understand the role of flexible contracts in the labor market, is that these contracts reduce the firm's adjustment cost, thereby transforming the dynamics of job destruction and job creation in the labor market (Boeri and Garibaldi, 2007; Cahuc et al., 2022; Cahuc and Postel-Vinay, 2002). However, while this view of flexible contracts may help us to rationalize the consequences they have in the labor market, it somewhat limits our overall understanding and appreciation of the broader role of flexible contracts in the economy.

In this paper, I provide a novel insight for understanding the role of flexible contracts in the economy. I argue that the interaction between incomplete markets and the endogeneity of labor market transitions in a dual labor market generates an additional and important macroeconomic-stabilization hedging role for flexible contracts. Using a New Keynesian model with imperfect unemployment insurance and a search-based labor market, where permanent and flexible jobs coexist, I present three novel results. First, I show that the transition toward a more flexible labor market helps to reduce the unemployment risk fluctuations of permanent workers. Second, I document that flexible contracts significantly reduce the aggregate volatility of the economy via the stabilization of the precautionary saving motives of permanent workers. Third, I show that this welfare-enhancing role of flexible contracts comes at a cost to flexible workers, resulting in a non-monotonic relationship between welfare and the share of flexible contracts in the economy.

The key insight of this paper is that workers under permanent contracts, the predominant contract type in the economy, usually transit to flexible contracts. Since workers cannot insure against job displacement, the availability of flexible jobs and their evolution over the business cycle will influence the unemployment risk of workers and, consequently, their precautionary savings motives. To motivate this *unemployment risk channel*, I draw upon administrative data from the Netherlands, a leading country in terms of contractual flexibility. The analysis reveals that permanent workers flow regularly into flexible contracts, and more when the economy is contracting, as the share of flexible contracts is

[1] Insecure contracts stand for contracts with worse working conditions and fewer rights (e.g., unemployment insurance premiums)

countercyclical.

Motivated by these facts, I set up a New Keynesian model with imperfect unemployment insurance and a labor market with a two-sector search model, where permanent and flexible jobs coexist. In this setting, I consider the first two features of flexible contracts and assume that flexible jobs, when compared to permanent jobs, have a higher destruction rate (Cahuc and Postel-Vinay, 2002; Centeno and Novo, 2012; Serrano, 1998) and greater wage flexibility (Babeckỳ et al., 2010; Grajales et al., 2018). Additionally, I assume that flexible jobs are less productive (Addessi, 2014; Caggese and Cuñat, 2008) and have a lower vacancy-opening cost (Abowd and Kramarz, 2003; Kramarz and Michaud, 2010).

The model highlights three key economic aspects of flexible jobs in the economy. The first key aspect is that the availability of flexible jobs influences the precautionary saving motives of permanent workers facing uninsured unemployment risk. The second key aspect is that the share of flexible contracts is countercyclical (Babeckỳ et al., 2010; Grajales et al., 2018). The third key aspect is that flexible contracts play a welfare-enhancing role in accommodating aggregate shocks, which leads to greater employment fluctuations for flexible workers (Adams-Prassl et al., 2020; Mas and Pallais, 2020). I then calibrate the model to match salient features of the Dutch labor market and use this model, which features 15% of flexible jobs in steady state, as a laboratory to quantify the role of flexible jobs in the adjustment of the economy.

I derive three main sets of results. First, I show that flexible contracts play an important role in reducing the unemployment risk fluctuations of permanent workers and thus, on the economy's adjustment process to aggregate shocks. To understand the mechanism at play, consider a contractionary productivity shock. In this scenario, the real wage falls for both permanent and flexible jobs, but the decline is steeper for flexible jobs. This leads to an increase in flexible job employment and a decrease in permanent job employment. Compared to a model without flexible jobs, my model shows a smaller decrease in total employment, because of the countercyclical nature of flexible jobs, resulting in a lower increase in unemployment risk for permanent workers. This decrease in unemployment risk reduces the precautionary motive of permanent workers, leading to a smaller decline in aggregate demand and thus contributing to stabilize the economy after a contractionary shock.

I perform several robustness checks and confirm that the role of flexible contracts in reducing the unemployment risk fluctuations of permanent workers is robust to different parameterizations of the wage rigidity parameter, the monetary policy rule, and shock characteristics, such as size, direction, and type. An important insight is that the role of flexible contracts in reducing the unemployment risk fluctuations of permanent workers is more important for long-lived shocks (more than 10 quarters), as in the case of short-lived shocks, the rapid adjustment of flexible employment to compensate for the decline in permanent employment is hindered by search frictions in the labor market, thereby reducing the effectiveness of flexible contracts in mitigating unemployment risk for permanent workers.

Second, I show that flexible contracts have a significant effect on reducing aggregate volatility. Specifically, I document a large drop in the volatility of output, employment, nominal interest rate, and inflation as result of a larger share of flexible jobs in the economy. For instance, an economy with a 15% share of flexible jobs exhibits an output volatility that is 11% lower than an economy without flexible jobs. One of the key contributions of my paper is to show that these volatility gains come at a cost to flexible workers in terms of excessive fluctuations in employment. In my baseline specification, I estimate that the volatility of flexible employment is 70% higher than that of permanent workers in an economy without flexible jobs. These findings show that while the economy may benefit from flexible contracts in terms of output volatility, flexible workers experience large levels of employment volatility, which can result in significant welfare costs.

Third, I find a non-monotonic relationship between welfare and the share of flexible contracts. To do so, I approximate the utility function up to a second order and focus on the unconditional welfare to rank the counterfactual simulations with different shares of flexible jobs (Kim and Kim, 2003; Schmitt-Grohé and Uribe, 2007). My welfare analysis reveals that while a 7% share of flexible jobs maximizes welfare, further increasing the proportion of flexible jobs reduces it. In my baseline specification with 15% of flexible jobs, I estimate that the share of flexible jobs depresses welfare equivalents by an average of 0.6 percent of lifetime consumption. Further analysis reveals that the excessive fluctuations in flexible employment are the primary cause of welfare losses. This suggests that while some level of contractual flexibility can be beneficial, too much of it can have significant welfare costs.

Related Literature. My paper is related to several strands of research. The first is the literature that combines microeconomic evidence with macroeconomic models to study the macro implications of flexible contracts. In this respect, I am close to Dolado et al. (2002), Cahuc and Postel-Vinay (2002), Caggese and Cuñat (2008), and more recently to Dolado et al. (2021), Carreño and Uras (2021), and Cahuc et al. (2022). All these papers focus on the role of flexible contracts in terms of job creation and destruction. However, the novelty of my paper is to show that the evolution toward a more flexible labor market where permanent and flexible jobs coexist changes both the labor market flows, as largely documented in the literature, and the unemployment risk of permanent workers. This important channel has not been studied before in the context of flexible contracts and imperfect unemployment insurance. This is the main contribution of my paper.

This paper is also related to the literature that studies the advantages of labor market flexibility (Caballero et al., 2004; Galí and Monacelli, 2016). In this context, Galí and Monacelli (2016) is a paper close to this paper. Galí and Monacelli (2016) study the gains from increased wage flexibility using a small open economy model with staggered price and wage setting. Galí and Monacelli (2016) conclude that wage flexibility may be welfare-reducing in an economy that is part of a currency union. Although our models are entirely different, I also show that having flexible jobs may be welfare-decreasing. Therefore, Galí and Monacelli (2016) and I share the view that "higher flexibility" in labor markets may not always be desirable.

My paper is also related to papers studying macroeconomic policies aimed at stabilizing the business cycle. For example, McKay and Reis (2016) study the role of fiscal stabilizers in the U.S. business cycle and find that tax-and-transfers programs that affect inequality and precautionary savings have a significant effect on reducing aggregate volatility.[2] Contrary to McKay and Reis (2016), I partial out the interaction of fiscal transfers and precautionary savings to focus on the role of flexible contracts on precautionary savings. I show that flexible contracts act as an automatic stabilizer of the economy by reducing the precautionary saving motives of workers under permanent contracts over the business cycle. This precautionary savings channel has also been studied in the context of unemployment insurance (UI). For example, Kekre (2021) study the effects of discretionary UI extensions on aggregate consumption and finds that UI stimulates the consumption of unemployed workers, but also affects the consumption of employed workers via precautionary savings, in the same venue as flexible jobs change the precautionary motives of permanent workers. My results suggest that flexible contracts, fiscal stabilizers, and unemployment insurance can complement each other as macroeconomic policies to reduce output volatility, primarily by influencing the level of precautionary savings.

[2] McKay and Reis (2016) also argue that these results may be largely affected by the labor market dynamics.

Another strand of literature that my paper complements is the literature that uses incomplete-markets models with nominal rigidities to answer business-cycle questions (Challe, 2020; Challe and Ragot, 2016; McKay and Reis, 2016; Ravn and Sterk, 2017, 2021). Challe (2020) and Ravn and Sterk (2017) are all papers close to this paper. In particular, my model extends Challe (2020) model to a two-sector search model in which permanent and flexible jobs coexist. Challe (2020) and Ravn and Sterk (2017) analyze the interaction of market incompleteness, precautionary savings motive, aggregate demand, and unemployment risk in an economy that prevents the emergence of a cross-sectional wealth distribution. Whereas Challe (2020) and Ravn and Sterk (2017) focus on optimal monetary policy and on accounting key features of the Great Recession, I focus on the precautionary savings consequences of flexible contracts and their macro-welfare implications.

2 Empirical Evidence

In this section, I present a descriptive analysis on how flexible contracts shape, in part, the unemployment risk fluctuations of permanent workers. Specifically, I show that permanent workers frequently transition to flexible contracts, and more when the economy is contracting, as the share of flexible contracts is countercyclical.

2.1 Permanent Workers Flow Into Flexible Contracts

I want to establish that flexible contracts play a role in the fluctuations of unemployment risk among permanent workers through job reallocation. To do this, I analyze the job-to-job transitions of Dutch workers, with a focus on contract transitions. I use data from a worker-firm dataset that includes monthly wages and contract information. This dataset covers all legal employment in the Netherlands, enabling me to track workers' movements across firms and contract types. I identify the first job change for workers aged 25 to 55 during the period 2008-2016, considering only the initial job change and excluding subsequent job movements. I categorize job-movements into two groups at annual frequency: job-to-job movements (86% of the total movements) and job-unemployment-job movements. I classify each job change based on the type of contract before and after the transition, resulting in four contract transition categories: permanent to flexible, permanent to permanent, flexible to permanent, and flexible to flexible.

Table 1 presents the results for the job-to-job movements (Panel A) and job-unemployment-job movements (Panel B). I begin by analyzing the job-to-job movements. In column (2), I show that the most common contract transition is workers transitioning from perma-

Table 1: Labor flows and the type of contract.

Panel A: Job-to-Job		Share of...					
	N	the total.		starting contracts.		ending contracts.	
	(1)	(2)		(3)		(4)	
(a): Permanent to Flex	297,408	22%	=(a)/(e)	29%	=(a)/(a+b)	55%	=(a)/(a+d)
(b): Permanent to Permanent	735,206	53%	=(b)/(e)	71%	=(b)/(a+b)	89%	=(b)/(b+c)
(c): Flex to Permanent	94,266	7%	=(c)/(e)	28%	=(c)/(c+d)	11%	=(c)/(b+c)
(d): Flex to Flex	248,275	18%	=(d)/(e)	72%	=(d)/(c+d)	45%	=(d)/(a+d)
		100%					
(e): Total	1,375,155						
Panel B: Job-Unemployment-Job							
(a): Permanent to Flex	49,087	22%	=(a)/(e)	34%	=(a)/(a+b)	47%	=(a)/(a+d)
(b): Permanent to Permanent	96,381	44%	=(b)/(e)	66%	=(b)/(a+b)	84%	=(b)/(b+c)
(c): Flex to Permanent	19,001	9%	=(c)/(e)	25%	=(c)/(c+d)	16%	=(c)/(b+c)
(d): Flex to Flex	56,324	26%	=(d)/(e)	75%	=(d)/(c+d)	53%	=(d)/(a+d)
		100%					
(e): Total	220,793						

Notes: This table characterizes labor flows in the Netherlands by examining the types of contracts before and after workers change jobs. I analyze both job-to-job movements (Panel A) and job-unemployment-job movements (Panel B) among workers aged 25 to 55 during the period 2008-2016. I consider only the first job change for all workers in the sample, excluding any subsequent job movements. The total number of movements considered in this analysis (1,595,948) represents 40% of the total movements in the sample, each corresponding to a single worker changing jobs for the first time during the sample period.

nent contracts to permanent contracts, accounting for 53% of the transitions, while the least common contract transition is workers moving from flexible contracts to permanent contracts, accounting for 7% of the transitions. In column (3), I show a strong correlation between the type of contract before and after the job change. Specifically, I find that 29% of former permanent workers transition to flexible contracts after changing jobs, a proportion similar to that of former flexible workers. In column (4), I show that 55% of the flexible vacancies are filled by former permanent workers, while only 11% of new permanent vacancies are filled by former flexible workers.

Moving on to Panel B, I present the findings for job-unemployment-job movements and observe similar results. Importantly, I find that while 29% of former permanent workers transition to flexible contracts in job-to-job movements, this number increases to 34% for former permanent workers who transition to flexible contracts in job-unemployment-job movements. This suggests that workers are more willing to accept flexible contracts after experiencing one year of unemployment.

Overall, Table 1 provides evidence that highlights the relationship between permanent workers' unemployment risk and flexible contracts. I will show next that flexible contracts, as an alternative to permanent contracts, will be even more important in scenarios where the economy is contracting.

2.2 The Share of Flexible Contracts is Countercyclical

In order to approximate the relationship between the business cycle and the availability of flexible jobs, I study the relationship between profit margins and the share of flexible contracts at firm level. I use the profit margins to approximate the business cycle, as it has been shown that profit margins are largely procyclical (see, for example, Bikker and Hu, 2002). I then use the share of flexible contracts to study the availability of flexible jobs compared to permanent jobs over the business cycle.

I estimate a panel VAR to uncover the relationship between profit margins and the share of flexible contracts. The proposed panel VAR is given by

$$Y_{i,t} = A(L)Y_{i,t-1} + \alpha_i + \lambda_t + \epsilon_{i,t}, \tag{1}$$

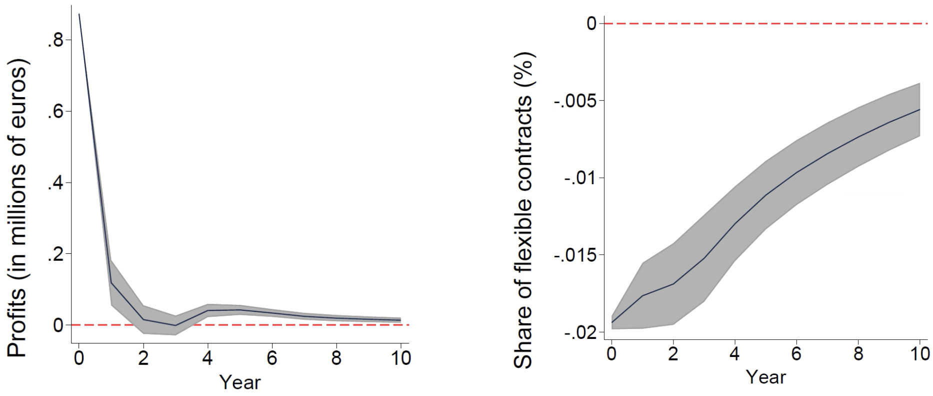
where $Y_{i,t}$ is a vector of the endogenous stationary series: profit margins (before tax), equity to assets ratio (leverage), and the share of flexible contracts. The subscripts, which are defined as i and t, refer to firm and time, respectively. $A(L)$ represents the matrix polynomial in the lag operator, α_i represents the firm specific fixed effect, and λ_t represents time-year fixed effects. Finally, $\epsilon_{i,t}$ denotes the residual vector.

I use the panel impulse response functions (IRFs) to describe the relationship between profit margins and the share of flexible contracts. Since the IRFs in the panel VAR are based on the Cholesky decomposition of the matrix of variance-covariance, the ordering is important for identification purposes. I order the variable as follows: profit margins, leverage, and the share of flexible contracts. In this way, I assume that profit margins is more exogenous than the share of flexible contracts.[3]

The main administrative data I use is a firm-year dataset with the balance sheet and income statement of all companies with legal personality that are active in the Netherlands in the non-financial industry (also called NFO dataset). The NFO data covers the period from 2006 to 2018. I complement this dataset with the number of flexible workers at firm level. I match this information from the worker-firm dataset containing monthly wages and contract information. Since this dataset is comprehensive for all legal employment in the Netherlands, I can recover the number of flexible workers for all firms available in the NFO dataset, although I consider firms with more than 10 employees only. My final dataset covers 87,779 firms over the period 2006-2018.

[3] In other words, profit margins affect the share of flexible contracts simultaneously or with a lag, while the share of flexible contracts affects profit margins only with a lag.

Figure 1: Impulse responses to a profit margin shock.



(a) (b)

Notes: This figure shows the impulse response to a profit shock from a Panel VAR, as described by Equation (1). Shaded are denotes 95 percent confidence interval based on 200 Monte Carlo draws.

In Figure 1, I present the impulse response to a one-standard-deviation shock in profit margins. I employ a three-lag model (i.e., $A(L = 3)$) based on model-selection criteria and define a time horizon of 10 years. The shaded area represents a 95 percent confidence interval based on 200 Monte Carlo draws. Figure 1 illustrates the negative relationship between profit margins and the share of flexible contracts. In the first year, the share of flexible contracts declines by almost 2%. There is some recovery in the following years, but 10 years after the shock, the share of flexible contracts is still 0.5% lower. I perform several robustness checks and confirm that the negative relationship between profit margins and the share of flexible contracts is robust to alternative measures for profit margins and different values for the lag operator. As a result, the evidence suggests that the share of flexible contracts is countercyclical, which is consistent with the limited evidence available (see, for example, Josten and Vlasbom, 2018).

3 Model

In this section, I develop a New Keynesian model that accounts for the interdependence between permanent and flexible contracts, from a precautionary-saving point of view. Additionally, the model will feature a countercyclical share of flexible contracts, as documented in the previous section.

The economy consists of households who consume, save, and work. The production structure has three layers. Intermediate goods firms produce using workers' labor (with no capital involved). Those goods are then sold to wholesale firms, each of which transforms intermediate goods into a differentiated goods. Wholesale firms are monopolistically competitive and face nominal rigidities a la Calvo. Wholesale goods are purchased and reassembled by final goods firms. The labor market is characterized by search and matching frictions, where intermediate goods firms decide whether to open permanent vacancies or flexible vacancies. This is a two-sector search model as in Acemoglu (2001). Workers cannot self-select into these types of jobs as the worker assignment is exogenous. Due to search and matching frictions, job prospects are uncertain, which expose households to idiosyncratic risk. Households cannot fully insure against this income risk (i.e., financial markets are incomplete), so they have precautionary motives to save when employed and to borrow when unemployed.

3.1 Households

Households are of two types: there is a unit measure of "workers," who can be employed or unemployed, and a measure $\Lambda > 0$ of capitalists who manage the firms and collect dividends. As in Challe (2020) and Ravn and Sterk (2021), I use capitalists to absorb fiscal transfers (including firm rents) that may affect the cyclicality of income risk and thus the implied savings response of workers to unemployment risk (see, for example, Acharya and Dogra, 2020).

Workers. A worker $i \in [0, 1]$ may be employed ($em_{i,t} = 1$) or unemployed ($em_{i,t} = 0$). When employed, a worker may have a permanent job ($q_{i,t} = 1$) or a flexible job ($q_{i,t} = 0$). A worker chooses the consumption sequence $\{c_{i,t+k}\}_{k=0}^{\infty}$ that maximizes $V_t^i = \mathbb{E}_t \sum_{k=0}^{\infty} \beta^k u(c_{i,t+k})$, where $c_{i,t} \geq 0$ is consumption.[4] Employed workers in a permanent (flexible) job earn the real wage w_t^p (w_t^f), while unemployed workers earn the exogenous home production income δ_t. Workers transit randomly between labor market statuses and the associated income risk is uninsured. The budget of worker i at date t is given by, respectively,

$$a_{i,t} + c_{i,t} = em_{i,t}(q_{i,t}w_t^p + (1 - q_{i,t})w_t^f) + (1 - em_{i,t})\delta_t + R_t a_{i,t-1} \tag{2}$$

where $a_{i,t}$ is the real value of worker's bond wealth at the end of date t and R_t is the gross real return on assets. Workers hold no wealth at $t = 0$. Workers' optimal consumption-saving choices must satisfy the Euler condition

$$\mathbb{E}_t[MRIS_{i,t+1}R_{t+1}] \leq 1, \tag{3}$$

[4] $\mathbb{E}_t$ is the rational-expectations operator and $u()$ is a period utility function such that $u' > 0$ and $u'' < 0$ for all $c \geq 0$.

where $MRIS_{i,t+1} = \beta u'(c_{i,t+1})/u'(c_{i,t})$ denotes the common marginal rate of intertemporal substitutions.

Capitalists. Capitalists have the period utility function $\tilde{u}(c)$. Capitalists do not face any idiosyncratic income risk, and they hold no wealth initially. Because of these assumptions, capitalists always stay symmetric (so I drop the i subscript) and I denote their common individual consumption and end-of-period asset wealth by c_t^C and a_t^C, respectively. Since the final goods sector is perfectly competitive, in every period capitalists get an equal share of the aggregate profits that results from profits of wholesale firms (Π_t^W) and profits from intermediate good firms (Π_t^I) as well as a home production income of amount Ω_t, in the aggregate, and a lump sum fiscal transfer of amount τ_t in the aggregate. A capitalist thus maximizes $V_t^C = \mathbb{E}_t \sum_{k=0}^{\infty} \beta^k \tilde{u}(c_{t+k}^C)$, subject to

$$a_t^C + c_t^C = \frac{\Pi_t^W + \Pi_t^I + \Omega_t + \tau_t}{\Lambda} + R_t a_{t-1}^C. \tag{4}$$

Given their preferences and constraints, the optimal consumption plan of a capitalist must satisfy

$$\mathbb{E}_t[MRIS_{t+1}^C R_{t+1}] \leq 1, \tag{5}$$

where $MRIS_{t+1}^C = \beta \tilde{u}'(c_{i,t+1}^C)/\tilde{u}'(c_{i,t}^C)$.

3.2 Firms

The production structure has three layers as in the New Keynesian tradition: final goods firms, wholesale firms, and intermediate goods firms.

Final Goods Sector. There is a representative, competitive firm that produces the final good by combining wholesale inputs according to the function

$$y_t = \left(\int_0^1 y_{h,t}^{\frac{\iota-1}{\iota}} \right)^{\frac{\iota}{\iota-1}}, \tag{6}$$

where $y_{h,t}$ is the quantity of wholesale good h used in production and $\iota > 1$ is the cross-partial elasticity of substitutions between wholesale inputs. The demand for inputs is given by $y_{h,t} = y_t p_{h,t}^{-\iota}$, where $p_{h,t}$ is the price of wholesale good $h \in [0, 1]$ in terms of the final good. I assume that this sector is perfectly competitive.

Wholesale Sector. Wholesale firms turn intermediate goods into specialized goods that are supplied to the final goods sector. The profit of wholesale firm h is

$$\Pi^W_{h,t} = y_{h,t}[p_{h,t} - \varphi_t(1-\tau^W)], \tag{7}$$

where φ_t is the price of intermediate goods in terms of the final good and τ^W a production subsidy to the wholesale sector, financed through a lump sum tax on capitalists. Wholesale firms face nominal pricing friction a la Calvo. In every period, a fraction $(1-\omega) \in [0,1]$ of the firms are able to reset their price optimally, while the other firms keep prices unchanged. The time-varying distribution of wholesale prices can be summarized by the optimal reset price $\tilde{p}_t$, the final good inflation π_t, and the price dispersion index Δ_t. The expressions for $\tilde{p}_t$, π_t, and Δ_t (as derived by Challe (2020)) are given by

$$\tilde{p}_t = \frac{\iota(1-\tau^W)\Xi_t}{(\iota-1)\Sigma_t}, \tag{8}$$

$$\pi_t = [\omega^{-1} - (\omega^{-1}-1)(\tilde{p})^{1-\iota}]^{\frac{1}{\iota-1}} - 1, \tag{9}$$

$$\Delta_t = (1-\omega)(\tilde{p})^{-\iota} + \omega(1+\pi_t)^{\iota}\Delta_{t-1}. \tag{10}$$

with $\Xi_t = \varphi y_t + \omega(1+\pi_{t+1})^{\iota}\,\mathbb{E}_t[MRIS^C_{t+1}\Xi_{t+1}]$ and $\Sigma_t = y_t + \omega(1+\pi_{t+1})^{\iota-1}\,\mathbb{E}_t[MRIS^C_{t+1}\Sigma_{t+1}]$. Total profits of wholesale firms are given by

$$\Pi^W_t = y_t[1 - \varphi_t(1-\tau^W)\Delta_t]. \tag{11}$$

Intermediate Goods Firms. A continuum of firms, indexed by j, produce differentiated goods using labor,

$$y_{j,t} = z_t \chi^s n^s_{j,t}, \tag{12}$$

where $s \in \{permanent, flexible\}$, $y_{j,t}$ is firm j's output, χ^s is a productivity wedge between permanent and flexible workers (i.e., $\chi^p > 1$, $\chi^f \equiv 1$), and $n^s_{j,t}$ its employment relationship which may be a permanent or a flexible. z_t is an aggregate productivity shock, $z_t = \mu_z z_{t-1} + \epsilon_{z,t}$, where $\mu_z \in (0,1)$ and $\epsilon_{z,t}$ is a white noise process with mean zero. In this setting, one firm is one job, which is the main simplifying assumption. This assumption allows me to partial out the implications of a multi-worker firm setting, namely, an endogenous dispersion in the distribution of firm sizes, an endogenous dispersion in the optimal shares of flexible jobs, and wage dispersion within and between firms and types of jobs (see, for example, Acemoglu and Hawkins, 2014), so I can focus on the trade-off between permanent and flexible jobs in the simplest and most transparent way.

In a permanent employment relationship, the real wage is sticky at the steady state real wage. On the contrary, in a flexible employment relationship, the real wage responds rapidly to economic conditions (wage setting is discussed in Section 3.4). I also assume that permanent employment relationships (when compared to flexible jobs) are (i) more productive (Addessi, 2014; Caggese and Cuñat, 2008); (ii) have a lower separation rate (Cahuc and Postel-Vinay, 2002; Centeno and Novo, 2012; Serrano, 1998); (iii) and have a higher vacancy-opening cost (Abowd and Kramarz, 2003; Kramarz and Michaud, 2010). Under this setting, firms post vacancies, $v^s_{j,t}$, at a cost η^s per unit. Each vacancy is filled with probability λ^s_t and firms are assumed to be sufficiently large that λ^s_t is also the fraction of vacancies that are filled.[5] The job separation rate is ρ^s and thus the law of motion of employment for firm j with a type of worker i is given by

$$n^s_{j,t} = (1-\rho^s)n^s_{j,t-1} + v^s_{j,t}\lambda^s_t. \tag{13}$$

Capitalists decide to open a permanent or flexible vacancy based on the value of each type of job, J^s_t, which is a function of job-characteristics and economic conditions. In particular, J^s_t is the sum of a flow payoff - the after-tax rent generated by the match - and a continuation value that depends on the survival rate of the match $(1-\rho^s)$ and capitalists' MRIS. J^s_t is given by

$$J^s_t = (1-\tau^{I,s})(z_t\chi^s\varphi_t - w^s_t + T + \zeta_t) + (1-\rho^s)E_t[MRIS^C_{t+1}J^s_{t+1}], \tag{14}$$

where T is a wage subsidy and $\tau^{I,s} \in [0,1]$ is the corporate tax. The corporate tax may be different for each type of job.[6] The variable ζ_t is a random wage tax evolving as $\zeta_t = \mu_\zeta\zeta_{t-1} + \epsilon_{\zeta,t}$ where $\mu_\zeta \in (0,1)$ and $\epsilon_{\zeta,t}$ is white noise process with mean zero. I assume a free entry condition, so the cost of a vacant job (η^s) must be equal to the expected payoff $(\lambda^s_t J^s_t)$, since vacancies can be filled immediately.

Unemployed workers search for jobs and are matched with a firm with probability f^s_t. The job-finding and the vacancy-filling rates are taken as given by agents but they are endogenously determined in equilibrium by a matching function that relates the measure of new matches (M^s_t) to the measures of vacancies (v^s_t) and job searchers (e_t). I assume a Cobb-Douglas matching function: $M^{s,t} = m^s(v^s_t)^{1-\gamma}(e_t)^\gamma$, where $m^s > 0$ and $\gamma \in (0,1)$. It follows that the job-finding and vacancy-filling rates are

$$f^s_t = m^s(\theta^s)^{1-\gamma}, \tag{15}$$

$$\lambda^s_t = m^s(\theta^s)^{-\gamma}, \tag{16}$$

[5]The underlying assumption here is that the search is undirected and thus both types of vacancies have the same probability of meeting workers.

[6]This assumption is motivated by the evidence that show that firms pay different taxes for different jobs, usually associated to social security.

where $\theta_t^s = v_t^s / e_t$ is the labor market tightness. Combining equations (14), the free entry condition, and equations (15) and (16), I get the forward recursion for the job-finding rate:

$$(f_t^s)^{\frac{\gamma}{1-\gamma}} = (1-\tau^{I,s})\frac{(m^s)^{\frac{1}{1-\gamma}}}{\eta^s}(z_t\chi^s\varphi_t - w_t^s + T - \zeta_t) + (1-\rho^s)\,\mathbb{E}_t\left[MRIS_{t+1}^C (f_{t+1}^s)^{\frac{\gamma}{1-\gamma}}\right]. \quad (17)$$

As shown by the equation (17), the job-finding rate (f_t^s) depends positively on the matching efficiency parameter (m^s), the productivity parameter (χ^s), the price of goods (φ_t), the productivity shocks (z_t), and the wage subsidy (T), and depends negatively on taxes ($\tau^{I,s}$), the vacancy-opening cost (η^s), the cost-push shock (ζ_t), the real wage (w_t^s), and the survival rate of the match (ρ^s).

3.3 Worker's Consumption Decisions and Unemployment Risk

I now focus on workers' consumption decisions. Agents receive information about aggregate productivity shocks at the beginning of each period. Employed workers are separated from their firm with probability ρ^s at the end of the last period but can find a job with probability f_t^s at the beginning of the period (after the realization of shocks). Households take their consumption decision after the new matches are formed. Therefore, the unemployment risk for a permanent worker is

$$\underbrace{U_t^p}_{\text{Unemployment risk}} = \underbrace{\rho^p}_{\text{Exogenous separation}} \times \underbrace{(1 - f_t^p - f_t^f)}_{\text{Not finding any job}}, \quad (18)$$

and the probability of losing a permanent job is

$$\underbrace{\sigma_t^p}_{\text{Prob. losing a permanent job}} = \underbrace{\rho^p}_{\text{Exogenous separation}} \times \underbrace{(1 - f_t^p).}_{\text{Not finding a permanent job again}} \quad (19)$$

I define in an equivalent way the unemployment risk for a flexible worker and the probability of losing a flexible job. Equation (18) states that the unemployment risk is the joint probability of exogenous separation and not finding any type of job in the labor market after the exogenous separation. Since the unemployment risk is a function of the job-finding rates of both permanent and flexible jobs, the model will produce a time-varying precautionary motive.

Under the assumptions made so far, permanent employment, flexible employment, and the number of job searchers evolve, respectively, as

$$n_t^p = \underbrace{f_t^p(1-n_{t-1})}_{\text{Unemployed finding a job}} + \underbrace{(1-\sigma_t^p)n_{t-1}^p}_{\text{Permanent keeping their job}} + \underbrace{f_t^p \rho^f n_{t-1}^f}_{\text{Flex finding a permanent job}}, \tag{20}$$

$$n_t^f = f_t^f(1-n_{t-1}) + (1-\sigma_t^f)n_{t-1}^f + f_t^f \rho^p n_{t-1}^p, \tag{21}$$

$$e_t = 1 - (1-\rho^p)n_{t-1}^p - (1-\rho^f)n_{t-1}^f. \tag{22}$$

Therefore, by combining equations (20) and (21), I get the law of motion for total employment

$$n_t = (f_t^p + f_t^f)(1-n_{t-1}) + (1-U_t^p)n_{t-1}^p + (1-U_t^f)n_{t-1}^p. \tag{23}$$

Finally, the aggregate rent generated by intermediate goods firms is

$$\Pi_t^I = \underbrace{n_t^p(1-\tau^{I,p})(z_t\chi^p\varphi_t + T - \zeta_t - w_t^p)}_{\text{Income from permanent firms}} + \underbrace{n_t^f(1-\tau^{I,f})(z_t\varphi_t + T - \zeta_t - w_t^f)}_{\text{Income from flexible firms}} - \underbrace{(\eta^p v_t^p + \eta^f v_t^f)}_{\text{Vacancy costs}}. \tag{24}$$

Therefore, the aggregate profits to capitalists are $\Pi_t^W + \Pi_t^I$.

3.4 Wage Setting for Permanent and Flexible Contracts

A salient feature of flexible contracts, when compared to permanent contracts, is that they allow firms to gain control over their labor costs (see, for example, Gu et al., 2018). A simple way of introducing this feature to my model, is by assuming that the real wage of flexible workers is Nash Bargained (responding strongly to economic conditions) while the real wage of permanent workers is also Nash Bargained but *rigid* around the long-run real wage (that is, a slow adjustment to the economic conditions).[7] Under this wage-setting mechanism, the Nash wage is given by

$$(w_t^s)^N = argmax(S_t^s)^{1-\alpha}(J_t^s)^{\alpha},$$

where $\alpha \in (0,1)$. S_t^s and J_t^s are the values of the match to the worker and the capitalists. The value of J_t^s is given by (14) (firms are assumed to be symmetric), while the worker's match surplus (S_t^s) is determined as the difference between the value of being employed

[7] As argued by Shimer (2005), a typical feature of calibrated search and matching models with Nash bargaining is to generate a too strong response of the real wage, and thus a too small a response of unemployment (as firms can reduce their labor costs through wage reductions).

in a job s ($V_t^{s,e}$) and the value of being unemployed (V_t^u) as

$$S_t^s = V_t^{s,e} - V_t^u. \tag{25}$$

The value functions of unemployed workers, permanent workers, and flexible workers are

$$V_t^u = u(\delta_t) + \beta\,\mathbb{E}[f_{t+1}^f V_{t+1}^{p,e} + f_{t+1}^f V_{t+1}^{f,e} + (1 - f_{t+1}^p - f_{t+1}^f)V_{t+1}^u], \tag{26}$$

$$V_t^{p,e} = u(w_t^p) + \beta\,\mathbb{E}[(1 - \sigma_{t+1}^p)V_{t+1}^{p,e} + \rho^p f_{t+1}^f V_{t+1}^{f,e} + U_{t+1}^p V_{t+1}^u], \tag{27}$$

$$V_t^{f,e} = u(w_t^f) + \beta\,\mathbb{E}[(1 - \sigma_{t+1}^f)V_{t+1}^{f,e} + \rho^f f_{t+1}^p V_{t+1}^{p,e} + U_{t+1}^f V_{t+1}^u]. \tag{28}$$

Using (25)-(28) and rearranging terms, I have that S_t^p and S_t^f can be written as

$$S_t^p = u(w_t^p) - u(\delta_t) + \beta\,\mathbb{E}[(1 - \sigma_{t+1}^p - f_{t+1}^p)S_{t+1}^p - f_{t+1}^f(1 - \rho^p)S_{t+1}^f], \tag{29}$$

$$S_t^f = u(w_t^f) - u(\delta_t) + \beta\,\mathbb{E}[(1 - \sigma_{t+1}^f - f_{t+1}^f)S_{t+1}^f - f_{t+1}^p(1 - \rho^f)S_{t+1}^p]. \tag{30}$$

Equation (29) makes clear that the worker's match surplus of a permanent job depends negatively on the worker's match surplus of a flexible job. As a job becomes more valuable, the value of the alternative jobs needs to decrease to maintain the equilibrium in the labor market (otherwise the worker's match surplus will explode).[8] Finally, since workers and firms are risk neutral and have the same discount rate, Nash bargaining implies that $(w_t^s)^N$ will be chosen so that

$$(1 - \alpha)J_t^s = \frac{\alpha S_t^s}{u'((w_t^s)^N)}. \tag{31}$$

Therefore, the real wages are

$$w_t^p \equiv ((w_t^p)^N)^{1-\phi}(w^*)^{\phi}, \tag{32}$$

$$w_t^f \equiv (w_t^f)^N, \tag{33}$$

where w^* is the long-run wage and $\phi \in [0, 1]$ is the degree of wage inertia. Equation (32) makes the real wage of permanent workers less responsive to economic conditions (Shimer, 2005). On the contrary, equation (33) states that the worker's pay of flexible workers is the Nash-bargained salary.

[8]It is also important to note that as the number of flexible jobs goes to 0, $f_{t+1}^f \to 0$, equation (29) converges to the expression $\lim_{f_{t+1}^f \to 0} S_t^p = u(w_t^p) - u(\delta_t) + \beta\,\mathbb{E}[(1 - \sigma_{t+1}^p - f_{t+1}^p)S_{t+1}^p]$, which is equivalent to the expression derived by Challe (2020).

To clarify the relationship between employment and wage setting, I loglinearize the job-finding rate, which governs the job creation dynamics of the model, for both permanent and flexible jobs under two simplifying assumptions. First, I assume that permanent and flexible jobs are identical except for wage setting, as explained above. Therefore, I focus on the wage-setting differences between these job types. Second, I assume that $\rho^p = \rho^f = 1$, meaning that all workers are reallocated either to other jobs or to unemployment in every period. This assumption eliminates the intertemporal dimension of hiring decisions. Under these assumptions, I derive the job finding rates for both type of jobs and focus on the availability of flexible employment compared to permanent employment, which may be approximated by the difference between job-finding rates, as follows:

$$\hat{f}_t^f - \hat{f}_t^p \simeq \Psi[\hat{w}_t^p - \hat{w}_t^f], \tag{34}$$

with $\Psi = (w^*)\Big(\frac{\gamma}{1-\gamma}(1-w^*)\Big)^{-1} > 0$. The variables $\hat{f}_t^f$ and $\hat{f}_t^p$ represent the level deviation of the job-finding rate of flexible and permanent jobs from steady state, respectively. Similarly, $\hat{w}_t^p$ and $\hat{w}_t^f$ denote the level deviation of the wage rate for permanent and flexible jobs from steady state. Equation (34) makes clear that the availability of flexible jobs compared to permanent jobs (i.e., the share of flexible jobs) is associated to firm's labor cost, which in this case is summarized by the real wage gap between the two jobs types. Since the real wage of flexible workers is highly responsive to economic conditions, the employment of flexible workers also reacts rapidly to economic conditions. Consequently, the share of flexible employment increases in contractions and decreases in expansions. All of this aligns with the macroeconomic evidence presented in Section 2.

3.5 Monetary Policy Rule

The central bank controls the nominal interest rate on bonds i_t and follows this monetary policy rule

$$1 + i_t = R^{(1-\mu_\pi)}(1 + i_{t-1})^{\mu_\pi}(1 + \pi_t)^{\phi_\pi(1-\mu_\pi)}\xi_t \tag{35}$$

where R is the steady state interest rate, μ_i is the degree of interest rate inertia, ϕ_π is the elasticity of the policy rate to inflation, and ξ_t is an IID monetary policy shock. Note that this monetary policy rule is fairly general, in terms of robustness checks tests (see, for example, Table A2). For instance, when $\mu_\pi = 0$, I arrive to the same monetary policy rule used by Acharya and Dogra (2020) or Ravn and Sterk (2017) for studying tractable HANK models: $1 + i_t = R(1 + \pi_t)^{\phi_\pi}\xi_t$. Finally, the gross real ex-post return that results from the policy rate and the dynamics of inflation is

$$R_t = \frac{(1 + i_{t-1})}{(1 + \pi_t)}, \tag{36}$$

with $R = (1 + i)$ in steady state.

3.6 Government and the Constrained-Efficient Steady State

The government sets the taxes and subsidies τ^W, $\tau^{I,p}$, $\tau^{I,f}$ and T and rebates the net revenue to capitalists in a lump sum manner. The net transfer to capitalists is

$$\begin{aligned}\tau_t = \tau^{I,p}[n_t^p(z_t\chi^p\varphi_t - w_t^p)] + \tau^{I,f}[n_t^f(z_t\varphi_t - w_t^f)] - \tau^W\varphi_t\Delta_t y_t \\ - (n_t^p(1-\tau^{I,p}) + n_t^f(1-\tau^{I,f}))(T - \zeta_t).\end{aligned} \tag{37}$$

Equations (11), (24), and (37) allow me to calculate the consumption of capitalists as

$$C_t^F = \frac{(\Pi_t^W + \Pi_t^I + \tau_t)}{\Lambda}.$$

In Appendix C, I decentralize the efficient allocation in the absence of aggregate shocks in steady state by setting taxes and transfers conveniently.

3.7 Market Clearing

Given the measures of workers and capitalists (1 and Λ) and the market and home production of final goods, the market-clearing conditions for bonds and final goods are given by $\int_0^1 a_{i,t}di + va_t^C = 0$ and $\int_0^1 c_{i,t}di + \Lambda c_t^C + \eta^p v_t^p + \eta^f v_t^f = y_t + (1-n_t)\delta_t + \Omega$, respectively. The supply of intermediate goods is $z_t\chi^p n_t^p + z_t n_t^f$, while the demand for intermediates goods is

$$\int_0^1 y_{h,t}dh = \Delta_t y_t. \tag{38}$$

Hence, clearing of the market for intermediate goods requires

$$\Delta_t y_t = z_t\chi^p n_t^p + z_t n_t^f. \tag{39}$$

3.8 Definition of the Equilibrium

I define the equilibrium as a set of sequences of optimal households decisions $(\{c_t^C, a_t^C, c_t, a_t,\}_{t=0}^{\infty}$ with $i \in [0,1]$, firms' decision $(\{y_t, y_{h,t}, \tilde{p}_t\}_{t=0}^{\infty}$ with $h \in [0,1]$, central banks' decision

$(\{i_t\}_{t=0}^{\infty})$ given prices; and aggregate variables

$$\{v_t^p, v_t^f, J_t^p, J_t^f, \lambda_t^p, \lambda_t^f, f_t^p, f_t^f, U_t^p, U_t^f, \sigma_t^p, \sigma_t^f, \theta_t^p, \theta_t^f, n_t^p, n_t^f, e_t, \Delta_t, \varphi_t, \pi_t, \Pi_t^W, \Pi_t^I, R_t\}_{t=0}^{\infty},$$

that solve the optimal reset price, the final good inflation, the price dispersion index, and equations (11) to (39), together with the free entry conditions $\eta^s = \lambda_t^s J_t^s$.

3.9 Solution of the Model

My model generates a non-degenerate cross-sectional distribution of income, consumption, and wealth, as well as individual mobility across the distributions. This is because households in my economy are subject to uninsurable idiosyncratic labor income risk (e.g., unemployment spells), which translates into a different "history of shocks" that they face in their life. I refer to this model as a Heterogeneous Agent New Keynesian (HANK) model (Kaplan et al., 2018). While HANK models are important for understanding the transmission of monetary policy (Auclert, 2019; Kaplan et al., 2018), HANK models are difficult to solve (Debortoli and Galí, 2017; Ragot, 2018). However, recent literature has shown that models with reduced heterogeneity (henceforth, RHANK) may very well reproduce both from a qualitative and a quantitative viewpoint, the aggregate output dynamics of a canonical HANK model in response to aggregate shocks, monetary and non-monetary shocks (Bilbiie, 2020; Debortoli and Galí, 2017; Kaplan and Violante, 2018; Ragot, 2018).

I leverage on these results and use a RHANK model to provide a first quantification of the unemployment risk channel generated by the rise of flexible contracts and their interaction with incomplete insurance markets (Ragot, 2018). While this simplification reduces the complexity of the model without sacrificing the aggregate output dynamics, it does not take into account the redistributive effects of monetary policy on household's heterogeneity, which may be important from a policy point of view.

To use a RHANK model with two types of jobs (henceforth, RHANK-2J), I assume that on top of the assumptions made so far, agents are unable to borrow (Bilbiie, 2020; Challe, 2020; Ravn and Sterk, 2017). So, no one is providing the asset that precautionary savers (i.e., employed workers) would be willing to buy for self-insurance. I also assume perfect insurance within types (but limited across types): employed-permanent, employed-flexible, and unemployed. So all agents within types have the same income and consumption.

Proposition 1: *The equilibrium of the RHANK-2J model is characterized by the following* *three equations*

$$a_{i,t} = 0 \quad \forall_i, \tag{i}$$

$$c_t = \begin{cases} w_t^p, & \textit{if employed in a permanent job} \\ w_t^f, & \textit{if employed in a flexible job} \\ \delta_t, & \textit{unemployed} \end{cases} \tag{ii}$$

$$\mathbb{E}_t \left[\left(\vartheta_t^p MRIS_t^{permanent,e} + (1 - \vartheta_t^p) MRIS_t^{flex,e} \right) R_{t+1} \right] = 1, \tag{iii}$$

where ϑ_t^p *is the share of permanent jobs.*

Point (i) states that because no one is issuing the assets that the employed workers would be willing a purchase for self-insurance, all individuals households hold zero bonds in equilibrium (the no-trade equilibrium of Krusell et al. (2011)). Point (ii) makes clear that all households consume their current income. This generates a degenerate wealth distribution. Point (iii) is the weighed Euler equation of the two employed workers (similar to the Euler equation of the analytical-HANK model of Bilbiie (2020), where unconstrained agents can become constrained agents). Importantly, this Euler equation prices the bonds even though they are not traded. In particular, I pin down the equilibrium real interest rate as a function of aggregate variables from the Euler equation for employed workers, which holds with equality. The Euler equation also takes into account the self-insurance in the face of idiosyncratic shocks: employed agents' possibility of becoming unemployed in the future (Bilbiie, 2020). I show these results in detail below.

Employed workers. The unemployment risk makes employed workers wish to save. Therefore, employed workers do not face a binding debt limit because they wish to precautionary-save. I have two types of employed workers and they can change jobs within a period. To show the relevance of job-to-job changes, I write the permanent worker's MRIS as

$$MRIS_{t+1}^{permanent,e} = \beta \frac{\overbrace{(1 - \sigma_{t+1}^p) u'(w_{t+1}^p)}^{\text{Keeping the job}} + \overbrace{\rho^p f_{t+1}^f u'(w_{t+1}^f)}^{\text{Job-to-Job transition}} + \overbrace{U_{t+1}^p u'(\delta_{t+1})}^{\text{Losing the job}}}{u'(w_t^p)}. \tag{40}$$

Equation (40) states that the employed workers' desire to save is driven by intertemporal substitution, i.e., employed workers wish to save more for future consumption when the current wage is unusually high, and unemployment risk, i.e., the greater the unemployment risk (as measured by U_{t+1}^p), the stronger the desire to save.[9] To explain the role

[9]Note that $1 - U_{t+1}^p = (1 - \sigma_{t+1}^p) + \rho^p f_{t+1}^f$. Since $\delta_t < w_t^p, w_t^f$, hence $u'(\delta_{t+1}) > u'(w_{t+1}^p), u'(w_{t+1}^f)$.

of the precautionary savings motive, I consider the case of higher unemployment risk next period. Higher unemployment risk next period contracts today's demand because it implies more need for self-insurance. Households internalize this by demanding more savings (or less consumption). But savings needs to be zero in equilibrium, so households consume less today and income adjust accordingly to deliver this allocation (starting a negative feedback loop).[10] As a result, my model has an operative precautionary motive without the need of tracking a time-varying wealth distribution (as in the case of HANK models).

Finally, it is important to note that the Euler equation, and consequently the MRIS equation, are expressed as one-period deviations (today vs. tomorrow). This may wrongly suggest that employed workers do not consider the entire sequence of unemployment risks when making decisions about today's consumption. Since optimizing agents equalize the present-value marginal flow benefit from consume across periods (e.g., $u'(c_t) = \beta^k R^k_{t+k} u'(c_{t+k})$), they only need to care about tomorrow's outcomes, as the Euler equation characterizes the evolution of consumption along any optimal path.

Unemployed workers. Because unemployed workers have the possibility of finding a job, they want to borrow today to smooth consumption. However, it is not possible to borrow in this economy, so the Euler holds with strict inequality

$$\mathbb{E}_t[MRIS^u_t R_{t+1}] < 1,$$

where

$$MRIS^u_{t+1} = \beta \frac{\overbrace{(1 - f^p_{t+1} - f^f_{t+1}) u'(\delta_{t+1})}^{\text{Stay unemployed}} + \overbrace{f^p_t u'(w^p_{t+1})}^{\text{Find a permanent job}} + \overbrace{f^f_t u'(w^f_{t+1})}^{\text{Find a flexible job}}}{u'(\delta_t)}. \tag{41}$$

Equation (41) states that unemployed workers' desire to save it is driven by the expectations of finding a job in the labor market.[11]

Capitalists. Capitalists are also borrowing-constrained. Because employed workers desire to precautionary-save to bring down the interest rate, capitalists want to borrow to take advantage of a lower interest rate (lower than $1/\beta$). However, capitalists cannot borrow to the prevailing interest rate, so the Euler equation also holds with strict

[10] As it is well known in the literature, market incompleteness contributes to a smaller steady-state interest rate compared to the complete market case (see, for example, Aiyagari, 1994).

[11] Contrary to equation (40), unemployed workers face a rising consumption profile because of the possibility of finding a job.

inequality

$$\mathbb{E}_t[MRIS_t^C R_{t+1}] < 1.$$

Therefore, my model distinguishes between two types of households at each point in time, which are labeled as "unconstrained" or "constrained", depending on whether their consumption satisfies or not a consumption Euler equation.[12]

4 Calibration

I assume the following functional forms for preferences over consumption: $u(c) = \ln(c)$ for workers and $\tilde{u} = (c^{1-\tilde{\sigma}})/(1-\tilde{\sigma})$ for capitalists, where the inverse of the intertemporal elasticity of substitution is $\tilde{\sigma} > 0$. Table 2 provides the baseline model parameter settings. In my baseline setting, while I target the Dutch economy, one of the leading countries in term of contractual flexibility, the parametrization is fairly general for the euro area. I target an economy with 15% of flexible jobs, which is a conservative benchmark of the level of contractual flexibility for the Dutch economy but also for the euro area and the U.S.[13] Following the empirical analysis of the Appendix, I also target an unemployment risk of 4.9% and 6.6% for permanent and flexible workers. Consistent with euro data over the years 2006-2018 from the De Nederlandsche Bank (DNB), I target an economy with an annual interest rate of 2% (Euribor - 12 months).[14]

Given these targets, I assign values for the parameters ρ^p, ρ^f, f^p, f^f, and β. I set the job-destruction rate for permanent and flexible workers to $\rho^p = 0.25$ and $\rho^f = 0.35$. I also set the job-finding rate for permanent and flexible workers to $f^p = 0.65$ and $f^f = 0.16$, respectively. As a result, the probability of losing a permanent and flexible job is 8.8% and 29.4% in steady-state, which implies an expected duration of a flexible job of around one year. However, as defined by the targets, the unemployment risk are 4.9% and 6.6%

[12]Compared to the RHANK model developed by Debortoli and Galí (2017), the number of constrained/unconstrained households changes over time in my model. However, in my model unconstrained households do not have access to financial markets as it is the case of Debortoli and Galí (2017), where unconstrained households can save while constrained households do not have access to financial markets. This assumption allows Debortoli and Galí (2017) to make the distinction between "normal" households who save and consume and hand-to-mouth households who always consume their current income. While this is an important distinction for understanding the consumption dynamics of both households, in my model I focus on the behavior of one group of workers: the workers under permanent employment.

[13]For instance, Katz and Krueger (2019) shows that the percentage of workers engaged in alternative work arrangements – defined as temporary help agency workers, on-call workers, contract workers, and independent contractors or freelancers – rose from 10.7 percent in February 2005 to possibly as high as 15.8 percent in late 2015. Although this definition does not include temporary workers and may include jobs that are not "insecure", I set a 15% of flexible jobs as lower bound for the U.S. but also for Europe.

[14]This will allow me to compare different economies with different shares of flexible jobs as the interest rate would be equivalent among simulations.

Table 2: Calibration of the Model.

Symbol	Description	Value
TARGET		
$ShareFlex$	Share of flexible jobs	15%
U^p	Unemployment risk of permanent workers	4.9%
U^f	Unemployment risk of flexible workers	6.6%
i	Annual interest rate	2%
PARAMETERS		
ρ^p	Job-destruction rate permanent workers	0.25
ρ^f	Job-destruction rate flexible workers	0.35
f^p	Job-finding rate permanent workers	0.65
f^f	Job-destruction rate flexible workers	0.16
β	Discount factor	$[0.9947 - 0.9895]$
δ^p/w^p	Constant loss upon employment permanent workers	90%
δ^f/w^f	Constant loss upon employment flexible workers	90%
ι	Elasticity of substitution	6.000
ω	Share of constant prices	0.750
Ω	Capitalists' home production	0.500
$\tilde{\sigma}$	Firm owners'risk aversion	0.283
ϕ	Wage inertia (permanent firms)	0.948
η^p/w^p	Vacancy cost permanent jobs (percent of wage)	4.5%
η^f/w^f	Vacancy cost flexible jobs (percent of wage)	1.35%
γ	Elasticity of matching function	2/3
χ^p	Productivity permanent workers	1.02
π_ϕ	Reaction to inflation	1.5
μ_π	Interest rule inertia	0.85
μ_z	Persistence productivity shock	0.95
μ_ζ	Persistence cost-push shock	0.95

for permanent and flexible workers. The parameter β is set to match an annual interest rate of 2%. Because the implied interest rate is different between models with and without perfect unemployment insurance, I use two different β values to keep the interest rate constant between models.

An important parameter is the constant loss upon unemployment. Bertay et al. (2022) estimate that Dutch households experience a labor income decrease of around 10% when they become unemployed. Therefore, I set the constant loss upon unemployment, δ^p/w^p and δ^f/w^f, to a conservative value of 90%. This value is quite general; for example, in the U.S., Chodorow-Reich and Karabarbounis (2016) estimate a consumption drop of between 10% and 20% for households experiencing unemployment.

Without further guidance from Dutch data, I set the rest of the parameters based on euro data. The elasticity of substitution, ι, is set to 6, resulting in a mean markup rate of 20% for wholesale firms. The Calvo price parameter, ω, is set to 0.75, implying an average duration of individual prices of four quarters, a value well within the range used in euro area macro models (Christoffel et al., 2008; Galí and Monacelli, 2016). I set the capitalists' home production, Ω, to 0.5, the capitalists' risk aversion, $\tilde{\sigma}$, to 0.283, the wage inertia of permanent jobs, ϕ, to 0.948. I set the vacancy cost to 4.5% of the wage of permanent workers and 1.35% for flexible jobs (70% lower when compared to permanent jobs) (Abowd and Kramarz, 2003; Kramarz and Michaud, 2010). Since in the efficient steady state the real wage of permanent and flexible workers should be the same, I use the productivity parameter of permanent workers, χ^p to match the real wages. Thus, I set $\chi^p = 1.02$ (i.e., permanent workers are 2% more productive than flexible workers). As is commonly done, I set the elasticity of the matching function to 2/3. About the monetary policy rule, I set the reaction to inflation, π_ϕ, to 1.5, and the interest rule inertia, μ_π to 0.85. Finally, I set the persistence of productivity shocks and cost-push shocks to 0.95.

5 Results

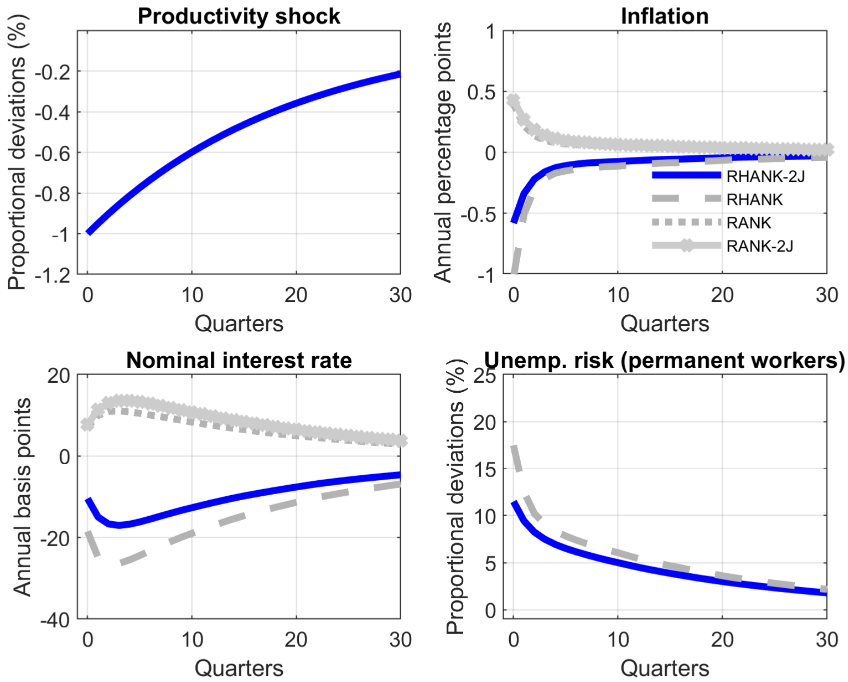
5.1 Understanding the Role of Flexible Jobs in the Economy

To understand the implications of flexible jobs in an economy like the one described in Section 3, I study the economy's response to a contractionary shock. Figure 2 shows the reaction of nominal interest rate, inflation, and unemployment risk (for permanent workers) to a contractionary productivity shock. My baseline specification is the model with imperfect-insurance and 15% of flexible jobs in steady state (RHANK-2J). For comparison, I also examine three alternative models: (1) the model with perfect-insurance but without flexible jobs (RANK); (2) the model with both perfect-insurance and 15% of flexible jobs (RANK-2J); (3) the model with imperfect-insurance but without flexible jobs (RHANK), as in Challe (2020).

In the RANK model, I show the standard response of inflation and the nominal interest rate to a contractionary productivity shock (Galí, 2015). A contractionary productivity shock results in an increase in inflation because there is the same aggregate demand for goods, but a lower aggregate supply of goods. As a result, the central bank raises the interest rate to balance the goods market. When I incorporate flexible jobs into the RANK model, forming the RANK-2J model, the economy's response remains qualitatively similar to that of the RANK model. In other words, flexible jobs are largely irrelevant in a perfect-insurance setting (see, for example, Cahuc and Postel-Vinay, 2002)

In contrast, the inflation and the nominal interest rate exhibit different responses in a RHANK model, as documented in the HANK literature (Bilbiie, 2018; Challe and Ragot, 2016). The contractionary productivity shock decreases not only the aggregate supply of goods (as in the RANK case), but also the aggregate demand of goods. This is because workers who expect to lose his or her job with greater probability tends to consume less in the present, leading to a decrease in aggregate demand. Under my parametrization,

Figure 2: Impulse responses to a productivity shock.



Notes: The figure shows the impulse response to a productivity shock under a monetary policy rule for the inflation, nominal interest rate, and the unemployment risk of permanent workers. My baseline specification is the model with imperfect-insurance and 15% of flexible jobs (RHANK-2J). I compared it to three alternative models: (1) the model with perfect-insurance but without flexible jobs (RANK); (2) the model with both perfect-insurance and 15% of flexible jobs (RANK-2J); (3) the model with imperfect-insurance but without flexible jobs (RHANK). Proportional deviations stand for the percentage deviations of the unemployment risk from the steady state value. Please refer to the calibration section for more details about the steady state values.

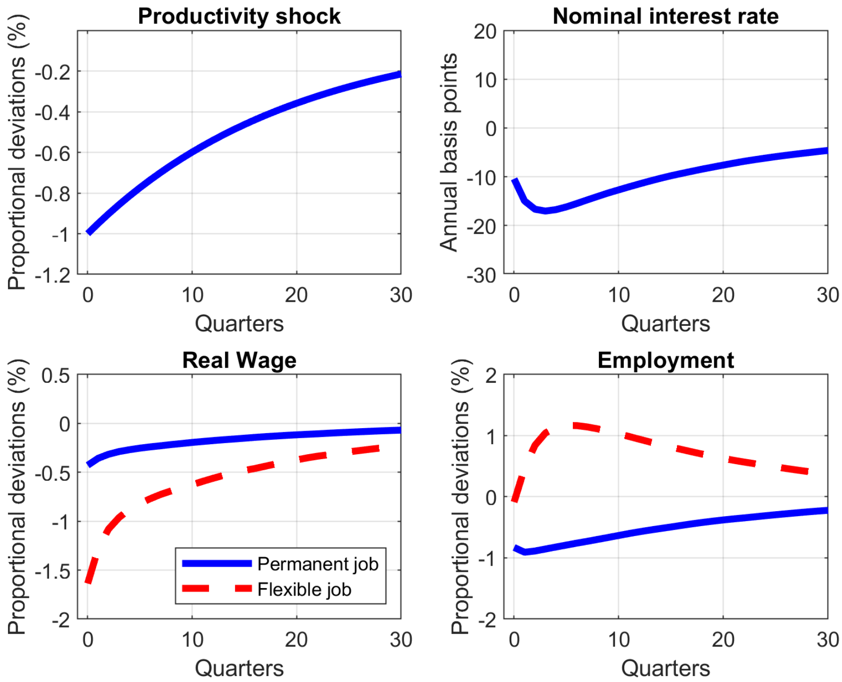
aggregate demand falls significantly more than the aggregate supply of goods, leading to a lower inflation rate. As a result, the central bank responds by decreasing the interest rate to stimulate the aggregate demand and equilibrate the goods market.

In the RHANK-2J model, I find similar dynamics to the RHANK model. However, the comparison of the unemployment risk between the RHANK and the RHANK-2J of permanent workers reveals an interesting result: the unemployment risk of permanent workers decreases from 17% in the RHANK model to 12% in the RHANK-2J model (when compared to the same steady state value). This fall in the unemployment risk reduces the precautionary motive of permanent households, leading to a *lower* decrease in aggregate demand and inflation. As a result, the central bank decreases the interest rate to stimulate aggregate demand, but to a lesser extent than in the RHANK model.[15]

To understand the reduction in unemployment risk in the RHANK-2J model compared to

[15] In general, the response of the nominal interest rate will always fall between the responses of the nominal interest rate in both the RANK and the RHANK models for any parameterization of the model.

Figure 3: Impulse responses to a productivity shock in the baseline model.



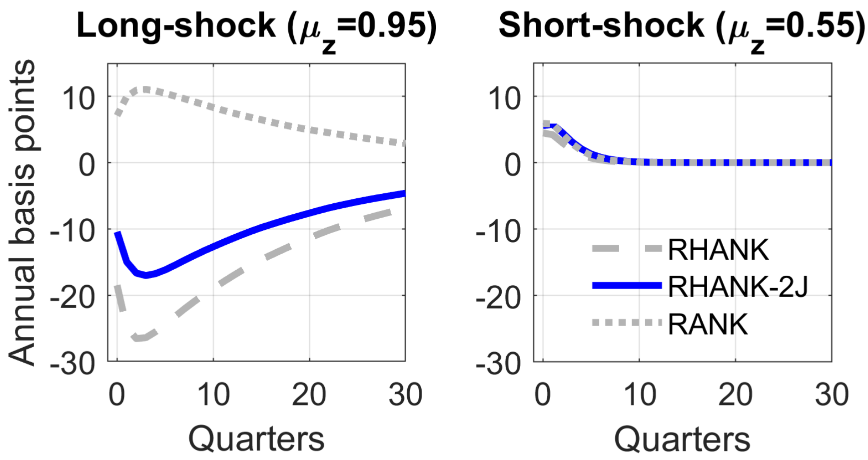
Notes: The figure shows the impulse response to a productivity shock under a monetary policy rule for the nominal interest rate, real wage, and employment under a model with imperfect-insurance and 15% of flexible jobs in steady state (RHANK-2J). Proportional deviations stand for the percentage deviations of the unemployment risk from the steady state value.

the RHANK model, Figure 3 shows the adjustment of the RHANK-2J economy in terms of real wages and employment for the same contractionary productivity shock of Figure 2. Under a contractionary productivity shock, the real wage falls for both jobs, however, the drop is steeper for flexible jobs. This leads to an increase in flexible job employment and a decrease in permanent job employment (as shown by Equation 34). Compared to the RHANK model, the total employment decrease less in the RHANK-2J model, and therefore the unemployment risk also increases less (see Figure 2), resulting in a lower fall in aggregate demand.

In the Appendix, I perform several robustness checks and confirm the role of flexible contracts in reducing the unemployment risk fluctuations of permanent workers. Specifically, I confirm that the unemployment risk for permanent workers exhibits a smaller increase during a contractionary shock (as shown in Figure 2) and a smaller decrease in an expansionary productivity shocks. I also document that the results shown in Figures 2 and 3 are robust to different parametrization of the wage rigidity parameter, the monetary policy rule, or shock characteristics, such as size, direction, and type.

Another important insight is that flexible contracts play a more significant role in reducing

Figure 4: Monetary policy response and shock persistence.



Notes: The figure shows the impulse response to a productivity shock under a monetary policy rule for the nominal interest for two different values of the persistence of productivity shocks (μ_z): $\mu_z = 0.95$, which is the long-shock, and $\mu_z = 0.55$, which is the short-shock. My baseline specification is the model with imperfect-insurance and 15% of flexible jobs (RHANK-2J). I compared it to two alternative models: (1) the model with perfect-insurance and without flexible jobs (RANK); and (2) the model with imperfect-insurance and without flexible jobs (RHANK).

the unemployment risk fluctuations of permanent workers during long-lived shocks. Figure 4 shows the nominal interest rate response for two different values of the productivity-shock persistence. When the shocks are long-lived (more than 10 quarters), as in my baseline specification, the contribution of flexible contracts is substantial in the reduction of the monetary policy response to aggregate shocks, as shown in Figure 2. However, when the persistence of productivity-shocks is shorter than 10 quarters, or within the 2-years window of monetary policy action, the contribution of flexible contracts is marginal. Because of search frictions in the labor market, flexible employment cannot adjust rapidly enough during economic contractions to compensate for the decline in permanent employment. As a result, the monetary policy response becomes similar to the response in a RANK model.

In summary, my results show that a small share of flexible jobs reduces the fall on aggregate demand of the RHANK model through the unemployment risk of permanent workers. This result is robust to different parametrizations of the model. In the next subsection, I will show the consequences of flexible jobs in terms of volatility gains.

5.2 Volatility Gains in an Economy with Flexible Jobs

To understand the consequences of reducing the unemployment risk fluctuations of permanent workers, I study the volatility gains of having a larger share of flexible jobs.[16] Figure 5 shows the standard deviation of output, employment, the nominal interest rate, and inflation based on the RHANK-2J model for observed levels of contractual flexibility in both Europe and the United States.[17] To compare the different counterfactual simulations, the standard deviation is expressed as a ratio relative to that of the RHANK model (i.e., the RHANK-2J without flexible jobs), at which level the standard deviation is equal to 1. The top-left panel of Figure 5 shows that the inclusion of flexible jobs in a RHANK model leads to a steady decline in output volatility from a value of 1 in the RHANK model to approximately 0.8 in the RHANK-2J model with 30% flexible jobs. When compared to my baseline specification (15% flexible employment), the results suggest that flexible employment reduces the standard deviation ratio to a value of 0.89, which implies a 11% fall in the standard deviation of output. Furthermore, Figure 5 reveals substantial reductions in the volatility of employment, the nominal interest rate, and inflation. Flexible jobs contribute to stabilizing aggregate demand, resulting in less pronounced fluctuations in inflation and, consequently, lower interest rate variability.

To show that my results are plausible regarding output volatility, I use eurozone data to run a regression of the standard deviation of GDP growth over the years 2010-2019 (that is, a measure of output volatility) against two measures of contractual flexibility: the share of flexible jobs in 2012 (at the start of the sample period) and the percentage change of contractual flexibility between 2012 and 2019. Figure 6 confirms that a larger level of contractual flexibility helps to reduce the GDP volatility. I also compared the regression estimates with my findings. A 15% increase in contractual flexibility in 2012, starting from the sample's average GDP standard deviation, led to a 28% reduction in GDP standard deviation. However, when considering the GDP standard deviation of the country with the lowest contractual flexibility as the starting point, the same increase resulted in a 24% reduction in GDP standard deviation, closer to my estimates.[18]

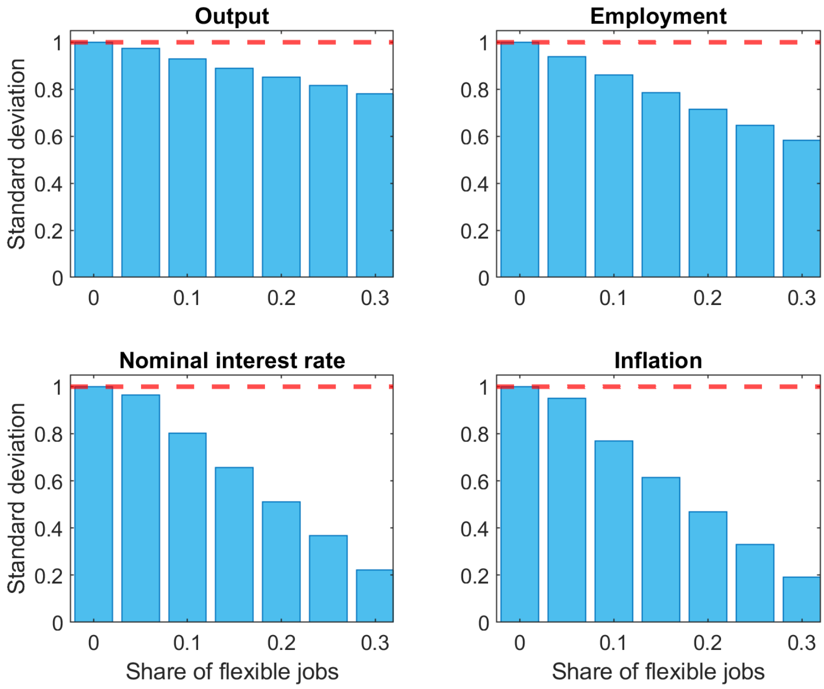
Although Figure 5 highlights the advantages of flexible contracts, they come at a cost to flexible workers in terms of excessive fluctuations in employment. Figure 7 shows the

[16] I focus on volatility gains because welfare losses are usually associated with deviations from the constrained-efficient steady state (as this model), which is usually approximated, when possible, through the standard deviations of variables such as output, employment, and inflation (Bilbiie, 2008; Carreño and Uras, 2021; Galí, 2015; Galí and Monacelli, 2016).

[17] See for example, Figure 6 (a) for eurozone data about contractual flexibility.

[18] From the regression associated to Figure 6 (a), I find a $\beta^{flex} = -0.0005395$, which implies a GDP volatility reduction of 0.00809 for every 15% increase in the level of contractual flexibility (15×0.0005395).

Figure 5: Implied volatility of the model as a function of the share of flexible jobs.

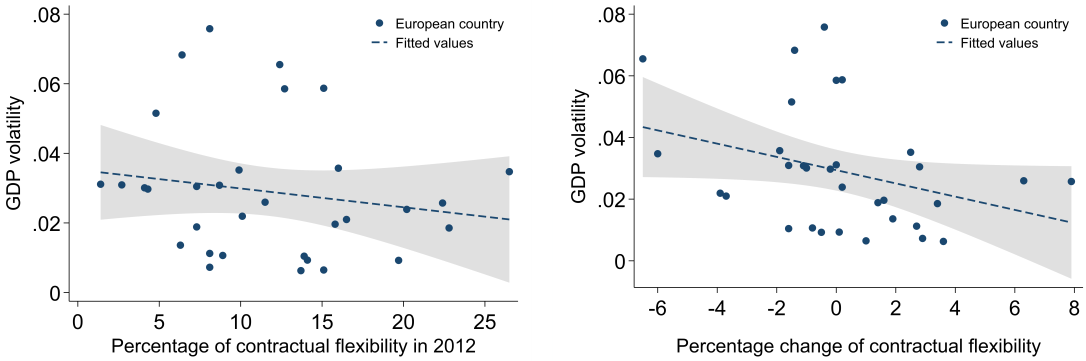


Notes: The figure shows the standard deviation of output, employment, the nominal interest rate, and inflation as a function of the share of flexible jobs. The RHANK model is the baseline model, so I divide the standard deviation of the variables under a RHANK-2J with different shares of flexible jobs by the standard deviation of these variables in the RHANK model. I express the standard deviation as a ratio to those under a RHANK model without flexible jobs, at that level the standard deviation is equal to 1.

relationship between the volatility of flexible employment over permanent employment as a function of the share of flexible jobs. Since the RHANK model does not include flexible employment, the volatility measure is zero when the proportion of flexible jobs is zero. The unweighted graph shows the total employment volatility for each group of workers, while the weighted graph shows the employment volatility per worker for each group.

In Figure 7, the unweighted graph shows that the volatility of flexible employment to permanent employment is increasing in the share of flexible jobs. This finding is consistent with the larger use of flexible employment (instead of permanent employment). In contrast, the weighted graph shows that the volatility per worker is decreasing in the share of flexible jobs. As flexible workers serve to absorb economic shocks, they need to overcompensate in terms of employment fluctuations. Therefore, a higher number of flexible workers aids in mitigating the volatility-per-worker ratio. Remarkably, my model reproduces a volatility pattern that is largely consistent with the data. When compared to my baseline specification of 15% flexible employment, I estimate that an increase in the share of flexible jobs would reduce the standard deviation ratio to a value of 1.7, resulting in a 70% increase in employment volatility (as shown in Figure 7). In the Appendix, I

Figure 6: Cross-country relationship between contractual flexibility and GDP volatility.



(a) (b)

Notes: This figure shows the relationship between contractual flexibility and GDP volatility for 32 European countries. I calculate the GDP volatility as the standard deviation of GDP growth over the years 2010-2019. The percentage change of contractual flexibility (2019 vs. 2012) corresponds to the measure of workers under a fixed-term contract. Data from Eurostat.

show that the worked hours volatility, which is a raw measure of employment volatility, is 78% higher for workers under flexible contracts over the average worked hours volatility.

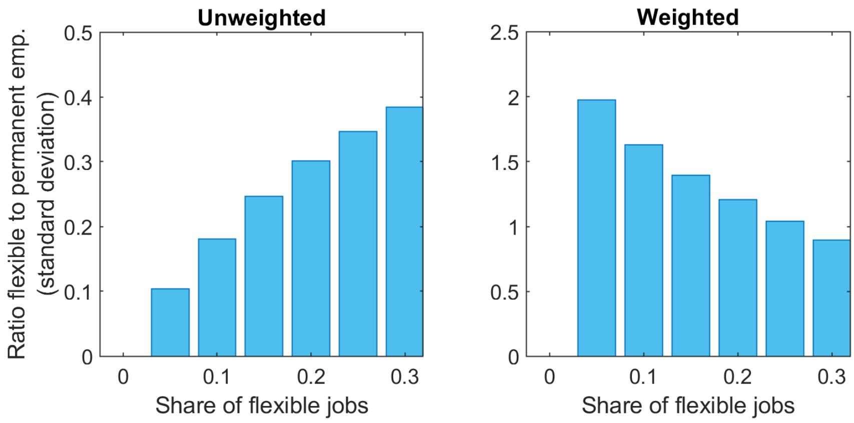
My findings in Figures 5, 6, and 7 suggest that while higher contractual flexibility reduces output volatility, a few flexible workers suffer an extreme level of employment volatility. Since workers are risk-averse, they are affected by high employment volatility. Therefore, it may be the case that flexible contracts are welfare-decreasing.

5.3 Macro-Welfare Effects of Flexible Contracts

I measure how welfare changes when I consider a steady state with a different share of flexible jobs (Kim and Kim, 2003; Schmitt-Grohé and Uribe, 2007). Because it is not possible to arrive at an analytical approximation of the welfare function that allows me to decompose welfare effects, my welfare measure is given by the discounted lifetime utility of an average household (i.e., unconditional welfare).[19] This is calculated with a second-order approximation of the value function and evaluated at the model's steady state (Figure 8 (a)) (Kim et al., 2008; Kim and Kim, 2003). To derive an alternative interpretation of welfare improvements, I express the gains and losses of the agents in terms of consumption equivalent (CE) variation (Figure 8 (b)), that is, the maximum fraction of consumption ξ that the agents would be willing to forgo (in perpetuity) in an economy with $A\%$ share of flexible jobs to join an economy with $B\%$ share of flexible jobs. Formally, ξ must satisfy

[19] In the context of macro models with household heterogeneity, there have been some advances in welfare decomposition (see, for example, Bhandari et al., 2023). However, this is still ongoing research.

Figure 7: Flexible employment volatility as a function of the share of flexible jobs.



Notes: The figure shows the relationship between the volatility of permanent and flexible employment as a function of the share of flexible jobs. The RHANK model is the baseline model and the RHANK-2J is the model for the rest of the simulations. The left-figure shows the standard deviation of flexible employment to the standard deviation of permanent employment. The right-figure shows the standard deviation of flexible employment to the standard deviation of permanent employment weighted by the share of flexible jobs (to compare the standard deviation between equivalent number of workers).

$$\mathbb{E}\left[\sum_{k=0}^{\infty}\beta^k \ln(c_{t+k}^A(1+\xi))\right] \equiv \mathbb{E}[W_t^A(\xi)] = \mathbb{E}[W_t^B] \equiv \left[\sum_{k=0}^{\infty}\beta^k \ln(c_{t+k}^B)\right], \tag{42}$$

where c_t^A and c_t^B stand for aggregated consumption (from the central planner's point of view). Solving equation (42) for ξ, I find

$$\xi = exp((1-\beta)\,\mathbb{E}[W_t^B] - \mathbb{E}[W_t^A])) - 1. \tag{43}$$

Therefore, the CE variation is positive when the economy with $B\%$ share of flexible jobs is the one with the highest welfare. This implies that the agents would require $\xi \times 100$ percent of consumption (extra) each period to be willing to remain in an economy with $A\%$ share of flexible jobs.

Figure 8 (a) shows the relationship between welfare and the share of flexible jobs. I express welfare as a ratio to those under a RHANK-2J model without flexible jobs (i.e., a RHANK model), at which level the welfare is equal to 1. As Figure 8 (a) shows, the relationship between the welfare measure and the share of flexible jobs is non-monotonic. Starting from a model without flexible jobs, an increase in the share of flexible jobs raises welfare by around 1%. However, a further increase in the share of flexible jobs leads to a decline in welfare, although the welfare measure is lower than the baseline value (that is, the welfare measure of lower than one) only when the share of flexible jobs is higher than 10%. To further quantify the welfare consequence of flexible contracts, Figure 8 (b) shows the welfare consequences of flexible contracts in terms of consumption equivalents.

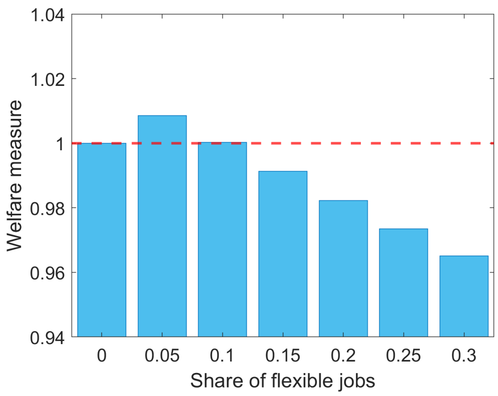
While the welfare gains of an economy with 5% of flexible jobs, relative to an economy without flexible jobs, are 0.5 percent of lifetime consumption, the costs of a higher share of flexible jobs are significant: 1.25 percent of lifetime consumption (for a 20% share of flexible jobs).[20]

I compare my results with Cahuc and Postel-Vinay (2002). Cahuc and Postel-Vinay (2002) study the desirability of temporary jobs, which are a form of flexible jobs, from a welfare point of view and calculate welfare as a function of the number of short-term contracts authorized by the government and the fixed cost of terminating any contract. Although my model is different, I estimate that my welfare changes are close in *magnitude* when compared Cahuc and Postel-Vinay (2002) (between 0.5% and 1% for 15% change in the share of temporary jobs). However, my results contrast with those of Cahuc and Postel-Vinay (2002), who find that temporary jobs are always welfare-increasing. While my model assumes an imperfect-insurance setting, Cahuc and Postel-Vinay (2002) assume a perfect-insurance setting. To explore the impact of this assumption on the relationship between flexible jobs and welfare, I also estimate my model under a perfect-insurance setting in the Appendix. Figure A5 shows that flexible jobs are always welfare-increasing. This is because, in a perfect-insurance setting, workers are fully protected against any risks associated with flexible jobs, such as the risk of job loss. Therefore, the potential costs of contractual flexibility, such as reduced job security, are not important in a perfect-insurance setting, and the benefits of flexible jobs, such as greater wage flexibility, are fully realized.

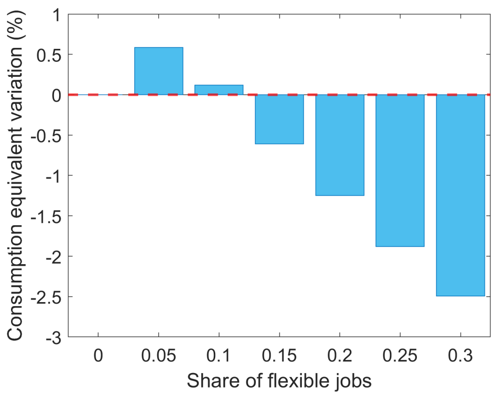
I perform several robustness checks and confirm that the results shown in Figure 8 are robust to different parameterizations of the wage rigidity parameter or the monetary policy rule. To understand the factors behind such a pattern in Figure 8, I examine the standard deviation of important model variables in Appendix B. I do this because movements around the efficient steady state are costly for households, and thus higher volatility is associated with a lower welfare measure. I conclude that the excessive fluctuations in flexible employment most likely explain the non-monotonic relationship between welfare and the share of flexible jobs.

[20] To put these numbers in perspective, I use the results of Bayer et al. (2019). In a DSGE model with precautionary savings and two assets to smooth consumption, Bayer et al. (2019) estimate that one standard deviation increase in household income risk (i.e., an increase in the variance of income shocks of 54%) depresses welfare equivalents to 0.27 percent of lifetime consumption on average.

Figure 8: Welfare as function of the share of flexible jobs.



(a) Welfare



(b) Consumption equivalent (%)

Notes: The figure shows the relationship between welfare and the share of flexible jobs. I approximate the utility function up to a second order to calculate welfare, and I focus on the unconditional welfare to rank the counterfactual simulations with different share of flexible jobs. I express welfare as a ratio to those under a RHANK model without flexible jobs, at which level the welfare is equal to 1. Figure (a) plots a welfare measure. Figure (b) plots the consumption equivalent (CE) variation, that is, the maximum fraction of consumption ξ that the agents would be willing to forgo in an economy with $A\%$ share of flexible jobs to join an economy with $B\%$ share of flexible jobs. The units are in consumption perpetuities.

6 Concluding Remarks

This paper has analyzed the macro-welfare implications of flexible contracts. To quantify the role of flexible contracts in stabilizing the economy, I have used a New Keynesian model that features an endogenous income risk arising from the combination of precautionary saving motives and the endogeneity of labor market transitions. As a result, I find that a even small share of flexible contracts can rapidly reduce aggregate demand fluctuations in the economy, which enhances welfare outcomes. However, this welfare-enhancing role of flexible contracts comes at a cost to flexible workers, resulting in substantial employment volatility for this group. This trade-off between the overall volatility of the economy and the employment volatility of flexible workers leads to a non-monotonic relationship between welfare and the share of flexible contracts in the economy.

My results have important policy implications for a wide range of developed countries that have growing and large flexible sectors. Specifically, these results highlight the importance of flexible contracts in stabilizing the business cycle. However, policymakers must ensure that all workers benefit from these contracts. In addition, my results suggest that flexible contracts, fiscal stabilizers, and unemployment insurance can complement each other as macroeconomic policies to reduce output volatility.

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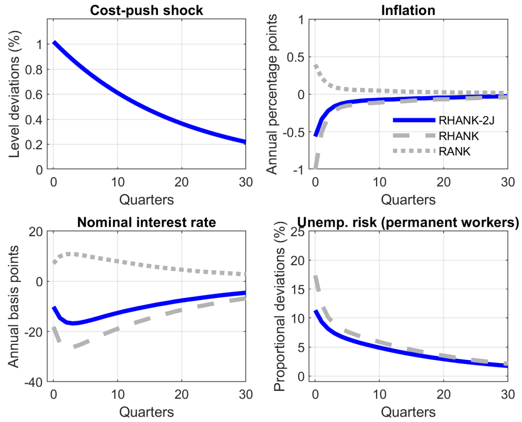
APPENDIX

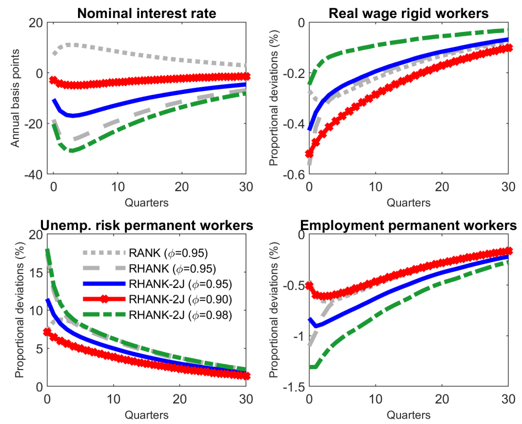
A Figures and Tables

Figure A1: Impulse responses to a cost-push shock.



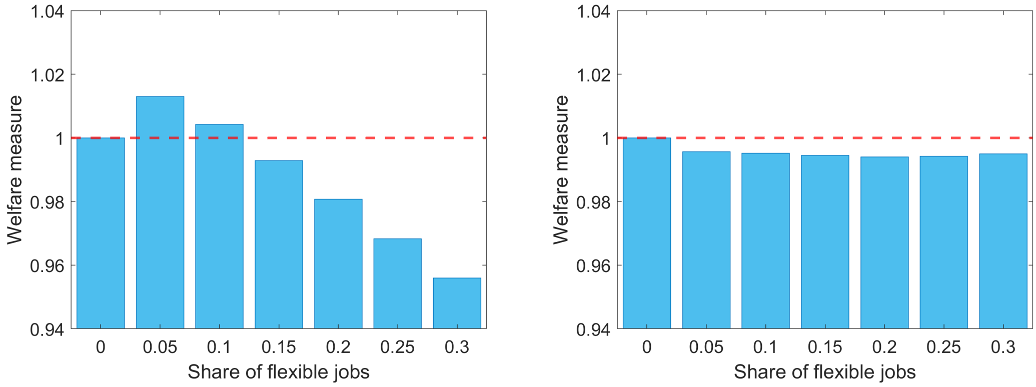
Notes: The figure shows the impulse response to a cost-push shock under a monetary policy rule for inflation, nominal interest rate, and the unemployment risk of permanent workers. I consider three models: imperfect insurance with only permanent jobs in steady state (RHANK); imperfect insurance with a 15% of flexible jobs in steady state (RHANK-2J); and perfect insurance limit with only permanent jobs in steady state (RANK). Proportional deviations represent the percentage deviations of the unemployment risk from the steady-state value.

Figure A2: Impulse response to a productivity shock for different degrees of wage rigidity (ϕ).



Notes: The figure shows the impulse responses to a productivity shock for the nominal interest rate, the real wage of permanent workers, the unemployment risk of permanent workers, and the employment for permanent workers under a model with imperfect insurance and 15% of flexible jobs in steady state (RHANK-2J). Proportional deviations stand for the percentage deviations of the unemployment risk from the steady state value.

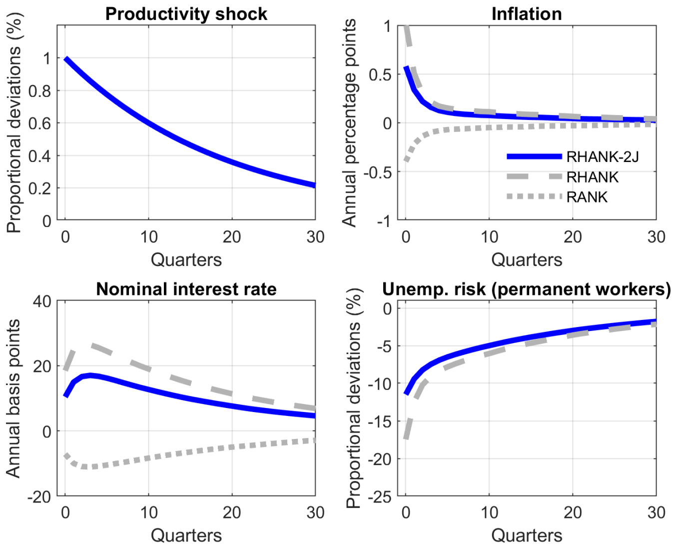
Figure A3: Welfare as function of the share of flexible jobs for different values of the loss upon unemployment.



(a) Loss upon unemployment, 20% (b) Loss upon unemployment, 0%.

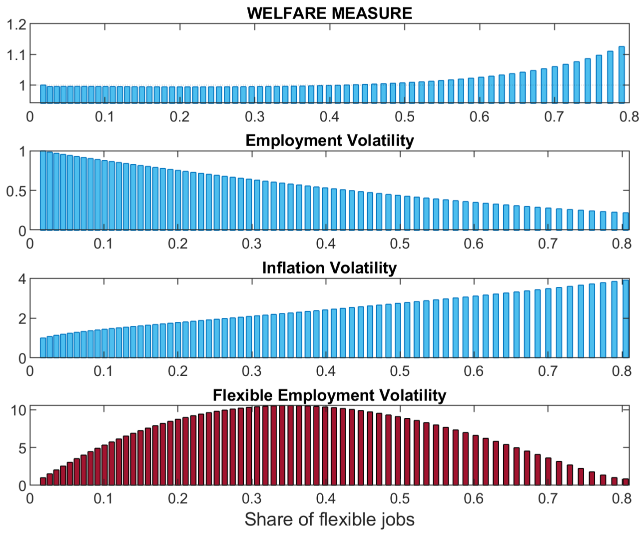
Notes: The figure shows the relationship between welfare and the share of flexible jobs for different values of the loss upon unemployment. Panel (a) assumes a loss upon unemployment of 20% (the baseline value is 10%). Panel (b) assumes a loss upon unemployment of 0% (so, it is a RANK-2J when the share of flexible jobs is positive). I express welfare as a ratio to those under a RHANK/RANK model without flexible jobs, at which level the welfare is equal to 1. I use the RHANK-2J/RANK-2J for the rest of simulations.

Figure A4: Impulse responses to an expansionary productivity shock.



Notes: The figure shows the impulse response to a productivity shock under a monetary policy rule for the inflation, nominal interest rate, and the unemployment risk of permanent workers. My baseline specification is the model with imperfect-insurance and 15% of flexible jobs (RHANK-2J). I compared it to two alternative models: (1) the model with perfect-insurance and without flexible jobs (RANK); and (2) the model with imperfect-insurance and without flexible jobs (RHANK). Proportional deviations stand for the percentage deviations of the unemployment risk from the steady state value (see calibration section for more details about the steady state values).

Figure A5: Welfare and standard deviation of important variables of the RANK-2J model.



Notes: The figure shows welfare and the standard deviation of employment, inflation, flexible employment, and inflation as a function of the share of flexible jobs. I assume that the income upon job loss is 0%, so the simulations correspond to a RANK-2J model. I express welfare as well as the volatility measures as a ratio to those under a RANK model without flexible jobs, at which level welfare or the volatility measure is equal to 1.

Table A1: Characterization of flexible contracts in the Netherlands.

	Volatility worked hours	Volatility gross wage	Unemp. (next year)
	(1)	(2)	(3)
Flexible contracts	0.155***	0.0133***	0.0165***
	(0.000279)	(0.000191)	(0.000311)
Mean (dependent variable)	0.198	0.436	0.049
Controls:			
Worker FE	Yes	Yes	Yes
Industry × year FE	Yes	Yes	Yes
Polynomial term age	Yes	Yes	Yes
Months flexible contract	Yes	Yes	Yes
Observations	41,059,546	41,059,546	34,772,891
R2	0.611	0.717	0.327

Notes: This table characterizes flexible contracts. I run the following the regression $Q_{i,t} = \phi \mathbf{1}_{it}^{Flex} + \boldsymbol{X\beta} + \alpha_i + \epsilon_{i,t}$, where $Q_{i,t}$ may be any of the following variables: the volatility of worked hours within a year, the volatility of the gross wage within a year, and a dummy variable for being unemployed next year; $\mathbf{1}_{it}^{Flex}$ is a dummy for employment under a flexible labor contract at the end of year; $\boldsymbol{X}$ includes a polynomial term on age (normalized to 40 years old), number of months under a flexible labor contract within a year, and industry-year fixed effects; α_i are worker fixed effects; Finally, $\epsilon_{i,t}$ is the error term. I consider workers from 25 to 55 years old. I drop extreme values. Robust standard errors at the worker level. t-statistics in parentheses. Data selection is described in Section 2 for further reference.

Table A2: Difference in the nominal interest rate reaction for a model with and without flexible jobs under different parametrizations of the monetary policy rule.

Monetary policy rule: $i_t - i = \mu_\pi(i_{t-1} - i) + (1 - \mu_\pi)\phi_\pi \pi_t + \xi_t$

Panel A: Productivity shock	Interest-rule inertia: μ_π					
	$\mu_\pi = 0$	$\mu_\pi = 0.25$	$\mu_\pi = 0.55$	$\mu_\pi = 0.75$	$\mu_\pi = 0.85$	$\mu_\pi = 0.95$
Reaction to inflation: ϕ_π						
	Annual basis points:					
$\phi_\pi = 1.5$	12.14	11.48	10.77	9.32	7.70	4.22
$\phi_\pi = 2.5$	6.59	6.54	6.44	6.16	5.68	4.11
$\phi_\pi = 3.5$	5.47	5.52	5.46	5.36	5.11	4.08
$\phi_\pi = 4.5$	4.98	5.08	5.02	5.00	4.84	4.07
Panel B: Cost-push shock						
$\phi_\pi = 1.5$	12.27	11.59	10.83	9.35	7.73	4.29
$\phi_\pi = 2.5$	6.69	6.62	6.51	6.20	5.71	4.18
$\phi_\pi = 3.5$	5.56	5.60	5.53	5.42	5.15	4.15
$\phi_\pi = 4.5$	5.07	5.15	5.09	5.06	4.88	4.13

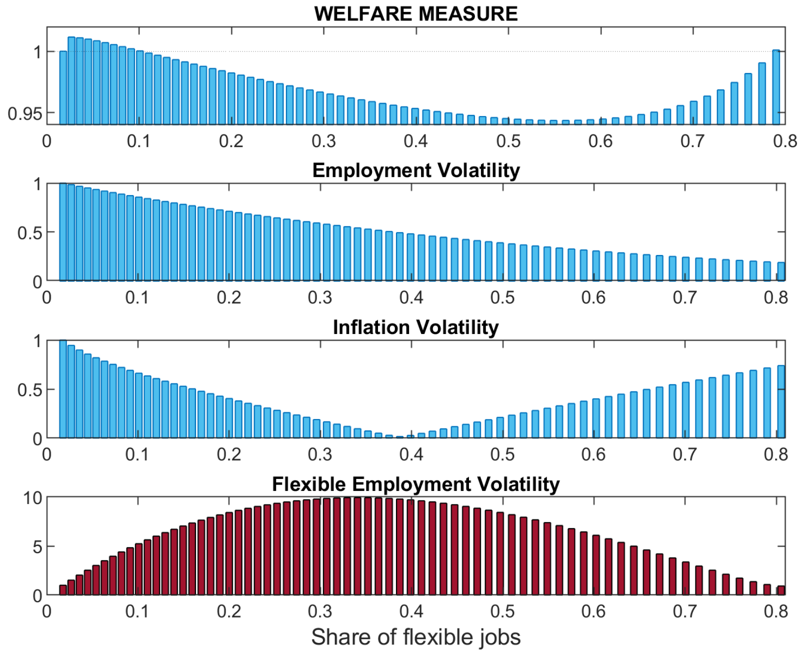
Notes: This table shows the difference in the nominal interest rate reaction for a model with and without flexible jobs under different parametrizations of the monetary policy rule. I compare two models with imperfect-insurance, one without flexible jobs (RHANK) and the other one with flexible jobs (RHANK-2J). The difference is calculated as the maximum difference over a 30 quarters-period of the interest-rate reaction for a productivity shock (panel A) and cost-push shock (panel B). The bold cell represents the benchmark value under the main parametrization (Figure 2).

B Understanding the Factors Behind Welfare Changes

In order to understand the factors behind such pattern in Figure 8, I study the standard deviation of important variables of the model. As documented in the literature of optimal monetary policy (15; 25; 32; 33), maximizing the welfare function is equivalent to minimizing a loss-function, which is usually approximated (when possible) by a linear combination of the volatility of important variables of the model. Although in this case, it is not possible to arrive at an analytical approximation of the welfare function that allows me to decompose welfare effects, the aggregate welfare movements can be described in terms of the standard deviation of employment and inflation. Since movements around the efficient steady state are costly for households, higher volatility is associated with a lower welfare measure.

Figure A6 displays the welfare measure for a wider range of values for the share of flexible jobs (top panel) and the standard deviation of employment, inflation, and flexible employment. Figure A6 (top-panel), which is Figure 8 for a wider range of the share of flexible jobs, shows that the welfare measure increases when starting from a setting without flexible jobs to a level of around 1.01, to then steadily decrease up to a level of 0.94 (around a 60% share of flexible jobs). After this level, the welfare measure starts to increase again until to achieve a similar welfare level to the setting without flexible

Figure A6: Welfare and standard deviation of employment and inflation.



Notes: The figure shows the welfare measure and the standard deviation of employment, inflation, and flexible employment as function of the share of flexible jobs. I express welfare as well as the volatility measures as a ratio to those under a RHANK model without flexible jobs, at which level welfare or the volatility measure is equal to 1.

jobs.

I can explain this non-monotonic behavior of the welfare measure by studying the evolution of the standard deviation of the variables shown in Figure A6. Figure A6 shows that the volatility of all variables except flexible employment decreases over the interval $(0\% - 40\%)$, suggesting a higher welfare measure. However, the volatility measure of flexible employment increases rapidly over the same interval, from a level of 1 (under the RHANK model) to a level of around 10, when the share of flexible jobs is 40% (note that these are implausible values for the share of flexible job). This higher volatility for flexible employment helps to explain the decline in welfare over the interval $(0\% - 40\%)$, despite the decrease in the volatility of other important variables in the model.

Consistent with the previous explanation, welfare starts to rise when the volatility of flexible employment falls. After the share of jobs is larger than 40%, the volatility of flexible employment starts to rapidly fall, as a larger number of flexible jobs secures a lower-adjust per worker (consistent with Figure 7 (weighted)). This would imply a higher welfare measure. However, this movement is partially off-set by the rising volatility of inflation, a usually important component of the welfare-loss function (34). As a result, welfare starts to increase again after the share of flexible jobs exceeds 60%.[21]

C Social Welfare Function

To decentralize the efficient allocation, I derive the constrained efficient steady state by maximizing the joint welfare of households and capitalists subject to the initial conditions, the law of motion for inflation and the price dispersion index, and the relationship between employment and vacancies. I write the social welfare function as

$$W_t = U_t + \beta\, \mathbb{E}_t[W_t], \tag{A44}$$

where $U_t = n_t^p u(w_t^p) + n_t^f u(w_t^f) + (1 - n_t)u(\delta_t) + \Lambda\Theta\tilde{u}(C_t^F)$ and Θ is the relative welfare weight of capitalists (25). The efficient allocation is then the solution to

$$W_t(n_{t-1}^p, n_{t-1}^f, \Delta_{t-1}; z_t) = \max_{\{\tilde{p}_t, w_t^p, w_t^f, n_t^p, n_t^f\}} \Big\{ U_t + \beta\, \mathbb{E}_t[W_{t+1}(n_t^p, n_t^f, \Delta_t; z_{t+1})] \Big\},$$

subject to

$$\pi_t = [\omega^{-1} - (\omega^{-1} - 1)(\tilde{p})^{1-\iota}]^{\frac{1}{\iota-1}} - 1,$$

$$\Delta_t = (1 - \omega)(\tilde{p})^{-\iota} + \omega(1 + \pi_t)^{\iota}\Delta_{t-1},$$

$$v_t^p = \left[\frac{n_t^p - (1 - \rho^p)n_{t-1}^p}{m^p e_t^\gamma}\right]^{\frac{1}{1-\gamma}},$$

$$v_t^f = \left[\frac{n_t^f - (1 - \rho^f)n_{t-1}^f}{m^f e_t^\gamma}\right]^{\frac{1}{1-\gamma}}.$$

In the efficient allocation, the optimal resetting prices needs to be equal to one (no price distortions in steady state), so $\tilde{p}_t = 1$. The former result along with the initial conditions (no distortions) leads to an allocation with zero inflation and symmetric wholesale prices, $(\pi_t, \Delta_t) = (0, 1)$, for all t. Given this and the FOCs, the value of w_t^p and w_t^f satisfies:

$$\frac{u'(w_t^{p,*})}{\tilde{u}'\big(C_t^C\big)} = \frac{u'(w_t^{f,*})}{\tilde{u}'\big(C_t^C\big)}. \tag{A45}$$

[21] Eventually, welfare becomes larger than 1, which means that an economy with only flexible contracts is better than an economy with only permanent jobs (better adjustment).

Equation (A45) states that the efficient wage w_t^* is that which equates the marginal utilities of permanent workers and flexible workers. From the FOCs with respect to n_t^p and n_t^f, I can get the forward recursion for the constrained-efficient job-finding-rate for permanent and flexible workers

$$
\begin{aligned}
(f_t^{s,*})^{\frac{\gamma}{1-\gamma}} = & \left(\frac{(m^s)^{\frac{1}{1-\gamma}}}{\eta^s}\right)(1-\gamma)\left[z_t\chi^s - w_t^* + \frac{u(w_t^*) - u(\delta_t)}{u'(w_t^*)}\right] \\
& + (1-\rho^s)\,\mathbb{E}_t\left[MRIS_{t+1}^{C,*}(f_{t+1}^{s,*})^{\frac{\gamma}{1-\gamma}}(1-\gamma)f_{t+1}^{s,*}\right].
\end{aligned} \tag{A46}
$$

I decentralize the efficient allocation in steady state now. First, the efficient allocation has $(\tilde{p}_t, \pi_t, \Delta_t) = (1, 0, 1)$, which eliminates the price dispersion in the wholesale prices. Second, I set $\tau^W = 1/\iota$ to get a $\varphi_t = 1$ and thus correct for monopolistic competition. Third, I set $(\tau^{I,p}, \tau^{I,f}, T)$ in such a way of making the job finding-rate (equation (17)) and the constrained-efficient job finding-rate (equation (A46)) equivalents in steady state. So, I get

$$
T = \frac{u(w_t^*) - u(\delta_t)}{u'(w_t^*)}, \tag{A47}
$$

$$
\tau^{I,p} = 1 - \frac{(1-\gamma)[1-\beta(1-\rho^p)]}{1-\beta(1-\rho^p)(1-\gamma f^{p,*})}, \tag{A48}
$$

$$
\tau^{I,f} = 1 - \frac{(1-\gamma)[1-\beta(1-\rho^f)]}{1-\beta(1-\rho^f)(1-\gamma f^{f,*})}. \tag{A49}
$$

Equation (A47) corrects for the lack of insurance and equations (A48) and (A49) correct for congestion externalities in the labor market.