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"Entrepreneurship and Labor Market Mobility: the Role of Unemployment Insurance"

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Entrepreneurship and Labor Market Mobility: the Role of Unemployment Insurance*

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Abstract

We evaluate the effects of unemployment insurance variations in a general equilibrium occupational choice model of entrepreneurship. We establish that the occupational flow from unemployment to entrepreneurship is remarkably sensitive to unemployment insurance generosity, corroborating our empirical findings. Beyond direct effects on unemployment, we find large reallocations between employment and entrepreneurship relative to changes in generosity. They contribute to an empirically consistent stable aggregate employment rate, despite increasing unemployment. We show that an *insurance coverage effect*, i.e. a change in the relative riskiness between occupations with respect to generosity, is a key driver of our results.

Keywords: Entrepreneurship, Unemployment Insurance, Labor Market Mobility.

JEL classification: E24, J65, E61.

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1 Introduction

The primary function of an unemployment insurance (UI) system is to provide coverage against the loss of employment. However, both the design of the UI scheme and the accompanying regulations are bound to have larger consequences on labor market mobility and occupations. The literature has extensively discussed the relation between UI generosity and lower incentives to search for a job. Yet, little is known of the impact of this generosity on the entrepreneurial sector. In this paper, we study how the design of the UI system, specifically its generosity, defined as the product between the level of benefits and coverage duration, conditions the entrepreneurship rate and the flows in and out of this occupation.

Our paper empirically establishes that a higher UI provision significantly reduces the probability of unemployed individuals selecting into entrepreneurship. The estimate is significant and economically large, especially when compared to that of the flow from unemployment to employment. Our empirical study uses the Current Population Survey (CPS) microdata from 1994 to 2015 and the variation in the regular UI and the extended benefits, i.e. the Extended Benefits (EB) and the successive Emergency Unemployment Compensation (EUC) programs, across US states and over time. Similarly to Hsu et al. (2018) in a housing market context, we identify the effect of a change in UI generosity on the selection into entrepreneurship by comparing two groups: the insured unemployed group, eligible following a layoff and the uninsured group, non-eligible for the UI. In the US, while they represent only 5 to 6% of the total workforce, unemployed individuals represent 20% of the individuals transiting into entrepreneurship. A more generous UI program significantly reduces the propensity to select into entrepreneurship and to a broader extent, into self-employment. In terms of magnitude, a standard deviation increase in total regular UI generosity corresponds to a 10% decline in the likelihood of a transition from unemployment to entrepreneurship and a 14% decline when considering regular generosity and UI extensions.[1]

We then introduce a quantitative model and a counterfactual experiment framework to explain the incentives behind the response to a change in the UI design. Our baseline economy is an incomplete markets general equilibrium model with endogenous search and occupational choices designed to capture the main features of the transitional flows between occupations, specifically occupational flow elasticities and occupational masses relative to UI generosity.

[1] This result is robust to alternative periods and the type of variations used. The magnitude would correspond to an increase by about 8,000$ in total generosity. It could broadly be illustrated as the difference in total UI generosity between the states of Pennsylvania and Michigan.

Individuals endogenously select into either employment or entrepreneurship. Employed individuals are subject to a layoff risk and, upon joining the insured unemployment pool, are eligible for UI benefits for a specific duration before potentially becoming long-run uninsured unemployed. Adverse shocks may compel entrepreneurs to cease their businesses and upon joining the unemployment pool, they are uninsured and not eligible for any UI benefits. An important aspect of the model is its ability to fully characterize unemployment spells and the long-run uninsured unemployment status. Our parameterization is able to closely reproduce the observed occupational flows in the US while the baseline UI system corresponds to that of an average US state both in terms of duration and benefits level. Our setup also fits a number of relevant non-targeted moments such as the reproduction of key moments of the income and wealth distributions.

Our model-based counterfactual experiments framework mimics the ability of a policymaker to broadly alter the UI design using two instruments: UI duration and UI benefits. In a nutshell, it is able to generate an extensive variety of UI generosity situations, well beyond the empirical variety provided by observing the US states data. It lets us capture key insights about the effects of varying UI generosity and the sizable repercussions on occupational flows, occupational masses, and aggregate outcomes while relating them to economic incentives. Using this framework, we establish that the elasticity to UI generosity of the flow from the insured unemployed pool to entrepreneurship is negative and almost two times higher than the corresponding elasticity of the flow to the employment pool. This result substantiates the idea that higher UI generosity lowers the incentives to exit insured unemployment and is supported by two well-known effects: a *moral hazard* and a *liquidity* effect.[2] We uncover an additional effect related to entrepreneurship that we refer to as the *insurance coverage effect*: it is the change in the relative riskiness between two asymmetrically covered occupations with respect to generosity. In essence, both the values of insured unemployment and employment respond positively to an increase in UI generosity. Insured unemployed individuals obtain higher UI benefits, while workers are better insured against the unemployment risk. However, the value of entrepreneurship is not directly responsive to generosity because entrepreneurs are not covered by the UI system. From the perspective of an unemployed agent, the incentive to search for a job is relative to the gap between the values of employment and

[2] The *moral hazard effect* captures the change in the marginal incentive to search following a variation in UI benefits that effectively lowers the expected net income gain of taking a job. The *liquidity effect* captures the variation of the search effort relative to the loosening of the liquidity constraint following a change in UI generosity. See for instance Shavell and Weiss (1979), Moffitt (1985), Meyer (1990), Hansen and Imrohoroğlu (1992), Hopenhayn and Nicolini (1997), Browning and Crossley (2001) and Chetty (2008) among many others.

unemployment while the incentive to start a business is relative to the gap between the values of entrepreneurship and unemployment. In the end, following an increase in UI generosity, the incentive to exit unemployment for entrepreneurship reduces relative to the incentive to exit unemployment for employment. In a broader sense, when UI generosity increases, the incentive to search for a self-employed activity *on-the-job* is also lower while the incentive to search for a job *on-the-business* is increased. On top of this effect, because an entrepreneurial activity is contingent on the ability to procure sufficient entrepreneurial capital, the incentive to exit insured unemployment (or employment) for entrepreneurship, conditional on other characteristics, appears only beyond a wealth threshold. Augmenting UI generosity increases that threshold and disincentivize poorer individuals from selecting into entrepreneurship even further. Overall, the above effects lead to a significant long-run loss in potential total entrepreneurial sector output.

Our approach also gives an additional perspective to a debated puzzle in the literature related to UI generosity. On one side, and as discussed above, UI generosity has a significant impact on labor market flows, especially the depressing effect on the flow out of insured unemployment. On the other side, as empirically established by Chodorow-Reich et al. (2019) and Boone et al. (Forthcoming), the effect of UI generosity on the aggregate level of employment is small or non-significant. Our contribution is to show that the flows into and out of entrepreneurship play a significant role in shaping the aggregate occupational masses. In substance, when UI generosity increases, the occupational flow from entrepreneurship to employment increases while the opposite flow decreases. Because the masses of employed agents and entrepreneurs are larger than the mass of insured unemployed agents, the reallocation from entrepreneurship to employment is a key factor in counterbalancing the flow out of insured unemployment. As a result, our model generates an empirically relevant stable mass of employed individuals in the economy when UI generosity increases. We discuss how much of the above results rest on the tax menu used to finance the UI system and review alternative options.

Finally, we investigate the effects of a temporary increase in UI generosity on entrepreneurship by accounting for Extended Benefits during the Great Recession. Consistently with the existing literature, we find that extensions significantly increase unemployment, but we underline that they generate a persistent and significant decrease in the entrepreneurship rate and the aggregate entrepreneurial sector output. In terms of magnitude, UI extensions may be responsible for about a 0.2 percentage points decrease in the entrepreneurship rate.

Related Literature Our paper is related to the literature studying the effects of UI on the selection into entrepreneurship. Røed and Skogstrøm (2014) study the relationship between the provision of UI benefits on the propensity to start a business and find that the selection into entrepreneurship increases around the time of insurance exhaustion. In a broader sense, our paper focuses on the provision of UI benefits and its effect on occupational choices. In this respect, we are related to the wide literature studying micro-level disincentives to UI provision from the *moral hazard* effect, studied in Moffitt (1985) or Meyer (1990) among many others, to the *liquidity effect* studied, for instance, in Hansen and Imrohoroğlu (1992) and Chetty (2008). We are especially concerned with the impact of UI variations when one occupation, e.g. entrepreneurship, is uninsured. None of the above contributions have raised the question of the importance of UI provision on occupational choices and the underlying mechanisms. This paper is also related to the quantitative literature on entrepreneurship in relation to mobility and wealth inequality issues pioneered by Quadrini (2000) and Cagetti and De Nardi (2006) and to the many policy issues that have been addressed using this framework, e.g. Kitao (2008), Cagetti and De Nardi (2009), or Brüggemann (Forthcoming) among others. Similarly to our contribution, recent papers address the question of insurance mechanisms in models with entrepreneurship. For instance, Fairlie et al. (2011) focus on the effects of introducing health insurance and Mankart and Rodano (2015) study the effect of alternative bankruptcy laws. In addition, our paper is related to the literature providing a quantitative evaluation of the effects of UI on the labor market, such as Hansen and Imrohoroğlu (1992) or more recently Nakajima (2012). Compared to the latter papers, we carefully model unemployment spells and insurance exhaustion in a model that features entrepreneurship. On the empirical front, using CPS data and a similar identification strategy as Hsu et al. (2018), we show that unemployed individuals respond to UI generosity and are less likely to select into entrepreneurship. Xu (2019) proposes an empirical evaluation focused on the creation of unincorporated or incorporated businesses. Our contributions hold for variations in regular and successive UI extensions as well as a definition of entrepreneurship that controls for business ownership. Moreover, we provide a theoretical analysis of the incentive effects at play, notably, through the *insurance coverage effect*.

The remaining of the paper is organized as follows. Section 2 presents our empirical contributions. Our baseline model and its parameterization are developed in Section 3. Section 4 discusses the properties of our baseline economy while our main results are reported in Section 5. Section 6 concludes.

2 Unemployment Insurance and Occupational Choice

We first document key facts about the US labor market mobility. We recover quarterly occupational flows using matched monthly CPS data. Individuals are either employed (W), unemployed (U), or self-Employed (SE). In the latter group, we further distinguish entrepreneurs (E) defined as self-employed business owners which is a common definition of entrepreneurship in the literature (Cagetti and De Nardi (2006), Brüggemann (Forthcoming)).[3] We then empirically establish a relation between UI generosity and the propensity to select into entrepreneurship out of unemployment.

2.1 Aggregate occupational flows

We start by characterizing the aggregate flows between occupations from 1997 to 2007. Table 1 documents transitions between occupations depending on whether entrepreneurs are defined as business owners or more generally as self-employed. We see two key takeaways. Comparing the employment and entrepreneurial activities, the former is significantly more persistent and flows in and out of it are also significantly less volatile than the latter.[4] For self-employed business owners (resp. all self-employed), we find an average quarterly exit rate of 6% (resp.7.5%), with 1% (resp. 1.4%) toward unemployment. Moreover, the flows out of the above activities have differing characteristics: most of the flows out of employment are toward unemployment whereas most of those out of entrepreneurship are toward employment. This suggests that many entrepreneurs voluntary quit their businesses for a job while not experiencing unemployment spells. Second, we find that unemployed individuals are about 5 times more likely to enter entrepreneurship than workers. When considering self-employed business owners (resp. all self-employed), 2.4% (resp. 3.7%) of the unemployed individuals and 0.5% (resp. 0.7%) of the workers start a business each quarter. We see at least two explanations for this fact: (i) workers are less likely to have the time to search for business ideas and learn about potential business markets, and (ii) unemployed individuals may choose to enter entrepreneurship as a better outside opportunity or out-of-necessity. As a result, while they represent only 5-6% of the workforce, unemployed individuals account for 20% of the individuals transiting into entrepreneurship.

[3] Appendix A.2 provides further details on the sample selection and variables.

[4] One possible explanation of these flows might be related to the risk faced by entrepreneurs. Herranz et al. (2015) document that smaller businesses display substantial losses. Moreover, as documented by Astebro and Chen (2014), a number of additional papers show that self-employment yields a lower income than employment.

Table. 1. Quarterly occupational flows for different definitions of entrepreneurship

	Transition (%)			Mass (%)
	Employment	*Entrepreneurship*	*Unemployment*	
A. All self-employed				
Employment	97.20 (0.36)	0.69 (0.1)	2.11 (0.34)	84.3
Entrepreneurship	6.15 (0.93)	92.45 (1.0)	1.40 (0.40)	10.3
Unemployment	46.04 (5.87)	3.72 (1.13)	50.25 (6.0)	5.4
B. Self-employed business owner				
Employment	97.35 (0.36)	0.50 (0.09)	2.15 (0.34)	85.2
Entrepreneurship	4.80 (0.82)	94.22 (0.89)	0.99 (0.34)	9.4
Unemployment	47.36 (5.86)	2.40 (0.88)	50.25 (6.0)	5.4

Source: authors' computations using CPS data from 1997 to 2007. Standard deviations between brackets.

2.2 Heterogeneity in UI generosity

Textbook labor economic theories posit that UI generosity is related to smaller incentives to exit unemployment and an extensive literature focuses on the efforts to find a job. Yet, little is known of the effects of UI generosity on occupational choices, especially toward self-employment and entrepreneurship.

In the following, we exploit the heterogeneity in UI generosity across US states and over time from 1994 to 2015 to study the impact of the UI scheme on the choice to become entrepreneur.[5] Over the above period, variations in generosity of regular benefits are quite large, not only in the cross-section but also over time within states. Each state applies its own benefit schedule with a typical replacement rate of around 50% of the prior wage of an individual. However, the level of benefits is capped at each state's inflation-adjusted maximum weekly benefit level, hereafter $Max\ Regular_{benefits}$. At the same time, each state applies a limit on the number of weeks UI benefits can be claimed, hereafter $Max\ Regular_{weeks}$. A maximum of 26 weeks has been the typical UI duration over the sample period. As such, variations in regular benefits are mostly driven by changes in the regular weekly benefit amount. Following Agrawal and Matsa (2013) and Hsu et al. (2018), we use the following as a proxy to generosity of the regular UI benefits in each state as:[6]

$$Total\ Max\ Regular_{benefits} = Max\ Regular_{benefits} \times Max\ Regular_{weeks}.$$

During periods of high unemployment, each state also provides extended benefits to in-

[5] Rothstein (2011) and Farber et al. (2015) study the effect of UI extensions on unemployment exit options. They focus on the timing of the switch toward employment and the potential disincentive effect. We, however, focus on the effect of UI on the resulting occupational choice.

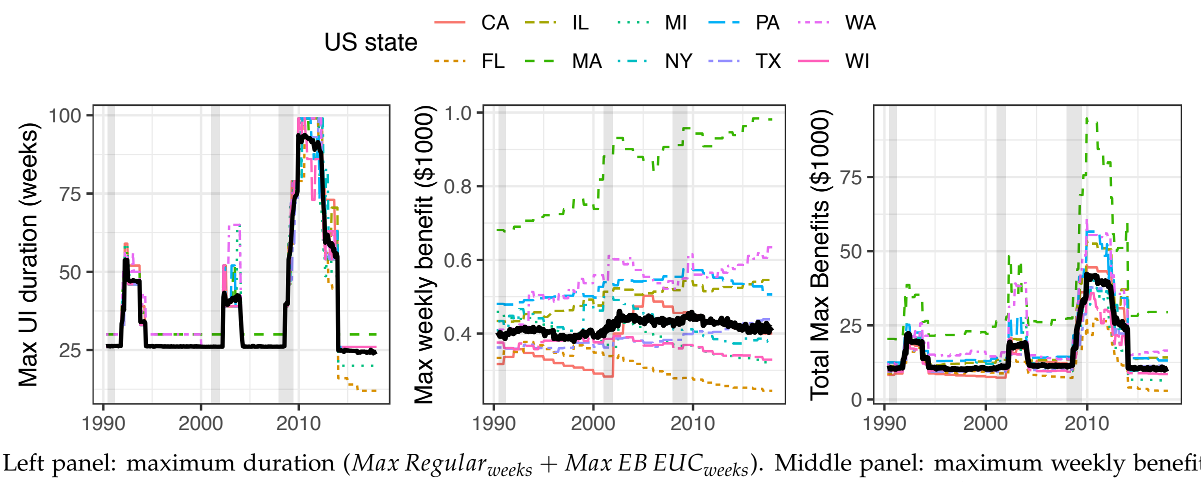
[6] Regarding the relation to actual UI benefits, Hsu et al. (2018) show that the elasticity of $Max\ Regular_{benefits}$ to total actual compensation payments at the state level is 1.0. Furthermore, they show that for 60% of the population, benefits are capped, and that $Max\ Regular_{benefits}$ captures changes in UI benefits well. To complement the analysis, we check the robustness of the results against alternative UI generosity measures in Appendix A.3.

dividuals exhausting their regular benefits in the form of additional weeks. The Extended Benefits (EB) and the Emergency Unemployment Compensation (the successive names of this program having been EUC91, TEUC, and EUC08, we hereafter refer to it as simply EUC) are such regulations. The above variations of regular benefits become even larger when considering the state by state activation of these extensions. For instance, during the Great Recession (GR), heterogeneous emergency extensions (EB and EUC) of UI generosity were activated and in some states, the duration of UI benefits was extended up to 99 weeks. To represent global UI generosity including the extensions, we build the following measure:

$$Total\ Max\ Benefits = Total\ Max\ Regular_{benefits} + Max\ Regular_{benefits} \times Max\ EB\ EUC_{weeks},$$

where $Max\ EB\ EUC_{weeks}$ is the number of weeks authorized for the extensions. In other words, it is the total amount of benefits that an individual falling into unemployment in a given month could claim over the maximum number of weeks the benefits could be claimed at that time, including UI extensions when available. Accounting for UI extensions provides additional variations (in UI duration only) that may generate disincentives toward finding an active occupation such as self-employment or employment.[7] Figure 1 displays the maximum duration ($Max\ Regular_{weeks} + Max\ EB\ EUC_{weeks}$), the maximum weekly benefit ($Max\ Regular_{benefits}$), and total claimable benefits ($Total\ Max\ Benefits$) both for as a US average and selected US states.

Figure 1. Maximum UI benefits duration and amount: US average and selected states



Left panel: maximum duration ($Max\ Regular_{weeks} + Max\ EB\ EUC_{weeks}$). Middle panel: maximum weekly benefit ($Max\ Regular_{benefits}$), CPI adjusted. Right panel: total claimable benefits ($Total\ Max\ Benefits$), CPI adjusted. The black line is the average for the US. Grey areas reports the NBER recessions. Further details about our computations can be found in Appendix A.2.
Sources: US Department of Labor, significant provisions of state unemployment insurance laws biannual reports.

[7]Moreover, EB and EUC put even more restrictions on the individuals concerning the active search for a new job, which are likely to further affect the propensity to select into entrepreneurship.

2.3 UI generosity and propensity to start a business

To establish the relation between UI generosity and flows to entrepreneurship, we distinguish recently laid off unemployed individuals who are eligible for UI from those who either voluntarily quit their job or are not eligible for the UI. Our empirical study uses a quarterly frequency to obtain sufficient flows toward self-employment. Moreover, we use only quarterly transitions for which we observe that individuals switched since at least two consecutive months to another occupation.[8] We distinguish two data panels. Panel A, covering the 1994-2007 period, excludes the GR and the significant UI benefits extensions that were then implemented. It will let us study the effects of a change in regular benefits. Panel B, covering the whole 2008-2015 period, encompasses the impact of all benefits changes including UI extensions. It will let us verify whether UI duration adjustments observed during the GR result in similar findings with respect to regular benefits. Consistently, for a laid off unemployed individual eligible for UI benefits, we impose that the unemployment duration does not exceed 30 weeks in Panel A and 99 weeks in Panel B. This corresponds respectively to the maximum UI duration of regular and extended benefits for Panel A and B.

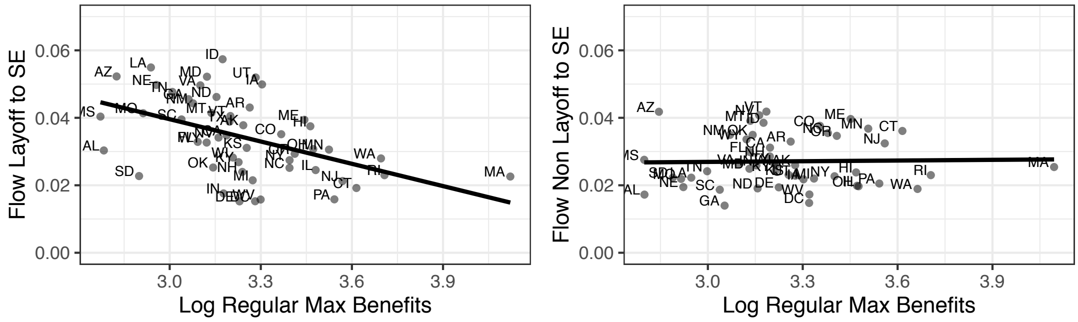
Based on the definitions of generosity above, Figure 2a shows the flows from unemployment to self-employment disaggregated by US states for Panel A. The left plot displays a downward relation between the maximum regular benefits level and flows from the pool of laid off unemployed individuals to entrepreneurship. Namely, US states that have a higher maximum regular benefits level tend to have a smaller flow from the laid off unemployment pool to self-employment. The right plot illustrates that such a downward relation does not exist for individuals that are unemployed for reasons other than a layoff and not eligible for UI. The left plot of Figure 2b establishes the same relation for Panel B, i.e. a timeframe where most of the UI benefits extensions offered after the GR had come into implementation. Consistently, when taking into account regular benefits as well as EB and EUC extensions, a higher generosity of UI is related to lower flows from the layoff pool to self-employment. The right plot shows that for individuals that are unemployed for reasons other than a layoff, there is again no such relation.

To further establish the relation between UI generosity and flows to entrepreneurship, we

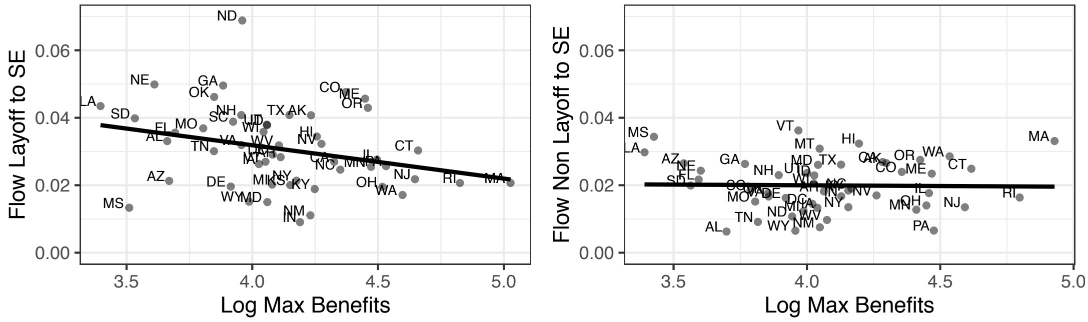
[8] The exact construction of the groups are provided in Appendix A.2. Notice that according to Rothstein (2011), about half of the displaced workers (eligible for UI) actually receive UI benefits. Although laid off workers are an imperfect measure of benefits recipients, only a few out of that group receive them. Therefore, laid off workers appears to be a good proxy for UI eligibility.

Figure 2. Average quarterly flow toward self-employment among the unemployed individuals

(a) Panel A: regular UI generosity ($Total\ Max\ Regular_{benefits}$) for the periods 1994:2007



(b) Panel B: regular and extended UI generosity ($Total\ Max\ Benefit$) for the period 2008:2015



investigate whether it holds when we control for characteristics of individuals and US states. Our key identifying strategy rests on the assumption that state-level changes in regular UI generosity are independent of factors that might otherwise affect the propensity to select into entrepreneurship among the unemployed, such as the level of incomes. Hsu et al. (2018) show that this assumption is supported by the data. The maximum regular UI benefits provided by a given state are not significantly related to the unemployment rate, average wage, log real gross domestic product per capita, home price growth, or other unobservable factors captured by state and year-by-month fixed effects.[9] Concerning the use of federal extensions of UI benefits during the GR, we follow Rothstein (2011) and Hsu et al. (2018) and control for the endogeneity of the EUC and EB activations by controlling flexibly for smooth cubic polynomial functions of the state's unemployment rate. Finally, we identify the effect of UI generosity on entrepreneurial selection by comparing the impact of state-level changes in UI benefits between the pool of eligible individuals unemployed after a layoff and the rest of the unemployed. We estimate the following linear probability model:

$$\begin{aligned}\text{Unemp. to Occ.}_{ist} = & \alpha + \beta \text{UI generosity}_{st} + \gamma \text{Layoff}_{it} + \delta \text{UI generosity}_{st} \times \text{Layoff}_{it} \\ & + \boldsymbol{\xi} \mathbf{X}_{it} + \boldsymbol{\eta} \mathbf{Z}_{st} + \boldsymbol{\lambda}_s + \boldsymbol{\mu}_t + \epsilon_{ist}\end{aligned} \quad (1)$$

[9] We replicate and confirm their findings for our sample and covariates in the Online Appendix 1.2.

where Unemp. to Occ.$_{ist}$ is an indicator of whether individual i in state s and quarter t is switching to the following specific occupation: Self-Employment in general (SE) or Entrepreneurship (self-employed business owners) (E). The Unemp. to Occ.$_{ist}$ variable is divided by the average transition rate from unemployment to the specific occupation over the sample, such that our estimates will reflect the percentage point change relative to the average probability of switching. The variable UI generosity$_{st}$ depends on the specification: $Total\ Max\ Regular_{benefits}$ for regular benefits or $Total\ Max\ Benefits$ for regular and extended benefits.[10] $\mathbf{X}_{it}$ is a vector of individual characteristics that includes household income brackets, educational attainment, ethnicity, sex, age, age squared, marital status, cubic polynomial in unemployment duration, and an indicator of whether the spouse is currently employed. $\mathbf{Z}_{st}$ is a vector of time-varying US states characteristics that includes a cubic in the monthly seasonally adjusted state unemployment rate, annual state log real GDP per capita, log income per capita and a housing price index. Those elements are likely to affect the incentive to start a business as this decision might be correlated with the economic environment and serve as controls for the endogeneity of the activation of UI extensions. For panel A, following Hsu et al. (2018), we use additional controls such as the percentage of unionized employees, the average wages (in thousand dollars), unemployment insurance (UI) trust fund reserve (percent of covered annual wages), and an indicator for the fraction of negative UI trust fund reserve. The latter two variables aim at measuring the fiscal condition of the UI system. Finally, $\boldsymbol{\lambda}_s$ and $\boldsymbol{\mu}_t$ are states and year fixed effects and ϵ_{ist} is an idiosyncratic error term.

The results of our baseline linear probability model are reported in Table 2. Given the estimates in column (1) and (2) our results indicate that an increase by a 1000$ of $Total\ Max\ Regular_{benefits}$ is associated with a significant 0.025 (resp. 0.016) percentage points decline in the average probability of switching from unemployment to self-employment (resp. self-employed business owners) among the laid off workers relative to other unemployed individuals.[11] To put this into perspective, a standard deviation increase in UI benefits, i.e. a 30% increase in average generosity, would lead to an 8.4% (resp. 9.8%) decline in the fraction of insured unemployed individuals moving to self-employment (resp. self-employment

[10]Those variables are centered around their respective means before being interacted with Layoff$_{it}$ such that δ measures the percentage change in the probability of switching to an occupation associated with being laid off (with respect to the mean probability) in a state with an average UI generosity.

[11]To obtain this number note that an increase by a 1000$ of UI corresponds to an increase of 3.2% of the average $Total\ Max\ Regular_{benefits}$. Therefore, in Panel A, the percentage point number corresponds to -0.78*3.2/100 (resp. -0.50*3.2/100).

business ownership). We, however, find no significant relation between regular UI benefits and the switch toward employment (column 3), which might be due to the quarterly frequency of our sample relative to the regular UI duration (26 weeks). Indeed, we are more likely to capture effects on the resulting occupational choice rather than disincentive effects of looking for a job. In Panel B, when accounting for UI extensions (column 4, 5, and 6) with $Total\ Max\ Benefit$, we consistently find that an increase in UI benefits reduces the probability to switch toward entrepreneurship (column 4 and 5), and employment (column 6). For instance, given our estimates, a standard deviation increase in $Total\ Max\ Benefit$ (corresponding to a 63% increase) is associated with a significant 7% (resp. 14%) decline in the fraction of unemployed individuals switching toward self-employment (resp. self-employment business ownership). Those results are robust to a variety of sensitivity analyses gathered in Appendix A.3 including alternative UI generosity measures and controls or different sample periods.

Table. 2. Unemployment insurance generosity and probability of exit toward an occupation

	Panel A: Regular UI benefits			Panel B: Incl. UI extensions		
	U to SE	U to E	U to W	U to SE	U to E	U to W
	(1)	(2)	(3)	(4)	(5)	(6)
Layoff	2.44^{***}	1.60^{**}	0.24	0.91^{***}	1.19^{***}	0.69^{***}
	(0.65)	(0.72)	(0.17)	(0.31)	(0.35)	(0.13)
log(Total Max Regular$_{benefit}$)	−0.13	−0.37	-0.12^{*}			
	(0.34)	(0.45)	(0.07)			
Layoff × log(Total Max Regular$_{benefit}$)	-0.78^{***}	-0.50^{**}	0.00			
	(0.20)	(0.21)	(0.05)			
log(Total Max Benefit)				−0.26	−0.39	−0.03
				(0.15)	(0.25)	(0.04)
Layoff × log(Total Max Benefit)				-0.23^{***}	-0.26^{***}	-0.10^{***}
				(0.08)	(0.09)	(0.03)
Individual & State-year controls	Yes	Yes	Yes	Yes	Yes	Yes
State and year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	70,471	70,471	70,471	68,703	68,703	68,703

Notes: *p<0.1; **p<0.05; ***p<0.01. Standard errors, adjusted for clustering at the state level, are reported in parentheses. This table summarizes the results from linear probability regressions of occupational choice out of unemployment on UI generosity. When uninteracted, the Layoff coefficient measures the effect in a state with average UI benefit. See text for the list of controls. Estimates are normalized by the mean transition rate of the flow, and can be interpreted as an elasticity relative to that mean transition rate.

The results above show that there is an economically significant and large empirical relation between UI provision and the probability that unemployed individuals select into entrepreneurship. However, this relation is measured under partial equilibrium conditions and leave the question of economic performances unanswered.

3 Model

We build an incomplete markets dynamic general equilibrium model of entrepreneurship with occupational flows and search frictions. A unit measure of *ex post* heterogeneous agents can be either employed, entrepreneurs or unemployed. Entrepreneurs hold small businesses and together with a representative corporate firms sector provide the production of the economy. The model characterizes the path of maximum UI benefits and duration and lets us study the interaction between UI generosity and entrepreneurship.

3.1 Corporate sector

A representative corporate firm produces Y_t using a Cobb-Douglas technology, with total factor productivity A, capital level K_t and labor L_t, such that: $Y_t = F(K_t, L_t) = AK_t^{\alpha} L_t^{1-\alpha}$, where $\alpha \in (0, 1)$ is the capital share. Profit maximization produces the competitive prices: $r_t = A\alpha \left(\frac{L_t}{K_t}\right)^{1-\alpha} - \delta$ and $w_t = A(1-\alpha)\left(\frac{K_t}{L_t}\right)^{\alpha}$, with w_t and r_t the wage and interest rates, and δ the depreciation rate in both the corporate and entrepreneurial sectors.

3.2 Households

The economy is populated by a continuum of infinitely-lived households distributed uniformly over $[0, 1]$. Every period, each agent falls in one of three occupations $o_t \in \mathcal{O} \equiv \{e, w, u\}$: entrepreneurship ($e$), employment ($w$), or unemployment ($u$). We keep using the $\{E,\ W,\ U\}$ notations to designate respectively entrepreneurs, workers and unemployed individuals. Life-time utility is derived from consumption c_t and disutility from search:

$$\mathcal{U}_t = \mathbb{E}_0 \left[\sum_{t=0}^{\infty} \beta^t u(c_t, s_{e,t}, s_{w,t}) \right], \tag{2}$$

where $s_{e,t}$ is the search effort exerted to start a business and $s_{w,t}$ is the job search effort. β is the discount factor. Labor is supplied inelastically and the utility function is of the form:

$$u(c, s_e, s_w) = \frac{c^{1-\sigma} - 1}{1-\sigma} - s_w^{\psi_w} - s_e^{\psi_e}, \tag{3}$$

with ψ_e and ψ_w the search elasticities.

We denote $a_t \in \mathcal{A}$ the savings of an agent with r_t the corresponding deposit interest rate. In the following, we drop the time index t.

Exogenous processes All individuals are endowed with a persistent component $\theta \in \Theta$ that we call *ability*. The labor income of a working household, the replacement income of an unemployed individual, and the business income of an entrepreneurial household all depend on this ability.[12] This component follows the process: $log(\theta) = \rho_\theta \log(\theta_{-1}) + \epsilon_\theta$, with $\epsilon_\theta \sim \mathcal{N}(0, \sigma_\theta)$ and Π_θ the invariant distribution.

Workers are subject to an additional persistent idiosyncratic shock $y \in \mathcal{Y}$ on their labor income that we call *match-quality*.[13] It follows the process: $\log(y) = \rho_y \log(y_{-1}) + \epsilon_y$, with $\epsilon_y \sim \mathcal{N}(0, \sigma_y)$. For a new worker, this shock is drawn from the invariant distribution Π_y.

Finally, entrepreneurs face a persistent idiosyncratic business shock $z \in \mathcal{Z}$ following: $log(z) = \rho_z log(z_{-1}) + \epsilon_z$, with $\epsilon_z \sim \mathcal{N}(0, \sigma_z)$. A new entrepreneur draws her initial shock in the invariant distribution $Q(z)$.

All idiosyncratic shocks above are realized at the beginning of the period before agents take any decision. All processes are discretized into a Markov process.

Unemployment Insurance The exact number of remaining periods with UI benefits is an important component of our model. This component is tracked by the state variable $j \in \{0, ..., J\} \equiv \mathcal{J}$, the remaining number of model periods with UI benefits. We note $\{b(\theta, j)\}_{j=\bar{J}}^{j=0}$ the path of UI benefits. $\bar{J}$ is the exogenous regulatory maximum UI duration converted to model periods but, due to discretization, this number can fall between two model periods. To implement the exact number of regulatory UI benefits periods, we set J as the number of model periods immediately above $\bar{J}$ and then apply a linear rule to provide only partial UI benefits in the last model period before losing coverage. UI benefits in the current period are:

$$b(\theta, j) = \begin{cases} \mu w h(\theta)(1-\tau) & , \quad j \in [2, J], \\ \mu w h(\theta)(1-\tau)\left[1 - (J - \bar{J})\right] & , \quad j = 1, \\ 0 & , \quad j = 0, \end{cases} \tag{4}$$

where w and τ denotes aggregate wage and income tax levels. μ is the replacement rate. With the above rule, agents can be either insured ($j > 0$) or uninsured ($j = 0$). In our benchmark setup, following UI eligibility rules, only a worker falling into involuntary

[12] In addition, we allow individual productivity to evolve in order to generate additional saving motives. Our model does not take into account life-cycle aspects, human capital accumulation at work, technological progress, or health risks. Those elements can also explain a large productivity dispersion along the life-cycle.

[13] This model does not include an explicit matching process but y can be viewed as a match-quality component because it starts and ends with a specific job while not appearing as a state for the unemployed or the entrepreneur. This process brings our generated distributions and transitional flows closer to the data.

unemployment (i.e. after a layoff) can claim any benefits.

Value functions and states With j the unemployment insurance status, the value function of a worker is $W(\mathbf{x}_w, j)$ with state vector $(\mathbf{x}_w, j) \in \mathbb{X}^w \times \mathcal{J}$ and $\mathbf{x}_w \equiv (a, \theta, y) \in \mathbb{X}^w \equiv \mathcal{A} \times \Theta \times \mathcal{Y}$. An entrepreneur has the value function $E(\mathbf{x}_e, j)$ with state vector $(\mathbf{x}_e, j) \in \mathbb{X}^e \times \mathcal{J}$ and $\mathbf{x}_e \equiv (a, \theta, z) \in \mathbb{X}^e \equiv \mathcal{A} \times \Theta \times \mathcal{Z}$. An unemployed individual has the value function $U(\mathbf{x}_u, j)$ with state vector $(\mathbf{x}_u, j) \in \mathbb{X}^u \times \mathcal{J}$ and $\mathbf{x}_u \equiv (a, \theta) \in \mathbb{X}^u \equiv \mathcal{A} \times \Theta$. Consistently with the current US unemployment insurance scheme, workers are assumed to have maximum insurance duration (i.e. $j = J$) while entrepreneurs are uninsured (i.e. $j = 0$).

3.2.1 Workers

Workers earn labor income $h(\theta)yw$, where the function $h : \theta \mapsto \mathbb{R}$ maps their individual ability θ into a working ability. They have a probability $\eta = \eta(\theta)$ of getting laid off. In such a case, they face insured unemployment and can expect to get continuation value $U(\mathbf{x}'_u, J)$.[14] By providing effort s_e, workers can search for business ideas *on-the-job* and start a business in the next period with probability $\pi_e(s_e)$.[15] They then voluntary change their occupation, lose their rights to UI claims and can expect a continuation value $E(\mathbf{x}'_e, 0)$. Their recursive program is:

$$W(\mathbf{x}_w, J) = \max_{c,a',s_e} u(c, 0, s_e) + \beta \mathbb{E}\Big\{ (1-\eta) \Big[W(\mathbf{x}'_w, J) + \pi_e(s_e) \max \left\{ E(\mathbf{x}'_e, 0) - W(\mathbf{x}'_w, J), 0 \right\} \Big] \quad (5)$$

$$+ \eta \Big[U(\mathbf{x}'_u, J) + \pi_e(s_e) \max \left\{ E(\mathbf{x}'_e, 0) - U(\mathbf{x}'_u, J), 0 \right\} \Big] \Big| y, \theta \Big\},$$

$$\text{s.t.} \quad c + a' \leq (1 - \tau_w) h(\theta) w y + (1 + r) a, \quad (6)$$

$$c > 0, \ a' \geq 0, \ s_e \geq 0, \quad (7)$$

where τ_w is a proportional labor income tax and equation (6) the worker's budget constraint.

3.2.2 Unemployed individual

Insured unemployed individuals ($j > 0$) receive benefits $b(\theta, j)$, in proportion to their individual productivity θ. By claiming UI in the current period, they shift from j periods of remaining UI rights to $j - 1$ at the end of the period. Non eligible individuals and those who have exhausted their rights ($j = 0$) receive no benefits. Moreover, all unemployed individuals are assumed to receive a fixed amount m from domestic production. Unemployed individuals search for both a business idea and a job opportunity with respective efforts s_e and s_w

[14]Notice that in the model, $U(\mathbf{x}_u, j) < W(\mathbf{x}_w)$, $\forall (\mathbf{x}_u, \mathbf{x}_w, j)$. Therefore, we rule out any voluntary transition to unemployment. Conversely, unemployed individuals getting a job opportunity always return to employment.

[15]Business search effort can describe market research on the feasibility of an idea, competition assessment, business education, agency costs or the time needed to fill administrative forms, validate product norms, etc.

and corresponding success probabilities $\pi_e(s_e)$ and $\pi_w(s_w)$. Upon finding a job, they become workers with continuation value $W(\mathbf{x}'_w, J)$. Similarly, upon having an idea, a business can be started in the next period with continuation value $E(\mathbf{x}'_e, 0)$. Their recursive program is:

$$U(\mathbf{x}_u, j) = \max_{c,a',s_e,s_w} u(c, s_w, s_e) + \beta \mathbb{E}\Big\{ \pi_w(s_w) \Big[W(\mathbf{x}'_w, J) + \pi_e(s_e) \max\{E(\mathbf{x}'_e, 0) - W(\mathbf{x}'_w, J), 0\} \Big] \\ + (1 - \pi_w(s_w)) \Big[U(\mathbf{x}'_u, j') + \pi_e(s_e) \max\{E(\mathbf{x}'_e, 0) - U(\mathbf{x}'_u, j'), 0\} \Big] \Big| \theta \Big\}, \tag{8}$$

$$\text{s.t.} \quad c + a' \leq m + b(\theta, j) + (1 + r)a, \tag{9}$$

$$c > 0,\ a' \geq 0,\ s_e \geq 0,\ s_w \geq 0,\ Equation\ (4), \tag{10}$$

where equation (9) is the corresponding budget constraint.

3.2.3 Entrepreneurs

Entrepreneurs invest capital k in their self-employed business and operate the technology:

$$f(k, \theta, z) = zg(\theta)(k)^{\nu}, \tag{11}$$

with $\nu \in (0, 1)$. The function $g : \theta \mapsto \mathbb{R}$ maps individual ability into entrepreneurial ability. To invest k, entrepreneurs can borrow from a financial intermediary funds that can only be invested in the business. Recalling that a is the current wealth of an agent, entrepreneurs choose whether to borrow ($k > a$) or save ($k < a$). If they borrow the amount $(k - a)$, we assume that it is only up to a fixed fraction λ of their total assets.[16] Entrepreneurial profit π_r is defined as entrepreneurial production net of capital depreciation, any interest repayment, and the fixed cost c_f. The latter accounts for all the additional functioning costs that entrepreneurs have to bear. By providing effort s_w, entrepreneurs can search for a job opportunity *on-the-business* and change occupation in the next period with probability $\pi_w(s_w)$ and value $W(\mathbf{x}'_w, J)$. Otherwise, if they choose to quit entrepreneurship, they can return to the uninsured unemployment pool with value $U(\mathbf{x}'_u, 0)$. Their recursive program is:

$$E(\mathbf{x}_e, 0) = \max_{c,a',k,s_w} u(c, s_w, 0) + \beta \mathbb{E}_{y',\theta',z'} \Big\{ \pi_w(s_w) \max\{W(\mathbf{x}'_w, J), E(\mathbf{x}'_e, 0)\} \\ + (1 - \pi_w(s_w)) \max\{U(\mathbf{x}'_u, 0), E(\mathbf{x}'_e, 0)\} \Big| z, \theta \Big\}, \tag{12}$$

[16] This type of borrowing constraint have been widely used in the context of entrepreneurship, see for example Kitao (2008), Buera and Shin (2013) and Brüggemann (Forthcoming) among many others.

$$\text{s.t.} \quad c + a' = (1-\tau_p)\pi_r(k,\theta,z) + a + r(a-k)\mathbb{1}_{\{k\leq a\}}, \tag{13}$$

$$\pi_r(k,\theta,z) = f(k,\theta,z) - \delta k - r(k-a)\mathbb{1}_{\{k\geq a\}} - c_f, \tag{14}$$

$$k \leq \lambda a, \tag{15}$$

$$c > 0, a' \geq 0, s_w \geq 0. \tag{16}$$

Equation (13) is the budget constraint and equation (15) is the borrowing constraint.[17] τ_p is a payroll tax rate paid by entrepreneurs.

3.3 Government

The government runs an UI system that covers the pool of recently laid-off unemployed individuals and finances it using labor income and payroll taxes. In our benchmark economy, we assume that UI is equally financed using by a symmetric tax scheme on entrepreneurs and workers, such that $\tau = \tau_w = \tau_p$.[18] Total government revenues (T) are:

$$T = \int_j \int_{\mathbf{x}_w} \tau_w h(\theta) wy \, d\Gamma(\mathbf{x}_w, j) + \int_{\mathbf{x}_u} \tau_w b(\theta, j) \, d\Gamma(\mathbf{x}_u, j) + \int_{\mathbf{x}_e} \tau_p \pi_r(k,\theta,z) \, d\Gamma(\mathbf{x}_e, j), \tag{17}$$

with $\Gamma(\mathbf{x}_o, j)$ the mesure of individuals in occupation o with remaining UI duration j. Total government expenditures G are equal to the allocated UI benefits:

$$G = \int_j \int_{\mathbf{x}_u} b(\theta, j) \, d\Gamma(\mathbf{x}_u, j). \tag{18}$$

3.4 Equilibrium

A stationary recursive equilibrium in this economy consists of a set of value functions $W(\mathbf{x}_w, j)$, $U(\mathbf{x}_u, j)$, $E(\mathbf{x}_e, j)$, policy rules over asset holdings $a'(\mathbf{x}_o, j)$, consumption $c(\mathbf{x}_o, j)$, job search effort $s_w(\mathbf{x}_o, j)$, business search effort $s_e(\mathbf{x}_o, j)$, business investment $k(\mathbf{x}_e, j)$, occupational choices, prices $(r, w) \in \mathbb{R}^+$, tax rate $\tau \in \mathbb{R}^+$ and a stationary measure over individuals $\Gamma(\mathbf{x}_o, j) \, \forall o, j$, such that: (i) Given prices (r, w) and tax rate τ, the policy rules and value functions solve household individual programs; (ii) The wage w and the interest rate r are equal to the marginal products of the respective production factor in the corporate sector; (iii) goods and factor markets clear: (a) capital: $\int a'(\mathbf{x}_o, j) d\Gamma(\mathbf{x}_o, j) = K + K^E$, with aggregate entrepreneurial

[17] Recall that the cash on hand of entrepreneurs in the baseline case can be written: $f(k,\theta,z) + (1-\delta)k - (1+r))(k-a)\mathbb{1}_{\{k\geq a\}} + (1+r)(a-k)\mathbb{1}_{\{k\leq a\}}$. Rearranging terms yield profit and budget constraint equations.

[18] In the US, entrepreneurs pay a self-employment tax and workers a labor income tax. However, Anderson and Meyer (2000) argue that average industry tax rates are largely passed on to workers through lower earnings. We choose a common benchmark tax rate between occupations in order to not significantly distort occupational choices in counterfactuals experiments. We discuss the consequences of this assumption in section 5.

capital $K^E = \int k(\mathbf{x}_e, j) d\Gamma(\mathbf{x}_e, j)$, (b) the measure of corporate workers $\int d\Gamma(\mathbf{x}_w, j)$ is equal to corporate labor demand; (iv) $\Gamma(\mathbf{x}_o, j)$ is the stationary measure of individuals induced by the decision rules and the exogenous Markov processes; (v) τ balances the government budget ($T = G$). Finally, we define total output $\mathbb{Y}$ as the sum of corporate sector output Y and entrepreneurial sector output Y^E

$$\mathbb{Y} = Y + Y^E = Y + \int_{\mathbf{x}_e} f(k(\mathbf{x}_e), \theta, z) d\Gamma(\mathbf{x}_e, j). \tag{19}$$

This model has no analytical solution and must be solved numerically. We detail our numerical implementation for this problem in the Online Appendix 3.[19]

3.5 Discussion and assumptions

We now briefly discuss a number of modeling assumptions we made.

Employment and job finding/separation A number of papers (for instance Cagetti and De Nardi (2009) and Brüggemann (Forthcoming)) introduce entrepreneurial labor demand. While such a framework appears more realistic, it is still very closely related to our current setup. In static versions of models with entrepreneurial employment, workers are hired in proportion to their entrepreneurial capital k, productivity θ and business shock z.[20] Mechanically, in such a case, a higher number of entrepreneurs lead to higher labor demand. This translates into a higher wage rate which comes at a cost for entrepreneurs but benefits the workers, and in turn, reduces the entrepreneurship rate. In our setup, instead, more entrepreneurs lead to fewer workers in the corporate sector (keeping the unemployment rate constant), which leads to a higher wage rate w. Employment becomes more attractive and the number of entrepreneurs reduces. In the end, it is not obvious that our setup needs to be extended in the entrepreneurial labor direction to better fit the dynamics of the data.

Making the job finding/separation rates endogenous would generate an additional general equilibrium mechanism. Clearly, the inclusion of vacancy posting in the entrepreneurial and corporate sectors may propagate even further the impact of a change in the UI system by raising hiring costs for entrepreneurs and hence reducing their labor demand. At the same

[19]Specifically, we solve the model using the Endogenous Grid Method (EGM) allowing for type 1 extreme value shock as in Iskhakov et al. (2017) to smooth the kinks arising from the discrete occupational choice.

[20]It can be shown that if $f(k, \theta, z, n) = zg(\theta)k^\nu n^\xi$ and entrepreneurs pay the a wage bill wn as in most of the literature with labor demand, the optimal condition is given by $n(k, \theta, z) = \left(\frac{\xi z g(\theta) k^\nu}{w}\right)^{\frac{1}{1-\xi}}$ and $f(k, \theta, z, n) = (1-\xi) z g(\theta) k^\nu n(\theta, z, k)^\xi$.

time, a lower labor demand would lead to lower wages, which in turn, would increase labor demand. We believe this channel to be especially relevant in the short-run. As the main concern of this paper is how occupational risks and choices are important for assessing the effects of unemployment benefits and, for the sake of parsimony, we leave this for future research.

Bankruptcy As in Mankart and Rodano (2015), a version of this model considers bankruptcy on unsecured entrepreneurial debt and as a result features more complex dynamics between occupations.[21] However, results are mostly identical. Indeed, bankrupt entrepreneurs constitute a very small fraction of the observed flows out of entrepreneurship. Moreover, we did not find significant interactions between the UI policy and entrepreneurial bankruptcy.

Learning In the Online Appendix 2.3 of this paper, we provide an additional robustness test regarding the introduction of business maturity and a form of learning upon the start of businesses. This specification does not change the qualitative message of the paper.

3.6 Parameterization

We parameterize the model to match key features of US occupational mobility, entrepreneurship as well as cross-sectional moments. Our data counterparts are taken from the CPS and the Survey of Consumer Finances (SCF). A model period is two months.[22]

3.6.1 Exogenous parameters

The share of corporate capital α is set to 0.33. We normalize the TFP parameter A to unity. The depreciation rate δ is set to 0.013. The coefficient of relative risk aversion σ is set to 1.5. To closely match CPS transition flows, each period, a fraction $\zeta = 0.65\%$ of individuals retires and is replaced by ζ uninsured unemployed individuals that enter the workforce.

The persistent individual working ability $h(\theta)$, the transitory match-quality y, and the business shock z all follow an AR(1) process in logs. We normalize $h(\theta) = \theta$. The persistence ρ_θ is set to 0.985, corresponding to 10 years in the model, and the variance σ_θ^2 to 0.21 in order to generate an earnings Gini coefficient of 0.36. For the match-quality, ρ_y is set to 0.85, corresponding to a persistence of about a year. The variance of the innovation σ_y^2 is set to 0.0225. For the idiosyncratic business process z, we set σ_z to 0.24 and the persistence is fixed

[21] This alternative version is available upon request.

[22] We produce robustness checks for a lower and a higher frequency of the model periodicity. Results are qualitatively similar. This periodicity was chosen because transition flows in and out of entrepreneurship in the data have more observations as compared to a monthly (or lower) frequency.

to 0.91, which is equivalent to 0.55 annually and is consistent with the estimates used in Clementi and Palazzo (2016).[23]

The search elasticities ψ_w and ψ_e are both set to 2.0 to generate quadratic search costs. We use a linear relation to characterize the $W \to U$ transition with respect to earnings in the CPS. We therefore specify the layoff probability $\eta(\theta)$ as a function of $h(\theta)$, such that:

$$\eta(\theta) = \alpha_\eta + \beta_\eta wh(\theta), \tag{20}$$

where α_η and β_η are estimated using earning quantiles as a proxy for $wh(\theta)$. We obtain $\eta(\theta) = \{0.024, 0.017, 0.010\}$. The benchmark UI replacement rate μ is set to 0.45, close to the average US state replacement rate in the last decades, and the UI duration is set to $\bar{J} = 3$, which corresponds to 26 weeks. As Kitao (2008), we set the maximum leverage ratio λ to 1.5.

3.6.2 Endogenously calibrated parameters and targeted moments

Job and business finding rates The probabilities of getting a business idea or a job opportunity, $\pi_e(s_e)$ and $\pi_w(s_w)$, arrive at a Poisson rate:

$$\pi_e(s_e) = 1 - e^{-\kappa_e s_e}, \qquad \pi_w(s_w) = 1 - e^{-\kappa_w s_w},$$

with κ_e and κ_w the matching parameters. κ_w is set to capture the 38.5% of unemployment individuals transiting toward employment as observed in the CPS, and κ_e is set to match the fraction of entrepreneurs. The literature considers various measures of entrepreneurship. For example, Quadrini (2000) considers self-employment as a first definition and a household with a participation in a business as another definition. He argues that the results are close using the two concepts and find a fraction of entrepreneurs of 12%. Based on this, Kitao (2008) target a fraction of entrepreneurs of 12%. Using a narrower definition of entrepreneurship that takes into account the active management role in the business, Cagetti and De Nardi (2006) target a fraction of entrepreneurs of 7.6%. The empirical counterparts for the fraction of entrepreneurs are based on continuously decreasing numbers since the 1980s. In 2015, the fraction of self-employment according to the BLS was evaluated at 9.6% of the total workforce. Given that our model is well-suited to capture the margin of self-employed business owners, we focus on this margin and target a fraction of entrepreneurs of 9.0% (over the total workforce) as computed in the CPS, which is in the range of the estimates in the literature.

[23] As discussed later, even if we do not use those parameters during the endogenous calibration procedure, the model will capture relatively well a number of non-targeted moments of the business income distribution.

Entrepreneurial abilities and business productivity The estimation of $g(\theta)$ is challenging since the contribution of an entrepreneur's skills to the performances of a business is generally unobservable.[24] We indirectly infer the mapping between worker and entrepreneur individual productivity using the observed relation in the $W \rightarrow E$ transition by earnings quantile. We divide the labor income distribution into 3 quantiles and compute in each the ratio of workers starting a business over the average ratio of workers starting a business in the economy. Over our sample period, workers in the bottom and the top quantiles are 0% to 15% more likely to start a business than the average worker whereas in the middle quantile they are 10% - 20% less likely. We use those relative flows to pin down the following values: $g(\theta) = [0.039, 0.047, 0.053]$. The resulting transition flows by ability group relative to the average flow are respectively 1.09, 0.83, and 1.09.

Other parameters The discount factor β helps to generate a realistic annual capital (excluding public capital) to output ratio of 3.1. The returns to scale parameter in the entrepreneurial sector ν lets us fit the ratio of median net worth between workers and entrepreneurs.

We use the fixed cost c_f to capture the fact that 4.4% of entrepreneurs exit entrepreneurship each period in the CPS. Finally, home production m is set to match an insured unemployment rate of 3.3%. The resulting estimated parameter set and targeted moments are summarized in Table 3. Typically, we find a low β value of 0.984. The implied bi-monthly interest rate, r, is 1.0% corresponding to an annual interest rate of 6.2%, which is in line with, for instance, Cagetti and De Nardi (2006).

Table. 3. Calibrated parameters and fit.

	Parameter	Value	Moment	Target	Model
Discount factor	β	0.984	K/Y (annual)	3.1	3.1
Home production	m	0.027	Insured Unemployment Rate	3.3	3.4
Returns to scale	ν	0.790	Ratio of median net worth E/All	6.6	6.8
Fixed cost	c_f	0.016	E exit rate (%)	4.4	4.4
Entrep. ability	$g(\theta)$	*See text*	W to E by quantile/avg rate (%)	*See text*	*See text*
Matching parameter	κ_e	0.281	Share of entrepreneurs (%)	9.0	9.1
Matching parameter	κ_w	0.636	$U \rightarrow W$ transition (%)	38.5	38.6

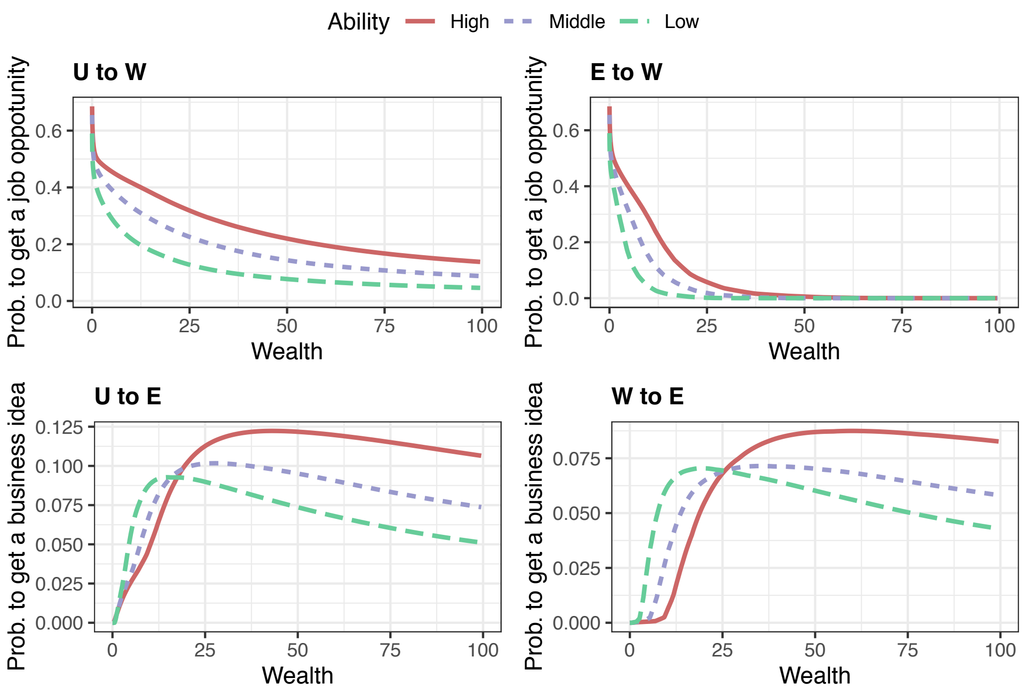
[24]Some authors, such as Kitao (2008), parameterize this ability by using the entrepreneur's income Gini. However, this is under the assumption that entrepreneurial and working abilities are uncorrelated.

4 Properties of the Model and Validation

Optimal search efforts With ability and wealth, the model embeds two parsimonious dimensions of heterogeneity that has an influence on occupational flows. In Figure 3, we report how those dimensions interact with optimal job and business search efforts. The model job search effort s_w behavior (top panels) is consistent with long-established results (see for example Lentz and Tranaes (2005) among others): optimal search effort of both unemployed individuals and entrepreneurs is decreasing in wealth. Wealth provides a means to smooth consumption that conditions the ability to wait for a job and in turn the search effort. We also illustrate that the higher the ability, the higher the job search effort in the case of unemployed individuals. For high ability individuals, there is a clear opportunity cost of unemployment with respect to the high wages they can earn in employment. There is a similar effect for entrepreneurs looking for a job but only for lower levels of wealth. Wealthy individuals are able to establish bigger firms with profitable income that eliminate the need to look for a job.

The more novel aspects here are displayed in the bottom panels: the optimal business search efforts s_e are hump-shaped with respect to wealth. This is the result of two opposing effects. First, wealth-poor individuals, who are the most likely to be credit constrained, do not find it interesting to run very small firms and thus provide very small effort. As wealth increases, individuals can invest larger capital amounts in their businesses and increase their search effort. Second, after reaching a certain threshold of wealth it becomes less interesting to try to establish a business. Similarly to looking for a job opportunity, wealthy unemployed individual face search disincentives due to their important financial wealth compared to the additional income business capital can procure. The same can be said for employed individuals looking to create a business *on the job*. We also find that wealth poor low ability individuals search more than the corresponding high ability individuals. For richer individuals, this ordering is reversed. Low ability individuals have low UI benefits and it becomes advantageous to invest in a business quicker as their wealth increase. But they also have a low ability to run a business making them reach the above threshold faster. High ability individuals receiving high UI benefits go through the same phases but for higher levels of wealth. The same type of reasoning applies to workers searching *on the job* for a business opportunity but relative to their current wage instead of UI benefits.

Figure 3. Implied optimal probability to find a job for insured unemployed individuals (top left) and entrepreneurs (top right). Implied optimal probability to find a business idea for insured unemployed individuals (bottom left) and workers (bottom rights). For workers we choose $y = y_2$ and for entrepreneurs we take $z = z_3$.



Occupational flows Our model successfully replicates a number of empirical characteristics of the occupational flows in the US economy even outside explicitly targeted moments. Table 4 reports aggregate flows between the employed, unemployed and entrepreneurial occupations. Aggregate occupational flows are very close to their CPS counterparts and the model is able to generate most of them endogenously.[25] It captures that unemployed individuals are 4 to 5 times more likely than workers to start a business, and replicates the high $E \to W$ transition (3.6%) and low $E \to U$ transition (0.7%). Using the 2014 CPS, the Kauffman Indicators of Entrepreneurship reports a share of new entrepreneurs out-of-unemployment of 20.5% (against 23% in the model). This fraction is higher for individuals with less than a high school degree (26.5%) and lower for college graduates (17.4%). In the model, the corresponding shares are consistently 29.7% and 17.9% for low and high ability.

Finally, concerning the mass of entrepreneurs in different ability groups, we obtain that within each of the three θ groups, the mass of entrepreneurs relative to the entrepreneurship rate is respectively 0.97, 0.91, and 1.20. This U-shape is consistent with BLS data, which report

[25]The $W \to U$ transition is captured by the $\eta(\theta)$ calibration. As we calibrated the model to match one occupational mass and two transitions, we are left with three degrees of freedom, since targetting masses also indirectly target some flows (up to the exogenous entry ζ). In the data, mismatches between masses and flows arise due to the transition to Not in the Labor Force (NLF), death, and various other reasons.

Table. 4. Bimonthly flow between occupations (data counterpart between braces).

	Masses (%)		**Flow: Model (Data)** (%)		
	Data	Model	W	E	U
W	85.8	85.6	97.90 (97.96)	0.41 (0.35)	1.69 (1.69)
E	9.0	9.1	3.65 (3.51)	95.61 (95.57)	0.74 (0.92)
U	5.2	5.3	38.56 (38.46)	1.99 (2.02)	59.45 (59.51)

Data sources: authors' computations using CPS data from 1997 to 2017. We restrict our sample to individuals aged between 20 to 65 years old.

a relative self-employment rate of around 1.02, 0.93, and 1.50 within the HS, M, and C group. In the Online Appendix 2.2.1 to this paper, we show that our model flows by ability θ are broadly consistent with the data when using educational attainment as a proxy for ability.

Additional validation We also capture a number of other moments related to the labor market and entrepreneurship that are not explicitly targeted but that are still reasonably well matched. The necessity share, which is the fraction of entrepreneurs who started businesses because of a lack of job opportunities is equal to 7.6% in our model and is evaluated by Ali et al. (2008) in 2008 to be 4.7% of early-stage entrepreneurs for men and 21.4% for women, representing 10% in total.[26] Therefore, in line with Caliendo and Kritikos (2009), among the 22% new entrepreneurs who were previously unemployed in the model – consistently with the CPS – a substantial fraction (33%) enters entrepreneurship *out-of-necessity*. Using the Survey of Income and Program Participation (SIPP), Hamilton (2000) finds that 10% of self-employed report zero or negative earnings. The model generates a corresponding 7% entrepreneurs with zero or negative earnings, showing that despite adverse shocks, a substantial number of entrepreneurs persist in their activity. As argued by Hamilton (2000) or more recently by Astebro and Chen (2014), a number of entrepreneurs (about 35% in the model) create and keep running a business although they would earn more as workers. In the model, expectations of a better business shock z and frictions induce some entrepreneurs to keep running a bad business while others search for a job opportunity and then exit.

The model generates heterogeneity in entrepreneurial earnings through different firm sizes, ability, and business shocks. The implied Gini coefficient for entrepreneurial earnings in the model is 0.57 against 0.65 in the SCF. In the model, the median ratio of entrepreneurial income over workers' income is 2.1 against 1.7 in the SCF at the household level. About the cross-sectional variance of earnings between occupations, we find a ratio of the standard deviation of entrepreneurial earnings with respect to wage earners of 2.5 in the model, while

[26]We define the necessity share as unemployed agents starting a business while $\mathbb{E}_y[W(\mathbf{x})] > E(\mathbf{x}) > U(\mathbf{x})$.

it is typically 3 to 4 in the US according to Astebro and Chen (2014).[27] The model does also match relatively well wealth characteristics between occupations. The median ratio of the net worth between entrepreneurs and workers is 9.0 in the model against 8.0 in the SCF. Moreover, the median ratio of entrepreneurial (resp. worker's) income (including capital gains) to net worth (i.e. total assets minus debt) is 0.13 (resp. 0.53) in the model, while it is 0.14 (resp. 0.73) in the data. The fraction of zero (or negative) net worth is roughly 10% in the SCF, whereas it is 4% in our model, and the fraction of total wealth held by entrepreneurs is around 30%-35% in the data, against 34% in the model. The model, however, underestimates the wealth Gini: we find 0.63 compared to 0.8 in the SCF. However, we do not target this statistic and our model abstracts from a bequest motive, which has been shown to play an important role in replicating the right tail of the wealth distribution.

Overall, despite the few limitations that we underlined, the model is well suited to capture occupational flow dynamics and key features expected from a rich entrepreneurial framework with unemployment spells.[28]

5 A Quantitative Assessment

In this section, we discuss the effects of varying UI generosity within our setup. We first present our counterfactual experiments framework and then analyze occupational choices along with the resulting aggregate outcomes. We next explore alternative tax options and finally, account for the Extended Benefits during the Great Recession.

5.1 Cross-sectional and aggregate implications of UI generosity

In section 2, we provided empirical evidence of a significant and economically important impact of UI generosity on the selection into entrepreneurship out of insured unemployment. We, therefore, start our analysis by characterizing the effects of a variation in UI generosity on the propensity to start a business and in turn the effects on occupational masses and aggregate outcomes in a general equilibrium context. Our investigation is based on counterfactual stationary economies under alternative UI designs with varying levels of UI generosity.

[27]While the mean and the median ratio of entrepreneurial earnings with respect to wage earners is subject to a debate, it is established that the ratio of standard deviations is high, even controlling for mismeasurement.

[28]In principle, it is possible to further constrain the model by matching more moments in the data but we choose to parsimoniously focus on statistics concerning the US labor market mobility.

A sample of counterfactual experiments In the model, total UI generosity is defined by: (i) a maximum duration $\overline{J}$ (this is a bimonthly variable in the model but, for clarity's sake, we express it in weeks equivalent hereafter), and (ii) a replacement rate μ. To analyze the effects of alternative UI designs, we use the following approach: we run a large number of counterfactual deviations from our baseline economy in which the parameters $\{\overline{J}, \mu\}$ are drawn randomly from a bivariate uniform distribution.[29] We choose the bounds of the associated distributions such that the maximum duration and replacement rate fall in the range of the variations observed across US states and over time, including UI extensions. We, thus, vary the replacement rate from 30% to 50%, $\mu \in \mathcal{U}(0.3, 0.5)$, and the duration from 16 to 99 weeks, $\overline{J} \in \mathcal{U}(16, 99)$. We compute maximum UI benefits as:

$$\text{Model UI max} = \sum_{j=0}^{\overline{J}} b(\overline{\theta}, j) = wh(\overline{\theta})(1-\tau) \times \mu \times \overline{J}, \qquad \overline{\theta} = \int_{\mathbf{x}} \theta d\Gamma(\mathbf{x}), \tag{21}$$

and express the data equivalent maximum UI generosity in terms of the number of weeks $\overline{J}$ an unemployed individual can claim UI benefits times the average weekly UI benefit:

$$\text{UI max} = \frac{\text{Data wealth median}}{\text{Model wealth median}} \times \text{Model UI max}. \tag{22}$$

We use the $\frac{\text{Data wealth median}}{\text{Model wealth median}}$ ratio to rescale nominal values in the model relative to nominal values in the data.

5.1.1 UI generosity and occupational choice

Using observations from the sample of counterfactual experiments, we estimate the elasticity of the flow from a given occupation to another with respect to a variation in UI generosity. To this end, we use the following specification:

$$\log(\phi_{X \to Y})_i = \xi_{X,Y} \log(\text{UI max})_i + err_i, \qquad (X, Y) \in \{E, U_I, U_N, W\}, \tag{23}$$

with X any occupation out of which the flow $\phi_{X \to Y}$ is originating and Y the destination occupation. Additionally, note that we separate the insured unemployment pool U_I from the uninsured pool U_N. $\xi_{X,Y}$ defines the occupational flow elasticity to UI generosity: it measures the percentage change in the likelihood to switch to a specific occupation Y out of the occupation X when UI generosity varies by 1%.[30] For instance, $\xi_{U_I \to E}$ is the elasticity of

[29] During our experiments, we found that running more than a hundred counterfactuals only change the results by a very negligible margin.

[30] $\log(\mathit{UI\ max})$ is our main measure of model-based UI generosity. As this measure does not explicitly specify the origin of a variation in generosity, we perform robustness checks in the Online Appendix 2.2. We verify

the flow from insured unemployment to entrepreneurship with respect to UI generosity.

To obtain consistent elasticities, we first compute the stationary distribution of the economy under our baseline UI parameters.[31] Then agents in this stationary equilibrium face an unanticipated UI shock corresponding to the specific counterfactual $\{\bar{J}, \mu\}$ set. This situation is comparable to the first period with an MIT shock. We then capture the change in the average flow from a given pool of individuals, arising from variations in search intensities and decisions to switch while keeping the population, prices, and taxes unchanged.

Selection out of unemployment Based on our counterfactual experiments framework, Figure 4 shows the change in the flow $\phi_{U_I \to E}$ from insured unemployment to entrepreneurship (top panels) and the $\phi_{U_I \to W}$ flow to employment (bottom panels) with respect to UI generosity. The pattern from unemployment to entrepreneurship is remarkably close to the empirical patterns we observed in Figure 2a and Figure 2b. The slope of that flow is linear in UI generosity. Moreover, it is noticeably steeper than the slope from insured unemployed to employment. The corresponding elasticities are $\xi_{U_I \to E} = -0.287$ and $\xi_{U_I \to W} = -0.172$. In contrast, the elasticities out of the uninsured unemployed pool show no sensitivity to UI generosity: $\xi_{U_N \to W} = 0.002$ and this pool is only slightly less likely to start a business as $\xi_{U_N \to E} = -0.015$.

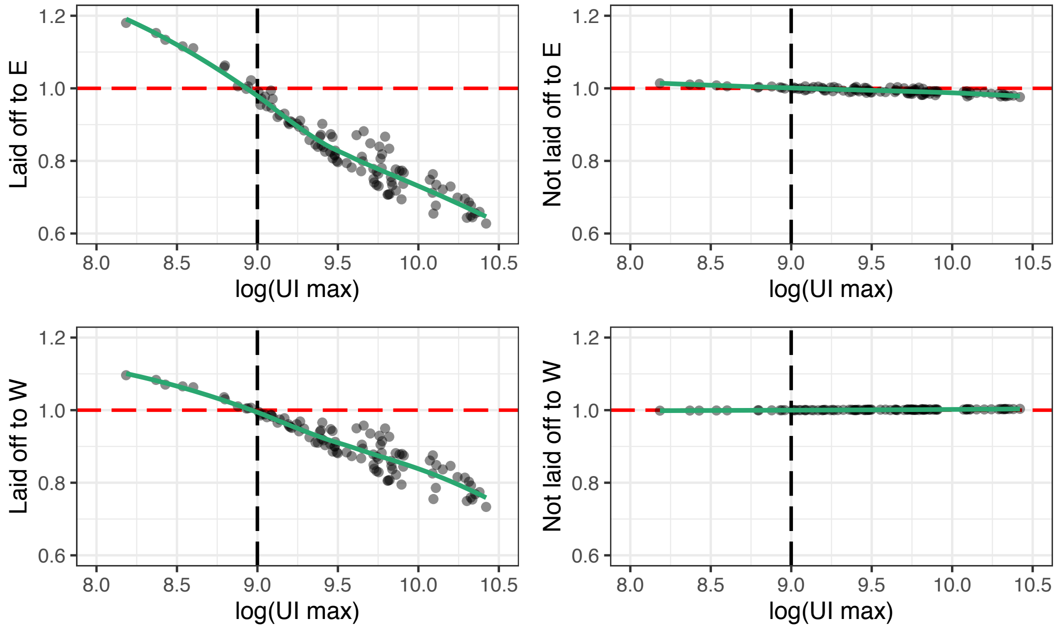
Our elasticities result substantiates the idea that a higher UI generosity lowers the incentives to exit insured unemployment. Two well-known effects support this interpretation: (i) a *moral hazard effect* which captures the change in the marginal incentive to search following a variation in UI benefits that effectively lowers the expected net income gain of taking a job; (ii) a *liquidity effect*, previously discussed in Browning and Crossley (2001) and Chetty (2008), which captures the variation of the search effort with respect to the loosening of the liquidity constraint following a change in UI generosity.

Specifically, search intensities $s_w(\mathbf{x})$ and $s_e(\mathbf{x})$ are function of the out of insured unemployment opportunities respectively captured by the differences in value $\Delta^W_{U_I}(\mathbf{x}) = \mathbb{E}[W(\mathbf{x}) - U_I(\mathbf{x})]$ for employment and $\Delta^E_{U_I}(\mathbf{x}) = \mathbb{E}[E(\mathbf{x}) - U_I(\mathbf{x})]$ for entrepreneurship. When UI gen-

whether changing generosity through a variation in the UI replacement rate or the UI duration is a decisive factor. We find that our results are qualitatively similar in either case.

[31] It is important that the initial distribution remains the same across counterfactuals as otherwise wealth profiles and abilities along the distribution will certainly bias the estimate: depending on wealth and ability, individuals might be more sensitive to variations in the UI when starting a business, conditioning the impact we are measuring. In the Online Appendix 2.2, we provide a second metric using the counterfactual long-run steady-state masses that yield long-run elasticities. The virtue of this measure of elasticities is that it better captures long-run GE adjustments. The drawback is that it is based on different population masses in each occupation.

Figure 4. UI generosity and model average flows from the insured and uninsured unemployed pools.

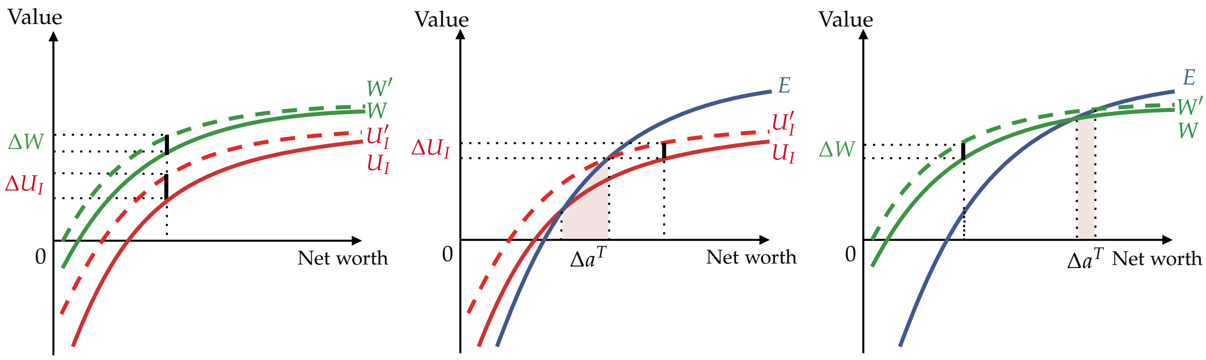


Note: the vertical dashed black line marks the current average regular UI provision in the US, with $\mu = 0.45$ and $\overline{J} = 26$ weeks. The dashed red line is the benchmark flow. The maximum UI generosity here corresponds to $\mu = 0.498$ and $\overline{J} = 99$ weeks.

erosity $b(\theta, j)$ increases, the relative wage from employment, $wh(\theta)y(1-\tau) - b(\theta, j)$, and the relative business income from entrepreneurship, $\pi_r(k, \theta, z) - b(\theta, j)$, are reduced in all subsequent periods with UI. For the job search intensity, the *moral hazard effect* refers to a shift in $s_w(a, \theta, \Delta^W_{U_I})$ following a decrease in the relative gain of finding a job. Consistently, for the business search intensity, it is a shift $s_e(a, \theta, \Delta^E_{U_I})$ following a decrease in the relative gain of starting a business. For a given level of wealth, the *liquidity effect* is symmetric between job seekers and business seekers. It is the effect of an extra amount of wealth coming from more UI generosity. This extra amount increases the distance to the borrowing constraint and helps with consumption smoothing, thereby lowering the incentive to quickly exit insured unemployment. Intuitively, it increases the beginning of period cash on hand $(1+r)a + \varsigma + b$ by an extra amount d to $(1+r)a + \varsigma + b + d$, where ς is the flow income and b the standard benefit level.

On top of those effects, we now discuss the additional considerations that appear when comparing the impact of UI generosity on entrepreneurship and employment. We illustrate this discussion with the first two panels of Figure 5 that plot the current value of being employed, insured unemployed, and entrepreneur, before and after an increase in UI generosity. First, the value of employment $W(\mathbf{x})$ is strictly higher than that of unemployment $U_I(\mathbf{x})$ for any element of the state vector $\mathbf{x}$. This is not the case for the value of entrepreneurship $E(\mathbf{x})$: relative to net worth, there is a threshold before which unemployment dominates entrepreneurship. The consequence is that an insured unemployment individual would exert a business search effort s_e and enter entrepreneurship only if $E(\mathbf{x}) > U_I(\mathbf{x})$. As a result, while the transition from unemployment to employment is only impacted by the combination of the moral hazard and liquidity effects, the transition from unemployment to entrepreneurship depends on this additional *threshold effect*. As illustrated by the middle panel of Figure 5, for given productivity z and ability θ, the net worth threshold a^T at which insured unemployed individuals select into entrepreneurship becomes higher with UI generosity.

Figure 5. Illustration of the change in employment and unemployment values (left panel), in entrepreneurship and unemployment values (middle panel) and in entrepreneurship and employment (right panel) following an increase in UI generosity.



Note: dashed lines correspond to the situation after an increase in UI generosity while solid line depicts the situation before. The amount Δa^T corresponds to the difference in the threshold of wealth for which an unemployed individual chooses to start a business before and after the reform.

Second, as illustrated by the dashed curves on Figure 5, the values of employment and unemployment are both responsive to an increase in UI generosity. In the case of employment, such an increase raises the value of a future unemployment situation and, therefore, provides better insurance against a job loss. In the case of unemployment, both its current and future values increase because of higher current and expected future UI benefits. However, as entrepreneurs are not part of the UI system, the value of entrepreneurship is not responsive to an increase in UI generosity, at least not directly, and $\frac{\partial E}{\partial b} \approx 0$ in the current and future periods.[32] As a consequence, insured unemployed individuals significantly reduce their business search effort s_e relative to their job search effort s_w. We refer to this additional effects as an *insurance coverage effect*: relative to a variation in UI generosity, it is the change in the relative riskiness between two asymmetrically covered occupations leading to a modification in the

[32]In extreme circumstances, such as the recent COVID-19 pandemic with the CARES Act enacted on March 27, 2020, the U.S. Department of Labor may provide insurance even for self-employed individuals. Such a case would be outside the scope of the baseline model we discuss here.

incentive to choose one or the other activity. In concrete terms, using Figure 5, the distance between the entrepreneurial and unemployment value is substantially affected by the change in UI generosity (i.e. $(E - U_I') \ll (E - U_I)$), while the distance between employment and unemployment value is less affected (i.e. $(W' - U_I') < (W - U_I)$), due to the asymmetric UI coverage between employment and entrepreneurship (i.e. $(W' - E) > (W - E)$). Therefore, the business search effort of insured unemployed individuals is more sensitive to a change in the UI relative to the job search effort.

Selection out of employment and entrepreneurship Perhaps more surprisingly, UI generosity also has a strong effect on employment/entrepreneurship flows in both directions. The intuition is again related to the *insurance coverage effect*. The risk of a job loss is covered by UI whereas the loss of a self-employed activity is uninsured. As a consequence, the higher the UI generosity, the higher the opportunity cost associated with a self-employment activity relative to employment. The right-most panel in Figure 5 provides an illustration of this mechanism. When UI generosity increases, the net worth threshold beyond which current employees decide to start a business is higher: as workers are better insured against unemployment risk, they are willing to start a business only if the stream of expected business income compensates the insurance benefits. Simultaneously, above that threshold, the disincentive to search for a business idea *on-the-job* increases as the distance $E(\mathbf{x}) - W'(\mathbf{x})$ after UI generosity increase is smaller than the initial distance $E(\mathbf{x}) - W(\mathbf{x})$.[33] Finally, to get an overall sense of the magnitude of those estimates, $\xi_{W \to E}$ is about -0.037 and $\xi_{E \to W}$ is about 0.024. As a consequence, changes in occupational choices *on-the-business* and *on-the-job* following a change in UI generosity are likely to have long-run consequences alongside the large and direct effect on unemployed individuals. We discuss these elements in section 5.1.2. Moreover, in Appendix A.4, we provide an empirical support for these additional selections *on-the-job* and *on-the-business*.

Selection by ability and wealth Increasing UI benefits has a disproportionate impact on particular groups of individuals in our economy. Table 5 displays the decomposition by ability and wealth of elasticities $\xi_{U_I \to E}$ and $\xi_{U_I \to W}$. First, it is noticeable that $\xi_{U_I \to E}$ increases with

[33] A similar argument is given in Fuchs-Schündeln and Schündeln (2005): they show that people with lower risk aversion select into civil service occupations. In our paper, the degree of employment coverage distorts the relative riskiness of self-employment relative to employment, which modifies the selection into those occupations. In Gaillard and Kankanamge (2020), we consider the introduction of a broader UI policy by extending UI insurance to insured unemployed individuals in the early stages of setting up a business. We show that this policy helps in reducing the above distortion but reallocates individuals from employment to entrepreneurship in the long-run.

ability whereas it decreases for $\xi_{U_I \to W}$. Second, for both elasticities, wealth poor individuals (relative to the median) have a stronger response than wealthier ones (above the median).

Table. 5. Elasticity of insured unemployment to UI generosity by ability and wealth

Elasticity $\xi_{X \to Y}$	Ability & wealth				
	$\theta = \theta_1$	$\theta = \theta_2$	$\theta = \theta_3$	$a <$ median	$a \geq$ median
$\xi_{U_I \to E}$	−0.264	−0.284	−0.296	−1.720	−0.234
$\xi_{U_I \to W}$	−0.257	−0.134	−0.105	−0.257	−0.097

The joint influence of the *liquidity*, the *moral hazard*, and the *insurance coverage* effects can rationalize those heterogeneous outcomes. First, overall the flow from insured unemployment to entrepreneurship has a stronger negative reaction to UI generosity than the flow to employment, which highlights the importance of the *insurance coverage effect*.

Second, on average, low ability individuals are poorer than higher ability ones. Thus, the liquidity effect of more UI generosity is stronger for low ability individuals. This explains the decreasing profile of $\xi_{U_I \to W}$ with ability and wealth. There are, however, additional elements to consider when individuals are trying to start a business out of unemployment. When searching for a job, wealth and ability can be decoupled: the earnings out of employment, $wh(\theta)y$, do not depend on wealth but only on ability. Instead, entrepreneurial income, $\pi_r(k, \theta, z)$, is dependent on both the capital invested in the business and ability. Specifically, due to the presence of a credit constraint as long as $\lambda \ll \infty$, even with a high ability the corresponding entrepreneurial income may be low if not enough capital is invested in the business. As a consequence, only sufficiently wealthy individuals are looking for a business to run, which makes the dependence between ability and the propensity to select into entrepreneurship less prompt to be driven by the liquidity effect. In the end, the opportunity cost of giving up UI benefits turns out to be slightly higher for high ability individuals since $\xi_{U_I \to E}$ is barely increasing in θ.

The decomposition by wealth is straightforward. On the one hand, and related to the *liquidity effect*, wealth-poor individuals are closer to the liquidity constraint and are therefore more sensitive to variations in UI generosity. On the other hand, a higher wealth lets prospective entrepreneurs run larger and more valuable firms. Again, only individuals beyond a minimum threshold of wealth are willing to start a business. As a consequence, the combination of the threshold and the liquidity effect makes wealth-poor individuals (below the median) 7 times more sensitive to UI generosity when trying to start a business than wealth rich individuals (above the median). Therefore, the presence of a credit constraint plays an especially important role in understanding the high elasticity of wealth-poor prospective entrepreneurs as a sufficient investment in productive capital is required.

5.1.2 Occupational masses puzzle

Our model gives an additional perspective to an important question in the literature concerning UI generosity. On the one hand, and as shown by the above results, occupational flows, especially out of insured unemployment, are consistent with those established in the literature and supported by liquidity and moral hazard effects. Notably, UI generosity has a depressing effect on the flow from insured unemployment. On the other hand, another strand of the literature, for instance, Chodorow-Reich et al. (2019) and Boone et al. (Forthcoming), empirically find a small (and non-significant) effect of UI generosity on the aggregate level of employment. This observed disconnect between micro-level transitions from unemployment to employment (based on incentive effects) and the resulting aggregate employment constitute a debated puzzle.[34]

To have a better understanding of aggregate occupational masses, we show that it is not enough to look at the flows out of unemployment but that the flows into and out of entrepreneurship play a significant role. Table 6 reports absolute changes (in percentage points) in flows when doubling UI generosity. This measure helps in better capturing the effect of the masses of occupation, especially the large employment mass, whereas relative variation measures such as the elasticity are less informative for this purpose. The traditional focus of the literature is the reduction in the $\phi_{U_I \to W}$ and $\phi_{U_I \to E}$ flows due to large disincentives to search on insured unemployed individuals. However, because of the *insurance coverage effect*, the $\phi_{E \to W}$ (resp. $\phi_{W \to E}$) flow increases (resp. decreases) with UI generosity as shown above. But, because the masses of employed and entrepreneurial agents are bigger than the mass of insured unemployed agents, even a small change in the $\phi_{W \to E}$ flow induces a large negative response on the entry flow into entrepreneurship. In absolute terms, doubling UI generosity changes the $\phi_{E \to W}$ and $\phi_{W \to E}$ flows more than the $\phi_{U_I \to E}$ flow.

As a result, our model generates an empirically relevant stable long-run invariant mass of employed individuals in the economy when UI generosity increases. Figure 6 shows the steady-state masses in each occupation after a permanent change in UI generosity in an econ-

[34]For instance, Boone et al. (Forthcoming) argue that a demand channel following an increase in UI benefits could generate an increase in the aggregate employment rate and dampen the negative effect from micro disincentives. Concerning recent empirical findings with small micro disincentive effects on the job finding rate, Farber et al. (2015) study the effects of UI extensions during the Great Recession and find little or no effect on job-finding but a reduction in labor force exits due to benefit availability.

Table. 6. Change in flows $\Delta\phi_{X\to Y}$ when doubling UI max at the time of a change (in pp).

	W	E	$U_I + U_N$
W	.0082	−.0090	.0007
E	.0055	−.0070	.0014
U_I	−.1147	−.0057	.1203
U_N	.0013	−.0007	−.0006

omy with and without general equilibrium (GE) adjustments. The mass points are generated from the long-run equilibrium outcomes of our counterfactual experiment. We find that the employment mass remains mostly unchanged (with a long-run elasticity of the mass to UI benefits of 0.001) while the mass of entrepreneurs and unemployed individuals are the most affected by UI generosity (with a respective long-run elasticity of the mass to UI benefits of −0.092 and 0.118). To put this into perspective, a doubling of UI generosity relative to the baseline value would increase the unemployment rate by 0.43 percentage points and decrease the entrepreneurship rate by 0.57 percentage points.[35]

Finally, when neutralizing GE effects of taxes and prices, we find similar patterns, as illustrated by the dashed blue line. This is indicative that this result is not driven by GE adjustments. Our results point out that UI generosity has a particularly large effect on entrepreneurship in the long-run, while it has a very mitigated impact on employment.[36] In section 5.2, we show that the way taxes are designed is an important driver of these findings.

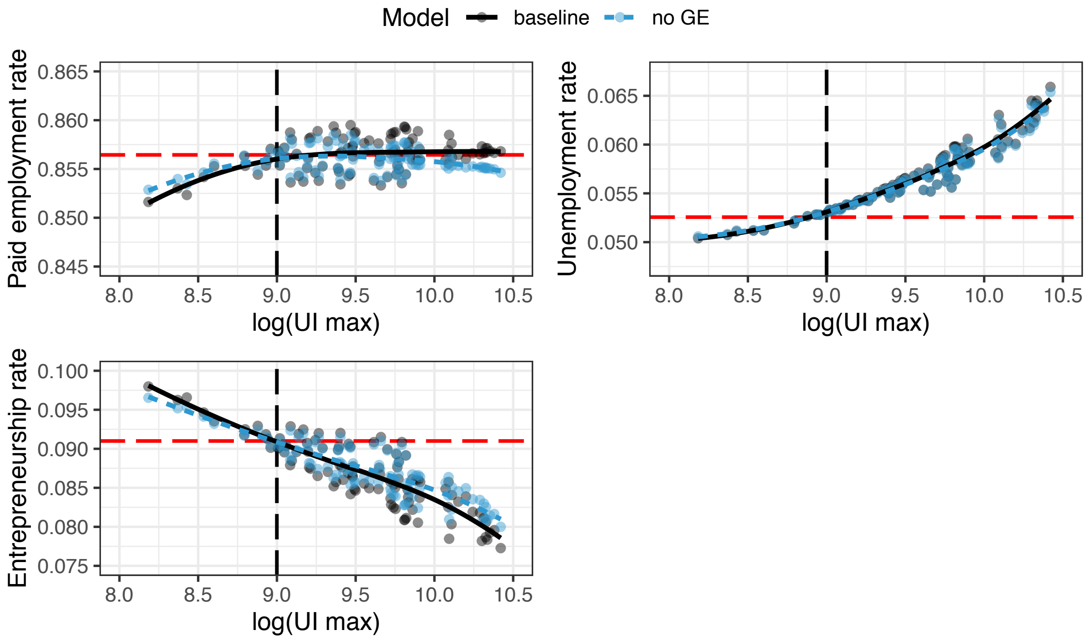
5.1.3 UI generosity and aggregate outcomes

We report in Figure 7 the effects of UI generosity on aggregate outcomes and the firm size distribution. As the unemployment rate increases at the expense of the mass of entrepreneurs, the long-run entrepreneurial sector output Y^E and capital K^E is significantly reduced. Conversely, as the mass of workers and aggregate corporate capital remains nearly constant, aggregate corporate output Y is only slightly impacted. Perhaps surprisingly, there are only small variations in the average size of new entrants firms. Indeed, due to the *insurance coverage effect*, individuals on the indifference margin, i.e. $E(\mathbf{x}_e, 0) \approx W(\mathbf{x}_e, J)$, are likely to select into employment when this occupation is better insured. As a result, a lower fraction of relatively wealth-poor individuals select into entrepreneurship. Interestingly, when the GE effects of τ, w and r are neutralized (dashed blue line), aggregate capital decreases with UI generosity:

[35] This decrease is on both the opportunity-driven and necessity-driven new entrepreneurs. Moreover, increasing the UI duration from 26 weeks to, for instance, 80 weeks decreases the out-of-necessity share among the unemployed from 33% to 24%.

[36] However, if one was to consider total employment as the addition of both self-employment and employment, UI generosity would have a negative and significant effect on this margin in the model.

Figure 6. UI generosity and occupational masses.



Note: the vertical dashed black line corresponds to the current average regular UI system in US, with $\mu = 0.45$ and $\bar{J} = 6$ months (26 weeks). The dashed red line is the benchmark mass of occupation. The maximum UI generosity in this figure corresponds to $\mu = 0.498$ and $\bar{J} = 23.75$ months.

in line with Engen and Gruber (2001), higher UI generosity lowers the level of precautionary saving but GE adjustments counterbalance this with a higher interest rate. Additionally, a lower level of precautionary savings, together with the fact that a higher UI generosity selects relatively wealthier entrepreneurs, lead the ratio of median net worth between entrepreneurs and the rest of the population to rise with UI generosity. Overall, most of the striking effects appear on entrepreneurial margins.

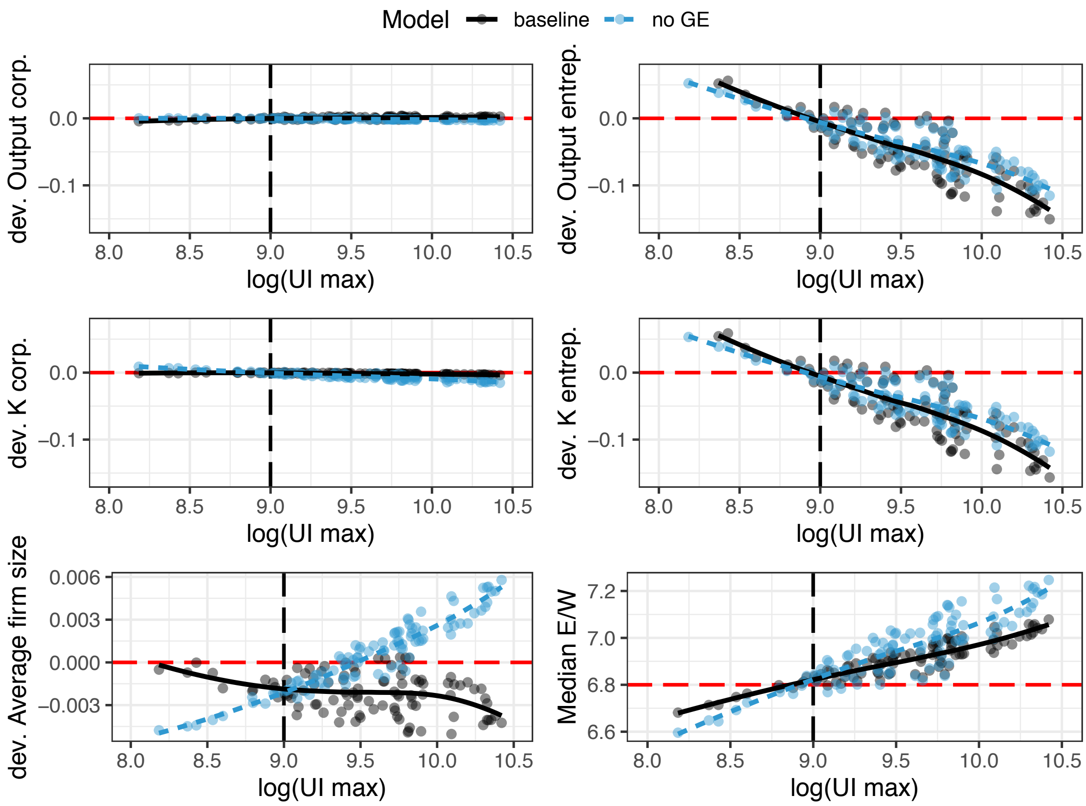
5.2 Alternative UI financing: the role of taxes

In the baseline economy, we consider that both workers and entrepreneurs bear the cost of higher UI insurance with $\tau = \tau_w = \tau_p$.[37] This was motivated by two reasons. First, even if the regular unemployment benefits are financed by employers in the US, employees may be indirectly facing the burden through lower wages.[38] For UI extensions (EUC and EB), they are financed at the federal level, which makes it unclear who will eventually pay for these programs. Second, by increasing both the tax on self-employees and employees with UI

[37] Notice that in light of our discussion about our modeling assumptions, we do not directly consider entrepreneurial labor demand, but we implicitly assume that entrepreneurs may be part of the labor market. Hence, entrepreneurs are assumed to contribute to the funding of UI.

[38] Anderson and Meyer (2000) show that higher taxes on employers to finance UI leads to wage reductions.

Figure 7. UI generosity and aggregate outcomes.



Note: the vertical dashed black line corresponds to the current average regular UI system in the US, with $\mu = 0.45$ and $\bar{J} = 26$ weeks. The maximum UI generosity in this figure corresponds to $\mu = 0.498$ and $\bar{J} = 100$ weeks.

generosity, we somewhat isolate the distorting effect arising from differences in occupational risk from the effect of a differential tax burden on entrepreneurs and workers. Therefore, we view our result as a benchmark case in which the burden is equally shared.

We now relax this assumption and explore the effects of alternative tax schemes. In a first counterfactual experiment, UI is financed entirely by higher taxes on employees (i.e. $\tau_w = \tau$ and $\tau_p = 0$). In our second counterfactual, workers pays 50% of the tax rate applied to entrepreneurs (i.e. $\tau_w = \tau/2$ and $\tau_p = \tau$). In both cases, we consider an initial level of UI generosity and then a significant increase. Table 7 summarizes our findings. When the tax burden of higher UI generosity is financed entirely by workers ($\tau_w > \tau_p = 0$), the impact on the entrepreneurship rate is smaller than in the baseline case as the entrepreneurial mass decrease by 6.8% against 17.9%. The employment rate decreases while it slightly increases in the baseline. This finding is reversed when entrepreneurs bear a higher tax burden ($\tau_p = \tau > \tau_w = \frac{\tau}{2}$). In that case, the employment rate increases with UI generosity but the entrepreneurial rate is significantly depressed. The intuition here is straightforward: a higher tax rate on entrepreneurs reduces the relative value of entrepreneurship captured by $E(\mathbf{x}) - W(\mathbf{x})$. Therefore, it induces an additional effect on top of the *insurance coverage effect* discussed earlier. We also measure the outcome in terms of aggregate output: taxing entrepreneurs appears more detrimental than taxing workers. Workers can share the tax burden over a larger fraction of the population and the slight reduction in the employment rate is mitigated by a strong increase in the entrepreneurial rate. Finally, notice that the unemployment rate remains fairly unchanged by the tax schemes and that overall, most of the effects come from a reallocation of the population between entrepreneurship and employment.

Table. 7. Effect of alternative tax scheme on occupation masses and aggregates.

Model	Tax scheme		Occupational mass (in %)						Output	
	τ_w	τ_p	E		W		U		Y	
UI max [a]			$5K$	$30K$	$5K$	$30K$	$5K$	$30K$	$5K$	$30K$
Baseline	τ	τ	9.5	7.8	85.4	85.8	5.1	6.4	2.24	2.16
Alt. tax on workers	τ	0	10.3	9.6	84.6	84.0	5.1	6.4	2.27	2.23
Alt. tax on entrep.	$\frac{\tau}{2}$	τ	8.9	6.5	86.0	87.0	5.1	6.5	2.22	2.11

[a] UI max for (5K,30K) are constructed with $(\mu_{5K}, \bar{J}_{5K}) = (0.40, 18)$ and $(\mu_{5K}, \bar{J}_{5K}) = (0.53, 83)$.

These findings are of particular importance since, across US states, differing rules are applicable to the financing of UI generosity that can extend to differences between the financing of regular UI and extensions. They also point out that economies taxing differently employers and employees when UI increases might results in differing trade-offs between occupations, especially since self-employment is not covered against unemployment risk.

Overall, the analyses above establish that UI generosity not only shapes how unemployed individuals set their search effort but also broadly how individuals choose their occupations.

5.3 Accounting for the Extended Benefits during the Great Recession

The 2007–2009 Great Recession (GR) stands out for its very slow recovery. It was also a period of special UI extensions: starting in late 2008, the UI extensions (the EB and EUC programs) were activated for about 5 years. Given the repercussions of UI generosity that we have uncovered above and the importance of the entrepreneurial sector for aggregate output, we now explore how entrepreneurship reacts to a temporary increase in UI extension policies during a recession.[39]

Our GR experiment is based on transitional dynamics and is similar to an MIT shock approach. The separation rate ($\eta(\theta)$), the job-finding rate (κ_w), and the business fixed cost (c_f)

[39] Nakajima (2012) discusses a similar experiment but abstracts from entrepreneurship.

are changed over time in addition to the duration of UI. All these changes are revealed at time $t = 1$ leading to a perfect-foresight transition path.[40] As our objective here is to quantify the impact of UI extensions on the incentive to start a business and not to explain the recession *per-se*, the changes we introduce should mimic a severe economic downturn. Consistently with the data, we first assume that a UI extension is implemented mid-2008 until the end of 2013: the UI duration $\bar{J}$ is increased to 64 weeks to replicate the average extension (EB and EUC08) during this period. Given the CPS data counterparts, $\eta(\theta)$ is set so as to replicate the job separation rate, κ_w the decreasing job finding rate, and c_f the decreasing entrepreneurship rate during this period.[41]

Figure 8 shows the flows between occupations during the GR. The model dynamics (in red) are broadly consistent with the data patterns (in black) observed during the GR with two caveats. First, there is a spike in the early transition from entrepreneurship to employment, due to the perfect-foresight announcement of the UI duration change which leads entrepreneurs to find a job in order to benefit from the higher UI. For a similar reason, there is a decline in the transition from employment to entrepreneurship, which was observed in the data only in mid-2012.

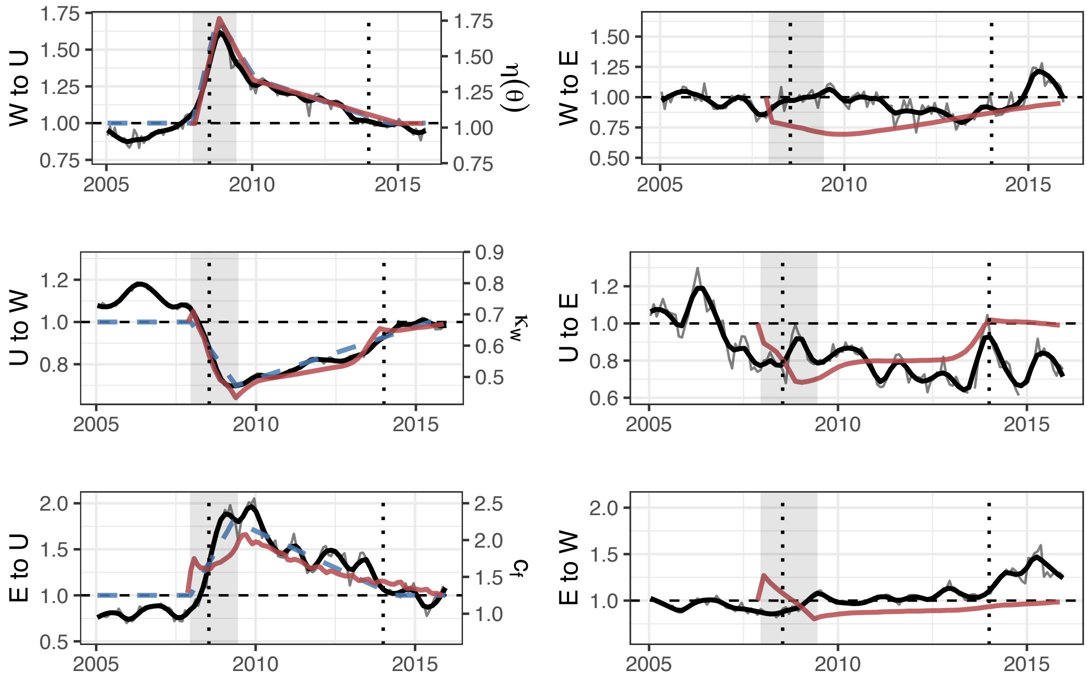
To provide a tractable quantification of the contribution of UI extensions on the entrepreneurial margin, we then run a counterfactual experiment in which, *ceteris paribus*, we remove the UI extension. That is, $\bar{J}$ is fixed to 26 weeks during the GR. We also decompose the contribution of each component ($\eta(\theta)$, κ_w, and c_f) in shaping the model patterns. Figure 9 displays the resulting occupation masses and the entrepreneurial sector GDP.

The main result is that UI extensions have a non-negligible impact on the entrepreneurship and the unemployment rates. First, consistently with Nakajima (2012), the extensions significantly increase the unemployment rate. Comparing the models with and without the extensions, we find a difference of about 1 percentage point in 2010 that persists until the end of the EB and EUC programs. Consistently with our previous findings, those extensions also decrease the entrepreneurship entry rate and thus the entrepreneurship rate, by about 0.18 percentage points in 2012. This decrease appears to be quite persistent, as finding a business

[40] Although conceptually more satisfactory, it is computationally more challenging to consider model expectations over shocks and gradually reveal policy changes. We acknowledge it is a limit of our experiment but we are not at odds with the literature on that point.

[41] The fixed cost c_f is used as it produces very consistent flows from entrepreneurship to unemployment. From the viewpoint of an entrepreneur, it is equivalent to a constant decrease in total sales that lead marginal entrepreneurs to exit. Over the period of interest, almost a one percentage point decrease in the entrepreneurship rate is observed in the data.

Figure 8. Transitions between occupations during the Great Recession



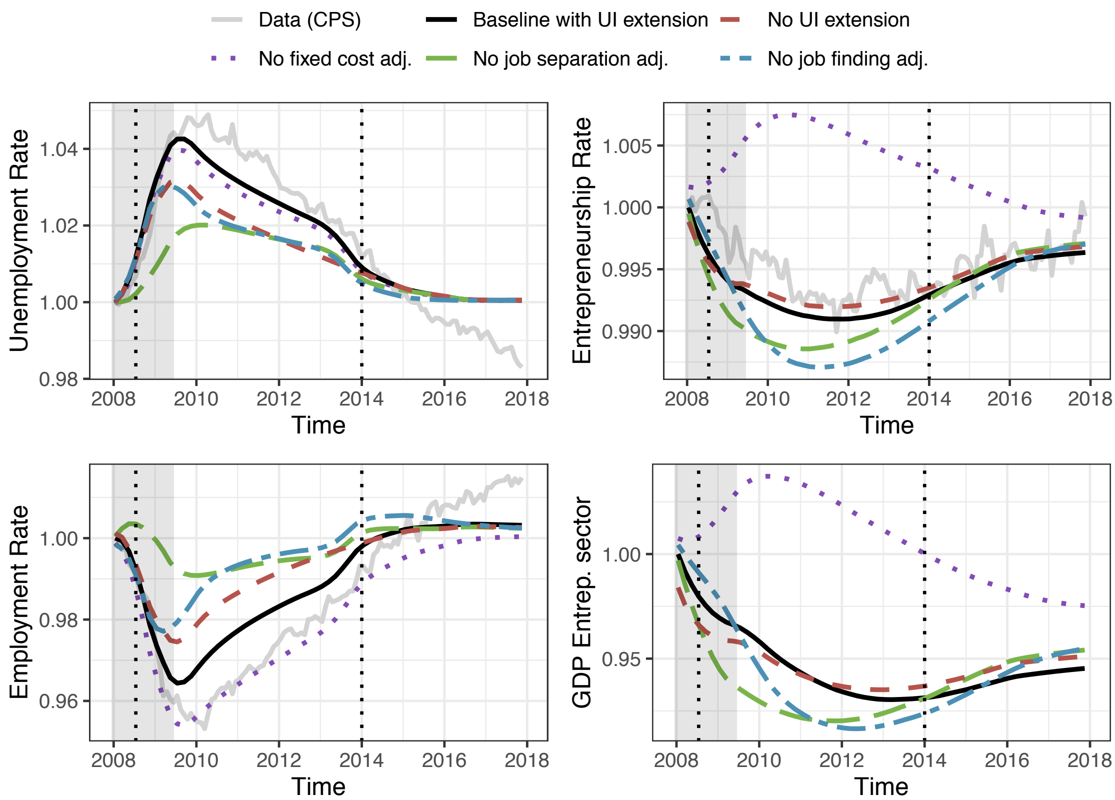
Notes: Black lines: CPS data (authors' computations). Red lines: model transitions. Grey area: NBER definition of the GR. Vertical dotted line: implementation dates EUC and EB, from mid-2008 to end-2013. Dashed blue lines (right scale): parameter change in the model (see text).

to run is a slow process. Even after all shocks have vanished, the self-employment rate is 0.5 percentage points below its long-run steady-state value of 9.1%. As in the data, we find the decrease in the self-employment rate to be very persistent.

We also find the impact of UI extensions on the entrepreneurial sector GDP to be ambiguous. On the one hand, by raising the number of unemployed agents in the economy, it contributes to a higher entry rate into entrepreneurship out of unemployment relative to the counterfactual without UI extensions. This effect is consistent with the literature (see for instance Evans and Leighton (1989)) supporting that unemployed individuals are more likely to select into entrepreneurship. On the other hand, UI extensions decrease the incentive to start businesses, as shown in the previous sections. In the end, between 2008 and 2010, the entrepreneurial sector GDP is higher under the UI extensions than without due to the first effect. Contrastingly, after 2010, the entrepreneurship rate and then the entrepreneurial sector GDP are lower under the UI extension. The difference in GDP persists over time even after the end of the UI extensions due to the long-lasting effect on the entrepreneurship rate.

Concerning the effects of each specific parameter we adjusted, we notice that the change in c_f allows the matching of the decreasing entrepreneurship rate. Without this change, the

Figure 9. UI change during the Great Recession.



Notes: Grey area: NBER definition of the GR. Vertical dotted line: EUC and EB implementation from mid-2008 to end-2013. The occupation rates are computed using the CPS. As it is well known that the self-employment rate is declining since the 80s, we detrended the occupation rates. We normalize the rates by their starting value in December 2007 such that the occupational rates are expressed in terms of deviations from their corresponding starting values. Only the entrepreneurship rate is matched, by adjusting the fixed cost c_f. All other occupational masses are the result of the implied transition between occupations.

high unemployment rate together with a riskier employment occupation given the increased job separation rate leads to a surge in the flow from unemployment to entrepreneurship, resulting in a higher entrepreneurship rate. Adjusting the job separation ($\eta(\theta)$) and the job-finding rates (with κ_w) to the data contributes to the overall increase in the unemployment rate, as shown in the top left panel.

6 Conclusion

This paper investigates the role of UI generosity on the propensity to select into entrepreneurship. We empirically find a negative and significant relation between UI generosity and the propensity of eligible unemployed individuals to select into entrepreneurship by exploiting variations in regular UI and extensions. We contribute an occupational choice general equilibrium model producing consistent flows between employment, unemployment, and entrepreneurship. We show that UI generosity has a significant impact on entrepreneurship mainly because insurance coverage between occupations is different: formerly self-employed unemployed agents are not eligible to the UI while those out of employment are. We quantify the elasticity of the flows from unemployment to entrepreneurship with respect to UI generosity: it is twice as large as the one from unemployment to employment. Overall, we demonstrate that the repercussions of varying UI generosity go well beyond the direct effect on unemployed individuals. Rather, the design of the UI system has a global impact on occupational flows and masses, especially in and out of entrepreneurship. Notably, the long-run relation between UI generosity and the entrepreneurship rate is downward sloping. Furthermore, our characterization of the occupational flows may contribute to the understanding of the observed irresponsiveness of the aggregate employment rate to UI variations. We show that reallocations from the entrepreneurial to the employment occupation lead to a stable aggregate employment rate following an increase in the UI.

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A Appendix

A.1 UI weekly benefit amount and maximum duration

We use information from the US department of labor "significant provisions of state unemployment insurance laws" that report the maximum weekly benefit amount and the regular UI duration at the state level. For UI extensions, we use the data from Farber et al. (2015) that we complement with UI duration extensions for the EUC91 based on the trigger rule (following the state insured unemployment rate and total unemployment rate used at the time of the extension.

A.2 CPS and SCF data sample

Throughout the paper, we use the IPUMS-CPS to compute the masses in each occupation and the corresponding flows between them. We retain a 1994 to 2015 sample and consider only the 20-65 years old population. Before 1994, key variables identifying self-employed business owners (HHBUS) are not available. We build a quarterly panel of around 10 million matched individuals for the empirical section of the paper. In order to control for false matches, we construct a specific individual identifier that controls for age, sex, ethnicity, and US state. Unfortunately, we are unable to track movers to a different US state. Finally, we use only quarterly transitions for which we observe a switch since at least two consecutive months. For instance, U – – E – U transitions (from unemployment to entrepreneurship and back over the quarter) are recoded as U – – – U. We do a similar adjustment if we observe U – – U – E. As such, only U – – E – E observations are coded as U – – – E. This restriction helps in reducing mismeasurements due to possible misreporting (see Farber et al. (2015)). Results are robust without this restriction.

We classify as a worker an individual who currently works in a paid job or who declares being temporarily absent from a paid job (EMPSTAT = $1, 10, 12$ and CLASSWKR = $20 : 28$). We classify unemployed individuals as those who did not have a job while being in the labor force (EMPSTAT = $20 : 22$). Layoff unemployed persons are job losers/on layoff and other job losers (WHYUNEMP = $1, 2$). We further condition the *layoff* category with unemployment duration as detailed in the core of the paper with DURUNEMP. Entrepreneurs are self-employed workers (CLASSWKR = $10, 13, 14$), who currently work (EMPSTAT = $1, 10, 12$) and own their business (HHBUS was 1 within the sample). HHBUS controls for business ownership within the family, as such we can not identify whether the individual is the owner of the family business or whether it is own by another member of the family. As our estimated share of entrepreneurs is close to the one estimated using the SCF (8-9%), we believe that our estimates are consistent. Further details and robustness on the construction of occupations are available in the Online Appendix.

We use the SCF 2001, 2004, and 2007 waves in order to compute various moments relative to entrepreneurship. To be consistent with our CPS sample, we restrict the definition of an entrepreneur to individuals declaring being self-employed and owning a business (in which they actively work in) with at least 5000$ of business capital. In the Online Appendix, we report those SCF moments that can be compared to those obtained with the model.

A.3 Sensitivity analyses: the selection out-of-unemployment

Table 8 provides robustness on the main exercise performed in the empirical section. We run our regression on the whole sample and a sample excluding the GR, but looking at the effects when incorporating UI extensions. Our main results are consistent with a strong effect of the UI on the propensity to select into entrepreneurship. We then employ a specification with a measure of layoff including only individuals with less than 15 weeks of unemployment. As expected, the results are dampened but consistent with our baseline. Distinguishing between incorporated and unincorporated self-employment indicates that both groups react to UI extensions. We then distinguish the effects of an increase in the UI duration and one in the weekly benefit amount. In both cases, higher UI generosity leads to a reduction in the propensity to start a business. We finally include additional controls: an interaction term between layoff and log GDP per capita and state by year and month fixed effects. In all cases, our results confirm the ones in our baseline.

A.4 Further evidence: The selection *on-the-job* and *on-the-business*

We investigate whether UI generosity is correlated with the likelihood that individuals move from employment to entrepreneurship as well as from entrepreneurship to employment. We use our panel data from 1994 to 2010 restricting our sample to the 25 to 50 years range to focus on individuals most likely to select into employment or self-employment as an alternative life prospect. As in section 2, we run Occ_1 to $\text{Occ}_{2ist} = \alpha + \beta \log(UI\,generosity)_{st} + \boldsymbol{\xi}\mathbf{X}_{it} + \boldsymbol{\eta}\mathbf{Z}_{st} + \boldsymbol{\lambda}_s + \boldsymbol{\mu}_t + \epsilon_{ist}$ with similar controls $\mathbf{X}_{it}$ and $\mathbf{Z}_{st}$ as in the main specification. $\boldsymbol{\lambda}_s + \boldsymbol{\mu}_t$ refers to

Table. 8. Sensitivity analysis: main regression [a]

	EB/EUC	U to E	U to SE	U to W	S - YM FE	Period
Sample selection						
1. Whole sample	No	-0.38^{***}	-0.67^{***}	0.02	Yes	1994-2015
2. Whole sample	Yes	-0.24^{***}	-0.20^{***}	-0.09^{***}	Yes	1994-2015
4. Excluding the GR	Yes	-0.43^{*}	-0.68^{***}	-0.03	Yes	1994:2007
Alternative measures						
5. Layoff, duration < 15	No	-0.45	-0.68^{***}	0.03	Yes	1994-2007
6. SE Incorporated	No	–	-0.77^{***}	–	Yes	1994-2007
7. SE Uncorporated	No	–	-0.59^{*}	–	Yes	1994-2007
8. log(UI WBA)	No	-0.32^{*}	-0.56^{***}	0.04	Yes	1994-2015
9. log(UI weeks)	Yes	-0.22^{***}	-0.12^{**}	-0.12^{***}	Yes	1994-2015
Additional controls						
11. Layoff$\times \log(GDP)$	No	-0.44^{**}	-0.76^{***}	0.05	Yes	1994-2007
11. Layoff$\times \log(GDP)$	Yes	-0.25^{***}	-0.29^{***}	-0.13^{***}	Yes	2008-2015
12. State $\times$ Year $\times$ Month FE	No	-0.35^{*}	-0.62^{***}	0.03	–	1994-2015
12. State $\times$ Year $\times$ Month FE	Yes	-0.22^{***}	-0.17^{***}	-0.09^{***}	–	1994-2015

Notes: *p<0.1; **p<0.05; ***p<0.01. In parenthesis: std. deviation. SE clustered by US states. FE stands for fixed effects and YM stands for Year-Month and S for state. Experiments using no UI extensions use a definition of laid off unemployed individuals with less than 26 weeks in unemployment.

state and time fixed effects. The results are provided in Table 9.[42] First, as expected, the sign of the effect of increasing UI is positive for the switch from entrepreneurship to employment and negative for employment to entrepreneurship. This apparent correlation is consistent with the findings of the model, higher UI generosity leads to a reallocation of individuals from self-employment to employment.

Table. 9. UI generosity and selection out of employment and entrepreneurship

	SE to W		E to W		W to SE		W to E	
$\log(Total\ Max\ Regular)$	0.330^{***}		0.302^{*}		-0.295^{**}		-0.126	
	(0.120)		(0.172)		(0.123)		(0.144)	
$\log(Total\ Max\ Benefit)$		0.193^{*}		0.182^{*}		-0.277^{***}		-0.132
		(0.097)		(0.105)		(0.101)		(0.154)
S – YM FE + controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	225352	157320	225352	157320	1447028	1447028	1447028	1447028

Notes: *p<0.1; **p<0.05; ***p<0.01. Standard deviation clustered by state and are in parentheses. Individual controls include age, age squared, sex, marital status, family income, educational attainment, type of occupation for workers and whether partner has a job. State controls include house hpi index, personal income, log real gdp per capita, cubic polynomial of unemployment rate and average wage rate. We restrict our sample to the period from 1994 to 2010. We focus on people aged from 25 to 50 years old.

[42]Sensitivity analyses with the population in the 25 to 55 age range or excluding the GR provide similar results, except that estimates of columns (3) and (4), while still positive, are sometimes not significant at 10% level.

Entrepreneurship and Labor Market Mobility: the Role of Unemployment Insurance

Online Appendix

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1 Empirical Appendix

1.1 Full details on the CPS sample

1.1.1 Sample construction

Throughout the paper, we use the IPUMS-CPS to compute both the masses in each occupation and the corresponding flows between them. We retain a sample from 1994 to 2015 and consider only the 20-65 years old population. We choose 1994 since key variables identifying self-employed business owners (HHBUS) are not available before. We build a quarterly panel of around 10 million matched individuals for the empirical section of the paper. In our empirical analysis, we use the longitudinal CPS weights: PANLWT.[1]

In order to control for false matches, we construct a specific individual identifier that controls for age, sex, ethnicity, and US state. Unfortunately, we are unable to track movers to a different US state. Unfortunately, if an individual is moving to another US state, we are not able to follow this individual. Probabilities are multiplied by the first-month respondent weight to generate a numeric value for the fraction of individuals in a specific occupation leaving to another occupation. Finally, we use only quarterly transitions for which we observe that individuals switched since at least two consecutive months to another occupation. For instance, U – – E – U transitions (from unemployment to entrepreneurship and back over the quarter) are recoded as U – – – U. We do a similar adjustment if we observe U – – U – E. As such, only U – – E – E observations are coded as U – – – E. This restriction aims to reduce the mismeasurement due to possible misreporting as highlighted in Farber et al. (2015). Results are robust without this restriction.

[1] We notice that the results of the paper hold with alternative weights, as the cross-sectional CPS weight and with an unweighted sample. Those additional results are available upon request.

1.1.2 Occupation definition

Worker We classify as a worker an individual who currently work in a paid job or who declares being temporarily absent from a paid job (EMPSTAT = 1, 10, 12, and CLASSWKR = 20 : 28).

Unemployed Individuals are classified as unemployed if they did not work for pay or profit and did not have a job from which they were briefly absent. The variable EMPSTAT = 20 : 22 identifies unemployed individuals. We distinguish layoff unemployed persons when WHYUNEMP = 1,2 which record job loser/ on layoff and other job losers. All other unemployed individuals are considered not eligible for unemployment insurance. We further condition the *layoff* category with DURUNEMP, which allows us to further select groups of eligible UI claimants which respect to their unemployment duration. When studying the effect of regular UI benefits (Panel A), we define layoff individuals eligible for UI as those with less than 30 weeks of unemployment duration, which is the maximum regular US state UI duration. When considering UI extensions, we define a laid off unemployed agent as an unemployed individual with less than 99 weeks in unemployment. In a robustness check, we further restrict a *layoff* unemployed to declare having worked in the last twelve months (WNFTLOOK to be either 0 or 11). Robust are quite similar.

Entrepreneur and self-employed We define an entrepreneur as a self-employed (incorporated or unincorporated) worker (CLASSWKR = 10, 13, 14), who currently work (EMPSTAT = 1, 10, 12) and own his business (HHBUS = 1). Unfortunately, as compared to Cagetti and De Nardi (2006), we cannot control for an active management role in the CPS. We control business ownership by creating a specific variable that indicates whether or not the individual was owning his firm from 1994 to 2015, allowing us to control for measurement errors arising in the survey.[2] The share of entrepreneurs varies between 8.5% to 11% (relative to the population of workers, entrepreneurs, and unemployed) depending on the assumption considered (self-employment or entrepreneurship) and the period. With this restriction on business ownership, we might bias upward the actual number of entrepreneurs since some individuals might first engage in self-employment and then acquire a business. Moreover, HHBUS controls for business ownership within the family, as such we can not identify whether the individual is the owner of the family business or whether it is own by another member of the family. As our estimated share of entrepreneurs is close to the one estimated using the SCF (8-9%) we believe that our estimates are consistent.

[2]If we do not construct this additional variable, the flow from entrepreneurship to employment during a quarter jump to 16%, which is inconsistent with yearly flows. Therefore, our definition captures a part of self-employment that is not business ownership, but this is more consistent with resulting flows.

1.1.3 Summary statistics

Table 1 present the (unweighted) summary statistics of the sample of unemployed individuals from 1991 to 2010 and the main variables used throughout the empirical part.

Table. 1. Descriptive statistics

Statistic	Mean	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
AGE	39.3	12.4	20	28	49	65
Partner has a job	0.4	0.5	0	0	1	1
Average weekly wage	541.5	440.0	0.01	264.0	673.1	2,884.6
CPI adjusted weekly max benefits	424.9	114.2	212.8	346.9	492.2	963.4
Duration	38.9	31.9	0.0	16.0	53.0	119.0
Layoff def1	0.5	0.5	0	0	1	1
Layoff def2 (duration < 31 weeks)	0.4	0.5	0	0	1	1
State unemployment rate	6.5	2.2	2.1	4.9	7.9	14.6
$Max\ Regular_{weeks}$	25.9	1.4	12	26	26	30
$Max\ EB\ EUC_{weeks} + Max\ Regular_{weeks}$	46.3	26.8	14	26	70.5	99
	0.4	0.1	0.2	0.3	0.4	1.1
Hpi index	178.4	49.2	81.9	147.4	203.7	476.5
Log real GDP	10.8	0.2	10.3	10.7	10.9	12.1
Log per capita income	10.5	0.3	9.9	10.3	10.7	11.3

Note: this table show the main statistics of a sample of unemployed individuals from 1994 to 2015.

1.2 Exogeneity of regular UI benefit changes

We verify whether UI laws are correlated with determinants of the flows from unemployment to self-employment and entrepreneurship that could confound our estimates. Table 2 evaluate the determinants of state UI benefits with various state macroeconomic variables and union coverage, conditional on state and year fixed effects. We employ a similar set of determinants as in Hsu et al. (2018) and find no evidence of a relation over the period from 1994 to 2007. The estimated correlations are small and not statistically significant for the state unemployment rate, union coverage, housing HPI index, log real GDP per capita, average wage, log per capita income, and the UI trust fund reserves.

1.3 Cross-country evidence

In this section, we provide further empirical evidence on the mechanisms highlighted in the core paper. We update the cross-country evidence in Koellinger and Minniti (2009) to a much longer panel with more countries. We show that the fraction of nascent entrepreneurs in the economy is negatively correlated with higher UI generosity. We measure UI generosity as total government expenditure going to unemployment benefits (as a fraction of GDP) divided by one plus the unemployment rate, which translates the average UI spending of a country per unemployed individual. We measure the willingness to start a business as the fraction of nascent entrepreneurs from the Global Entrepreneurship Monitor (GEM) and an index of perceived opportunity measuring the percentage of 18-64 population (individuals involved in any

Table. 2. UI generosity and selection out of employment and entrepreneurship

	Total Max Regular$_{benefit}$							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Unemployment Rate (%)	0.016							0.015
	(0.016)							(0.032)
log(Housing HPI index)		0.000						0.001
		(0.000)						(0.000)
log(real GDP per capita)			0.112					−0.038
			(0.250)					(0.243)
log(per capita income)				2.704				5.254
				(2.173)				(2.984)
Average wage					−0.002			−0.006
					(0.007)			(0.006)
Union Coverage						0.001		0.000
						(0.005)		(0.004)
UI trust fund reserves							0.012	−0.006
(% of covered wages)							(0.016)	(0.014)
State and year-month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.95
Observations	714	714	714	714	714	714	714	714

Notes: *p<0.1; **p<0.05; ***p<0.01. Standard deviation clustered by state in parentheses. The measure of Total Max Regular$_{benefit}$ is in thousand of dollars.

stage of entrepreneurial activity excluded) who see good opportunities to start a firm in the area where they live. We build a panel dataset of 20 developed countries from 2001 to 2018 and regress the following specification:

$$\text{Entrepreneurship}_{it} = \beta \text{UI generosity index}_{it} + \delta \text{Unemp. rate}_{it} + \mathbf{X}_{it} + C_i + Y_t + u_{it}$$

where the measure of entrepreneurship is either perceived opportunity or nascent entrepreneurship, $\mathbf{X}_{it}$ is a vector of controls.[3] Those includes business taxes index and government program and support indexes toward entrepreneurs. All from the GEM data. C_i and Y_t define country and year fixed effects. Finally u_{it} is an error term. Table 3 show the results. Our results confirm the insight in Koellinger and Minniti (2009): nascent entrepreneurship is negatively correlated with UI generosity, a feature that our model reproduces well. Moreover, the share of individuals declaring that entrepreneurship is a good opportunity is significantly reduced with UI generosity.

[3]Perceived opportunity measure the percentage of 18-64 population (individuals involved in any stage of entrepreneurial activity excluded) who see good opportunities to start a firm in the area where they live.

Table. 3. Entrepreneurship and UI generosity

	TEA				Opportunity			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
UI index	-1.27^{**}	-1.10^{*}			-12.76^{***}	-12.46^{***}		
	(0.62)	(0.59)			(3.37)	(3.15)		
Replacement rate			-0.03	-0.02			-0.55^{**}	-0.55^{*}
			(0.03)	(0.03)			(0.26)	(0.30)
Unemployment rate	-1.99	0.68	-7.69	-5.93	-70.55^{***}	-80.91^{***}	-119.81^{***}	-123.90^{***}
	(8.38)	(7.79)	(5.47)	(5.74)	(24.60)	(26.61)	(24.16)	(25.70)
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Window FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	Yes	No	Yes	No	Yes	No	Yes
Observations	267	232	264	229	267	232	264	229

Notes: *p<0.1; **p<0.05; ***p<0.01.

2 Model Appendix

2.1 Additional model validation

2.1.1 SCF sample

We use the SCF 2001, 2004, and 2007 waves in order to compute various moments relative to entrepreneurship. To be consistent with our CPS sample, we restrict the definition of an entrepreneur to individuals declaring being self-employed and owning a business (that they actively work in) with at least 5000$ of business capital. In table 4, we report those SCF moments that can be compared to those obtained with the model.[4]

Table. 4. Moments in different SCF waves and resulting moments in the baseline model.

Moment	SCF wave in				
	2001	2004	2007	*Data*	Model
Share of entrepreneurs (in %)	8.8	8.5	9.1	9.0	9.1
Fraction of unemployed (in %)	4.2	5.2	5.2	4.9	5.0
Ratio of median net worth (entrepreneur to worker)	7.3	8.7	7.5	7.8	8.1
Ratio of median net worth (entrepreneur to all population)	6.2	7.2	6.6	6.6	6.8
Ratio of median income (entrepreneur to worker)	1.71	1.67	1.57	1.65	1.66
Fraction of pop. with net worth < 1/10 of median (in %)	10	13	14	10	4
Gini coefficient - wealth	0.81	0.82	0.82	0.8	0.63
Gini coefficient - Entrepreneur's earnings	0.64	0.65	0.65	0.65	0.57
Fraction of capital hold by entrepreneurs (in %)	28.5	30	31.5	30-35	34
Ratio std. log earnings entrepreneurs to workers	1.3	3.83	1.71	?	2.1
Ratio of median entrepreneurs' debt to entrepreneurs' earnings	0.95	1.37	1.59	1.3	0.93
Ratio of median ent. income to ent. net worth (in %)	0.166	0.128	0.11	0.14	0.13
Ratio of median worker income to worker net worth (in %)	0.72	0.73	0.63	0.73	0.53

[4]The magnitude of the moments are quite similar under different assumptions for this value. We impose a restriction of 5000$ to reduce misreporting effects and to be more consistent with our CPS sample. Moreover, note that this definition of an entrepreneur selects individuals that are on average better off than the average of all self-employed.

2.1.2 Occupation flows by ability level

Figure 1 compare the shapes of the occupational flows in the model to their CPS counterparts. The flows are taken by educational attainment in the CPS data and ability levels θ are the model counterparts.[5] Note that the flows in and out of entrepreneurship are in general unchanged whether we define entrepreneurs as business owners or all self-employed individuals. The decreasing shape of the $W \rightarrow U$ flow is imposed with $\eta(\theta)$. While our calibration targets the *U-shape* of the $W \rightarrow E$ flow by earnings quantiles, we do no target it by ability and the latter relation is increasing both in the data and the model. All the other patterns are endogenously generated by the model and most of them are well-reproduced: we capture the decreasing pattern of the entrepreneurship to unemployment flow as well as the increasing shape of the reverse flow. We also capture the *hump-shape* of the $U \rightarrow W$ transition. Eventually, the flow shape the model captures the least is the *S-shape* from entrepreneurship to employment. We still capture the increasing part of this flow for HS to M groups but not the highly non-linear extremes.[6] In the model, highly-skilled entrepreneurs exit more often since corporate jobs are better outside opportunities without any business risk resulting in a higher incentive to search for a job.[7] Having a reasonably good fit of these flows in our baseline economy is an especially important premise since a key subject we will develop concern the effect of UI and its generosity on these flows.

2.2 Robustness and alternative specifications

In this section, we investigate alternative assumptions and specifications that potentially affect the conclusion of our main quantitative exercise.

2.2.1 Long-run elasticities of flows

We first provide the model estimates of the specification in equation (23) in the core of the paper when we use the resulting steady-state flows when computing the elasticity $\xi_{X,Y}$. The resulting elasticity of flows from insured unemployment to entrepreneurship is -0.245 while from insured unemployment to employment it is -0.167. The corresponding elasticity using flows

[5] Educational attainment is divided among $< HS$: less than a high school degree, H: high school degree, $< C$: some college but no degree, B: bachelor's degree, M: master's degree, $> C$: higher college and professional school degrees. Matching ability groups with education groups is a subject of discussion. There is a caveat: the CPS data do not provide any information about wealth or business earnings and unemployment compensation. The included family income variable is rather imprecise and its range is too small. Education is the best directly available element comparable to the model. However, we still tried to match by indirect means: in a supplementary appendix available upon request, we report flows by *reconstructed wages* using a fitted wage that takes into account age, education, etc.

[6] According to the BLS, groups $> C$ and $< HS$ together represent fewer than 15% of the working population.

[7] In the online appendix section A, we show that this *S-shape* becomes a hump-shaped curve at a yearly frequency for self-employed business owners. At the higher bi-monthly frequency, we might capture movements that may mainly concern the lowest educated group potentially running more unstable businesses in the short-run.

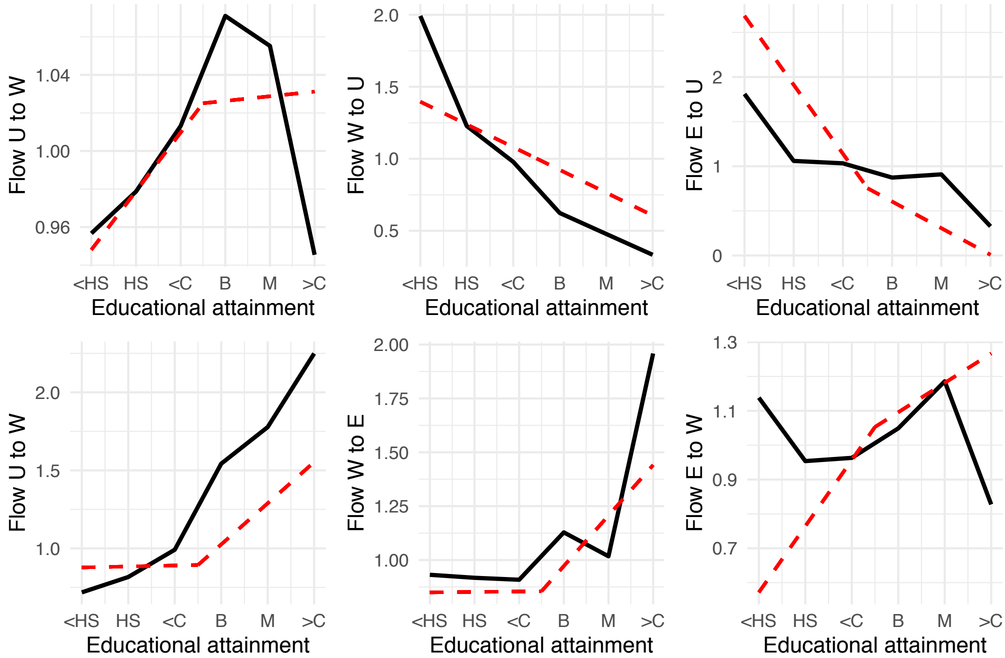


Figure 1. Mean two months occupational flows by CPS educational attainment (black, top horizontal axis) and model ability level θ (red, 3 values order by θ_1,θ_2,θ_3). The solid lines refer to self-employed business owners. Legend: U: unemployment, W: employment, E: entrepreneurship. *Data sources:* authors' own computations using CPS data from 1997 to 2017.

from the initial steady-state distribution are $\xi_{U^I \to E}$ =-0.287 and $\xi_{U^I \to W}$ =-0.172. This means that there are not substantial composition effects among the population of insured unemployment after having implemented the policy change.

2.2.2 Source of UI generosity: UI duration versus UI benefit amount

UI generosity is contingent on the level of UI benefits or their duration. In section 5.1.1 of the core paper, our metric of UI generosity did not explicitly specify the origin of a variation in UI generosity. We run a robustness exercise to investigate the impact on occupational flows and masses when UI generosity is due only to a variation of the UI replacement rate or due only to a variation in UI duration. Table 5 displays the results of this exercise. Overall, whether we increase the level of UI benefits or the duration, we find that the measured flows and masses respond qualitatively the same as our elasticities in the core paper. Differences in magnitudes are explained by the fact that a variation in the level of UI benefits is not directly comparable to a variation of the duration. The former acts directly on the entire path of UI benefits while the latter increases the number of periods of total UI claims. Whether it is better to implement a change in UI generosity through higher replacements rates or higher UI durations is a policy question out of the scope of the current investigation.

Interestingly, results from our empirical appendix also indicate a similar discrepancy between UI benefits and UI duration. Increasing UI duration is shown to impact less the flow from unemployment to self-employment, consistently with the model. Finally, when the UI duration is relatively low (around 20 weeks of duration), the effect of increasing UI benefits turn out to be small for the flow from unemployment to employment (an elasticity of around -0.09 against -0.17 in the benchmark.). Again, this is consistent with the result in our main empirical appendix: when considering variations in regular benefits, we find no statistically significant effects on the flow from unemployment to employment.

Table. 5. Elasticity of insured unemployment and long-run occupation masses to UI generosity

	Insured U flow to		Long-run mass of		
	Entrep.	Paid Emp.	Unemp.	Entrep.	Paid Emp.
Elasticity to UI benefit level	-0.42^{***}	-0.31^{***}	0.17^{***}	-0.22^{***}	0.01^{***}
Elasticity to UI duration	-0.27^{***}	-0.15^{***}	0.11^{***}	-0.07^{***}	0.00

Note: *p<0.1; **p<0.05; ***p<0.01.

2.3 Additional Robustness

We run two additional robustness checks that we believe might influence the main message of the paper that the UI has important effects on the selection into entrepreneurship. We first verify if including a form of learning changes the results. Indeed, learning can be an important part of the business prospect that can not be well captured by our endogenous business search s_e. Second, we check whether our results hold with tighter labor market frictions.

2.3.1 Business Maturity and Learning

In this alternative specification, we assume that upon entry, entrepreneurs face a higher probability to start with a low shock z. This aims to capture a form of learning about the demand the time needed to accumulate goodwill, client lists, or customer base. We assume that new entrants draw their productivity from the distribution $z \sim \mathcal{H}(z)$ with $Q(z) \leq \mathcal{H}(z), \ (\forall z)$ where $Q(z)$ defines the probability distribution of z of new entrants in the baseline model. This condition states that new entrants start with, on average, a lower business productivity, and then evolve over-time according to the AR(1) described in the baseline model.[8] By sake of parsimony, we assume $\mathcal{H}(z)$ shifts the mean of the $Q(z)$ distribution over the possible discretized values of z by 10%. Under this new specification, we calibrate again the model to match targeted moments. Table 6 shows that our results remain valid under this specification, with an increase in the adverse effect of UI on the propensity to start a business due to the additional risk generated by the learning profile.

[8] A similar learning/maturity process is used in Clementi and Palazzo (2016) to give a role to the age of the firm.

Table. 6. Elasticity of insured unemployment to UI generosity with/without learning

	Elasticity to UI			
	$U_I \to E$	$U_N \to E$	$U_I \to W$	$U_N \to W$
1. Benchmark	-0.287^{***}	-0.015^{***}	-0.167^{***}	0.002^{***}
2. With learning [a]	-0.331^{***}	-0.015^{***}	-0.171^{***}	0.002^{***}

Note: *p<0.1; **p<0.05; ***p<0.01. [a] recalibrated to match key moments.

2.3.2 Higher labor market frictions

The last experiment we perform is to check the sensitivity of our results with relatively more frictional labor market. To do so, we increase the worker firing rate by 1pp for each ability level and decrease the job and business finding rate by 3pp. The corresponding new stationary equilibrium displays a higher unemployment rate of 6.8%. Under this new calibration, the main results of the paper are qualitatively similar: higher insurance significantly dampens the propensity of unemployed workers to select into entrepreneurship, and reallocate the labor force to employment activities. The elasticity of unemployment flow to entrepreneurship is close to the benchmark economy, of about -0.312. This slight increase is due to the higher frictions in the labor market: when employment is riskier, increasing unemployment insurance lead unemployed individuals to search for employment, and less so for starting a self-employment business.

3 Numerical implementation

State space and grid definition In our model, an household is fully characterized by a state vector $\mathbf{x} = (o, y, \theta, z, j, a)$ with $a \in A$, $y \in \mathcal{Y}$, $z \in \mathcal{Z}$, $\theta \in \Theta$, $o \in \{w, e, u\}$ and $j = J$. We compute the household problem using a grid of asset $\mathbf{a}$ of 350 points (adding more points only very marginally increase our accuracy), spaced according to an exponential rule. We discretize the process z, y and θ with respectively 7, 5 and 3 grid points.

3.1 Algorithm

We organize the algorithm as follows.

1. Initialize a full dimension grid space composed of all different possible asset values (a), productivity level (y), innate ability (θ) and entrepreneurial state (z). The maximum asset level is chosen sufficiently large to place the policy functions in an ergodic set.

2. Guess initial tax rate τ_w and prices $\{w, r\}$.

3. Given prices, solve the consumption-saving-search (CSS) problem, productive capital k, and search efforts of an agent. We use the DC-EGM algorithm of Iskhakov et al. (2017)

for the CSS problem.

4. Construct the transition matrix $\mathbf{M}$ generated by Π_y, Π_z and Π_θ, $a'(\mathbf{x})$, $s_w(\mathbf{x})$, $s_e(\mathbf{x})$. Compute the associated stationary measure of individuals $\Gamma(\mathbf{x})$, by first guessing an initial mass of one of households with zero asset and then by iterating on $\Gamma'(\mathbf{x}) = \mathbf{M}\Gamma(\mathbf{x})$ until $|\Gamma'(\mathbf{x}) - \Gamma(\mathbf{x})| < \mu$, with μ very small.

5. Compute the resulting total asset level, total labor supplied and total investment in the entrepreneurial sector. Total capital invested in the corporate sector is given as the difference between total savings and total capital invested in the entrepreneurial sector. Total labor used in the corporate sector is given by total labor supplied by workers.

6. Update prices $\{r, w\}$ using the marginal productivities in the corporate sector and tax rate τ_w to close the government budget up to a relaxation. Back to step 2 until convergence of labor income tax rate and prices.

3.2 Transitional dynamics

To solve the transition, we compute the solutions of the household problem backward, starting at the new steady-state. We then find prices that are consistent with the implied policies and we iterate until convergence. We assume that the economy is in the initial steady-state in period 0 and the reform is announced and implemented in period 1. Agents did not anticipate the policy before its implementation. The economy makes a transition to reach the final steady-state in period T. We choose T large enough so that the resulting stationary distribution in period T is close enough to the final steady-state equilibrium. The algorithm for the transition dynamics is:

1. Guess a path for $\{\mathcal{L}_1, ..., \mathcal{L}_{T-1}\}$ with $\mathcal{L}_t = \{r_t, w_t, \tau_{w,t}\}$. $\mathcal{L}_0$ and $\mathcal{L}_T$ are given by initial and final steady-states.

2. Use value functions of the final steady-state (period T) to solve the households' problem backward starting from $T - 1$ until period 1.

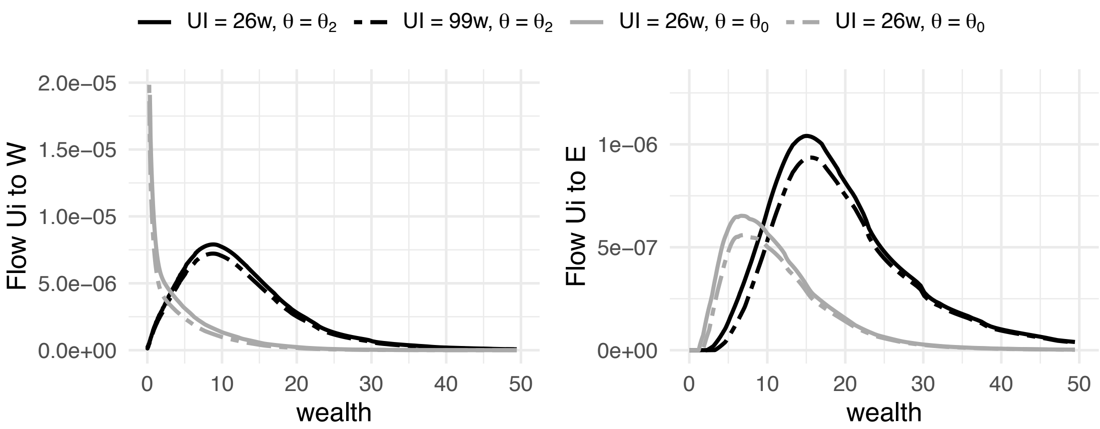
3. Use the distribution of the initial steady-state and the resulting policy functions to compute the path of the distribution of household $\{\hat{\Gamma}(\mathbf{x})_1, ..., \hat{\Gamma}(\mathbf{x})_T\}$.

4. Given these distributions, compute new path $\{\mathcal{L}_1, ..., \mathcal{L}_{T-1}\}$. Iterate from step 2 until the difference between the initial path is close enough to the resulting path.

5. When convergence is achieved, check if the resulting final distribution $\hat{\Gamma}(\mathbf{x})_T$ is close enough to the steady-state distribution $\Gamma(\mathbf{x})_T$ up to a relaxation. If the two distributions are identical, then stop, else, increase the number of periods T.

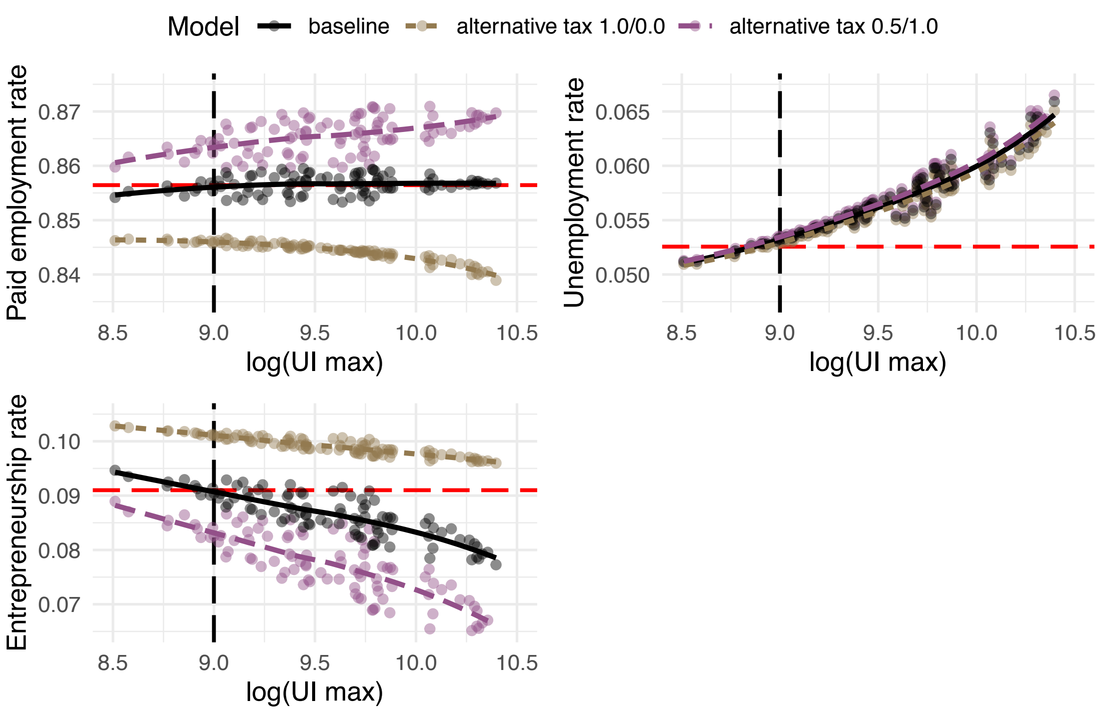
3.3 Additional figures

Figure 2. Model flows from insured unemployment to entrepreneurship.



Note: we display the flows out of insured unemployment with $j = \bar{J}$ for two models with the same benchmark initial distribution: the baseline with $\bar{J}$ = 26 weeks (solid line) and an alternative with $\bar{J}$ = 99 weeks (dashed line).

Figure 3. Effect of alternative tax scheme on occupation masses.



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