Consumption Commitments and Unemployment Insurance

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August 25, 2023

Abstract

Households allocate around 40% of their budget to goods and services that are difficult to adjust, such as rents, mortgages, or mobile plans, which are called "commitments". Only about 11% of households adjust the consumption of these goods every quarter. Commitments imply monthly payments that are hard to avoid and make employment and income fluctuations more costly. This paper analyzes the role of unemployment insurance in the presence of commitments using a heterogeneous agents search model with incomplete markets and unemployment shocks. The model is calibrated to the US data and matches key features of the US labor market. Using this framework, we show that the existence of commitment goods amplifies the effects of unemployment insurance on search effort and unemployment duration. Commitments also induce households to build larger precautionary savings. Morover, we show that welfare gains from elimating UI increase from 3.4% to 4.2% when commitments are considered. The optimal replacement rate is 57% in the benchmark economy, higher than the current US policy (50%).

JEL Codes: E2, H2, I38, J64.

Keywords: Unemployment, Consumption Commitments, Precautionary Savings, Optimal Unemployment Insurance

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I am indebted to Nezih Guner for his encouragement and support throughout this project. I thank Christian Bayer, Sebastián Fanelli, Keith Kuester, Claudio Luccioletti, Jinfeng Luo, Pedro Mira, Borja Petit, Josep Pijoan-Mas, Morten Ravn, Yongkun Yin, and seminar participants at Macroeconomics Reading Group (CEMFI), PhD Workshop (CEMFI), EEA Summer Meeting (2022), Symposium of the Economic Association (2022), Universitat de les Illes Balears, Bank of Spain and University of Barcelona for helpful comments and suggestions. I also thank Alfredo Aguado for giving me access to high speed computing at Universidad Autónoma de Madrid. Support by the German Research Foundation (DFG) through CRC TR 224 (C05) is gratefully acknowledged.

1 Introduction

Households allocate a significant part of their budget to goods or services that are costly to adjust, the so-called "consumption commitments". These commitments include mortgage or rental payments, insurance payments, or mobile phone plans. They imply predetermined, regular (typically monthly) payments that can't be easily avoided and limit households' ability to adjust consumption. Theoretical analysis by Chetty and Szeidl (2007) shows that commitments increase the welfare cost of adverse income shocks since the consumption adjustment is almost entirely made through adjustable goods, such as food, entertainment, transport, etc.

Unemployment spells are one of the most important negative income shocks that households experience throughout their working life. Around 1.3% of individuals transit from employment to unemployment each month in the US, and the average duration of unemployed individuals is around 4.7 months (Current Population Survey, 2017-2019).

Unemployment insurance is the main government program that supports unemployed individuals. In the US, a worker, who has been employed at least for a year, can receive UI benefits for up to 6 months if she becomes unemployed. Yet, for 23% of households, unemployment can last for more than 6 months. Ganong and Noel (2019) find that households' expenditures drop by more than 12% once the entitlement period ends. In 2017, around 2.6% of households received unemployment insurance at some point during the year. The numbers were much higher during the great recession (7.7% in 2009) and COVID-19 crisis (12.4% in 2020).

The benefits of the UI program depend critically on how much it helps households smooth their consumption (Gruber 1997). These benefits have to be weighted against the negative labor supply incentives it creates (Baily 1978, Chetty 2008). There is an extensive literature in macroeconomics that studies the impact of UI programs on labor markets and tries to evaluate its costs and benefits. The existing analysis, however, abstracts from consumption commitments. This is surprising since households devote a significant fraction of their budget to commitments. In this paper, we fill this void in the literature. We ask: How do commitments affect the search behavior of unemployed individuals? How does it affect their savings?

How valuable are the UI programs in an economy with commitments?

To answer these questions, we first present evidence on the importance of commitments. Using the Consumer Expenditure Survey (CEX) and the Survey of Income and Program Participation (SIPP), we show that a small fraction of households adjust shelter (2.1%), insurance (30%) or phone payments (40%) every quarter. The expenditure on these services amounts to almost 40% of household expenditures. In contrast, 80-90% of households adjust food, transport or entertainment expenses each quarter. We also show that consumption expenditures on commitments barely change during unemployment, while consumption of food, transport and entertainment fall by 15 to 25%. Thus, the consumption adjustments during unemployment are mainly made through the "adjustable goods" margin, making unemployment spells more painful. As a result, individuals with commitments have higher incentives to leave unemployment. Indeed, renters or individuals with mortgage payments are more likely to leave unemployment than homeowners. Even after controlling for observable characteristics, individuals with commitments have 27% higher hazard rate of exiting unemployment each month.

Next, we build an infinite horizon, search model with heterogeneous agents and incomplete markets with two goods, an adjustable good and a commitment good. Individuals are heterogeneous in their labor productivity, which consists of a persistent component and a fixed component. The fixed types capture college and non-college individuals in the data. Individuals face exogenous unemployment shocks and decide how much effort to exert to find a new job when they are unemployed. The government taxes income and runs an unemployment insurance program. The model period is a month, and unemployed individuals can receive unemployment benefits for a maximum of 6 months, with a replacement rate of 50% up to a cap. Furthermore, the probability of finding a job decreases with unemployment duration so that the model can generate a distribution of durations in unemployment consistent with the data. The model captures the key trade-off for the UI design. On the one hand, the UI provides transfers to individuals when the marginal value of such transfers is very high. On the other hand, transfers reduce search effort and have to be financed by increasing distortionary taxes.

We calibrate the model's parameters to the US data for the 2017-2019 period.

The model reproduces the share of commitments in household budgets and the fraction of households who adjust their consumption of commitments. It also captures the distribution of unemployment durations and moments of the wealth distribution. The model also generates a realistic fraction of hand-to-mouth households, whose ability to smooth consumption is low. Furthermore, the model can generate an elasticity of unemployment duration with respect to unemployment insurance benefit duration that is consistent with available micro evidence.

We then use the calibrated model to study the importance of commitments. We first show that commitments increase precautionary savings and the marginal propensity to consume significantly. If we set the cost of adjustments for commitments in the benchmark economy to zero, i.e., make both goods fully adjustable, median savings decline by 40% and average savings by 15%. The marginal propensity to consume is 37% higher with commitments. In fact, commitments allow the model to generate an average marginal propensity to consume consistent with empirical studies, while without commitments the marginal propensity to consume is too low.

Next, to examine the effects of commitments on search effort and unemployment durations, we eliminate UI by reducing the replacement rate from its benchmark value of 50% to zero (no unemployment insurance case). We do this both in the benchmark economy and an alternative economy without commitment goods. The model without commitments matches the same moments as the benchmark economy, except those regarding commitments. When unemployment insurance is eliminated, the unemployment duration reduces by 12% in the benchmark, while the fall is only 8% in the economy without commitments. Similarly, the effort exerted to find a job increases faster in an economy with commitments, as households have larger incentives to move out of unemployment.

Finally, we quantify the welfare benefits of unemployment insurance, focusing again on the benchmark versus no-commitments economy. The welfare benefits of unemployment insurance in the benchmark are significant: eliminating unemployment insurance implies a median welfare loss of 4.2%, measured in consumption variations (of the adjustable good). The loss, however, is much lower in an economy without commitments, 3.4%. The loss for non-college individuals is more significant,

5.3% in the benchmark and 4.5% in the no-commitments economy. We find that the optimal, welfare-maximizing, UI replacement rate in the US should be 57%, higher than the current US policy (50%).

1.1 Related Literature

This paper is related to three strands of the literature. First, it is related to the literature on consumption commitments. Chetty (2003) and Chetty and Szeidl (2007) show how commitments amplify the welfare costs of adverse income shocks since households have to concentrate reductions in consumption on the adjustable goods' margin (like food). Chetty and Szeidl (2016) explore the differences between models with consumption commitments and habit formation. While both models behave similarly for small and moderate shocks, in commitment models, agents can sharply reduce commitments in the face of extreme events, which is consistent with empirical evidence. Other papers have studied the implications of commitments for different economic outcomes, e.g., wage rigidities (Postlewaite, Samuelson, and Silverman 2008), housing consumption (Shore and Sinai 2010), and marriage behavior (Santos and Weiss 2016). We bring insights from this literature into a quantitative macro model of unemployment insurance.

Second, the paper is related to the empirical studies on the welfare value of unemployment insurance. Traditional approaches, carried by Baily (1978) or Gruber (1997) among others, are based on measuring consumption changes after job loss and then scaling by the risk aversion coefficient to estimate the welfare value of UI. This literature finds significant but moderate consumption drops after unemployment events and a low value of unemployment insurance for standard levels of risk aversion. These findings have been revisited by recent studies. Landais and Spinnewijn (2021) use differences in the marginal propensity to consume of employed and unemployed and find significant welfare gains from unemployment insurance.[1] Giupponi, Landais, and Lapeyre (2021) suggest that unemployment insurance offers more insurance value than other programs like short-time-work (widely used in Europe during the COVID-19 recession), but that both programs are good comple-

[1] Hendren (2017) finds that existing willingness to pay measures underestimate the value of UI due to individuals' knowledge of future job loss.

ments during recessions.

Finally, there is an extensive literature that studies unemployment insurance within quantitative macroeconomic models. Following Bewley (1986), Huggett (1993), Aiyagari (1994) tradition in macroeconomics, these papers emphasize the importance of heterogeneity and insurance, features that imply a high optimal replacement rate for UI programs. Hansen and Imhoroğlu (1992) study optimal UI in a model with incomplete markets where agents can reject employment opportunities and collect UI benefits. Abdulkaridoğlu, Kuruşçu, and Şahin (2002) extend their environment to an economy where agents can hide savings.

On the other hand, the adverse effects of UI on search behavior, as emphasized by Chetty (2008), and on job creation, as stressed by Krusell, Mukoyoma, and Sahin (2010), can imply low, even zero, replacement rates. Among recent contributions, Setty and Yedid-Levi (2021) find that the optimal replacement rate should be 27%, and that UI can be very valuable for individuals at the bottom of the wealth distribution. Choi and Valladares-Esteban (2020) find that the optimal replacement rate should be close to zero for married couples since household labor supply can provide enough insurance. Similarly, Haan and Prowse (2020) emphasize the importance of other welfare programs and find a minimal role for unemployment insurance.[2] We complement this literature by exploring the importance of unemployment insurance under the presence of commitments.

The rest of the paper is organized as follows. Section 2 presents evidence on commitments. Section 3 describes the model economy. Section 4 discusses the calibration. Section 5 presents the effects of unemployment insurance on unemployment duration in an economy with commitments. Section 6 discusses the value of UI in an economy with commitments. Finally, section 7 concludes.

[2] Within this literature, other papers focus on how UI should vary over the business cycle, e.g., Mitman and Rabinovich (2015), Jung and Kuester (2015), and Landais, Michaillat, and Saez (2018), or UI as an automatic stabilizer within models with nominal rigidities, e.g., Kekre (2022), McKay and Reis (2021), Nakajima (2012) and Hagedorn, Karahan, Mitman, and Manovskii (2013) study the role of UI extensions during the Great Recession.

2 Facts

2.1 Commitments

In this section, we document how often households adjust their consumption expenditures for different goods. The main data source is the Consumer Expenditure Survey (CEX hereafter) from 2017 to 2019. The CEX is conducted by the U.S. Bureau of the Census, and provides detailed information on how much households spend on products and services, together with other socio-economic variables, such as demographic characteristics, income, assets and employment.

The CEX consists of two surveys: the Interview Survey and the Diary Survey. The analysis in this section uses the Interview Survey. The Interview Survey is a rotating panel in which households are asked to report their expenditures for different items for the previous 3 months. Around 7,100 consumer units are interviewed for a maximum of four consecutive calendar quarters, and around 25% of the sample in every quarter are new families interviewed for the first time. The Interview Survey contains data on purchases of goods and services like food, transport, rent, insurance, cars, etc. which amount to around 95% of all household expenditures.[3]

Table 1 shows the fraction of households adjusting expenditures from one quarter to the next for different goods and services and the share of each item in total household expenditures for non-durable goods.[4] For any consumption item i, the fraction of households adjusting consumption of that good in quarter t is computed as the share of households whose expenditure changes by more than 10% from quarter $t-1$ to quarter t.[5] This is done for all items in the first column of Table 1, except for shelter.

While the CEX contains rich data on consumption and surveys households for a maximum of 4 quarters, it does not follow households that change their residence.

[3] The Diary Survey is conducted for a period of two consecutive 1-week periods where the household must complete a diary of expenditures, and it is meant to capture very high frequency expenditures.

[4] The analysis abstracts from durable goods, since their expenditure is infrequent and consumption does not require a periodic payment. Shelter (or housing services) is included since almost 80% of households pay either a mortgage or a rent, i.e. they make a periodic payment.

[5] In Appendix A, we have explored other thresholds for the definition of adjustment, in particular, we present Table 1 for thresholds of 1% and 5%. While the fraction adjusting for every item increases, we find a clearly difference in adjustment rates for commitments and the other goods.

This poses a limitation to analyze the dynamics of payments related to shelter, i.e. rents, mortgages, housing insurance, etc. Expenditure changes in these items are likely to be due to households moving to a new house and getting a new mortgage, housing insurance, or paying a different rent. As a result, to overcome this limitation, we use the Survey of Income and Program Participation (SIPP hereafter) from 2015-2018. The SIPP is a continuous series of panels in which households are interviewed every quarter, for up to four years, about income, taxes, transfer government programs, assets and demographic characteristics. The SIPP includes a binary variable for each month that indicates whether the household has moved to a new house, which can be used to compute the fraction of households that move.

For shelter in Table 1, we use SIPP and compute adjustments as the fraction of households that move to a new address from quarter $t-1$ to quarter t. Our approach follows Chetty and Szeidl (2007), who compute the fraction of households adjusting shelter expenditures based on households who move to a new address in the Panel Study of Income Dynamics (PSID).

The second column in Table 1 reports the expenditure share of each item in households' total expenditure. We take the first quarter of 2018 and aggregate expenditures of each item for all households and divide them by total expenditures.[6]

The critical message from Table 1 is that a significant fraction of households adjusts their expenditures on goods like food, transport, entertainment, or utilities each quarter. Almost 80% of households adjust their food consumption, while the share that adjusts transport or entertainment is above 80%.

On the other hand, a much smaller fraction of households adjust shelter (payments on mortgages, rents, and housing insurance), phone services, or insurance contracts (life, vehicle, or health). The fraction that adjusts these items is well below 50%; around 30% for most items, and only 2.1% for shelter, which reflect their nature as commitment goods.

In total, adding the expenditure shares of commitments, the consumption of commitments amount for around 40% of household expenditures other than durables. This figure is close to the one found by Chetty and Szeidl (2007), who estimate

[6] The choice of a specific quarter is done to reduce sample attrition bias, since some households appear for less than 4 quarters. We have checked computing those figures for several different quarters and years and expenditure shares remain essentially the same.

Table 1: Fraction of Households Adjusting between two Quarters

	% Adjust	Expenditure Share
Food	78.1%	21.1%
Utilities	71.9%	5.8%
Transport	87.0%	22.5%
Entertainment	85.2%	6.3%
Shelter	2.1%	27.2%
Phone	40.6%	2.6%
Life insurance	29.5%	0.8%
Vehicle insurance	33.8%	3.0%
Health insurance	30.4%	5.9%

Note: All the figures are obtained from CEX (2017-2019), except for fraction adjusting shelter which is computed as the fraction of movers using the SIPP. See the text for more details.

that around a half of household expenditures are commitments. The fraction of households adjusting commitments can be computed as the weighted average of the fraction of households adjusting each item weighted by their expenditure share. We obtain that about 11% of households adjust commitments each quarter.

In Appendix B, we reproduce Table 1 conditional on the socioeconomic characteristics of household heads. We focus on education groups (college vs. non-college), marital status (married vs. single), and whether children are present at home. The expenditure shares and fraction of households that are adjusting are pretty similar for these the groups. The singles tend to spend a larger fraction of their expenditures on commitments, 43%, than married couples, 38%, and are more likely to move, but differences are rather small.

2.2 Unemployment and Commitments

Next, we study whether households are less likely to adjust commitments and other goods during an unemployment spell. This is critical to understand how much households can smooth consumption during an unemployment spell and, as a result, how much they value unemployment insurance.

While the CEX has very rich information on consumption categories, information on labor market outcomes is much more limited. Information on employment status is gathered in the first and fourth interviews of the CEX, and only provides the number of weeks worked during the previous 12 months. However, no specific

question about the employment status of the head of the household, i.e. a categorical variable on whether the head is employed, unemployed or out of the labor force, at the time of both interviews is asked.[7] This poses important limitations. First, given that questions on employment are asked in the first and the last interviews, which are three quarters apart, the analysis can only be done on an annual basis (not quarterly, as in Table 1). However, around 75% of unemployed individuals have unemployment durations that are less than 6 months, and they can receive unemployment insurance benefits for at most 6 months. As a result, an analysis on annual frequency will not capture how unemployment affects household expenditures. Second, the lack of a specific question about employment status makes it impossible to determine whether the household head is unemployed in the last interview. We only know the fraction of weeks they did not work during the previous year. Therefore, Table 1 cannot be replicated for unemployment events, and a different strategy should be used to study the consumption adjustments during unemployment.

To overcome these limitations, we follow Chodorow-Reich and Karabarbounis (2016), and use the number of weeks worked in the previous 12 months (asked in the last interview of each household) as a measure of unemployment exposure. Then, we study how households' annual expenditure on different consumption items is related to their exposure to unemployment during the year. In particular, we can run the following regression for each good category k:

$$\log C_{kit} = \gamma_k^0 + \beta_k X_{it} + \gamma_k^u D_{it}^u + \gamma_k^n D_{it}^n + \epsilon_{kit}, \tag{1}$$

where C_{kit} corresponds to consumption of good k by individual i in year t, X_{it} denotes a vector of socioeconomic characteristics, D_{it}^u and D_{it}^n are the fraction of time individual i spends as unemployed and out of the labor force in year t, respectively. Parameter γ_k^u (γ_k^n) measures the log point difference of consumption of good k between a household whose head is unemployed (out-of-the labor force) with respect to that of the same good of households whose head is employed.

Since, as pointed out above, the CEX does not ask questions about job search, we set $D_{it}^n = 1$ if the household head reports not having worked at all in the previous year. For the rest of households, D_{it}^u is defined as the fraction of weeks the household

[7] See Gruber (1998) and Aguiar and Bils (2015) for further discussion.

head has not worked, that is, $D^u_{it} = 1 - (\text{weeks worked})_{it}/52$. We use cross-sectional variation to identify the change in consumption as a consequence of unemployment. For that purpose, we need an extensive vector of controls, X_{it}, so that differences in ex-ante permanent income are absorbed. The control variables include region and year fixed effects, housing tenure categorical variable, liquid savings, a polynomial of order 2 in the age of the household head, a polynomial of order 2 in household size, an indicator for marital status, the number of children below age 16, an indicator variable for education of the head interacted with year dummies, number of cars, race of the household head and rental value of the home splitted into deciles by region and year.[8]

The results are presented in column 1 of Table 2. Estimates for γ^u imply a statistically significant decline for food, entertainment and transportation expenditures of between 15 and 25% during unemployment.[9] In contrast, if we focus on commitments, like shelter or insurance contracts, the decrease in consumption is not statistically significant for most of the cases. Only vehicle insurance exhibits a significant decline. This suggests that consumption of commitment goods is also much less adjusted during unemployment than other goods or services like food or entertainment.

These results are consistent with available evidence on how households adjust their consumption during unemployment. Ganong and Noel (2019), using data on consumer checking and credit card accounts in the US, construct a database with monthly spending categories and unemployment insurance recipients. They find that insurance payments decrease by a small amount after individuals exhaust unemployment insurance benefits (only by 2.8%), while other goods or services like groceries, transportation or entertainment fall by a much more important magnitude (between 10-15%). There is also evidence on consumption adjustments in other countries. Kolsrud, Landais, Nilsson, and Spinnewijn (2018), using data from a household consumption survey in Sweden, find that, during an unemployment spell, goods like food, transportation and recreation fall significantly, between 10 and 30%,

[8] Housing tenure indicates whether the head of the household owns the house where she lives with a mortgage, without a mortgage or whether she is a renter. Education includes less than college and college. Finally, race is a categorical variable indicating whether the head is White, Asian, Latin American, Native American or African American.

[9] Part of this decline might reflect households switching to cheaper products, as emphasized by Aguiar and Hurst (2005).

Table 2: Unemployment and Commitments

Consumption item	Estimates for γ^u	Ganong and Noel (2019)	Kolsrud et al. (2018)
Food	-0.134***	-15.8%	-0.083*
	(0.040)		(0.044)
Transport	-0.179***	-10.6%	-0.348***
	(0.089)		(0.080)
Entertainment	-0.225***	-13.4%	-0.189***
	(0.081)		(0.072)
Shelter	-0.063	—	0.043
	(0.047)		(0.031)
Health insurance	-0.184	-2.8%	—
	(0.119)		
Vehicle insurance	-0.139*		—
	(0.074)		
Life insurance	0.004		—
	(0.186)		

Note: The first column displays the estimates for γ^u from regression 1. Second column includes the decrease in consumption after UI benefit exhaustion calculated by Ganong and Noel (2019), their study include only aggregate payments for insurance and not by item as done in the first column. The third column shows the estimates of decrease in consumption during an unemployment spell from Kolsrud et al. (2018), shelter in this case only include rental payments.

while rental payments are not reduced.[10] These results, which are in line with the ones obtained using CEX data for the United States, are presented in columns 2 and 3 of Table 2.[11]

In summary, households devote a significant fraction of their expenditures, around 40%, on goods or services that are difficult to adjust. These goods and services, which are mainly shelter payments (rents and mortgages) and insurance payments, are also infrequently adjusted by households when the head experiences an unemployment spell. On the other hand, goods or services that are frequently adjusted cover food, transportation or entertainment, which are also the ones whose adjustment is larger during an unemployment event.

2.3 Commitments and Unemployment Duration

Next, we study how fast individuals leave unemployment depending on whether they have commitments or not. We focus on shelter as a proxy for commitments. The SIPP provides detailed monthly information on unemployment and homeownership status. In particular, it specifies whether the household head is an owner without a mortgage, an owner with a mortgage or a renter. On the other hand, it does not contain any information on insurance or phone payments. So, we consider an individual as having commitments if she owns a house and makes mortgage payments or if she is a renter. Otherwise she does not have any commitments.

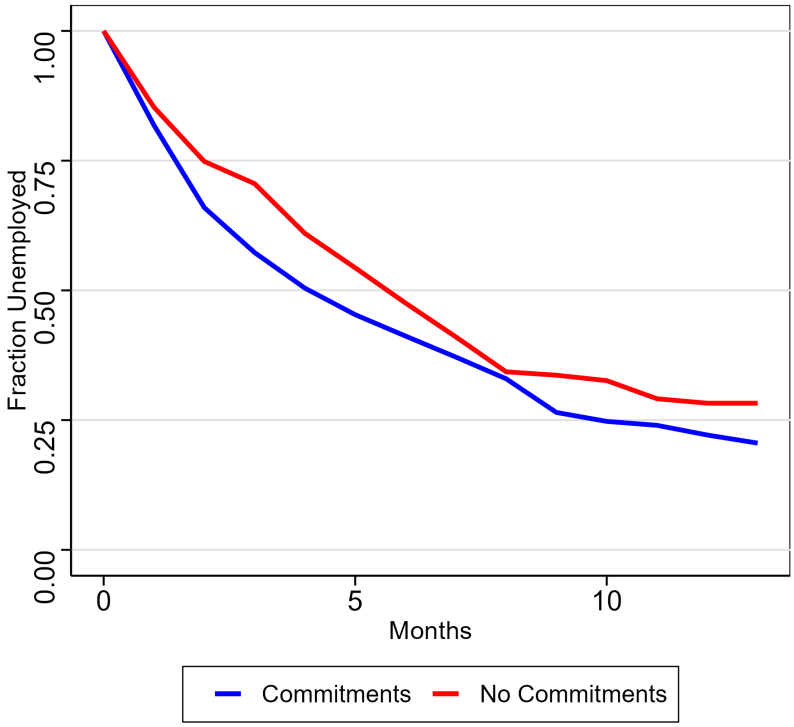
Figure 1 shows the Kaplan-Meier survival functions for individuals with and without commitments. The Kaplan-Meier non-parametric estimator of the survival function gives the fraction of individuals unemployed by unemployment duration.[12] Figure 1 shows that individuals with commitments leave unemployment faster than individuals without commitments. In particular, after 5 months of unemployment,

[10] These authors run the regression: $\log c_{it} = \eta_1 \mathbb{I}[0 < t <= 20\ wks] + \eta_2 \mathbb{I}[t > 20\ wks] + X_i'\gamma + \epsilon_{it}$ where $\mathbb{I}[0 < t <= 20\ wks]$ denotes whether the individual has been employed for less than 20 weeks, $\mathbb{I}[t > 20\ wks]$ for more than 20 weeks and X_i a vector of controls including year and month dummies. η_1 (η_2) denotes the effect on consumption of being unemployed for less than (more than) 20 weeks relative to an individual that will become unemployed in the following 6 months. Coefficients for η_2 are presented in table 2.

[11] Harmenberg and Öberg (2021) focus on adjustment on durables vs non-durables and show that, during unemployment, households mainly adjust non-durables.

[12] In particular, the Kaplan-Meier survival function is defined as $S(t) = \prod_{t_i<t} \frac{n_i - d_i}{n_i}$, where n_i denotes the number of unemployed individuals just before t_i and d_i the individuals that leave unemployment at t_i. While computing the Kaplan-Meier survival functions, we take into account censored spells (some individuals end their spell in unemployment).

Figure 1: Unemployment duration and consumption commitments



Note: The figure shows the Kaplan-Meier survival function for households with commitments (blue line) and without commitments (red line)

about 55% of individuals without commitments remain unemployed, while only 45% of those with commitments do.

However, the different survivals in Figure 1 might be driven by different characteristics of these groups, such as education or wealth. To address this concern, we next extend the analysis by controlling observable characteristics in the data. We use a Cox proportional hazards model. In particular, we run the following regression:

$$\log h_{it} = \alpha_t + \beta_1 \text{Commit}_i + \beta_2 X_{it} \tag{2}$$

where h_{it} denotes the hazard rate, α_t denotes the logarithm of the baseline hazard function, Commit_i is a binary variable that takes value 1 if she has commitments just before becoming unemployed, and 0 otherwise. X_{it} is a vector of covariates that includes education, age, year, state, marital status, race, unemployment insurance reception and liquid assets before unemployment. β_1 is the coefficient of interest and denotes the hazard ratio or relative hazard of leaving unemployment of individuals with commitments with respect to individuals without them. $\beta_1 > 0$ means that

Table 3: Cox Regression Model

	Regression coefficient	exp(coefficient)
Commit	0.233** (0.073)	1.26
Education COL	0.191** (0.067)	1.21

Note: The first row shows the coefficients for β_1 (column 1) and $\exp(\beta_1)$ (column 2).

individuals with commitments have a higher hazard rate of exiting unemployment, thus they leave unemployment faster. On the other hand, $\beta_1 < 0$ means that individuals without commitments leave unemployment faster.

Table 3 presents the results of regression 2. The first line presents the coefficient β_1 and its exponential. To put this estimate in perspective, we also show the coefficient for education in row 2. According to the exponential of β_1 (1.26), the hazard rate of exiting unemployment for individuals with commitments exceeds by 26% that of those without commitments. This effect is similar in magnitude, and even bigger, to the effect of education. The hazard rate of exiting unemployment for college-educated individuals is 21% higher than that of non-college educated. This suggests that commitments may play an important role on how fast people leave unemployment.

3 Model

We study a search model with heterogenous agents and incomplete markets with two consumption goods: an adjustable good (c_t) and a "commitment" good (s_t) that is costly to adjust. The economy is populated by a unit mass of infinitely-lived individuals, who face a constant probability of death, π, every period. Individuals can save in a risk-free asset, a_t, with (exogenously given) return, r, and, for simplicity, they are not allowed to borrow, $a_t \geq 0$.

Individuals are heterogeneous in their fixed type, θ, which captures permanent pre-labor market differences in education or skills. Each period they also face an idiosyncratic productivity shock, denoted by ξ. Every period, there is a chance that

the individual is hit by an exogenous unemployment shock and becomes unemployed. Once unemployed, individuals need to exert search effort to find a new job. Finally, there is a government that taxes households and provides unemployment insurance (UI henceforth) to unemployed individuals that are eligible to receive benefits.

Preferences Individuals choose consumption of each good, savings, and search effort to maximize their lifetime utility. They discount future consumption by $\beta_\theta = \widehat{\beta}_\theta \pi$, where $\widehat{\beta}_\theta$ denotes the standard discount factor which may depend on the fixed type of the individual.[13]

The per-period utility function from consumption at time t is given by

$$u(c_t, s_t, s_{t-1}) = \frac{\mathbb{C}_t^{1-\sigma}}{1-\sigma} - \kappa_f \mathbb{I}\left\{s_t \neq s_{t-1}\right\}, \tag{3}$$

where $\mathbb{C}_t$ denotes a consumption aggregator and σ the coefficient of risk aversion. Whenever consumers change consumption of their commitment goods, i.e. whenever $s_t \neq s_{t-1}$, the household incurs a fixed cost of adjustment, denoted by κ_f. The function $\mathbb{I}\{x\}$ is an indicator that is equal to one whenever the statement x is true. When a household dies, a new household is born with zero assets and an initial level of commitments, s_0. The consumption aggregator, $\mathbb{C}_t$, is defined as

$$\mathbb{C}_t = \left[\alpha c_t^\eta + (1-\alpha) s_t^\eta\right]^{\frac{1}{\eta}}, \tag{4}$$

where η determines the elasticity of substitution between adjustable goods and commitments. In particular, the elasticity of substitution between adjustable goods and commitments is given by $\epsilon = 1/(1-\eta)$. If $\eta = 0$, the CES function collapses to Cobb-Douglas with unit elasticity. If $\eta < 0$ the goods are complements while if $\eta > 0$ they are substitutes. α is the weight of adjustable goods in the utility function.

Unemployed individuals exert effort, $e \in [0, 1]$, to find a job. The level of effort affects the probability of finding a job. However, effort has a utility cost. In particular, we assume a quadratic utility cost,

$$\psi(\nu) = \psi\ e^2, \tag{5}$$

[13] As it will become clear in Section 4, discount factor heterogeneity is introduced to generate a realistic wealth inequality in the model, as in, for example, Krusell and Jr (1998) and Hendricks (2007).

where ψ controls the level of disutility.

3.1 Labor Market

Employed individuals Labor income (w) for an employed individual is given by

$$\log w = \theta + \xi, \tag{6}$$

where θ is the fixed component of productivity, and ξ is a persistent productivity shock. The permanent component takes two values $\theta \in \{\theta_l, \theta_h\}$. The fraction of each type is f_l and f_h, respectively. The persistent component follows a standard AR(1) process while the individual is employed, and it is given by

$$\log \xi' = \rho_\xi \log \xi + \epsilon_\xi, \quad \epsilon_\xi \sim \mathcal{N}(0, \sigma_\xi^2), \tag{7}$$

where ρ_ξ is the autocorrelation coefficient of the persistent producitivity process and ϵ_ξ an i.i.d. shock normally distributed with zero mean and variance σ_ξ^2. For any variable x, x' indicates its next period value.

Each period, an employed individual is separated from her job with probability δ_θ, which depends on her skill type.

Unemployed individuals Unemployed individuals exert search effort, e, which affects the job finding probability,

$$\mathcal{P}(e, n_u) = e\ \Phi(n_u), \tag{8}$$

where the function Φ controls for the duration dependence of the probability of finding a job per unit of search effort and, following Kekre (2022), it is given by

$$\Phi(n_u) = \begin{cases} \exp(n_u \lambda) & \text{if } n_u < 8, \\ \exp(7\lambda) & \text{if } n_u \geq 8, \end{cases} \tag{9}$$

where n_u corresponds to the number of periods the individual has been unemployed and λ determines the rate of the decline in the probability of finding a job with unemployment duration. This function captures duration dependence of unemployment consistent with empirical evidence that hazard rates of finding a job are higher

for newly unemployed than for long-term ones, see Kroft, Lange, Notowodigdo, and Katz (2016). As in Kekre (2022), we assume a flat profile of the function after 8 months unemployed.[14] During unemployment, the idiosyncratic productivity shock of an individual, ξ, remains constant.

3.2 Government

Unemployment Insurance The government runs an unemployment insurance program that provides benefits to unemployed individuals. Following the UI rules in the US, unemployed individuals are entitled for benefits for a maximum of $\overline{N_{UI}}$ periods. Benefits depend on labor income before unemployment and are given by

$$B(w_{-1}) = \min\left\{\Theta_0 w_{-1}, \Theta_1\right\}, \tag{10}$$

where w_{-1} denotes earnings in the period before becoming unemployed, and Θ_0 is the replacement rate, the ratio of benefits to earnings before unemployment. UI benefits are subject to a cap, Θ_1, which makes the replacement rate progressive, i.e., it is lower for individuals who surpass the cap.

Taxes The government collects income taxes through a progressive tax schedule, and uses these revenues to fund the unemployment insurance system and exogenous government expenditure, G. We consider a parametric function for the average tax rate that depends on income widely used in the public finance literature (Benabou 2002, Heathcote, Storesletten, and Violante 2017). In particular, the average tax rate of a household with income y is

$$t(y) = 1 - \gamma y^{-\tau} \in [0, 1], \tag{11}$$

where γ controls for the level of taxes, and τ drives the degree of progressivity of the tax system. Household's tax liability is then given by $T(y) = y \cdot t(y)$.

[14] This is done both for computational purposes, and for the fact that the profile of empirical hazard rates after 8 months looks much flatter than for shorter durations, see Kroft et al. (2016).

3.3 Individual Decisions

Employed individuals The state of an employed individual consists of her productivity (θ and ξ), the amount of commitments consumed in the previous period (s_{-1}) and assets (a). The problem of an employed agent is given by

$$V_E(\theta, \xi, a, s_{-1}) = \max_{c,s,a'} [u(c, s, s_{-1}) + \beta_\theta \{(1 - \delta_\theta)\mathbb{E}_{\xi'} \{V_E(\theta, \xi', a', s)\} + \delta_\theta V_U(\theta, \xi, 1, \mathcal{E}', a', s)\}],$$

subject to

$$c + s + a' = y + a - T(y),$$
$$y = w(\theta, \xi) + ra,$$

and

$$c > 0, \quad s > 0, \quad a' \geq 0.$$

The indicator $\mathcal{E} \in \{0, 1\}$ denotes the eligibility status for unemployment insurance benefits.

Employed individuals decide how much to consume of adjustable goods, commitments, and save. As noted before, adjusting commitments is costly, therefore not all agents will decide to adjust them each period. They receive labor income and asset income and pay taxes according to the progressive tax schedule, $T(y)$. Employed individuals become separated from their jobs with probability δ_θ, the second line in the value function. If the individual remains employed, then she will experience a productivity shock to the persistent component next period, ξ'. On the other hand, if the individual becomes unemployed, she will start next period with $n_u = 1$, which indicates the number of periods an individual has been unemployed. We assume $\mathcal{E}' = 1$ for new unemployed individuals.

Unemployed individuals The state space of unemployed individuals comprises her skills, persistent component of productivity before unemployment (denoted by ξ_{-1}), number of periods unemployed (n_u), eligibility for UI benefits ($\mathcal{E}$), assets and commitments from previous period. An unemployed individual is eligible for UI benefits if she has not been unemployed for more than $\overline{N_{UI}}$. The problem for un-

employed individuals is given by

$$V_U(\theta, \xi_{-1}, n_u, \mathcal{E}, a, s_{-1}) = \max_{c,s,a',e} [u(c, s, s_{-1}) - \psi(e) + \beta_\theta \{\mathcal{P}(e, n_u) V_E(\theta, \xi_{-1}, a', s) + (1 - \mathcal{P}(e, n_u)) V_U(\theta, \xi_{-1}, n_u + 1, \mathcal{E}', a', s)\}],$$

subject to

$$c + s + a' = y + a - T(y),$$

$$y = \mathcal{E} B(\exp(\theta + \xi_{-1})) + ra,$$

$$\mathcal{E}' = \begin{cases} 1, & \text{if } n_U < \overline{N_{UI}}, \\ 0, & \text{otherwise.} \end{cases}$$

and

$$c \geq 0, \quad s \geq 0, \quad a' \geq 0,$$

Like employed individuals, unemployed individuals decide how much to consume of both goods and how much to save. They also decide how much effort to exert in order to find a job. With probability $\mathcal{P}$, which depends on effort (e) and the number of periods unemployed (n_u), the individual finds a job. Then, she starts employment with persistent productivity $\xi' = \xi_{-1}$. If the individual does not find a job, then she will continue to be unemployed, and will be eligible for unemployment insurance in the next period ($\mathcal{E}' = 1$) if she has been receiving unemployment benefits for less than $\overline{N_{UI}}$ periods. Otherwise she is not eligible for benefits and her income will only come from her assets.

3.4 Government's Budget

Let $x^E = (a, s_{-1})$ be the state vector for employed individuals over assets and last period's commitments. Define $x^U = (n_u, a, s_{-1})$ accordingly, adding the number of periods unemployed. We denote the probability distribution of employed individuals as $\Psi^E(\theta, \xi, x^E)$, and the one for unemployed individuals as $\Psi^U(\theta, \xi, \mathcal{E}, x^U)$. Then, the marginal distribution over productivity types for employed individuals corresponds to $\widehat{\Psi}^E(\theta, \xi) = \int \Psi^E(\theta, \xi, x^E) dx^E$ and for unemployed individuals is $\widehat{\Psi}^U(\theta, \xi, \mathcal{E}) = \int \Psi^U(\theta, \xi, \mathcal{E}, x^U) dx^U$. Finally, define by $\widehat{T}(\theta, \xi, x^E)$ and $\widehat{T}(\theta, \xi, \mathcal{E}, x^U)$ taxes paid by

employed and unemployed individuals and $\widehat{B}(\theta, \xi, \mathcal{E})$ unemployment benefits. Then the budget constraint for the government is given by

$$\begin{aligned} &\int \mathcal{E}\widehat{B}(\theta, \xi, x^U)\ \widehat{\Psi}^U(\theta, \xi, \mathcal{E})\ d\theta\ d\xi\ d\mathcal{E} + G = \\ &\int \widehat{T}(\theta, \xi, x^E)\ \widehat{\Psi}^E(\theta, \xi)\ d\theta\ d\xi + \int \widehat{T}(\theta, \xi, \mathcal{E}, x^U)\ \widehat{\Psi}^U(\theta, \xi, \mathcal{E})\ d\theta\ d\xi\ d\mathcal{E} \end{aligned} \tag{12}$$

The first line of equation 12 denotes government expenditure. Government expenditures comprise unemployment benefits for those unemployed who are eligible for benefits (that is, $\mathcal{E} = 1$) and other government spending, G. The second line includes government revenues from taxation of employed and unemployed households.

4 Calibration

We calibrate the model economy in two stages. In the first stage, some parameters are directly estimated from the data, taken from the literature, or chosen to reflect the existing US policies. Then, we calibrate internally the remaining parameters so that the model replicates some key features of the US economy regarding unemployment durations and commitments expenditures. Model period is set to 1 month.

4.1 Parameters set a priori

Unemployment Insurance We set $\overline{N_{UI}} = 6$ so that benefits last for a maximum of six months.[15] The replacement rate and the cap are set to $\Theta_0 = 0.50$ and $\Theta_1 = 0.67$, following Graves (2021).

Labor Market We assume that the two values of the fixed effect, low and high, correspond to non-college and college education in the data. The fraction of each group is computed from CPS (2017-2019) for people aged 25-54, as $f_h = 0.367$ and $f_l = 0.633$.

For the parameters of the persistent shock process, ρ_ξ and σ^2_ξ, I take the values

[15] Although rules for unemployment insurance varies by states, most of them set these eligibility requirements and maximum period of benefits as of January 1, 2020 (see U.S. Department of Labor 2020, pages 3-2 and 3-27).

from Kekre (2022) that converts to monthly frequency the values estimated by Krueger, Mitman, and Perri (2016). Thus, $\rho_\xi = 0.997$ and $\sigma_\xi^2 = 0.053$.

Finally, the probability that employed individuals get separated from their job is set to $\delta_{\theta_l} = 0.0147$ and $\delta_{\theta_h} = 0.00849$, which corresponds to the employment-unemployment transitions in CPS for the 2014-2018 period.

Taxes We take the values for γ and τ, which govern the level and the progressivity of taxes, from Guner, Kaygusuz, and Ventura (2014), and set $\gamma = 0.89$ and $\tau = 0.05$. This estimates imply an average tax rate of 11.0% and a marginal tax rate of 15.4% for a household with income equal to the mean, which was around $97,000 in the US in 2018 (U.S. Census Bureau). For higher incomes, both average and marginal tax rates increase due to progressivity of the system.

Other parameters The probability of death is set to $\pi = 1/360$ so that agents remain alive, on average, for 30 years. We set the curvature in the utility function to $\sigma = 1.5$, a standard value in the literature (see, e.g., Blundell, Dias, Meghir, and Shaw (2016)). We set the interest rate to $r = 0.0015$ so that the annual interest rate is 2%.[16] Parameters set a priori are presented in table 4.[17]

4.2 Calibrated parameters

We are left with 10 parameters to calibrate internally: values for the fixed effects (θ_h and θ_l), parameters for patience ($\hat{\beta}_{\theta_h}$ and $\hat{\beta}_{\theta_l}$), the share of commitments in the utility function (α), the utility cost of adjusting commitments (κ_f), the parameter that determines the probability of finding a job (λ), the level of disutility from exerting effort (ψ), and the parameter that determines the elasticity of substitution between adjustable goods and commitments (η). We calibrate them using the Simulated Method of Moments. In particular, let $\mathcal{C}$ be the vector of parameters, $\mathcal{M}(\mathcal{C})$ the vector of moments that the model generates with those parameters, and $\overline{\mathcal{M}}$ the

[16] The real lending interest rate between 2014 and 2019 has fluctuated around 2%, the World Development Indicators, the World Bank, https://data.worldbank.org/indicator/FR.INR.RINR?locations=US.

[17] We set $s_0 = 0.02$ so individuals are born with commitments equal to 2% of average earnings. Setting s_0 to a small number is necessary for computational reasons, but do not play a significant role for the quantitative results.

Table 4: Parameters set a priori

Parameter		Description	Source
π	1/360	Probability of death	Average of 30 years
σ	1.5	Coefficient risk aversion	Standard
$\overline{N_{UI}}$	6	Employment requirement for benefits	Department of Labor
Θ_0	0.50	Replacement rate	Graves (2021)
Θ_1	0.67	Cap on UI	Graves (2021)
f_l	0.633	Fraction non-college	CPS (2017-2019)
f_h	0.367	Fraction college	CPS (2017-2019)
ρ_ξ	0.997	Persistence shock	Krueger et al (2016)
σ_ξ	0.053	Variance persistent shock	Krueger et al (2016)
δ_{θ_l}	0.0147	Probability job loss, non-college	CPS (2017-2019)
δ_{θ_h}	0.00849	Probability job loss, college	CPS (2017-2019)
r	0.0015	Interest rate	Annual rate 2%
γ	0.89	Tax function level	Guner et al. (2014)
τ	0.05	Tax function curvature	Guner et al. (2014)

Note: Parameters taken from the literature or directly estimated from the data.

vector of targets from the data. Then, the parameter vector, $\mathcal{C}^*$, is determined by

$$\mathcal{C}^* = \arg\min_{\mathcal{C}} (\mathcal{M}(\mathcal{C}) - \overline{\mathcal{M}})'(\mathcal{M}(\mathcal{C}) - \overline{\mathcal{M}}). \tag{13}$$

Moments

We consider four sets of moments. The first set of moments includes the ratio of average earnings of college educated to non-college educated, which is equal to 2.18 (CPS, 2014-2018), and normalization of average earnings in the economy to 1. The second set includes targets on consumption commitments. As we reported in section 2, commitments constitute 39% of total household expenditures. Furthermore, 11% of households adjust commitments in each quarter.[18]

The third set of moments is related to unemployment duration: average duration of unemployed and the fraction of unemployed staying longer than 6 months. Average duration of unemployed individuals is 4.67 months, and 23% of durations in unemployment are longer than 6 months (CPS, 2017-2019).

We also target the elasticity of unemployment duration, D, with respect to

[18] Given that the target is on a quarterly, adjustment in the model is computed comparing commitments at period t and period $t-3$, so both are comparable.

unemployment insurance benefit duration, i.e. $\frac{dD}{d\overline{N_{UI}}}\frac{\overline{N_{UI}}}{D}$.[19] In their review of the literature, Schmieder and von Wachter (2016) provide a range of estimates for this elasticity, with a median value of 0.37, which is targeted here. The last set of moments is related to the wealth distribution. We target the ratio of median liquid assets to mean earnings from the Survey of Consumer Finances, which equals to 0.51.[20] Finally, we target the fraction of liquid wealth held by the top 40% of the wealth distribution, which is 93% (SCF, 2013).

Identification

The parameters for the fixed effect of labor productivity, θ_h and θ_l, are key to match the ratio of average earnings of college educated to non-college educated and to normalize average earnings to 1.

The parameters regarding commitments, α and κ_f, are important to match the fraction of commitment expenditures in total expenditure and the fraction of households adjusting commitments on a quarterly basis. A higher κ_f makes it harder for individuals to change commitments and, thus, implies a lower fraction of individuals who decide to adjust. The level of the disutility from effort, ψ, helps to match the average unemployment duration. However, the average unemployment duration does not ensure that the right tail of the distribution of durations that the model generates will be consistent with the data. For that purpose, the parameter for the job finding probability function, λ, is used. Specifically, we target the fraction of long-term (more than six months unemployed).

The elasticity between adjustable goods and commitments, η, determines how easily a household can substitute for different types of goods. Suppose the utility function was close to linear, with a high elasticity. In that case, a household could achieve a given utility level by freely substituting goods that are subject to adjustments with others. In such a world, commitments would not make income and employment shocks more challenging to cope with. On the other extreme, if the utility function was Leontief, any adjustment in adjustable goods had to be matched with adjustment of commitment goods, making consumption smoothing much more

[19] In the model, it is computed using the change in average unemployment duration when the maximum number of periods for receiving UI is increased by 1 period, from 6 to 7 months.

[20] Median liquid assets in the US were \$2,902 and average annual income was \$68,631. Converting annual income to monthly basis, median assets amount to 51% of average monthly income.

difficult. As a result, the elasticity of substitution between two types of consumption goods impacts how much households are willing to put effort to move out of unemployment and, therefore, determines the elasticity of unemployment duration with respect to unemployment benefits.

Finally, to determine the parameters for patience, we turn to the liquid wealth distribution. Since more than 60% of individuals in the model are non-college, β_{θ_l} helps to match median assets in the US. On the other hand, β_{θ_h} helps to match the fraction of wealth held by the top 40% of the wealth distribution as college individuals have higher wealth and constitute more than 36% of individuals in the model. We focus on liquid wealth, rather than total wealth, since it represents better the actual amount of funds that households can access in the face of an unexpected unemployment event.[21]

The parameters are presented in Table 5. A cost of $\kappa_f = 0.15$ implies that individuals that want to adjust consumption of commitments must pay a utility cost equivalent to more than 5% of utility derived from average consumption in the economy. λ implies a decreasing profile of job finding probabilities. In particular, the probability of finding a job, for a unit of effort, in the first month of unemployment is around 82%, decreasing this probability quickly towards 30% after 6 months. $\eta = -1.0$ implies an elasticity of substitution between commitments and adjustables of $\epsilon = 0.5$, that is, in the monthly model, both goods are poor substitutes. Finally, patience parameters imply that college individuals are more patient in the model than non-college ones, so the model can generate a wealth concentration at the top of the distribution consistent with the data.

4.3 Benchmark Economy

Table 6 collects the moments included in the calibration and their data counterparts. The model captures well the ratio of average earnings of college educated with respect to non-college educated. The model also reproduces well moments related to consumption commitments. The share of commitments in total expenditure generated by the model is 0.39, like its data counterpart. A total of 10% of individuals in the model adjust commitments from quarter to quarter, in line with the fraction

[21] See Kaplan and Violante (2022) for more details.

Table 5: Parameters and targets

Parameter		Value	Moment
Labor Productivity			
θ_l	Permanent shock non-college	-0.36	Normalized average earnings to 1
θ_h	Permanent shock college	0.42	Ratio average earnings COL/NCOL
Preferences			
α	Share of adjustables in utility	0.70	Commit. expenditure/Total expenditure
κ_f	Cost of adjusting commit.	0.15	Fraction adjusting commitments
ψ	Level disut. effort	22.0	Mean duration unemployment
η	Elasticity adjust-commit	-1.0	Elasticity U duration-UI benefit duration
$\widehat{\beta}_{\theta_l}$	Patience non-college	0.986	Median assets
$\widehat{\beta}_{\theta_h}$	Patience college	0.994	Fraction of wealth top 40%
Job finding function			
λ	Slope job finding function	-0.20	Fraction duration unemp. >6 months

Note: Calibrated parameters and the corresponding moments they target.

computed from the data.

The model also does a good job in matching the average unemployment duration. Individuals, in the model, stay in unemployment for an average of around 4.66 months, very close to that in the data. The model also generates a right tail of distribution of durations close to the one of the data. Around 23% of unemployed individuals stay unemployed for a period longer than 6 months, which is the maximum benefit period to receive unemployment insurance benefits.

A critical moment in the calibration is the elasticity of unemployment duration with respect to changes in benefit durations (the maximum number of months they can receive benefits). For the counterfactual exercises in the next section to be reliable, we would like individuals in the model to react to changes in UI generosity as they do in the data. To this end, we select η, along with other parameters, so the elasticity of unemployment duration with respect to changes in benefit durations is 0.34, close to the median value of available estimates in the literature.[22]

Another important dimension of the model is the wealth distribution. Median assets in the economy is a key moment in the calibration. Median assets capture the

[22] In an economy with commitments, assuming a Cobb-Douglas utility function (i.e. elasticity of substitution equal 1) calibrated to match the same targets as the benchmark, the elasticity of unemployment duration with respect to the maximum UI benefit duration falls to 0.28, far from the 0.37 median estimate provided by Schmieder and von Wachter (2016).

Table 6: Model fit, Targeted Moments

Moment	**Model**	**Data**
Ratio average earnings COL/NCOL	2.16	2.18
Normalized earnings	1.0	1.0
Commitments' expenditure/Total expenditure	0.39	0.39
Fraction adjusting commitments (quarterly)	0.10	0.11
Mean duration unemployment (months)	4.66	4.67
Fraction unemployed with duration >6 months	0.23	0.23
Elasticity U duration-UI benefit duration	0.34	0.37
Median assets/Mean earnings	0.51	0.51
Fraction wealth top 40%	0.87	0.93

Note: Targeted moments generated by the model and their data counterpart.

ability to self insure, against adverse income shocks, of most of the individuals of the economy. The model generates a fraction of median assets to average earnings equal to 0.51, in line with the data. Finally, to generate the concentration of wealth at the top of the wealth distribution, we target the share of wealth held by the top 40% of the wealth distribution. The share of wealth held by the top 40% of individuals generated by the model is 87%, close to, although slightly below, the data.

4.3.1 Non-targeted moments

In this section, we briefly discuss how the model performs with respect to some non-targeted moments, reported in Table 7. The unemployment rate generated by the model is 5.1%, consistent with its data counterpart. Average unemployment durations by education group generated by the model are also close to the durations in the data. In particular, average duration of non-college educated is 4.2 months (4.5 months in CPS 2017-2019). For college educated individuals, the average duration generated by the model, 5.4 months, is slightly larger than the one in the data, which is 5.1 months. In summary, the model generates realistic unemployment rate and unemployment durations by education group and unemployment rate for non-college educated.

Finally, we can also look at the fraction of hand-to-mouth individuals generated by the model. Hand-to-mouth individuals consume most of their available resouces each period, hold little liquid assets and, thus, are less able to smooth consumption

Table 7: Non-targeted moments

	Model	Data
Unemployment rate	5.1%	4.8%
Duration, non-college	4.2	4.5
Duration, college	5.4	5.1
Fraction Hand-to-Mouth	0.29	0.31

Note: Moments not targeted during the calibration and their data counterparts.

over time. Hand-to-mouth individuals are identified in the model as those whose amount of liquid assets is lower than one fourth of monthly earnings, corresponding to one week of earnings following Kaplan, Violante, and Weidner (2014). In the model, 29% of individuals are hand-to-mouth, very close to the 31% estimated for the U.S. by Kaplan et al. (2014). Thus, the model generates a realistic fraction of individuals whose ability to smooth consumption is low.

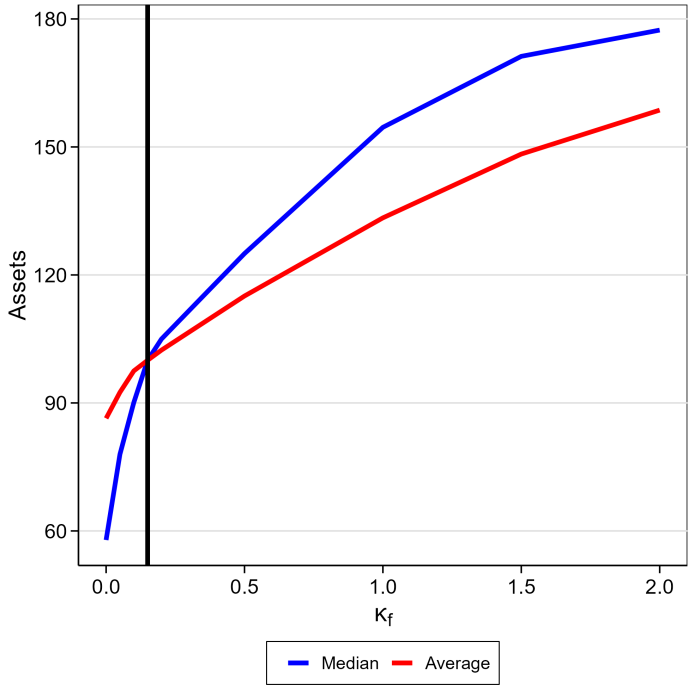
4.3.2 Precautionary Savings

Since commitments make consumption adjustments more difficult, it is expected that agents in an economy with commitments would like to increase asset holdings in order to moderate these costs. Figure 2 presents median (blue line) and average (red line) asset levels in the economy as a function of the cost of adjusting commitments κ_f. Median and average assets in the benchmark economy (i.e., when $\kappa_f = 0.15$) are both normalized to 100. We present assets for counterfactual economies with different values of κ_f, expressed as a fraction of benchmark level. Parameters other than κ_f are kept at their benchmark values.

As κ_f increases, i.e. the commitment good becomes harder to adjust, individuals accumulate more assets. The relation between κ_f and savings is quite non-linear, with a sharp increase, especially remarkable in the case of median assets, when we move from zero to positive κ_f. This happens since, with small values of κ_f, the fraction of individuals adjusting commitments decreases very rapidly from 100% in the no commitments case ($\kappa_f = 0$) to 10% in the benchmark ($\kappa_f = 0.15$). For larger values of κ_f, the fraction adjusting decreases more slowly. A change of κ_f from 0.15 to 0.5 reduces the fraction of households adjusting from 10% to 6%.

The main message that emerges from Figure 2 is that precautionary savings are

Figure 2: Savings and cost of adjustment



Note: The black vertical line represents the benchmark value. Average (red line) and median (blue line) savings are normalized to 100 in the benchmark. The rest are expressed as a fraction of benchmark savings.

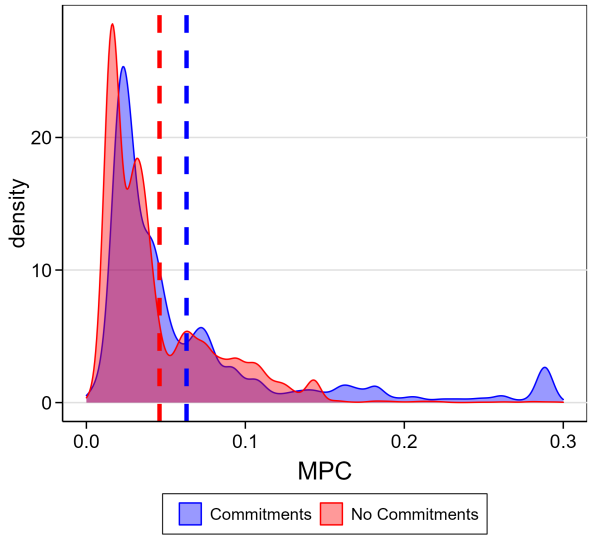
substantially higher in an economy with commitments. The average assets decrease (from the benchmark value) by more than 10% when κ_f is set equal to 0, i.e. when both goods become fully adjustable. The effect of commitments is especially important in median assets, which decrease by 40% when both goods are fully adjustable. This suggests that commitments become especially important for the bottom part of the wealth distribution.

4.3.3 Marginal Propensity to Consume

We can also look at how commitments affect the marginal propensity to consume (MPC henceforth). The MPC is an important magnitude to understand how much individuals' consumption change to changes in income.[23] High marginal propensities to consume suggest that individuals are not able to smooth consumption so well. For that purpose, we compare the average MPC in an economy with and without commitments, i.e. an economy with two goods but no adjustment cost. The economy without commitments is recalibrated so that unemployment durations and median

[23] When refering to MPC, we mean MPC of adjustable goods.

Figure 3: Distribution of MPCs



Note: Kernel density of the distribution of MPCs in the economy with and without commitments. The dashed vertical lines show the average MPC in the economy with commitments (blue line) and the economy without commitments (red line).

wealth are the same as the value of those moments in the benchmark economy with commitments.[24]

Figure 3 shows the distribution (kernel density) of monthly MPCs in the benchmark economy and the economy without commitments. We can see that, although median assets in both economies are similar, the MPCs in the economy without commitments are more concentrated towards values close to zero. In fact, the average MPC in the economy with commitments (0.063) is 37% higher than in the economy without commitments (0.046). The value obtained in the economy with commitments is close to 0.07 the lower bound of empirical average MPC found by Bunn, Roux, Reinold, and Surico (2018), while the one generated by the model without commitments is much further from the empirical MPCs. Furthermore, in the economy with commitments, there is an important concentration of individuals at MPCs around 0.3, which we do not see in the economy without commitments.

In summary, commitments increase the MPC of individuals. Thus, they cannot smooth consumption that well in the economy with commitments. Furthermore, commitments make the average MPC generated by the model closer to the empirical

[24] In particular, we recalibrate r and ψ to obtain the same moments. We recalibrate r instead of β to make welfare comparisons cleaner so individuals discount the future in the same way. See Appendix C for details of the calibration of the economy without commitments.

values found in the literature.

5 Unemployment Insurance and Unemployment Duration

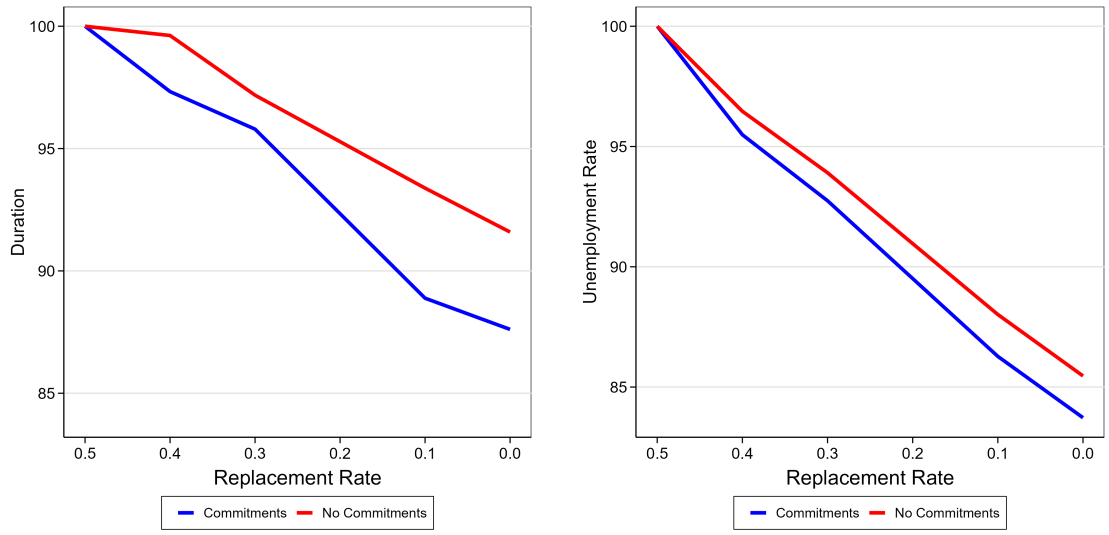
In this section we try to understand how the presence of commitments affects unemployment durations and the unemployment rate in the economy. For that purpose, we compare the response of individuals to different unemployment insurance replacement rates for an economy with and without commitments, i.e. an economy with two goods but no adjustment cost. Keep in mind that the economy without commitments is recalibrated so that unemployment durations and median wealth are the same as the value of those moments in the benchmark economy with commitments.

The left panel of Figure 4 shows how average unemployment duration changes for different replacement rates. The effects of reductions in the maximum duration of benefits are presented in Appendix D. Values are normalized such that the benchmark economy corresponds to a value of 100 in both economies and then subsequent values for lower replacement rates are presented as a fraction of the benchmark values. We can see that as replacement rates decrease, the reaction of individuals in an economy with commitments becomes larger than in an economy without them. In particular, in the case of no unemployment insurance, average unemployment durations in the economy with commitments decrease by more than 12% with respect to the benchmark, while only by 8% in the case of an economy without commitments.

The right panel of Figure 4 plots how the unemployment rate varies with replacement rates. We can see that unemployment rates in the economy with and without commitments diverge gradually as the replacement rate is reduced. This reduction is consistent with the results obtained from unemployment duration.

In summary, in an economy with commitments, individuals leave unemployment faster than in an economy without commitments. But why does this happen? Figure 5 shows the average effort of unemployed in both economies as a function of replacement rates. Effort is the choice through which the individual controls the speed of finding a job. Furthermore, effort depends on the difference between the expected value of employment and the expected value of unemployment.

Figure 4: Unemployment and Unemployment Insurance

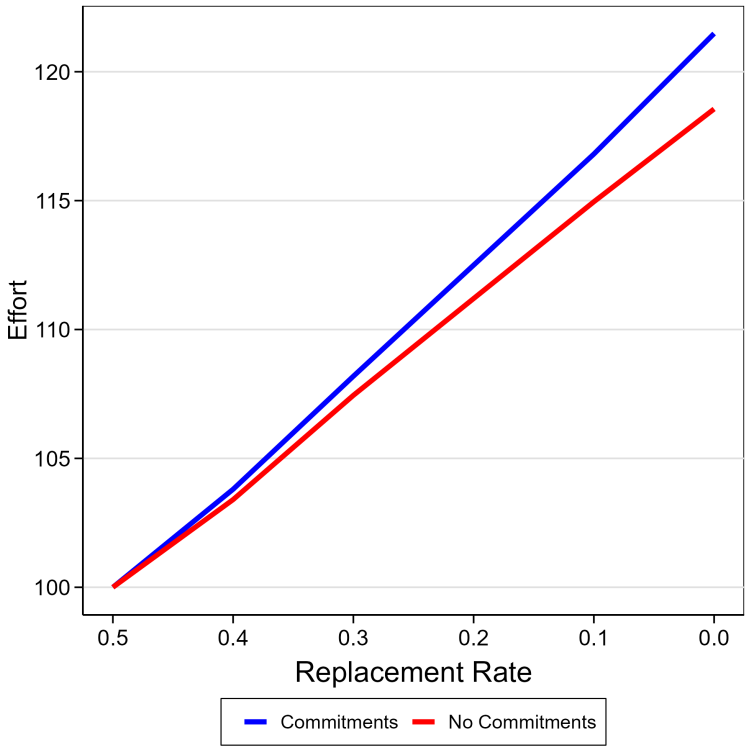


Note: The left panel shows the reaction of average unemployment duration with changes in the replacement rate of UI for the economy with commitments (blue line) and without commitments (red line). The right panel shows the reaction of the unemployment rate. Values in the respective benchmark economies (i.e. with replacement rate equal to 0.5) are normalized to 100.

In Figure 5, we can see that effort increases faster in the economy with commitments when the replacement rate is reduced. This happens because the gap between the value of employment and unemployment widens faster in an economy with commitments. In an economy with commitments, individuals do not adjust commitments immediately after experiencing an unemployment shock. Furthermore, they do not adjust their consumption in every period during the unemployment spell. The rigidity not allowing to adjust easily more than 40% of total expenditures makes individuals to concentrate most of the adjustment on adjustable goods. This is more costly in utility terms than adjusting both margins by the same magnitude, as shown by Chetty and Szeidl (2007). Therefore, when replacement rates are high, unemployment insurance allows the individual to moderate the reductions of adjustable goods and, thus, unemployment behavior is close in both economies. However, for low replacement rates, the ability to moderate reductions in consumption is lower and, thus, unemployment events become much more costly in welfare terms in the economy with commitments.

In summary, the cost of unemployment in an economy with commitments is higher than in an economy without commitments, especially for low replacement rates, and, thus, unemployed individuals try to get out of unemployment faster in

Figure 5: Unemployment duration and Replacement Rates



Note: The graph shows the reaction of job search effort to changes in the replacement rate of UI. Benchmark values in both economies normalized to 100.

the former economy.

6 Value of Unemployment Insurance

After having studied the job finding response of individuals to unemployment insurance in both economies, we want to quantify how much individuals value unemployment insurance in an economy with commitments with respect an economy without them. For that purpose, we compare the benchmark economy with an economy without unemployment insurance for both cases. For this experiment, we adjust the level of taxes γ so that the government budget remains balanced.

To assess the welfare value of unemployment insurance, we compute welfare losses from removing UI in consumption terms of the adjustable good (extra adjustable consumption in each period that should be given to each individual in a counterfactual economy to equalize welfare to the benchmark one).

Table 8 shows the median welfare loss from the elimination of unemployment in-

Table 8: Welfare losses from eliminating unemployment insurance

	Commitments	No Commitments
All		
Median CE	4.2%	3.4%
College		
Median CE	2.8%	1.8%
Non-College		
Median CE	5.3%	4.5%

Note: Welfare losses from eliminating unemployment insurance measured as the equivalent consumption compensation of the adjustable good.

surance for an economy with commitments and an economy without commitments. We find that for the median individual in an economy with commitments, the elimination of unemployment insurance implies a welfare loss of 4.2% of consumption compensation. This figure is significantly lower under an economy without commitments, which amounts to 3.4%. Thus, in line with results in the previous section, unemployment insurance is much more valuable in an economy with commitments.

Both groups, college and non-college, value unemployment insurance. Welfare losses from unemployment insurance are very important in an economy with commitments for non-college individuals (5.3%). However, for college individuals, the welfare losses from eliminating unemployment insurance in an economy with commitments is more limited (2.8% of adjustable consumption) but they are still significantly higher compared to an economy without commitments (only 1.8%). The lower welfare gains from unemployment insurance for college individuals come from their higher ability to smooth consumption through higher savings and their lower probability of losing their job.

Next, we try to understand where the difference in welfare gains, from the existence of unemployment insurance, in both economies comes from. Table 9 presents a decomposition of the welfare gains from unemployment insurance. There are three components that contribute to the welfare gains from unemployment insurance: the effect of UI on consumption fluctuations of both goods, job search response and the cost of adjusting commitments.

The first row of Table 9 shows the welfare gains shown in Table 8. The second row shows the welfare gains coming from the effect of UI on how frequent individuals

Table 9: Sources of welfare gains from UI

	Commitments (%)	No Commitments (%)	Difference (p.p.)
CE, all	4.2	3.4	0.8
Adjustment cost	0.0	—	—
Job search effort	1.2	1.1	0.1
Cons. fluctuations	3.0	2.3	0.7

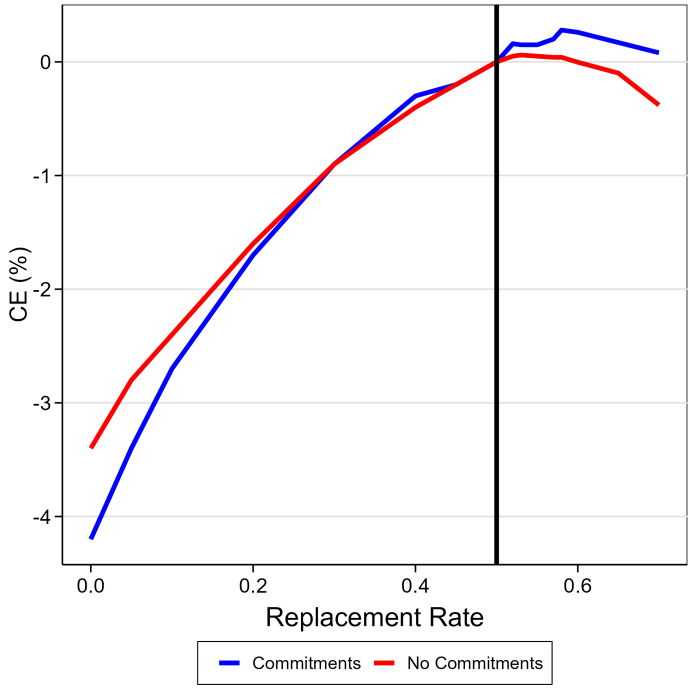
Note: The first row shows the overall welfare gains from UI. The second row shows the welfare gains coming from the effect of UI on how frequent individuals adjust commitments. The third row shows the welfare gains due to the effect of UI on job search effort. The fourth row, shows the welfare gains from how affects UI consumption fluctuations faced by individuals

adjust commitments. The cost of adjusting commitments plays a very small role on overall welfare gains. This is not very surprising as the fraction of individuals adjusting commitments only increases from 10% to 10.9% when UI is removed. The third row shows the welfare gains due to the effect of UI on job search effort. We can see that job search effort contribute importantly to overall welfare gains of UI. This component has a slightly higher effect in the economy with commitments due to the stronger response of effort to changes in UI shown in section 5. However, the difference in this component between both economies only contributes to 12% of the overall difference in welfare gains from UI. Finally, the fourth row, shows the welfare gains from how affects UI consumption fluctuations faced by individuals. Consumption fluctuations makes the largest contribution to the welfare gains from UI. Furthermore, as individuals are more poorly insured with commitments, the welfare gains from UI are much higher in the economy with commitments. Indeed, most of the difference in the value of UI between both economies comes from this last component.

6.1 Optimal Replacement Rate

What is the optimal UI replacement rate in an economy with consumption commitments? To answer this question, we search for the replacement rate that maximizes welfare of the median individual in the economy. We keep the other elements of the

Figure 6: Welfare gains by replacement rate



Note: The black vertical line represents the benchmark value. The vertical axis presents the consumption (of the adjustable good) compensation needed to be given so the median individual is indifferent between that replacement rate and the benchmark one. Negative values imply welfare losses with respect to the benchmark.

UI program, the duration and the cap, intact.[25] The average taxes are again adjusted for each possible replacement level to keep revenue neutrality. Figure 6 presents the changes in welfare of the median individual compared to the benchmark economy.

We find that welfare of the median individual is maximized for a replacement rate of 57% (compared to 50% in the benchmark). With this replacement rate, average welfare gain is 0.29%, in consumption terms, with respect to the benchmark. However, not all individuals benefit from the optimal replacement rate. While non-college individuals have large gains, around 1.33% of adjustable consumption for the median individual, from moving from the current system to the optimal replacement rate, college individuals experience a welfare loss of 0.32%. College individuals have higher savings and experience fewer separations, while the tax rate needs to be increased, average tax increase by 0.2 percentage points, to finance the higher replacement rate. In total, moving from the current UI system to the optimal replacement rate, 63% of individuals experience a welfare gain.

[25] The Baily-Chetty formula cannot be directly applied to this case as its derivation requires indefinite duration of UI benefits, while the actual U.S. system only provides benefits for a maximum of 6 months.

In an economy without commitments, the optimal replacement rate is 53% and an average welfare gain of only 0.06%. The median non-college individual experiences a welfare gain of 0.12% at the optimal replacement rate, while the median college individual would have a welfare loss of 0.44%. At this optimal replacement rate, 56% individuals would be better off.

The optimal replacement rate in an economy with commitments is higher than in an economy without them. However, despite the large welfare gains from UI in the economy with commitments, the difference in the optimal value of the replacement rate in both economies is not that high. As we have seen, in the economy with commitments, job search effort reacts more to changes in replacement rates compared to an economy without commitments. This effect reduces the effect of insurance on the value of UI as it has to be financed by a higher increase in taxes in the economy with commitments.

Finally, it is also remarkable that there are welfare gains, in the economy with commitments, for large replacement rates. In particular, for a replacement rate of 70%, significantly higher than the optimal and benchmark ones, the median individual has still a welfare gain of 0.08%. In contrast, this does not happen in the economy without commitments. Without commitments, the median individual experiences welfare losses for replacement rates over 60%. In summary, although optimal replacement rates are not very different in both economies, the high insurance value of commitments makes that replacement rates much higher than the benchmark one are welfare improving. In contrast, welfare gains above a replacement rate of 50% are very limited in the economy without commitments.

7 Conclusions

Around 40% of household expenditures are devoted to the consumption of goods and services whose expenditure is difficult to adjust. These commitments are also much less adjusted than other goods during unemployment events. The presence of commitments magnifies the welfare costs of unemployment since only part of consumers' consumption can be adjusted. As a result, unemployment insurance, which allows individuals to smooth consumption during unemployment spells, becomes a

more valuable policy tool.

In this paper, we study the implications of unemployment insurance for employment and welfare under the presence of commitments. To this end, we build a model of heterogeneous agents who face unemployment and income shocks. Individuals consume two types of goods: an adjustable good and a commitment whose consumption is costly to adjust. The government taxes income to finance unemployment benefit payments and exogenous government expenditure. We calibrate this economy to the US 2017-2019 in order to quantify the effects of the unemployment insurance program.

The model economy is used as a quantitative laboratory to study the role of unemployment insurance in an economy with commitments. We first investigate what happens when we make unemployment insurance less generous by reducing its replacement rate. We do this both in the benchmark economy and in an economy where individuals can adjust both goods freely. In an economy with commitments, as the unemployment insurance becomes less generous, unemployed individuals exert more effort to find a new job. As a result, both unemployment durations and the level of unemployment decline sharply. These effects are also present in an economy without commitments, but they are much more muted. The average unemployment duration decreases by 12% in the benchmark economy with commitments when unemployment insurance is completely eliminated. The decline is just 8% in the economy without them. Precautionary savings and the marginal propensity to consume also increase significantly under the presence of commitments.

We also find that unemployment insurance is much more valuable in an economy with commitments, especially for low-income, non-college-educated individuals. Eliminating unemployment insurance implies a welfare loss of 4.2% (measures in consumption variation of the adjustable good). The loss is only 3.4% in an economy without commitments. Finally, we calculate the optimal, welfare-maximizing replacement rate. In the benchmark economy, the optimal replacement rate is 57%, 7 percentage points higher than the current US value.

The findings suggest that the composition of the consumption basket of households may be an important feature to take into account to understand the value and macroeconomic effects of different public policies.

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A Adjustments for 5% and 1% thresholds

In Appendix A, we present the fraction of households that adjust their spending on different goods each quarter. We assume that households adjust their consumption in good i if their expenditures have changed for that item for more than 5% from quarter $t-1$ to quarter t (Table A.1). A similar calculation, but with a threshold of 1% instead of 5%, is done to produce Table A.2. In Table 1 in Section 2, the threshold was 10%. The fraction of households adjusting commitments computed as the weighted average of fraction adjusting by the expenditure share of each item is 14.0%, for 5% threshold, and 15.8% for 1% threshold. We can see that overall, regardless of the threshold we impose, the difference in expenditures' adjustment patterns between those goods classified in the main text as commitments and adjustables remains.

Table A.1: Fraction of Households Adjusting between two Quarters, Threshold 5%

	% Adjust	Expenditure Share
Food	88.5%	21.1%
Utilities	83.6%	5.8%
Transport	93.0%	22.5%
Entertainment	90.4%	6.3%
Shelter	2.1%	27.2%
Phone	49.4%	2.6%
Life insurance	33.4%	0.8%
Vehicle insurance	40.6%	3.0%
Health insurance	36.8%	5.9%

Note: Shelter is the same as in Table 1 in Section 2, since it is computed as the fraction of movers in SIPP.

Table A.2: Fraction of Households Adjusting between two Quarters, Threshold 1%

	% Adjust	Expenditure Share
Food	96.4%	21.1%
Utilities	94.9%	5.8%
Transport	97.9%	22.5%
Entertainment	95.6%	6.3%
Shelter	2.1%	27.2%
Phone	59.3%	2.6%
Life insurance	35.2%	0.8%
Vehicle insurance	46.9%	3.0%
Health insurance	41.2%	5.9%

Note: Shelter is not modified as it is computed as the fraction of movers in SIPP

B Adjustments by different demographic groups

In Appendix B, we reproduce Table 1 for different demographic groups: educational attainment of the household heads, college vs. non-college (Table B.3), their marital status, married vs. single (Table B.4), and whether there are children present at home or not (Table B.5). We can see that, while less than college, singles and households without children spend more on commitments and adjust more frequently, although differences are rather small. Note also that the shares of expenditures devoted to commitments is similar to college and non-college. Note too that college individuals save more, as a result, the fraction of their income devoted to commitments is lower than the fraction devoted by non-college. Finally, single individuals tend to devote a higher share of their expenditures to commitments (43%) compared to married households (38%), but differences are not large.

Table B.3: Adjustment patterns by education

	Less than College		College	
	% Adjust	Expenditure Share	% Adjust	Expenditure Share
Food	79.2%	22.3%	77.5%	18.1%
Utilities	71.1%	7.1%	72.3%	5.2%
Transport	85.6%	23.3%	88.4%	19.9%
Entertainment	84.0%	5.2%	86.2%	7.6%
Shelter	2.5%	26.4%	1.8%	29.2%
Phone	41.5%	3.8%	39.2%	2.1%
Life insurance	29.3%	0.6%	31.7%	0.8%
Vehicle insurance	32.2%	4.3%	38.2%	2.8%
Health insurance	32.7%	5.8%	29.2%	6.3%

Table B.4: Adjustment patterns by marital status

	Married		Single	
	% Adjust	Expenditure Share	% Adjust	Expenditure Share
Food	76.7%	20.7%	79.5%	21.7%
Utilities	70.6%	5.6%	72.7%	6.0%
Transport	86.7%	24.5%	87.0%	17.7%
Entertainment	85.4%	7.2%	83.9%	6.0%
Shelter	1.7%	26.1%	3.0%	30.9%
Phone	41.7%	2.5%	40.3%	2.7%
Life insurance	28.5%	0.9%	30.8%	0.5%
Vehicle insurance	35.8%	2.7%	32.8%	3.4%
Health insurance	29.3%	6.3%	32.1%	5.6%

Table B.5: Adjustment patterns by children presence at home

	Children		No Children	
	% Adjust	Expenditure Share	% Adjust	Expenditure Share
Food	76.6%	21.8%	78.9%	20.2%
Utilities	70.4%	6.0%	72.5%	5.6%
Transport	85.9%	21.1%	87.6%	23.0%
Entertainment	85.5%	7.5%	84.0%	5.7%
Shelter	1.6%	26.5%	3.0%	28.7%
Phone	43.3%	2.7%	40.0%	2.4%
Life insurance	31.3%	0.8%	29.1%	0.7%
Vehicle insurance	33.6%	2.7%	34.4%	3.5%
Health insurance	29.6%	5.7%	31.5%	6.1%

C Calibration for Economy without Commitments

In this Appendix, we present the parameter values used for the counterfactual economy without commitments. Note that the only parameters recalibrated in this counterfactual economy are the interest rate, r, and the disutility of job search effort, ψ, to match the median wealth and average duration. The resulting economy is a two-good economy in which both goods are fully adjustable and matches the same moments as the benchmark economy, except those related to commitments. To make the welfare comparisons clear, we keep the elasticity of substitution between both goods the same as in the benchmark economy, equal to 0.5, and the consumption equivalent is expressed in terms of the extra consumption on the first good c. This is done so that the lower welfare gains from UI in the economy without commitments are due to differences in consumption fluctuations, job search effort and adjustment costs, and not due to the sustitutability of both goods. Also note that, since we want to study the effect of commitments on job search effort, we do not recalibrate the elasticity of unemployment duration with respect to changes in the maximum number months that individuals can receive UI benefits. Table C.6, presents the recalibrated values of the parameters in the economy without commitments. In this economy, the interest rate is higher and the disutility of effort is lower compared to an economy with commitments to match median assets and average unemployment duration.

Table C.6: Calibrated parameters in economy without commitments

Parameter		**Value**	**Moment**
r	Interest rate	0.0051	Median assets
ψ	Level disut. effort	19.6	Mean unemployment duration

Note: Calibrated parameters and the corresponding moments they target.

Table C.7 and Table C.8 present the parameters used in the economy with commitments that remain unchanged in the economy without commitments. The only parameters that changes is κ since in this counterfactual economy there are no cost of adjusting commitments.

Table C.7: Parameters unchanged from the economy with commitments

Parameter		Description	Source
π	1/360	Probability of death	Average of 30 years
σ	1.5	Coefficient risk aversion	Standard
$\overline{N_{UI}}$	6	Employment requirement for benefits	Department of Labor
Θ_0	0.50	Replacement rate	Graves (2021)
Θ_1	0.67	Cap on UI	Graves (2021)
f_l	0.633	Fraction non-college	CPS (2014-2018)
f_h	0.367	Fraction college	CPS (2014-2018)
ρ_ξ	0.997	Persistence shock	Krueger et al (2016)
σ_ξ	0.053	Variance persistent shock	Krueger et al (2016)
δ_{θ_l}	0.0147	Probability job loss, non-college	CPS (2017-2019)
δ_{θ_h}	0.00849	Probability job loss, college	CPS (2017-2019)
γ	0.89	Tax function level	Guner et al. (2014)
τ	0.05	Tax function curvature	Guner et al. (2014)

Table C.8: Calibrated parameters unchanged from the economy with commitments

Parameter		**Value**	**Moment**
Labor Productivity			
θ_l	Permanent shock non-college	-0.36	Same as benchmark
θ_h	Permanent shock college	0.42	Same as benchmark
Preferences			
α	Share of adjustables in utility	0.700	Same as benchmark
κ_f	Cost of adjusting commit.	0.000	No Commitments
$\widehat{\beta}(\theta_l)$	Patience non-college	0.986	Same as benchmark
$\widehat{\beta}(\theta_h)$	Patience college	0.994	Same as benchmark
η	Elasticity both goods	-1.0	Same as benchmark
Job finding function			
λ_1	Slope job finding function	-0.20	Same as benchmark

Note: Calibrated parameters that remain the same from the economy with commitments, except κ, and the corresponding moments they target.

Table C.9 presents the value of the targets in the recalibrated economy. We can see that median assets and average unemployment duration remain very close to the data counterpart, as in the economy with commitments. Table C.10, presents the value of the other moments that were targeted in the economy with commit-

ments, except those related to commitments. As can be seen, the economy without commitments matches well those moments too.

Table C.9: Targeted Moments: economy without commitments

Moment	**Model**	**Data**
Median assets/Mean earnings	0.47	0.51
Mean duration unemployment (months)	4.71	4.67

Note: Targeted moments generated by the model and their data counterpart.

Table C.10: Targeted Moments: economy without commitments

Moment	**Model**	**Data**
Ratio average earnings COL/NCOL	2.16	2.18
Normalized earnings	1.0	1.0
Fraction unemployed with duration >6 months	0.24	0.23
Fraction wealth top 40%	0.92	0.93

Note: Targeted moments generated by the model and their data counterpart.

D Maximum UI Duration and Unemployment

In this Appendix, we present how reducing the maximum benefit period affects average unemployment duration, unemployment rate and search effort in economies with and without commitments.

The left panel of Figure D.7 shows the average unemployment duration as a function of the maximum number of months that individuals can receive UI benefits, which is 6 months in the US. The right panel shows unemployment rate as a function of maximum benefit duration. We can see that the unemployment rate decreases faster in an economy with commitments when benefit duration is decreased. The difference becomes significantly higher when individuals can receive benefits for 4 or less months. The figure for unemployment durations have a similar pattern.

Figure D.7: Unemployment and Unemployment Insurance Durations

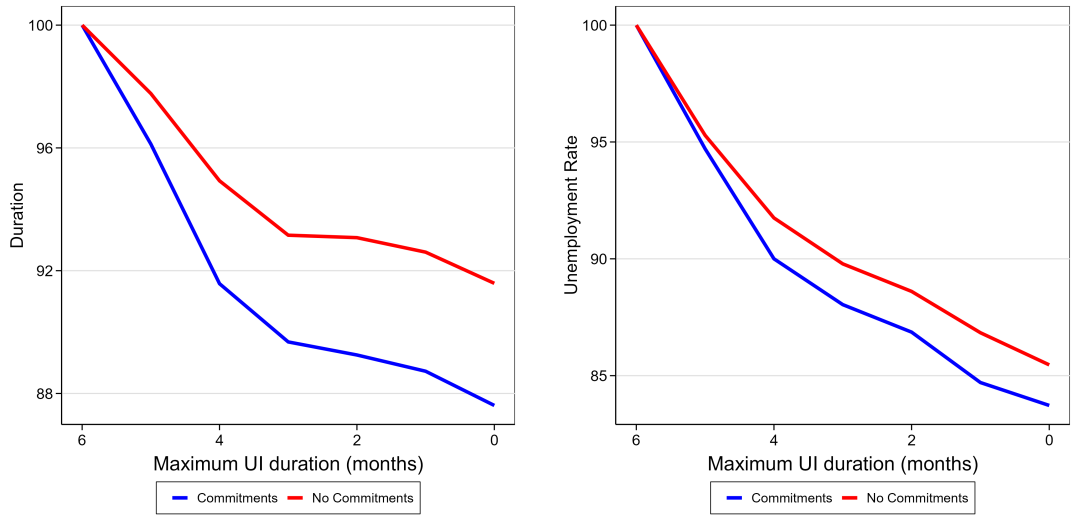
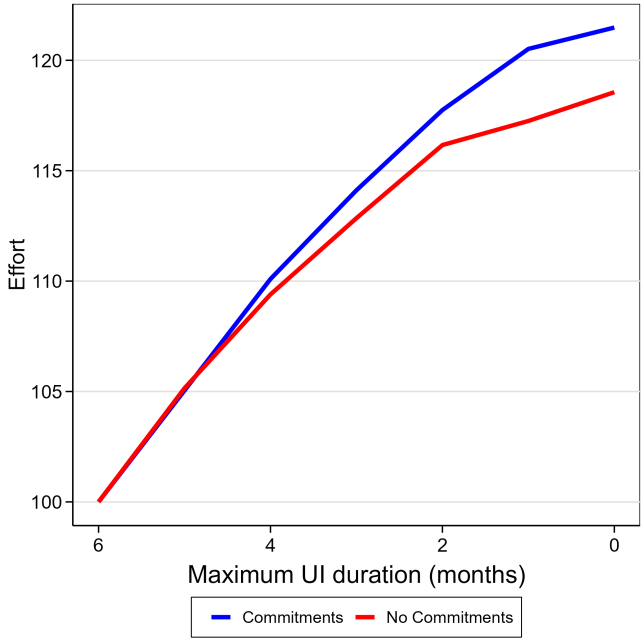


Figure D.8 plots effort as a function of maximum benefit durations. Consistently with unemployment duration and unemployment rate, reducing the maximum benefit duration has a similar effect in both economies if households can receive benefits for more than 2 months. When maximum benefit duration decreases to 2 months or less, effort becomes significantly higher in the economy with commitments.

Figure D.8: Unemployment duration and Replacement Rates



Overall, the impact of commitments on different labor market outcomes are similar to reductions in the replacement rate (Section 5) than the maximum benefit duration.