From Unemployment to Self-employment: An Evaluation of Self-employment Assistance Programs*

Alexandre Gaillard†
Princeton University

Sumudu Kankanamge‡
Toulouse School of Economics, University of Toulouse Capitole, Toulouse, France

This version: February 2023

Abstract

We study how self-employment assistance (SEA) programs extending the unemployment insurance system affect labor mobility, unemployment, and the composition and performances of self-employment. We use a general equilibrium model of the US labor market to decompose and evaluate the attributes of SEA programs. We find that type-dependent programs select more skilled and richer self-employed individuals. Allowing eligible individuals to resume claiming outstanding UI rights following a business failure mitigates business risk and significantly fosters business creation. In contrast to partial equilibrium studies, we do not find a significant effect of SEA programs on the unemployment rate.

Keywords: Active Labor Market policies, Self-employment, Entrepreneurship, Unemployment Insurance.

JEL classification: J68, J62, E24, H25, E61.

---

*We are indebted in no specific order to Arpad Abraham, Mark Bils, Patrick Fève, Christian Hellwig, Dirk Krueger, Tim Lee, Franck Portier, and José Víctor Ríos Rull for their useful discussions. The authors are solely responsible for any remaining errors or omissions.

†Address: Princeton University – School of Public and International Affairs, 214 JR Rabinowitz Building, Princeton, NJ. Email: ag6575@princeton.edu. Alexandre Gaillard acknowledges funding from ANR under grant ANR-17-EURE-0010 (Investissements d'Avenir program) and from Banque de France.

‡Address: Toulouse School of Economics, University of Toulouse Capitole, 31080 Toulouse, France. Email: sumudu.kankanamge@tse-fr.eu. Sumudu Kankanamge acknowledges funding from ANR under grant ANR-17-EURE-0010 (Investissements d'Avenir program).

1 Introduction

In recent years, an increasing number of Active Labor Market Policies (ALMP) in OECD countries have been providing financial assistance to unemployed individuals to help them start a business. These policies, that we generically refer to as self-employment assistance (SEA) programs, target the risk faced by unemployed individuals when creating a self-employed activity. Broadly speaking, a first class of SEA programs provides assistance to unemployed individuals in the form of monetary grants, loan guarantees, or training, somewhat independently of the unemployment insurance (UI) system. A second class of policies extends the UI system to cover part of the self-employment risk. The latter policies can be *type dependent* when their assistance scheme rests on previous labor earnings and individual productivity. They can be *business income dependent* when the assistance is contingent on self-employed business outcomes. Some policies even let eligible individuals cease their business activity upon failure and recover outstanding UI benefits as returning unemployed agents.

In the US, a *type dependent* policy called the *Self-Employment Assistance Program* waives regular UI beneficiaries from active job search and dispenses an allowance of the same amount and duration as regular benefits, provided they engage in the establishment of a business. However, this policy, only active in less than ten states, is constrained by quotas. In Europe, several countries experimented with SEA programs in the last decades. Table 1 provides a non-exhaustive typology of existing or former SEA programs.[1] When available, these programs constitute one of the largest self-employment subsidies. In Germany, between 2002 and 2011, around 40-50% of new self-employed per year received this type of insurance. In France, the 2002 *Plan d'Aide au Retour à l'Emploi (PARE)* policy concerned almost 50% of all new self-employed. According to Hombert et al. (2020), the *type* and *business income* dependent *PARE* policy was designed to insure the so-called downside risk: it is the risk supported by self-employed individuals on their income stream because of bad business performances. These authors estimate an increase of 12% of the number of newly created firms after the *PARE* reform while the pool of entrepreneurs and their relative performances remained un-

[1] It should be noted that the rules regulating these programs are in the details more complex than the simplified classification we provide here. Much of the complexity comes from the fact that many programs are entangled with other unemployment assistance programs. Related papers on European SEA policies include Ejrnæs and Hochguertel (2014) who use a Danish retirement reform incorporating self-employment UI to study the effects of a downside risk insurance. They find that entry into self-employment increases by 1.2 - 1.8% and that those agents are not any different in terms of performance. Caliendo and Künn (2011) estimate the effects of two different German programs helping unemployed individuals to start businesses. In the first program, individuals were given a lump-sum startup subsidy each month for three years, with the amount declining every year. Under the alternative *bridging allowance* (BA) program, individuals received their unemployment benefits for six months. The authors find that under the two experiments, new entrepreneurs tend to be less qualified, but are more qualified under the BA than under the start-up subsidy.

Type dependent policy	Business income dependent policy	UI rights if failure	Countries
Yes	Yes	Yes	France ACCRE (1998-2006), France ARE (2008-), Finland (current), The Netherlands (current)
Yes	No	Yes	Ireland BTWEA (1999-), US SEAP (1998-) Sweden Self-employment Grants, Germany Bridging Allowance (1986-2006), Germany new start-up subsidy (2006-)
Yes	No	-	Canada SEA (1993-), Hungary SEA
No	No	Yes	Finland Start-up Grant (1988-), UK EAS (1983-1991)
No	No	No	Australia NEIS (1985-), Denmark EAS (1989-1994) Germany start-up subsidy (2003-2006), UK NEA (2010-)

Table. 1. Typology of self-employment assistance programs.

changed.

In this paper, we use a structural approach to evaluate the class of SEA programs that extend the UI system. This approach let us fully decompose the attributes of these programs and capture mobility and selection effects within a controlled environment. We employ the following steps: (i) we build a general equilibrium model of the US labor market with a detailed characterization of self-employment and labor market flows; (ii) using our model, we characterize the impact of SEA programs on production, unemployment, mobility, composition and performances of the self-employment pool, and welfare.

The basic building block of our economy is an incomplete markets general equilibrium model with heterogeneous agents. Agents take occupational decisions and endogenously choose between employment, unemployment, and self-employment. We provide a detailed account of the self-employment risk including business failure and default. Our framework, thus, includes financial and labor market frictions to provide a credible environment for our policy investigations. The model is able to account for both macro and micro-level characteristics of the US labor market as compared to empirical counterparts in the Current Population Survey (CPS) and the Survey of Consumer Finances (SCF).

The model predicts that all the SEA programs we study have important mobility effects. We use a *type* and *business dependent* policy as a reference. Under this policy, the share of self-employed increases by 1.5% and the fraction of unemployed individuals starting businesses rises by 11% as compared to a no-policy economy. We show that the fraction of unemployed individuals who would have entered self-employment even in the absence of this SEA program, survive longer, but invest and produce slightly less due to moral hazard effects under the policy. For the remaining fraction, who entered because of the policy, we show that a *type dependent* program selects more skilled and richer new self-employed individuals, who therefore invest more than those selected under a *non-type dependent* program (i.e. under lump-sum compensations). In contrast to the previous literature that focuses on partial equilibrium, we do not find a significant effect of SEA programs on the unemployment rate at the general equilibrium but rather that employment in the non-entrepreneurial sector is crowded out.

After decomposing the reference SEA into components, we show that the single mechanism of letting individuals return to the unemployment pool upon business failure and resume claiming any outstanding UI rights would account for about 40% of the increase in the share of self-employed due to a full SEA scheme but at virtually no extra cost for the economy. This confirms that business risk is fundamental for aspiring self-employed individuals and that a fallback plan fosters business creation.

We find that all the SEA reforms we consider generate positive levels of steady-state welfare. However, relatively poor and unskilled individuals with low UI rights are borrowing-constrained and do not benefit from these reforms. As it is usual with this type of policy, we find that the short-term costs of implementing them can be large and somewhat mitigate the long-run gains. As a result, the welfare along the transition is on average negative, albeit only very slightly, while around 30-40% of the individuals benefit from the reforms. The main driver for this finding is that the vast majority of the agents paying for this policy are already employed in the corporate sector and do not directly benefit from it.

Finally, we show that the design of the UI system itself and the level of self-employment is tightly linked. A more generous UI system has a negative effect on the propensity of becoming self-employed: increasing UI benefits and/or extending UI duration imply a lower incentive for unemployed agents to start a business, amplified by the rising opportunity costs of abandoning their status. This adverse effect can significantly be mitigated using a SEA program and even reverted in the case of an increase in the UI duration.

Related literature There is a substantial literature on self-employment and many papers are concerned about the impact of existing barriers to self-employment on the share of entrepreneurs in the economy. Several contributions such as Landier and Thesmar (2008), Schoar (2010) or Hurst and Pugsley (2011) show that only focusing on this share might prevent us from understanding the vast amount of heterogeneity in the self-employment pool and the rich composition or selection effects underneath. Our specification is able to capture a number of those effects like, for instance, the high quarterly flow from self-employment to paid employment. While this latter finding is not new (see for instance Cagetti and De Nardi (2006) at a yearly frequency), our model generates this flow as the result of mostly endogenous decisions. The literature introduces a distinction between self-employed starting a business *out-of-necessity* and *out-of-opportunity* to understand the choice of becoming self-employed with respect to the working ability (Poschke (2013)). Our model theoretically characterizes the related notion of necessity share and shows how insurance mechanisms affect its magnitude. This paper is also related to the quantitative literature on self-employment in relation to mobility and wealth inequality issues pioneered for instance by Quadrini (2000) or Cagetti and De Nardi (2006) and to the many policy questions that have been addressed using this framework (Kitao (2008), Cagetti and De Nardi (2009) and Buera and Shin (2013) among others). Similarly to our contribution, some recent papers have begun addressing the question of insurance mechanisms in models with self-employment. This literature has mainly focused on the effects of introducing health insurance (Fairlie et al. (2011)) or alternative bankruptcy laws (Mankart and Rodano (2015)) on the fraction of self-employed and their performances. While many papers often argue that improving entrepreneurial conditions could be a way to reduce unemployment (for instance, Caliendo and Künn (2011) or Thurik et al. (2008)), our results mitigate this argument based on self-employment insurance. Some authors (Evans and Leighton (1989), Thurik et al. (2008), Røed and Skogstrøm (2013), or Gaillard and Kankanamge (2022) among others) have studied the relationship between unemployment, UI benefits and the probability to start a business. In this respect, our paper is closest to Hombert et al. (2020) and Ejrnæs and Hochguertel (2014), although their contributions are mostly empirical and use partial equilibrium models.

The remaining of the paper is organized as follows. Our baseline model, its parameterization, and its validation are developed in the next section. In section 4, we evaluate and decompose the SEA policies. Section 5 concludes.

2 Model

In this section, we describe a Bewley - Huggett - Aiyagari type general equilibrium model in incomplete markets with occupational choices. We include risky entrepreneurial investment choices, occupational search frictions, and the possibility to default in equilibrium. Our model accounts for a baseline economy and alternative ones under various SEA programs, as it is our main policy concern.

2.1 Corporate sector

Our economy has two production sectors: a corporate one presented here and a self-employed entrepreneurial one discussed later. The corporate output Y is produced by a single competitive representative firm using a Cobb-Douglas technology, with total factor productivity A, capital level K, and labor L, such that: $Y = F(K, L) = AK^{\alpha}L^{1-\alpha}$, where $\alpha \in (0, 1)$ is the capital share. There is no aggregate uncertainty. Profit maximization produces the competitive prices: $r = A\alpha\left(\frac{L}{K}\right)^{1-\alpha} - \delta$ and $w = A(1-\alpha)\left(\frac{K}{L}\right)^{\alpha}$, with w and r the wage and interest rates, which by a no-arbitrage condition are identical in the self-employment sector, and δ the depreciation rate in both sectors.

2.2 Households

Occupations and preferences The economy is populated by a continuum of infinitely-lived households of unit mass. Every period, a household falls in one of three occupations $o \in \mathcal{O} \equiv \{o_e, o_w, o_u\}$: self-employment ($o_e$); unemployment ($o_u$); or employment ($o_w$) (worker in the corporate sector). An agent's occupation can change either exogenously or endogenously. Agents derive utility from consumption and disutility from search. The life-time utility of a household is given by $\mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t u(c, s_e, s_w)$, with c the consumption, s_e and s_w respectively business and job search efforts, and β the discount factor. We assume that labor is supplied inelastically. We denote $a \in \mathcal{A}$ the agent's wealth. Any wealth saved in the model pays the deposit rate r^d, with $r^d = r - v$. The competitive interest rate r can thus be interpreted as a lending rate and v as a wedge between the lending rate and the deposit rate.

Insurance status Depending on their previous occupation, agents can either be insured ($j = i$) or uninsured ($j = n$). In the baseline economy, only a worker falling into involuntary unemployment (i.e. when laid off) can claim any insurance in the form of a standard UI. In the alternative economy subject to a specific policy discussed below, eligible self-employed are also insured during their entrepreneurial endeavor. Section 2.6 describes this policy in details.

Exclusion status Self-employed individuals can borrow from a creditor subject to an endogenous interest rate and use these amounts in their entrepreneurial venture. The exact nature of the credit contract is explained later on. However, an agent who has defaulted in the past is excluded temporarily from the credit market. Such an agent cannot borrow and is labeled constrained, with credit flag $e = C$, but can still start a business. Following Chatterjee et al. (2007) and Mankart and Rodano (2015), we model exclusion in a probabilistic way. Upon recovering access to credit, her credit flag is $e = A$.

Exogenous processes The exogenous states of an agent are summarized by (θ, y, z_{-1}) and we assume that the three associated processes are AR(1) with orthogonal innovations. All individuals are endowed with a persistent component of individual productivity $\theta \in \Theta$ that we call ability. This component is initially determined according to the invariant distribution Π_θ and then evolves at a very slow rate.[2] We stress that a working household's labor income,

[2] We allow individual productivity to evolve 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

an unemployed individual's replacement income, and a self-employed household's business income all depend on this component. Workers are subject to an additional persistent idiosyncratic shock $y \in \mathcal{Y}$ on their labor income that we call match-quality.[3] If an agent was not a worker in the previous period, she does not know her match quality before receiving a job offer. In that case, this shock is initialized by drawing it from the invariant distribution Π_y associated with the process for y. Otherwise, both individual productivity and match-quality shocks are realized at the beginning of the period before agents take any decision. Self-employed individuals face a within-period persistent idiosyncratic business shock $z \in \mathcal{Z}$. Contrastingly to the other shocks, only its previous value z_{-1} is known at the beginning of the period, and the current shock is realized within the period after self-employed individuals have decided on their business investment. An individual not currently running a business, but starting one next period will initialize her shock z according to the invariant distribution Π_z associated with the process for z.[4]

Value functions We denote $\mathbf{x} = (a, y, \theta, z, j, e)$ the full state vector of households over all occupations. We will sometimes use a subset $\mathbf{x}_o$ for a specific occupation o. We note W the value function associated with a worker, U with an unemployed individual, and E a self-employed individual. Future value functions are respectively denoted: $W' = W(a', \theta', y', e')$, $U'_{j'} = U(a', \theta', e', j')$ and $E'_{j'} = E(a', \theta', z, e', j')$. Finally, eligible unemployed individuals benefit from self-employment insurance. The value of being newly self-employed while uninsured is given by $\mathcal{E}'_n = \mathbb{E}_z[E(a', \theta', z, e', j = n)]$. The value $\mathcal{E}'_i$ of being newly insured self-employed depends on the economy considered.[5] We specify this value in section 2.6. Note that in section C of the online appendix, we write a more detailed version of model equations, explicitly including transition probabilities that we omit below for readability.

2.3 Workers

In the corporate sector, a worker receives the labor income $h(\theta)yw$, where the function $h : \theta \mapsto \mathbb{R}$ transforms the individual productivity component into working ability. She has a probability $\eta(\theta)$ of getting laid off, depending on her individual productivity. In such a case,

elements can explain a large productivity dispersion along the life cycle but are unaccounted for here.

[3]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 self-employed. Adding this process brings our earnings distribution closer to reality but our results are insensitive to it.

[4]We assume that z is observed only after experimenting with the business idea. In our model as in the reality, an important fraction of new self-employed experiments a business and exit if the project is not profitable enough.

[5]We denote this value with the subscript i even if no insurance policy is currently in place in the baseline model. The subscript can thus be interpreted as access to insurance in the alternative economy.

she falls in insured unemployment and can expect to get value U_i'.[6] To finance UI benefits, a worker pays a proportional tax τ_w on their labor income. By providing effort s_e, a worker can search for a business idea *on-the-job* and start a business in the next period with probability $\pi_e(s_e)$.[7] She then voluntary exits her current occupation, cannot claim UI benefits (i.e., $j = n$) and can expect to get value $\mathcal{E}_n'$. If she gets laid off at the same time as getting a business idea, she can claim UI rights and start a business with value $\mathcal{E}_i'$, which depends on the policy status: no insurance in the baseline case and the self-employment insurance otherwise. To simplify notations, let us denote $\eta \equiv \eta(\theta)$ and $\pi_e \equiv \pi_e(s_e)$. The recursive formulation of a worker is given by:

$$W(a,\theta,y,e) = \max_{\substack{c>0,a'\geq 0,\\ s_e\geq 0}} u(c,0,s_e) + \beta\mathbb{E}_{e',y',\theta'|e,y,\theta}\Big\{(1-\eta)\left[(1-\pi_e)W' + \pi_e \max\{\mathcal{E}_n', W'\}\right] + \eta\left[(1-\pi_e)U_i' + \pi_e \max\{\mathcal{E}_i', U_i'\}\right]\Big\} \tag{1}$$

$$\text{s.t.} \quad c = (1-\tau_w)h(\theta)wy + (1+r^d)a - a' \tag{2}$$

where equation (2) is the worker's budget constraint.[8]

2.4 Unemployed individuals

We assume that all unemployed individuals are endowed each period with a fixed amount m, which can be interpreted as domestic production. An unemployed individual can either claim UI ($j = i$) or not ($j = n$). Insured unemployed agents receive UI benefits proportional to their individual productivity, with replacement rate μ and lose UI rights with probability ρ. An uninsured unemployed individual cannot claim any UI benefits and remains uninsured until finding a job. Unemployed agents search for a business idea and a job opportunity with respective efforts s_e and s_w and corresponding success probabilities π_e and $\pi_w \equiv \pi_w(s_w)$. Upon finding a job, such an agent becomes a worker with value W'. Similarly, when getting an idea, a business can be started in the next period. An insured agent ($j' = i$) do so with value $\mathcal{E}_i'$, while an uninsured agent ($j' = n$) will have value $\mathcal{E}_n'$. Finally, exclusion from the credit market evolves similarly to a worker. The recursive program of an unemployed individual is:

$$U(a,\theta,e,j) = \max_{\substack{c>0,a'\geq 0,\\ s_e\geq 0,s_w\geq 0}} u(c,s_w,s_e) + \beta\mathbb{E}_{\theta',y',j',e'|e,j,\theta}\Big\{\pi_w\left[(1-\pi_e)W' + \pi_e \max\{\mathcal{E}_{j'}', W'\}\right] + (1-\pi_w)\left[(1-\pi_e)U_{j'}' + \pi_e \max\{\mathcal{E}_{j'}', U_{j'}'\}\right]\Big\} \tag{3}$$

$$\text{s.t.} \quad c = m + \mathbb{1}_{\{j=i\}}(1-\tau_w)h(\theta)w\mu + (1+r^d)a - a' \tag{4}$$

where equation (4) is the budget constraint.

[6] Notice that in our model, value functions associated with unemployment are always lower than those associated with a worker. Therefore, we exclude any voluntary switch to unemployment. Conversely, an unemployed agent getting a job opportunity always exits.

[7] 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.

[8] For simplicity, we assume that w already internalizes other taxes not related to the UI financing. Relaxing this assumption would need to account for a more realistic set of taxes.

2.5 Self-employed individuals

A self-employed agent raises revenues from her business venture. She decides to invest resources k, which can be either her own or borrowed, in a decreasing returns to scale technology governed by the parameter $\nu \in (0,1)$, before knowing the current realization of the business shock $z \in \mathcal{Z}$. All self-employed agents are subject to this within-period idiosyncratic shock affecting the firm's productivity. The entrepreneurial activity also depends on $g(\theta)$ where the function $g : \theta \mapsto \mathbb{R}$ transforms the individual productivity component into entrepreneurial ability.[9] The entrepreneurial technology is thus: $f(k,\theta,z) = zg(\theta)(k)^{\nu}$. We define self-employment income as the entrepreneurial production net of capital depreciation and any interest repayment on borrowed entrepreneurial capital. Moreover, by providing effort s_w, a self-employed individual can search for a job opportunity *on-the-business* and change occupation in the next period with probability π_w. The sequence of choices a self-employed is facing is summarized in Figure 1. We now detail this sequence.

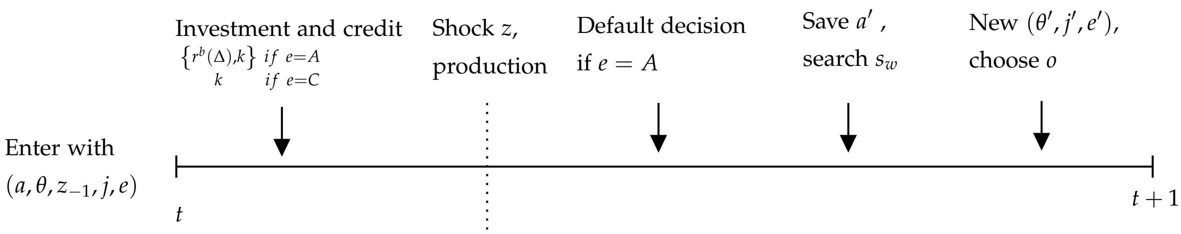

Figure 1. Timing for a self-employed agent.

2.5.1 Non-excluded self-employed agents

When a self-employed agent has access to the credit market, she is allowed to borrow from a financial intermediary an amount that can only be invested in her business. Recalling that a is the agent's current wealth, a self-employed chooses whether to borrow ($k > a$) or save ($k < a$). If she borrows from a creditor the amount $(k - a)$, we assume that it is only up to a fixed fraction λ of their total assets.[10] The self-employed agent decides the amount k invested in her firm to maximize her expected value with respect to the shock z, as expressed below:

$$E(a,\theta,z_{-1},e = A,j) = \max_k \Big\{ \sum_{z\in\mathcal{Z}} \pi_z(z|z_{-1}) \max\{B(a,k,\theta,z,j), R(a,k,\theta,z,j)\} \Big\} \tag{5}$$

$$\text{s.t.} \quad (k - a) \leq \lambda a \tag{6}$$

[9] $g(\theta)$ could reflect the fact that individuals with different abilities (i.e educational attainment for instance) run very different businesses.

[10] In principle, a self-employed could borrow an amount and then decide to invest none or only a part of it in her business. Such behavior is excluded in this model. In that sense, the self-employed agent pledges the totality of her business collateral amount a invested in her firm before borrowing any amount. Alternatively, we could introduce an endogenous borrowing constraint as in Cagetti and De Nardi (2006). However, this considerably increases the computational time.

The interior max operator in expression (5) corresponds to the choice the self-employed has to make between bankruptcy (B) or repayment (R) options once the realization of the shock z is known.

Repayment The standard behavior of a borrowing self-employed agent is to repay her loan after production. In case of a bad shock, the self-employed will receive a low (possibly negative) entrepreneurial income but can still decide to repay and thus not be excluded from the credit market in future periods. If she repays, the self-employed agent also has to cover the endogenous interest $r^b(\Delta)$ on her loan. The associated recursive problem is:

$$R(a,k,\theta,z,j) = \max_{\substack{c>0,a'\geq 0,\\ s_w\geq 0}} u(c,s_w,0) + \beta \mathop{\mathbb{E}}_{\theta',y',j'|\theta,j} \Big\{ \pi_w \max\{W', E'_{j'}\} + (1-\pi_w)\max\{U'_{j'}, E'_{j'}\} \Big\} \tag{7}$$

$$\text{s.t.} \quad c + a' = \pi_r^A + \mathbb{1}_{\{j=i\}} b_e(\theta, \pi_r^A) + a + r^d(a-k)\mathbb{1}_{\{k\leq a\}} \tag{8}$$

$$\pi_r^A = zg(\theta)(k)^\nu - \delta k - r^b(\Delta)(k-a)\mathbb{1}_{\{k\geq a\}} \tag{9}$$

where equation (9) is the profit function defined as total production minus depreciation and interest paid on debt. Equation (8) is the budget constraint. We emphasize that the baseline economy is only populated with uninsured self-employed agents. Contrastingly, there are two groups of self-employed in the alternative economy with SEA: the insured group ($j = i$) and the uninsured group ($j = n$). We stress here for clarity that insured self-employed might receive an additional income $b_e(\theta, \pi_r)$ on top of their current entrepreneurial income π_r. Thus this self-employed agent's consumption and saving decision depend on her total income and assets, composed of her entrepreneurial income, possible SEA benefits, interests on savings not invested in her company for an amount $r^d(a-k)\mathbb{1}_{\{k\leq a\}}$ and personal assets a.[11]

Bankruptcy When a self-employed agent chooses not to repay the borrowed amount or the interest, she defaults and goes bankrupt. Her firm is liquidated and her business idea is lost.[12] We assume, in the spirit of D'Erasmo and Boedo (2012), that after producing and observing her shock z, a self-employed can choose to renegotiate what is due through judicial action in a court. Bankruptcy is characterized by the cost of the procedure χ (including court fees and the cost of insolvency practitioners), proportional to the invested business capital and the recovery rate ξ referring to the portion of the original loan that the creditor can recover.[13] This portion captures what can be recovered using different channels, including liquidation

[11] To see this, recall that the cash on hand of such a self-employed in the baseline economy can be written: $zg(\theta)(k)^\nu + (1-\delta)k - (1+r^b(\Delta))(k-a)\mathbb{1}_{\{k\geq a\}} + (1+r^d)(a-k)\mathbb{1}_{\{k\leq a\}}$. Rearranging terms yield the profit and household budget constraint equations.

[12] In that case, the agent has to exit self-employment for at least one period: she can start searching for a new business idea in the next period and create a new business the period after that.

[13] Unlike Mankart and Rodano (2015), we abstract from Chapter 7 bankruptcy exemptions, as we do not distinguish secured and unsecured debt. They generate default with an *iid* investment shock inducing large capital losses. Here, we focus on productivity shocks impacting current profit. We, therefore, need a bankruptcy specification that implies a higher default incentive. Despite this potential limitation, our specification can capture

and reorganization. After defaulting, the self-employed agent is excluded temporarily from the credit market in subsequent periods. The recursive formulation of such a self-employed individual is:

$$B(a,k,\theta,z,j) = \max_{\substack{c>0,a'\geq 0,\\ s_w \geq 0}} u(c,s_w,0) + \beta \mathbb{E}_{\theta',y',j'|\theta,j}\left\{\pi_w W' + (1-\pi_w)U'_{j'}\right\} \tag{10}$$

$$\text{s.t.} \quad c + a' = \max\{(1-\chi)k + \min\{\pi_r, 0\} - \xi(k-a), 0\} + \mathbb{1}_{\{j=i\}} b_e(\theta, 0) \tag{11}$$

$$\pi_r = zg(\theta)(k)^{\nu} - \delta k \tag{12}$$

where we assume that banks recover all the positive profit.[14] In our alternative economy with a SEA program, an insured but bankrupt self-employed agent can claim any outstanding UI rights $b_e(\theta, 0)$. This is consistent with the current bankruptcy law: public benefits, including unemployment compensation, are fully exempted from any debt recovery.

Credit contract Following the literature on the entrepreneurial option to default, the interest rate $r^b(\Delta)$ on an entrepreneurial loan is chosen endogenously by the creditor. We assume the latter has perfect information about the self-employed agent's default probability based on the *observable* characteristics $\Delta = (a, \theta, z_{-1}, j)$.[15] We also assume perfect competition and free entry into the credit market. Thus, a self-employed with a zero default probability will pay the competitive rate r. The creditor and the borrowing self-employed agent agree on the terms of the credit contract $\{k - a, r^b(\Delta, k)\}$, detailing the amount loaned and its cost. The interest rate applied to the loan is set such that the creditor makes zero profit in expectation given the self-employed agent's decision to default on a specific loan. When the self-employed agent chooses not to repay the debt, the creditor can recover a fraction ξ of the original loan (plus the positive profit). The zero profit condition includes three elements: (i) the expected return in case of bankruptcy (V_B), (ii) the expected return in case of repayment (V_R), and (iii) on the right-hand side, the amount that the creditor would get by investing the loaned amount in a project paying the safe interest rate of the economy, such that:

$$V_B + V_R \geq (1 + r^d + v)(k - a) \tag{13}$$

where V_B and V_R are given by:

---

the self-employed agent's income distribution as shown in section 3.2, which is our major concern for our policy experiment to be meaningful.

[14]The self-employed starts the period with asset a, borrows $(k-a)$ and uses $k = a + (k-a)$ in production. She then pays depreciation δk and recovers k but decides to default on the borrowed amount. Thus her asset after production is indeed k, but she has to pay all her positive profits, cost of bankruptcy χk, and recovery $\xi(k-a)$. Creditor preempting profit is an assumption ensuring a better reproduction of the default rate.

[15]We assume here that there is a sufficient relation between the creditor (bank) and the self-employed agent. In particular, we argue for instance that the creditor can observe enough elements (past entrepreneurial income, wage income, etc.) about the self-employed agent to infer this value. Concerning the literature see, among others, Herranz et al. (2015), Mankart and Rodano (2015), or D'Erasmo and Boedo (2012).

$$V_B = \sum_{z \in \mathcal{B}(\Delta)} \pi(z|z_{-1}) \Big[\min \left\{ \xi(k-a), (1-\chi)k + \min\{\pi_r, 0\} \right\} + \max\{\pi_r, 0\} \Big] \tag{14}$$

$$V_R = \sum_{z \in \mathcal{B}^c(\Delta)} \pi(z|z_{-1})(1 + r^b(\Delta))(k-a) \tag{15}$$

with $\mathcal{B}(\Delta)$ the set of values z for a given state vector Δ for which the self-employed bankrupts and $\mathcal{B}^c(\Delta)$ is the complement for which she repays. Note that if the self-employed agent's cash on hand is too low and that $\pi_r < 0$, the creditor can only recover what the self-employed has, that is, only the amount $(1-\chi)k + \pi_r$.

Bankruptcy has several roles in this model. First, it prevents poor self-employed agents from entering a credit contract because the charged interest rate would be too high for them to borrow. Second, while the self-employed agent's upper borrowing limit is identical between agents ($k \leq (1+\lambda)a$), the option to default generates different behavior among different ability group of self-employed. Finally, bankruptcy may interact with our policy experiments. In particular, the reforms could modify the default incentive.[16]

2.5.2 Excluded self-employed agents

A self-employed agent excluded from the credit market runs her business using only her own wealth. She has a probability ϕ of reentering the credit market in the next period. Her recursive program after the realization of the shock z is thus:

$$\hat{E}(a,k,\theta,z,j) = \max_{\substack{c>0, a' \geq 0, \\ s_w \geq 0}} u(c, s_w, 0) + \beta \mathbb{E}_{\theta', y', j', e' | \theta, j, e=C} \Big\{ \pi_w \max\{W', E'_{j'}\} + (1-\pi_w) \max\{U'_{j'}, E'_{j'}\} \Big\} \tag{16}$$

$$\text{s.t.} \quad c + a' = \pi_r^C + \mathbb{1}_{\{j=i\}} b_e(\theta, \pi_r^C) + a + r^d(a-k)\mathbb{1}_{\{k \leq a\}} \tag{17}$$

$$\pi_r^C = zg(\theta)(k)^\nu - \delta k \tag{18}$$

Therefore, the excluded self-employed agent decides the amount k invested in her firm in order to maximize her expected value with respect to the shock z, as expressed below:

$$E(a, \theta, z_{-1}, e = C, j) = \max_{k \in [0,a]} \Big\{ \sum_{z \in \mathcal{Z}} \pi(z|z_{-1}) \hat{E}(a,k,\theta,z,j) \Big\} \tag{19}$$

2.6 Policy reforms: insurance and entry subsidy

We now detail the self-employment assistance reform that extends the baseline economy. This policy only concerns eligible agents: formerly unemployed individuals with outstanding UI rights. We recall that a self-employed agent entering this program after a period of unemployment is expected to have a future value $\mathcal{E}'_i$. Depending on whether the reform is implemented, we define this value using the indicator Ψ:

$$\mathcal{E}'_i = \mathbb{E}_z \big[\underbrace{(1-\Psi)E(a',\theta',z,e',j=n)}_{\text{baseline}} + \underbrace{\Psi E(a',\theta',z,e',j=i)}_{\text{SEA reform}} \big] \tag{20}$$

[16] In section G of the online appendix, we show that bankruptcy as we model it does not alter our qualitative results, but slightly impact their magnitude.

where $\Psi = 0$ defines the baseline economy and $\Psi = 1$ the reformed economy.

SEA reform The major policy reform we introduce is a *type dependent* entrepreneurial insurance in the spirit of entrepreneurial policies active in France, Germany, and some US states. An eligible self-employed agent entering this program will continue to benefit from her UI rights, even after starting a business activity. The UI provision will depend on the realized entrepreneurial income. Specifically, the additional amount $b_e(\theta, \pi_r)$ is given to the self-employed agent, depending on her current entrepreneurial income π_r and the UI benefits she could have claimed as an unemployed individual. When the entrepreneurial income is negative (i.e., $\pi_r < 0$), a self-employed agent can fully claim her unemployment benefits. Otherwise, the UI supplement diminishes proportionally with the realized entrepreneurial income. The policy is characterized with a couple of parameters $(f, \bar{q})$, where $f \in [0, 1]$ is a downside risk insurance (DRI) replacement parameter[17] and $\bar{q}$ the maximum insurance duration. The rule governing $b_e(\theta, \pi_r)$ is given by:

$$b_e(\theta, \pi_r) = \begin{cases} b(\theta) & \text{if} \quad \pi_r < 0 \\ b(\theta) - (1-f)\pi_r & \text{if} \quad 0 \leq \pi_r \leq \frac{b(\theta)}{1-f} \\ 0 & \text{if} \quad \pi_r > \frac{b(\theta)}{1-f} \end{cases} \tag{21}$$

where $b(\theta) = (1 - \tau_w)h(\theta)w\mu$ is the full UI benefit that the self-employed agent could have claimed if she was only unemployed. Figure 2 illustrates this policy with an example. The higher the f, the higher the amount of insurance provided in case of a positive but low profit. Moreover, the higher the f, the higher the fraction of self-employed agents insured. Indeed, the maximum level of entrepreneurial income π_r for which some UI benefits are provided is equal to $\frac{b(\theta)}{1-f}$. By increasing the DRI parameter f, entrepreneurial incomes are covered up to a higher threshold value. Therefore the insurance mechanism displays three regions: (i) a supplement that guarantees at least the UI benefits if the entrepreneurial income is positive but low; (ii) an insurance subsidy which provides an additional supplement even if the entrepreneurial income is greater than the UI benefits; and (iii) in case of a negative entrepreneurial income the full extent of the UI benefit. On top of the above, our benchmark SEA scheme lets the insured self-employed agent return to the unemployment pool and keep claiming her outstanding UI benefits.

An unemployed individual starting a business and who does not use all her outstanding UI in the form of SEA payments must keep her UI rights as long as they are unused. To model this feature, we let the probabilistic policy duration $q(\pi_r)$ vary endogenously with π_r,

[17] f lets the entrepreneurial income be larger than her UI payment, but the compensation $b_e(\theta, \pi_r)$ cannot exceed her UI rights. Even when $f = 0$, the insurance is effective as shown later.

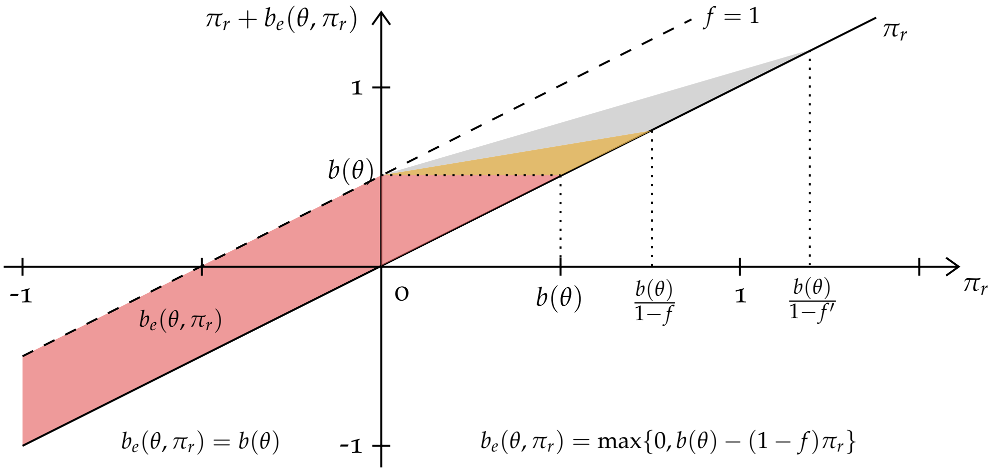

Figure 2. SEA reform. The red (darkest) region corresponds to a minimal case where $f = 0$ (the self-employed agent gets at least $b(\theta)$ when $b(\theta) > \pi_r > 0$). Note that if current entrepreneurial income $\pi_r < 0$, this zone will be the same whatever the value of f. The orange (lighter) zone refers to a case where $f = 0.3$: self-employed agents will get at least the red zone and the extra orange zone depending on their income. The grey (lightest) zone is a case where $f = 0.45$. Finally, the white zone between the grey zone and the upper dashed line is the case where $f \to 1$ (the self-employed agent always gets $b(\theta)$).

such that:

$$q(\pi_r) = \bar{q}\,\frac{b_e(\theta, \pi_r)}{b(\theta)} \tag{22}$$

In particular, in the case where $\pi_r > \frac{b(\theta)}{1-f}$, the government does not provide any compensation, $b_e(\theta, \pi_r) = 0$, and the probability $q(\pi_r)$ equals zero, a lower bound: the self-employed agent keeps all her remaining UI rights. Contrastingly, a self-employed agent with $\pi_r < 0$ will receive all of her SEA payments and lose her rights with the upper bound probability $\bar{q}$. When $\pi_r \in (0, \frac{b(\theta)}{1-f})$, this probability, $q(\pi_r)$, lies in $(0, \bar{q})$, depending on the amount of compensation provided.

2.7 Government

In all considered economies, the government runs an UI system that covers the pool of short-term unemployed individuals. Under the reforms, the government extends the UI program to unemployed individuals starting a business activity and finances the programs using labor income taxes τ_w.[18] Total government revenues (T) are (with a slight abuse of notations): $T = \int_{\mathbf{x}_{ow,u}} \left(\tau_w h(\theta) wy \, d\Gamma(\mathbf{x}_{o_w}) + \tau_w h(\theta) w\mu \, d\Gamma(\mathbf{x}_{o_u})\right)$, with $\mathbf{x}_o$ and $\Gamma(\mathbf{x}_o)$ respectively the individual's state vector and the mesure of individuals in occupation o. Total government expenditures

[18] In France, the PARE entrepreneurial insurance program is an extension of the UI system and this insurance is only available after contributing enough as a former worker.

G are equal to distributed UI benefits plus the reform's cost: $G = \int_{\mathbf{x}_{o_{u,e,eu_i}}} \Big(h(\theta)\mu w \, d\Gamma(\mathbf{x}_{o_u}) + \Psi b_e(\theta, \pi_r) \; d\Gamma(\mathbf{x}_{o_e^i}) \Big)$, where $\Gamma(\mathbf{x}_{o_e^i})$ is the measure of insured self-employed agents coming from the pool of unemployed individuals with outstanding UI rights.

2.8 Equilibrium

Given $\mathbf{x} = (a, y, \theta, z, j, e) \in A \times \mathcal{Y} \times \Theta \times \mathcal{Z} \times \{i, n\} \times \{A, C\}$, a stationary recursive equilibrium in this economy consists of a set of value functions $W(\mathbf{x}), U(\mathbf{x}), E(\mathbf{x})$, policy rules over asset holdings $a'(\mathbf{x})$, consumption $c(\mathbf{x})$, job search effort $s_w(\mathbf{x})$, business search effort $s_e(\mathbf{x})$, business investment $k(\mathbf{x})$, bankruptcy decision, occupational choice, prices ($r, w \in \mathbb{R}$), tax parameters ($\tau_w \in \mathbb{R}$) and a stationary measure over individuals $\Gamma(\mathbf{x})$, such that:

(1) Given prices (r, w) and tax τ_w, the policy rules and value functions solve household individual programs and the zero profit condition of competitive creditors is respected; (2) The wage w and the interest rate r are equal to the marginal products of the respective production factor in the corporate sector; (3) Goods and factor markets clear: (a) capital: $\int a'(\mathbf{x}) d\Gamma(\mathbf{x}) = K + K^E$, with aggregate entrepreneurial capital $K^E = \int k(\mathbf{x}_{o_e}) d\Gamma(\mathbf{x}_{o_e})$, (b) the measure of corporate workers $\int d\Gamma(\mathbf{x}_{o_w})$ is equal to corporate labor demand; (4) $\Gamma(\mathbf{x})$ is the stationary measure of individuals induced by the decision rules and the exogenous Markov processes; (5) τ_w balances the government budget ($T = G$).

This model has no analytical solution and must be solved numerically. We detail our numerical implementation for this problem in section F of the online appendix.

3 Parameterization and Model Validation

3.1 Parameterization strategy

We parameterize the model to be consistent with key features of occupational mobility, self-employment, and the wealth distribution in the US. We compute moments related to mobility using the basic CPS from 2001 to 2008 and those related to the wealth distribution using SCF 2001, 2004, and 2007. The model period is the quarter.

Fixed parameters The share of capital in the corporate production function α is set to 0.33. The depreciation rate δ is set to 0.015 and total factor productivity $A = 1$. We use the following CRRA and power functions to describe the utility of consumption and the disutility of search: $u(c, s_w, s_e) = \frac{c^{1-\sigma}}{1-\sigma} - s_w^{\psi_w} - s_e^{\psi_e}$. The coefficient of relative risk aversion σ is set to 1.5 and ψ_w and ψ_e are calibrated. Each period, a fraction ζ of individuals retires and is replaced by ζ unemployed individuals without UI rights. ζ is set to 0.5%, corresponding to the average entry rate of young individuals into the working population each quarter in the CPS.

The labor income process has persistent components $h(\theta)$ (individual labor productivity) and y (match-quality), each following an AR(1) process in logs. We set the individual productivity component such that $h(\theta) = \theta$ and the persistence ρ_θ is 0.975, corresponding to 10 years in the model. The variance of the innovation of the individual productivity process σ_θ^2 is 0.24 and is chosen to generate a Gini index for the earnings distribution of about 0.38 as in Cagetti and De Nardi (2006). For the match quality, ρ_y is set to 0.75, corresponding to a persistence of about a year. The variance of the innovation σ_y^2 is set to 0.0225. We document a linear relationship for the transition from employment to unemployment with respect to earnings using the CPS. We therefore specify the layoff probability η as a linear function of the working ability $h(\theta)$, such that $\eta(\theta) = \alpha_\eta + \beta_\eta w h(\theta)$, where α_η and β_η are estimated. The found layoff rates are, thus, 3.2%, 2.2%, and 1.2%. Earning quantiles are used as a proxy for $wh(\theta)$. Home production income m is set to 0.04.[19] The US Joint Federal-State Unemployment Compensation program, established under the Social Security Act of 1935, provides regular UI benefits for 26 weeks. Additionally, since 1993, the Federal-State Extended Benefits program extends the duration up to 20 weeks in states with especially high unemployment. We choose the least generous UI duration and set the probability ρ of falling in uninsured unemployment to 0.5, corresponding to about 26 weeks of benefits. The replacement rate μ is set to 0.4 according to Shimer (2005).[20]

The probability ϕ of reentering the credit market after exclusion is set to 4.2%, corresponding to a period of 6 years. The intermediation cost v translating the transaction cost banks face when lending is set to 0.4% per quarter, which is in the range of the literature.[21] The recovery rate of a bankrupt self-employed agent ξ is set to 77% of the capital invested in the firm, according to data from the World Bank 2009 *Doing Business* report. The bankruptcy cost χ, however, is calibrated endogenously to generate a realistic default rate. Finally, we set the maximum leverage ratio λ to 50% following Kitao (2008).

Endogenously calibrated parameters and targeted moments The literature does not provide clear indications as to how entrepreneurial abilities evolve over time. The estimation procedure for such abilities is challenging since: (1) the contribution of the self-employed agent's skills to the business returns is generally unobservable; and (2) entrepreneurial income could be the sum of different income sources (business income, wage, or capital income). Some authors, for instance, Kitao (2008), parameterize this ability using the self-employed agent's

[19] By increasing the agent's current income and lowering the incentive to search for either a job or a business idea, this value helps to generate a realistic unemployment rate.

[20] In section 4.3, we study policy effects under various UI systems with longer durations and higher benefits.

[21] For instance, Mankart and Rodano (2015) set a wedge of 1% for secured debt and 4% for unsecured debt. Bassetto et al. (2015) report a spread of about 1.5% annually (i.e. 0.37% quarterly).

income Gini. However, this assumes that entrepreneurial and working abilities are uncorrelated. We instead stress that working and entrepreneurial abilities are correlated and can generate the observed U-shaped relationship in the transition from paid employment to self-employment by earning quantiles. We use this relation to indirectly infer the mapping between working and entrepreneurial individual productivity. To do so, 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. This measure tells us how likely a worker in a given quantile is to start a business as compared to the average worker. Depending on the period and the definition considered, we find that 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. Therefore, we estimate entrepreneurial abilities $g(\theta) = \{g_1, g_2, g_3\}$ such that the resulting transition ratios by earning quantiles in the model are close to their data counterparts.[22]

Parameters			**Targets**		
Parameter	**Symbol**	**Value**	**Moment**	**Target**	**Model**
Discount factor	β	0.9742	Capital-output ratio (annual)	2.65	2.6
Business return to scale	ν	0.79	Ratio of net worth E/W	8.0	8.07
Matching parameter	κ_e	0.267	Share of self-employed (in %)	8.8	8.8
Matching parameter	κ_w	0.855	Entrepreneurial exit rate (in %)	6.0	5.9
Search elasticities	ψ_e, ψ_w	2.41	Unemployment rate (in %)	5.0	5.0
z process persistence	ρ_z	0.869	New self-employed from unemp. (in %)	20	18.9
z process variance	σ_z^2	0.185	Self-employed with earnings ≤ 0 (in %)	10	10.8
Bankruptcy cost	χ	0.0238	Entrepreneurial bankruptcy rate (in %)	0.57	0.57
Entrepreneurial productivity	g_1	0.0679	W to E flow in quantile Q_1 / avg rate (%)	1.075	1.075
Entrepreneurial productivity	g_2	0.0775	W to E flow in quantile Q_2 / avg rate (%)	0.85	0.85
Entrepreneurial productivity	g_3	0.1026	W to E flow in quantile Q_3 / avg rate (%)	1.075	1.075

Table. 2. Endogenously calibrated parameters and targeted moments.

In the model, a persistent business shock generates an incentive to exit self-employment when an individual falls into a bad state. Therefore exit in our model arises endogenously as an optimal decision. (σ_z, ρ_z) are pinned down endogenously and capture the high entrepreneurial exit rate and the fraction of self-employed agents with zero or negative earnings.

After setting the above parameters, other structural parameters have to be pinned down. The discount factor β helps to generate a realistic annual capital-output ratio of 2.65.[23] The return to scale parameter in the entrepreneurial sector ν lets us fit the ratio of median net

[22]Notice that we could also take the ratio by educational attainment, however, in the model, there is no state variable summarizing education exactly. θ reflects education, but also experience, professional training, etc.

[23]As Kitao (2008), we follow Quadrini (2000) and choose a capital-output ratio without taking into account public capital. Capital in the model refers to equipment and structures, inventories, land, and residential structures, which is 2.65 of total output annually.

worth between workers and self-employed agents. The probabilities of getting a business idea or a job opportunity depend on search efforts. Exit probabilities are thus: $\pi_e(s_e) = 1 - e^{-\kappa_e s_e}$ and $\pi_w(s_w) = 1 - e^{-\kappa_w s_w}$. The matching parameters (κ_w, κ_e), the persistence of the process z and the search elasticities, ψ_w and ψ_e (with the restriction $\psi_w = \psi_e$), are used to obtain consistent masses and transitions between occupations in the model. We target a fraction of self-employment in the economy of 8.8%, which is close to the CPS estimate and equal to the average observed rate in the SCF. We target an unemployment rate of 5%, which is roughly the US average between 2001 and 2008. We target a self-employment exit rate of about 6% and a fraction of (previously unemployed) new self-employed agents of 20%, as approximately observed in the CPS. The variance of the innovation of the process z lets us match a fraction of self-employed agents with zero or negative earnings of about 10%, following Hamilton (2000), who uses self-employed individuals and his own annual entrepreneurial earnings measure and controls for under-reporting using the SIPP.[24] Finally, we let the bankruptcy cost χ adjust in order to generate a realistic default rate of 0.57% following Mankart and Rodano (2015).[25] Note that while some parameters mainly affect some moments, changing one parameter affects the whole set of generated moments. In order to estimate those parameters, we use a simulated method of moments (SMM).[26] Let $\mathbf{p}$ represent the vector of parameters to be endogenously estimated. The parameter vector is chosen to minimize the squared difference between simulated and empirical moments: $\hat{\mathbf{p}} = \arg\min_{\mathbf{p}} \sum_{k=1}^{10} \left(m_k - m_k(\mathbf{p}) \right)^2$, where $m_k(\mathbf{p})$ represents the k-th simulated moment and m_k its data counterpart.[27] The resulting estimated parameter set and targeted moments are summarized in Table 2.[28]

3.2 Model properties

We now detail the properties of the calibrated quantitative model for occupational mobility and other moments related to self-employment.

The definitions of self-employment in the literature take into account three main dimen-

[24] Astebro and Chen (2014) report a fraction of self-employed households with zero and negative annual earnings of 7%. However, they do not distinguish household and individual earnings. Moreover, according to the 2016 Annual Survey of Entrepreneurs, 18.5% of businesses with paid employees experienced a profit loss.

[25] Some papers assume a bankruptcy cost close to 7% according to existing estimation. However, this does not generate enough bankruptcy in our setting. As shown in section G of the online appendix, models recalibrated with alternative bankruptcy specifications do not alter the qualitative results of the paper.

[26] To be more precise, we use a version of the Control Random Search (CRS) algorithm with a set of starting points generated via Sobol sequences along a dimension of 11 parameters.

[27] Minimizing this function is computationally intensive since it requires solving policy functions and all equilibrium outcomes for each set of parameters.

[28] We also present the resulting policy functions and distributions in the section D of the online appendix.

sions: self-employment status, business ownership, and active management status. Depending on the definition and the survey used, the fraction of self-employed individuals in the US varies from 7% to 12%. Surveys such as the SCF or CPS contain questions that let an individual define himself as self-employed according to her own perception. Our empirical counterpart is the CPS as it let us compute both the masses in each occupation and the corresponding flows between them.[29] Our definition of self-employment concerns a self-employed individual owning her business. According to this definition, from 2001 to 2008, we find an average fraction of self-employed of 9.4%. In the SCF, over the 2001, 2004, and 2007 waves, the corresponding number is 8.8%.[30] As a comparison, Cagetti and De Nardi (2006) use a more restrictive definition as they define as an entrepreneur a self-employed individual owning her business and actively managing it in the Panel Study of Income Dynamics. Unfortunately, we cannot control for an active management role in the CPS.

Labor market flows emerge here as the aggregation of endogenous optimal decisions to search and exit to a new occupation, with the exception of the flow from worker to unemployment that we pin down to the data. The aggregate flows reported in Table 3 are fairly comparable to their CPS counterparts. In particular, the model captures the fact that unemployed individuals are 4 to 5 times more likely than workers to start a business. The model reproduces the empirically high entrepreneurial exit rate into paid employment. Two forces lead to such a high rate. On the one hand, an adverse business shock generates low future expected profits and encourages self-employed agents to search for a job *on-the-business*. On the other hand, a sizable fraction of unemployed individuals started their business *out-of-necessity*. Since the option to work in the corporate sector is better for those individuals, they continue to search for a job *on-the-business* and exit as soon as a job is found. The model is also able to match the shapes of the flows from a given occupation to another at a more micro level. We report in section A of the online appendix occupational flows by individual ability levels as compared to CPS counterparts and verify that these flows are reasonably accounted for.

Individual job search and business search efforts play an important role in shaping the flows between occupations and, in our setup, ability and wealth are two minimal dimensions that drive these efforts. The model is consistent with established results about job search efforts: they are decreasing in wealth for both unemployed and self-employed agents. Moreover, a more able individual will provide a higher effort at all wealth levels. Business search

[29]We restrict our sample to the period from 2001 to 2008 and consider only the 20-65 old population. Ratios are computed with respect to the total number of self-employed, unemployed, and workers. Section B of the online appendix details our sample selection approach and additional details.

[30]Section B of the online appendix summarizes our reference SCF moments. Self-employment relates to a self-employed individual holding a positive share of her businesses in order to be consistent with our definition in the CPS.

	Masses (%)		Flow: Model (Data) (%)		
	Target	Model	W	E	U
W	86.2	86.2	97.36 (97.35)	0.53 (0.50)	2.11 (2.15)
E	8.8	8.8	5.19 (4.80)	94.07 (94.22)	0.74 (0.99)
U	5.0	5.0	45.07 (47.36)	2.14 (2.40)	52.79 (50.25)

Table. 3. Flow between occupations during a quarter (data counterpart between braces). *Data sources:* authors' computations using CPS data from 2001 to 2008. We restrict our sample to individuals aged between 20 to 65 years old.

efforts are hump-shaped in wealth. Wealth-poor individuals, most likely to be constrained, do not find it interesting to run very small firms and thus provide very small effort. As wealth increases, individuals are willing to invest larger amounts in their businesses, and the effort increases. At some point, search costs become larger than the benefit of additional capital in the business and search efforts decrease.

The model also captures a number of other moments related to the labor market and self-employment that are not explicitly targeted but that are still reasonably well matched. The necessity share, which is the fraction of self-employed individuals who started businesses because of a lack of job opportunities is equal to 7.4% 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.[31] Therefore, in line with Caliendo and Kritikos (2009), among the 20% new self-employed agents who were previously unemployed, a substantial fraction enters self-employment *out-of-necessity*.

Concerning entrepreneurial earnings, we obtain that 10.8% of the self-employed get zero or negative earnings (profits in the model). If we consider only those who do not exit self-employment at the end of the period, this fraction falls to 9.5%. This means that despite the realization of bad shocks, a substantial number of self-employed agents persist in their activity. As argued by Hamilton (2000) or more recently by Astebro and Chen (2014), a number of self-employed agents (about 35% in the model) create and keep running a business although they would earn more in a paid job. In the model, expectations of a better business shock z and frictions induce some self-employment to keep running a bad business while others search for a job opportunity and exit as soon as possible. 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 0.58 against 0.65 in the SCF. Now considering all forms of income (including accrued interests from savings and realized profits), the fraction of self-employed agents with zero or negative income falls to 2.7% in the model, and between 0 and 2.8% in the SCF. Finally, concerning the cross-sectional variance of earnings between occupations, we find a ratio of the standard deviation of entrepreneurial

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

earnings with respect to wage earners of 3.5 in the model, while it is typically 3 to 4 in the US according to Astebro and Chen (2014).[32]

The model does also match well the relative wealth between occupations and the associated saving characteristics. First, it is worth noting that the median ratio of entrepreneurial net worth relative to the one held by the whole population is equal to 6.2 in the model against 6.6 in the SCF. Additionally, the ratio of median debt to income ranges from 0.95 to 1.6 between SCF waves, whereas it is 0.93 in our model. Moreover, the median ratio of entrepreneurial (resp. worker's) income (including capital gains) to net worth (i.e. total assets minus debt) is 0.11 (resp. 0.63) in the model, while it is 0.13 (resp. 0.68) in the data. Finally, 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 self-employed agents is 30% in the data, against 29.4% in the model.The model, however, underestimates the wealth Gini: we find 0.63 compared to 0.82 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.

Finally, we compare the entrepreneurial survival rate with records available for surviving establishments. The fraction of self-employed agents surviving after 2 years and 4 years are respectively 59% and 43% in the model, whereas the average establishment rates are respectively 66% and 44% in the data (see Knaup and Piazza (2007)). However, the empirical data excludes two-thirds of the observations, as it does not account for sole-proprietorship who might survive less.[33] Overall, we potentially underestimate the true survival rate, however, as evidenced by Figure 3, we capture well the usual shape of the survival rate. That is, the largest exit rates occur during the first and second years and, after the fourth year, the probability of exit is considerably reduced. In the model, as non-self-employed agents have no prior knowledge of their business productivity, some start with an unfavorable business shock and rapidly exit self-employment.

Overall, despite the few limitations that we underlined, the model is well suited to capture occupational flow dynamics and provide a consistent setup for the SEA policy experiments.

[32]While the mean and the median ratio of entrepreneurial earnings with respect to wage earners is subject to a debate, it is recognized that the ratio of standard deviations is high, even controlling for mismeasurement. In the model, the median ratio of self-employed earnings (business and wage) over worker's earnings is equal to 1.5 in the model, against 1.6 in the SCF, at the household level.

[33]It is worth noting that establishment dynamics might be somewhat different from the actual firm and entrepreneurial dynamics. As another comparison, using the Panel Study of Entrepreneurial Dynamics (PSED), Reynolds (2017) finds that 48% of firms survive after 4 years, taking the first transaction as a measure for firm birth.

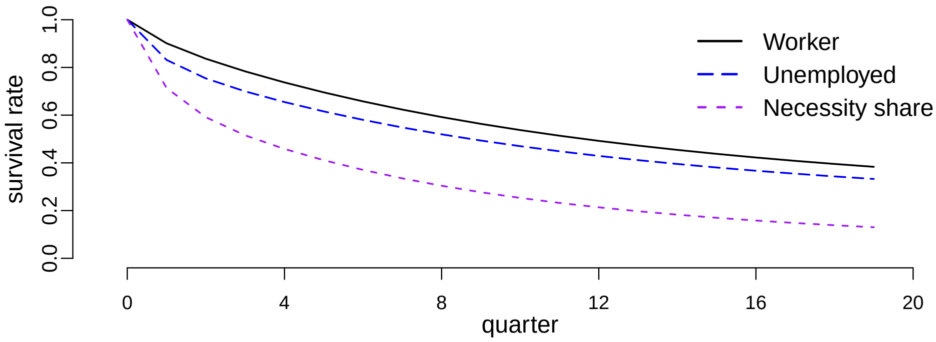

Figure 3. Survival rate of new self-employed agents depending on their previous situation.

4 Self-Employment Assistance Programs: Evaluation and Decomposition

This section studies the introduction of self-employment assistance programs as an extension to the existing UI policy. For our reference SEA program, denoted **SEA***, we use the US unemployment insurance duration of 26 weeks, corresponding to $\bar{q} = \rho = 0.5$. The DRI replacement parameter is set to $f = 0.3$, corresponding to the French PARE case. This SEA policy includes three key features: *type dependency*, *business income dependency*, and the option to return to unemployment as an insured unemployed agent. This policy is compared to two alternative specifications. First, by setting $f = 1$, we study a *non-business income dependent* SEA policy, denoted $\mathbf{SEA_{NB}}$, closely resembling the existing US SEAP or the German *Bridging Allowance* policies. Under that policy, new self-employed agents continue to perceive their type-dependent UI benefits, irrespective of their profit and can return to the unemployment pool and claim outstanding UI benefits in case of failure. Under the second alternative experiment, denoted $\mathbf{SEA_{LS}}$, self-employed agents receive a periodic lump-sum amount that is neither *type dependent* nor *business income dependent*, as in the German *Existenzgrundungszuschuss* start-up subsidy or the UK NEA policy. Here, the DRI parameter remains at $f = 1$ but $b_e(\theta, \pi_r) = \overline{b_e}$.[34] Additionally, self-employed agents cannot return to the insured unemployment situation when ceasing their business activity. All policies are only available to eligible self-employed individuals. We focus on the effects of these alternative insurance reforms on production, unemployment, mobility, entrepreneurial composition, and performances, as well as welfare.

[34] We assume, as in the German system, that the lump-sum amount is lower than the lowest possible unemployment benefit such that $\overline{b_e} = \vartheta b(\theta_1)$. We arbitrarily set $\vartheta = 0.9$ but adjust the policy duration $\bar{q}$ in order to generate the same share of self-employed agents as in **SEA***. We obtain a duration of 1.5 years.

4.1 Equilibrium aggregate outcomes

Mobility effects Table 4 reports the aggregate steady-state effects of the reforms. In all three experiments, the additional support the SEA scheme provides to early-stage eligible self-employed agents leads to significant mobility effects. At the equilibrium, the fraction of self-employed agents insured by the policy over total self-employed is 2.9% for $\mathbf{SEA^*}$, 1.6% for $\mathbf{SEA_{LS}}$ and 0.7% for $\mathbf{SEA_{NB}}$. The fraction of unemployed individuals starting a business increases between 11 and 19%. Consequently, the fraction of self-employed agents increases by 1.5% for $\mathbf{SEA^*}$ and $\mathbf{SEA_{LS}}$ and by 2% for $\mathbf{SEA_{NB}}$, implying that the number of newly created firms per year goes up by respectively 2.6, 3.2 and 4.6%.[35]. Mobility effects are thus stronger under $\mathbf{SEA_{LS}}$ and $\mathbf{SEA_{NB}}$, mostly because benefits are provided to self-employed agents independently of their business performances under these policies: the systematic support mechanism of these two policies dominates the downside risk insurance mechanism found in $\mathbf{SEA^*}$. However, these experiments select very different types of self-employed agents, both in terms of ability and wealth, as detailed in the next section.

Interestingly, all the reforms significantly reduce the fraction of necessity self-employed agents, that is to say, those that would have been better off working in the corporate sector. Our results suggest a decrease of about 20% of the necessity share.

	Baseline	$\mathbf{SEA^*}$	$\mathbf{SEA_{LS}}$	$\mathbf{SEA_{NB}}$
DRI replacement rate f	-	0.3	1.0	1.0
Type	-	*type-dep*	*lump-sum*	*type-dep*
Fraction of self-employed	8.8%	+1.47	+1.45	+1.93
New firms per year	500000	+2.6	+3.2	+4.6
Entrepreneurial sector capital	1.49	+1.34	+0.94	+1.67
Fraction unemployed starting businesses	2.14%	+11.05	+13.24	+18.66
Self-employment exit rate	5.9%	+1.37	+1.99	+2.88
Bankruptcy rate per quarter	0.57%	+2.64	+1.58	+2.11
Unemployment rate	5.0%	-0.16	-0.26	-0.32
Necessity share	7.4%	-20.58	-23.07	-19.71
Corporate jobs	86.2%	-0.14	-0.13	-0.18
Corporate sector capital	3.585	-0.08	-0.08	-0.11
Total production	1.957	+0.10	+0.05	+0.15

Table. 4. Summary statistics: steady-states outcomes.

Note: $\mathbf{SEA^*}$, $\mathbf{SEA_{LS}}$, and $\mathbf{SEA_{NB}}$ values are given in percent deviations from the baseline case. **Baseline** values are given in their original units as indicated.

Unemployment and production In contrast to the empirical literature (see among other Caliendo and Künn (2011), Ejrnæs and Hochguertel (2014) or Hombert et al. (2020)) that studies country-specific SEA policies in partial equilibrium without endogenous occupational

[35] We normalize this number in the baseline model to be 500.000 new businesses created as in the US. A firm in the model corresponds to a self-employed agent.

choices, we do not find significant effects on the unemployment rate, as reported in Table 4. In the model, the response of the unemployment rate to the reforms is determined by the magnitude of two opposing forces. On the one hand, a positive change in the expected value of being a self-employed agent relative to the value of being a worker leads to a shift in the cutoff point along the two dimensions of assets and abilities at which unemployed individuals start businesses. This leads to the entry of new self-employed agents and an increase in the search effort to find a business idea, with both effects reducing either unemployment or corporate employment. On the other hand, the policy also improves the value of remaining unemployed and lowers the incentive to search for a job, potentially leading to an increase in unemployment. Our results tend to show that overall the reforms encourage unemployed individuals to exit unemployment, but this is mostly detrimental to corporate jobs. Finally, the effects on aggregate production are quite small, in part because the increased capital invested in the entrepreneurial sector crowds out capital invested in the corporate sector and because the targeted unemployed population is a relatively small group.

Steady-state welfare and costs As summarized in Table 5, the implementation of any of the SEA programs above improves the steady-state welfare measured in terms of *ex-ante* consumption equivalent variations (cev^*), despite the higher labor income taxes (labor income taxes increase between 1.8% and 2.7%).[36] This is explained by the fact that eligible self-employed agents are much better off under the policies since they obtain a minimum income level with $\mathbf{SEA_{NB}}$ and $\mathbf{SEA_{LS}}$ or are directly insured against the downside risk under $\mathbf{SEA}^*$. Moreover, insured unemployed individuals also directly benefit from the policies, but welfare gains mostly go to those with sufficient wealth to run a valuable business. On the other hand, costs are small and spread widely among the masses of corporate workers and the unemployed. The steady-state welfare is higher with $\mathbf{SEA_{LS}}$ than with $\mathbf{SEA^*}$ but the largest gain comes from $\mathbf{SEA_{NB}}$, where benefits are the highest irrespectively of the business outcomes, even if this policy is more expensive.

	Baseline	$\mathbf{SEA^*}$	$\mathbf{SEA_{LS}}$	$\mathbf{SEA_{NB}}$
Consumption equivalent variation (cev^*)	—	0.061%	0.066%	0.088%
Cost of the policy over total production	—	0.003%	0.008%	0.004%
Tax rate τ_w	0.902%	0.921%	0.919%	0.927%

Table. 5. Steady-state welfare and cost.

[36] *Ex ante* cev^* computes the constant percentage change in per period consumption, c, that equates the discounted expected sum of lifetime utility under the baseline economy and under the reform. It measures whether an agent, taking into account all the uncertainty, would rather be born in an economy with or without the reform.

Ability	θ_1	θ_2	θ_3
SEA*	+0.131	+0.125	+0.136
$\mathbf{SEA_{NB}}$	+0.166	+0.165	+0.183
$\mathbf{SEA_{LS}}$	+0.199	+0.112	+0.089

Table. 6. Increase (relative to the baseline economy) in the share of self-employed agents by ability groups.

4.2 Selection effects

Selection by ability To understand this selection mechanism and the change in the composition of the self-employment pool, the crucial element is whether or not the reform induces the entry of low-skilled self-employed agents. Since regular UI benefits are proportional to working ability, highly productive workers receive higher UI compensation when laid off than those with low productivity. Therefore, the insurance mechanism generated by the compensation $b_e(\theta, \pi_r)$ in the two experiments **SEA*** and $\mathbf{SEA_{NB}}$ are *type-dependent*. Contrastingly, $\mathbf{SEA_{LS}}$ provides an additional amount of income that is unrelated to previous earnings and self-employed agents cannot recover UI rights in case of failure. This policy is thus fully independent of an agent's ability θ. Contingent on whether they are type-dependent or not, very different self-employed agents are likely to be selected by the policies. Table 6 displays the increase in the share of self-employed agents by ability groups for each policy in simple differences to the baseline economy.

Qualitatively, results can be stated as follows: *type-dependent* policies favor the entry of more able self-employed agents while a lump-sum SEA program encourages the entry of low-skilled individuals. Because they have to give up on relatively high UI benefits, highly skilled unemployed individuals are less likely to enter self-employment under $\mathbf{SEA_{LS}}$ as compared to other reforms. Indeed, the lump-sum amount $\overline{b_e}$ is too low to resorb the opportunity cost coming from the loss of their original UI benefits for this population.[37] These composition effects could also be related to incumbent self-employed agents by maintaining the activity of those who would have left without the reforms. Figure 4 shows that entry effects are undoubtedly a driver of the results. Highly-skilled (resp. low-skilled) unemployed individuals are more likely (resp. less likely) to start a business under both *type-dependent* reforms and less likely to take a job opportunity, while under $\mathbf{SEA_{LS}}$ the selection into self-employment is closer to what is observed in the baseline economy.

[37] Our findings corroborate results in the empirical literature. In Germany, the 2003 start-up subsidy is similar to a lump-sum SEA and has been shown to significantly increase the entry of unemployed individuals into self-employment, especially for lowly educated individuals (see Caliendo and Künn (2011)). Additionally, Hombert et al. (2020) show that the DRI introduced in France in 2002 - 2003 did not lower the quality of new self-employed agents, especially in terms of education. Finally, in Table 2 of Caliendo et al. (2015), the selection by education in a *type-dependent* SEA policy implemented in Germany after 2006 is also found to have more homogenous effects.

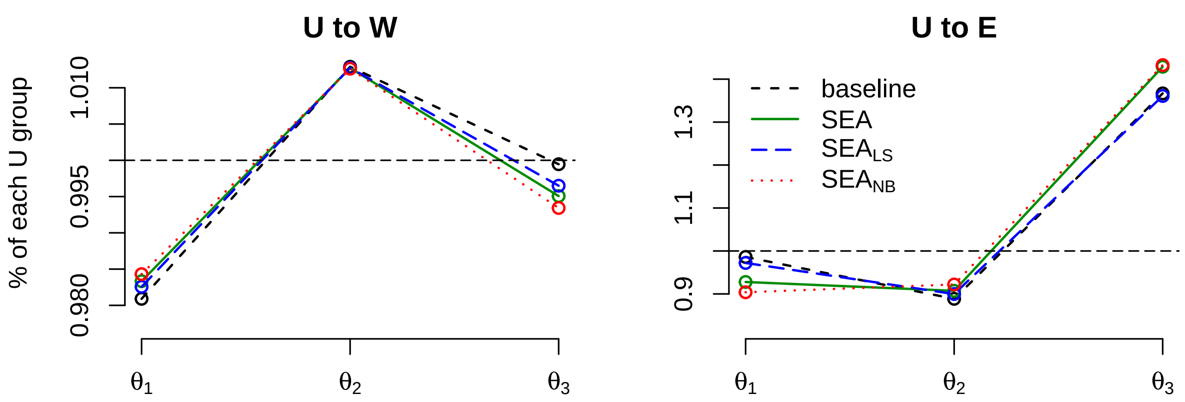

Figure 4. Flows (relative to the average transition rate) from unemployment toward paid-employment and self-employment by ability group.

Selection by wealth Turning to the wealth distribution, the effects mirror the observations made by ability. The left panel of Figure 5 displays the difference in the mass of self-employed agents with respect to the baseline case under both **SEA*** and $\mathbf{SEA_{LS}}$. Compared to a lump-sum SEA, the steady-state distribution under the *type-dependent* policy has richer self-employed agents. These individuals are more likely to run bigger businesses and increase aggregate production. Contrastingly, the small increase in the leftmost bin shows that even under these assistance mechanisms, financial constraints prevent very poor individuals from running valuable businesses. The right panel of Figure 5 shows that both policies lead to a significant and similar reduction in the necessity share. By removing part of the incentives toward job search, the SEA reforms magnify the value of being a self-employed agent and reduce the number of unemployed individuals entering self-employment due to a lack of job opportunities.

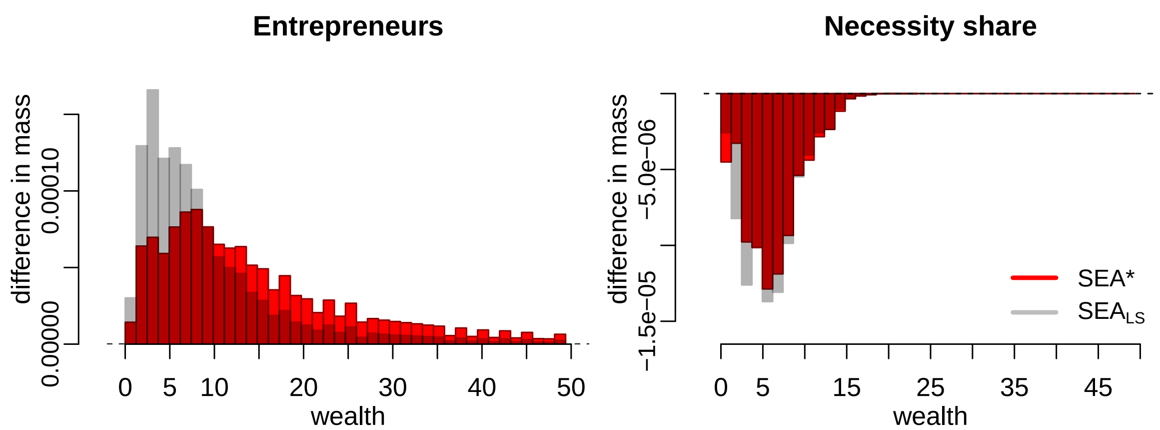

Figure 5. Difference in the mass of self-employed agents (left panel) and the necessity share (right panel) relative to the baseline economy for the **SEA*** and $\mathbf{SEA_{LS}}$ reforms.

Selection and performances A natural question when implementing a program fostering self-employment is how eligible new self-employed agents perform under the policies. In particular, as pointed out by Caliendo and Künn (2011), these self-employed agents could have entered and performed similarly without the reform, resulting in important deadweight losses. These losses are even stronger if the reforms generate moral hazard effects and reduce the incentives to run and expand a business. These effects are usually hard to estimate empirically. We use our model to evaluate the performance of eligible self-employed agents on production, invested capital, bankruptcy rate, skills, and survival rate, in the quarters and years after their entry under $\mathbf{SEA}^*$ and $\mathbf{SEA}_{\mathbf{LS}}$ as compared to the same group under the baseline economy. We, therefore, separate new self-employed agents into two groups: (i) the intensive margin group (IMG) composed of those who would have entered self-employment even without the reforms, (ii) an extensive margin group (EMG) with those who started a business essentially because the program was available. The IMG lets us compare the performances and behaviors implied by the reforms relative to the baseline economy, without selection effects: we mark individuals becoming self-employed agents in the baseline economy, before providing them with each reform and measuring their average performances. The EMG sheds light on the performance of new eligible self-employed agents that entered due to the reforms. In the model, the share of recipients who would have started a new business even in the absence of the policy is 69% under $\mathbf{SEA}^*$ and 64% under $\mathbf{SEA}_{\mathbf{LS}}$.[38] Table 7 summarizes the average performances of both groups over 5 years.

The IMG shows a reduction in the average capital invested, resulting in lower production and accumulated wealth over the five years. This is indicative of a moral hazard issue. That effect is stronger under $\mathbf{SEA}_{\mathbf{LS}}$ for two reasons. First, that policy provides a minimum amount of benefits irrespectively of the business performance, resulting in a lower incentive to invest in the business. Second, it provides benefits for a longer period as compared to $\mathbf{SEA}^*$, reinforcing the first effect. However, since the latter policy allows self-employed agents to claim their remaining UI benefits in case of business failure, recipients tend to bankrupt more often.

Concerning the EMG, $\mathbf{SEA}^*$ selects higher skilled and richer unemployed individuals than the $\mathbf{SEA}_{\mathbf{LS}}$, and this persists over the 5 years. This is similar to our previous observation. The resulting average production under $\mathbf{SEA}^*$ is close to the baseline case and 26% higher than under $\mathbf{SEA}_{\mathbf{LS}}$. Because this increased entrepreneurial production does not necessarily mean higher aggregate production, we compute the (virtual) average marginal productivity of labor (MPL) that translates the marginal production that an additional worker in each considered

[38]While hard to measure empirically, our numbers seem to be comparable to those estimated in the empirical literature according to Caliendo (2016) who reports a fraction between 20% and 60% depending on the country.

5 years average	Baseline	*Intensive margin group*		*Extensive margin group*	
		SEA*	$\mathbf{SEA_{LS}}$	**SEA***	$\mathbf{SEA_{LS}}$
$g(\theta)$ (skill)	0.079	0.079	0.079	0.083	0.078
Wealth	12.063	12.050	11.626	10.081	8.094
Production	0.825	0.812	0.786	0.821	0.654
Capital invested	12.699	12.466	12.149	11.522	9.339
Bankruptcy rate (in %)	1.006	1.174	0.872	2.326	1.478
Marginal productivity of labor (MPL)	0.298	0.302	0.292	0.370	0.292

Table. 7. Performance and quality of self-employed agents after 5 years for the intensive vs. extensive margin groups. *Notes:* all values are an average over 5 years.

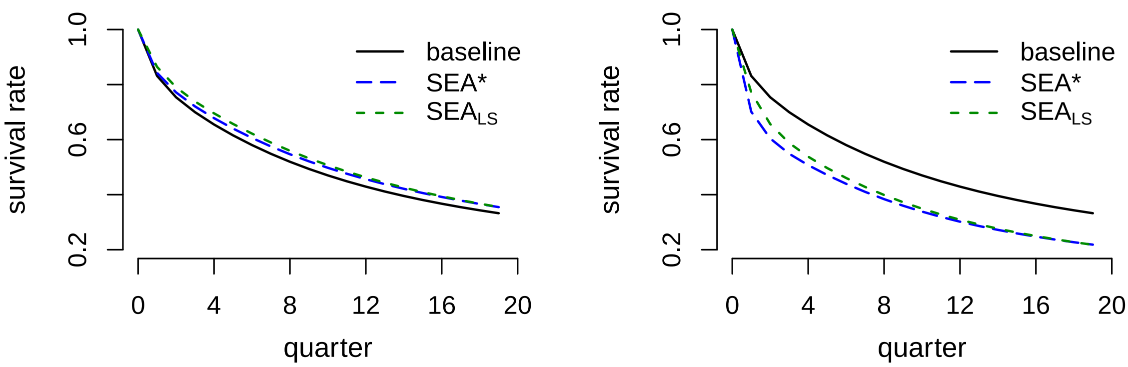

Figure 6. Survival rate for the IMG (left panel) and the EMG (right panel).

group would have generated if she was employed in the corporate sector.[39] We find that the corporate production loss implied by the entry of more skilled individuals under the **SEA*** is largely compensated by the increased production of those individuals in the entrepreneurial production sector.

Finally, Figure 6 depicts the survival rate of self-employed agents in the IMG (left panel) and the EMG (right panel). Self-employed agents in the IMG are significantly more likely to survive as compared to the same group in the baseline economy. On the other hand, an average of about 20% of the EMG survives after 5 years. In the end, both policies are able to foster a number of long-lasting businesses.

4.3 Insurance effects and the UI system

SEA decomposition Three reasons explain why insured unemployed individuals would not start a business in the model: it requires some business search effort costly in terms of utility; it is risky, and; it implies losing UI benefits. To support unemployed individuals in starting businesses, the **SEA*** combines three insurance components: (1) in case of business failure, the

[39]We abstract from the additional production coming from the self-employed agent's wealth that would have been also invested in the corporate sector, especially since it represents a very small amount.

	SEA policy		
	SEA*	$f = 0$	*o-compensation*
(Δ%) Fraction self-employed agents	1.48	1.37	0.59
(Δ%) Fraction unemployed	-0.16	-0.14	0.02
(Δ%) Fraction unemployed → new business	11.2	10.0	8.3
(Δ%) Tax rate τ_w	2.09	2.05	0.5
Consumption equivalent variation (*cev*∗) (in %)	0.061	0.053	0.021

Table. 8. Effect of the entrepreneurial insurance policy under **SEA *** and two partial insurances with respect to the baseline. *Note:* (Δ%) means deviation in percent from the baseline case.

option of claiming any outstanding UI rights after returning to the unemployment pool; (2) a compensation that guarantees at least UI benefits in case of low but positive entrepreneurial income; (3) the provision of a supplementary income that, depending on f, can let them earn more than their initial UI rights. In Table 8, we disentangle the various components of this insurance policy by inspecting the effects of two alternative partial entrepreneurial insurances. Provided they were unemployed with UI rights before, the first insurance only lets self-employed agents return to the unemployment pool if necessary and keep claiming any outstanding UI rights. As this insurance does not pay any compensation or supplement, we call it the *o-compensation* case. The second partial insurance is simply a SEA with $f = 0$: the supplementary income part is removed.[40]

Under both partial insurances, the fraction of self-employed agents and the fraction of unemployed individuals starting a new business increase significantly. Obviously, the effects are smaller in the *o-compensation* case: the fraction of unemployed individuals starting businesses increases by 8.3% relative to the baseline, against 11.2% with the compensation. In the $f = 0$ case, the government does not provide any extra supplementary assistance when the business income is above UI benefits: this same fraction goes up by 10% and the share of self-employed agents is reduced only by 0.11%. Therefore, this subsidy part does not play a crucial role in the total effect. It is rather the insurance compensation component and the right to claim UI benefits after returning to the unemployment pool that make the **SEA *** effective. In particular, we stress that allowing self-employed agents to return to the unemployment pool and keep claiming UI rights is a substantially beneficial policy for resorbing the distortion generated by a UI system encouraging paid-employment search, with virtually no costs. This single component accounts for 40% of the increase in the share of self-employed agents under the **SEA ***, with significant occupational mobility.

[40]This is close to the Finnish and Dutch SEA, where business income is fully deducted from UI benefits.

The role of the UI system The specification of UI programs itself can change. For instance, the US experienced several such reforms, especially during recessions.[41] We now study the interplay between alternative UI systems and the provision of SEA. In the model, both the duration of UI and the level of benefits directly affect the decision to start a business. First, the more generous the UI system (i.e. longer duration or larger benefits), the lower the incentive to exit unemployment (reflected in lower search efforts). Second, the more generous the UI system, the higher the opportunity cost of starting a business, since previously unemployed new self-employed agents have to give up larger UI claims, reinforcing the incentives to not start a business. Third, a more generous UI system lets unemployed individuals accumulate more wealth in order to start their own business.[42] This last effect goes in the opposite direction to the other two but our quantitative results suggest that incentive effects dominate the wealth channel. Table 9 reports the impact of alternative UI systems on occupational decisions: (1) variations of the UI (ρ) and SEA ($\bar{q}$) durations from 26 weeks to either one year or 99 weeks; (2) variations of the replacement rate (μ) from 40% to either 60% or 80%.[43]

When the UI duration is extended, most of the resulting unemployment rate increase is compensated by a smaller entrepreneurial fraction while corporate jobs are only very slightly reduced. On top of that, starting a business is also riskier, since it means giving up larger outstanding UI benefits while business profits are still uncertain. Consequently, the number of newly created firms and production is also reduced. Alternatively, increasing UI benefits produces a somewhat different effect: while the unemployment rate increases and the fraction of self-employed agents is reduced, the share of corporate jobs increases. Indeed, higher UI benefits considerably improve the value of having a job relative to creating a business, compelling the poorest self-employed agents into stopping their activity to search for a job. The incentives to exit unemployment are still high as the UI duration remains at 26 weeks. In the end, production is lower as there are fewer entrepreneurial firms. Under both reforms, taxes considerably increase.

[41] As an example, in late 2009, the UI duration was extended several times beyond the normal 26 weeks, up to a maximum of 99 weeks. Such a reform usually has a controversial effect on the unemployment rate by potentially lowering the incentive to search for a job. Here, we argue that it could also largely impact the share of self-employed agents.

[42] There are also general equilibrium effects, such as increased taxes and wages, but our quantitative investigations suggest that those effects are small because unemployed agents account for a small share of the population.

[43] 26 weeks correspond to a ρ and a $\bar{q}$ set at 0.5 while a year is 0.25 and 99 weeks is 0.132. More generous UI systems sometimes lead to $W(a, \theta, y, e) < U(a, \theta, e, i)$ for low values of y. We still assume that an insured unemployed individual receiving a job offer switch to paid employment. This could reflect the fact that they can not refuse a job offer, otherwise, they lose their UI rights and get $U(a, \theta, e, n) < W(a, \theta, y, e)$. Notice also that $\mathbb{E}_y[W(a, \theta, y, e)] > U(a, \theta, e, i)$, therefore, they still search for a job with high intensity. Alternatively, we could let agents refuse some offers, and the unemployment rate would be even larger under a very generous UI system. For a simple comparison with the benchmark results, we do not explore this issue.

	Baseline	Extended UI duration				Increased UI benefits			
(ρ or $\bar{q}$, μ)	(0.5, 0.4)	(0.25, 0.4)		(0.132, 0.4)		(0.5, 0.6)		(0.5, 0.8)	
	—	Ini.	**SEA ***	Ini.	**SEA ***	Ini.	**SEA ***	Ini.	**SEA ***
Frac. of self-employed agents (%)	8.8	8.63	8.86	8.49	8.96	8.6	8.80	8.41	8.68
- % increase	—	—	2.57	—	4.20	—	2.2	—	3.2
- % insured	—	—	5.46	—	8.50	—	2.81	—	2.82
Frac. of unemployed (%)	5.0	5.19	5.17	5.38	5.36	5.09	5.07	5.18	5.15
Frac. of workers (%)	86.2	86.18	85.97	86.13	85.68	86.31	86.13	86.41	86.17
Frac. of U $\rightarrow$ E (%)	2.14	1.98	2.25	1.84	2.16	2.08	2.39	2.03	2.43
Frac. of U $\rightarrow$ W (%)	45.07	43.49	43.32	41.91	41.73	44.36	44.16	43.63	43.39
Total production	1.957	1.949	1.955	1.943	1.954	1.949	1.953	1.942	1.948
Labor income tax (%)	0.902	1.133	1.173	1.311	1.381	1.362	1.391	1.827	1.870
Welfare gains (cev^*)	—	—	0.115	—	0.182	—	0.096	—	0.139

Table. 9. Effects of alternative UI systems with and without **SEA ***. *Ini.* is the baseline economy without the SEA policy but with the considered change to the UI system.

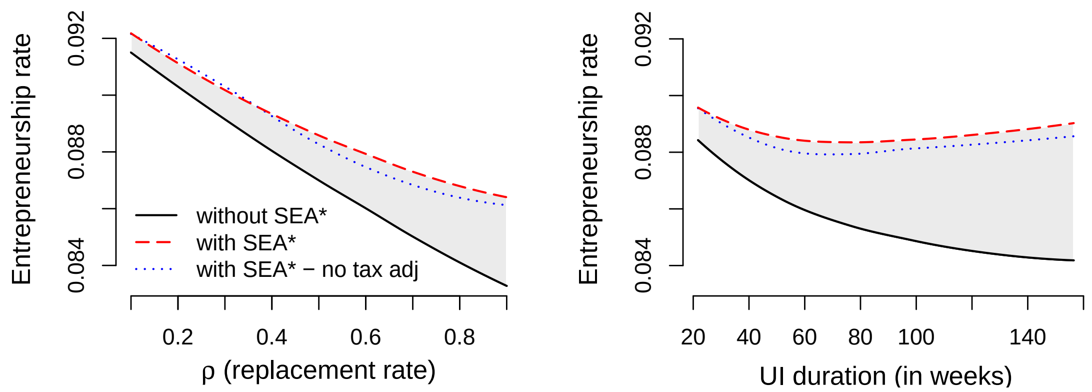

Figure 7. Effects of a more generous UI system on the self-employment rate, with/without **SEA***.

When the SEA is implemented, self-employment, occupational mobility, and production are strongly increased as the UI system becomes more generous. Indeed, the more generous the UI and the stronger the incentives not to establish a business and therefore the larger the effectiveness of the SEA. Figure 7 demonstrates the interplay between the UI design and the SEA implementation. Starting from a duration of 20 weeks, increasing the UI duration (right panel) first reduces the self-employment rate: at this stage, the value of unemployment (and indirectly the value of employment) is increased more than the value of self-employment. However, if the UI duration is increased further, the self-employment rate starts rising: the insurance value provided by the SEA over this longer period increases the value of self-employment enough to compensate for the increase in the value of unemployment. This specific interaction does not appear when increasing the replacement rate as evidenced by the left panel of this Figure: the self-employment rate is decreasing monotonically in that case even under the SEA. This suggests that more than the amount of insurance, it is the possibility of obtaining a regular amount over a longer duration that matters the most for entry into self-employment.[44] Those conclusions remain valid even when we do not adjust for labor income taxes. In that case, government spendings are not balanced, which lowers the value of working in the corporate sector relative to a self-employment situation. Finally, in line with the findings above, implementing a SEA program under the considered UI reforms largely enhances steady-state welfare.

4.4 Transitional dynamics and robustness

We now compute the transition path of the economy between steady states, following a sudden and unexpected introduction of the reforms. Figure 8 depicts the dynamics. At the time of the reform, the share of self-employed agents and labor income taxes sharply rise under all the considered reforms, while the number of corporate jobs and the unemployment rate are reduced. After 5 years, 60% of the occupational adjustment has taken place under $\mathbf{SEA_{LS}}$ against 47% under $\mathbf{SEA^*}$, and production has increased in all reforms.

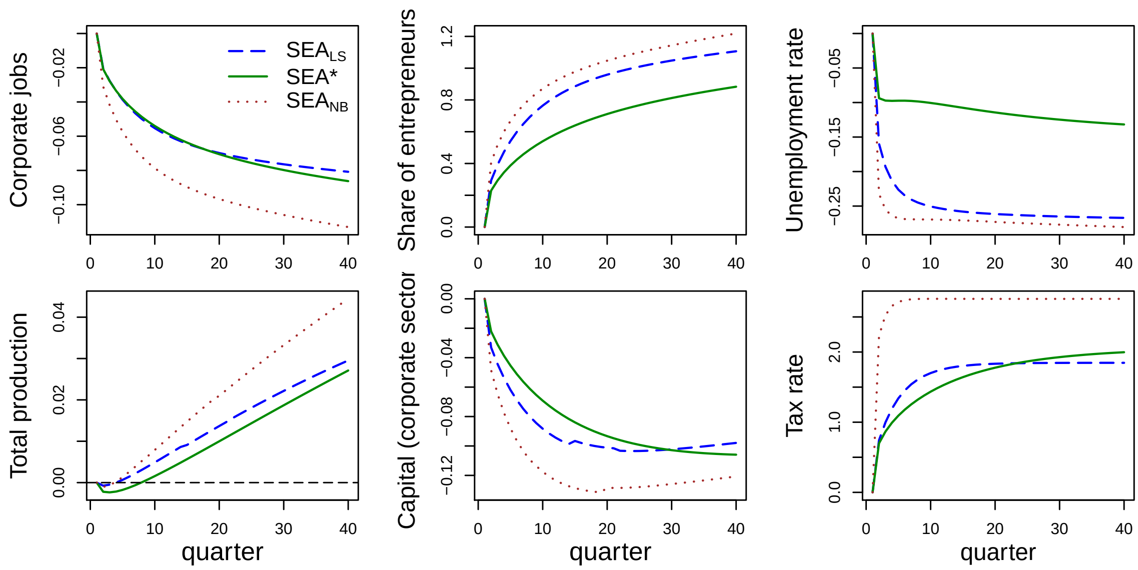

Figure 8. Transitional dynamics after an unexpected introduction of the policies.

Welfare along the transition We quantify welfare gains and losses along the transition as the *ex-post* consumption equivalent variation (cev_i): it quantifies whether individuals alive at the

[44]The empirical literature also seems to support the larger impact of a SEA on occupational decisions when UI is more generous. For instance, taking the case of France which has an especially more generous UI duration of 3 years (around 156 weeks), we find that $\mathbf{SEA^*}$ implies an increase of 6% of the share of self-employed agents and around 11% of the self-employed agents are insured (against 1.5% and 3% in the baseline). This corroborates the finding of Hombert et al. (2020) on the large magnitude of the DRI in France, with an increase of about 12% of the number of newly created firms. The difference can also be accounted for by a much larger unemployment rate in France as well as a larger UI replacement rate.

time of the reforms and with perfect knowledge about the future would prefer experiencing them or not. Table 10 summarizes the results for $\mathbf{SEA^*}$, $\mathbf{SEA_{NB}}$, $\mathbf{SEA_{LS}}$ and the *0-compensation* case. Welfare along the transition mirrors the steady-state findings. Under all reforms, richer individuals (and the least constrained to start a business) are better off. Concerning ability, it appears that $\mathbf{SEA_{LS}}$ favors much more the low-skilled individuals, while *type-dependent* SEA impacts all three ability levels in a similar way, with a slight advantage for the high-skilled. Under all reforms, workers who suffer from higher taxes are less likely to support the reforms. Interestingly, because they disfavor poor and constrained individuals with a larger marginal propensity to consume, the reforms do not appear to be supported by a majority. Nevertheless, the *0-compensation* and the $\mathbf{SEA_{LS}}$ cases, that benefit more to the (on average poorer) unskilled group, are better accepted. Overall, relative to steady-state welfare, transitional welfare gains and losses are quite small.

Type	*Ability dependent*						*Lump-sum*	
	$\mathbf{SEA^*}$		$\mathbf{SEA_{NB}}$		*0-compensation*		$\mathbf{SEA_{LS}}$	
Median wealth	≤med.	>med.	≤med.	>med.	≤med.	>med.	≤med.	>med.
Occupation								
Worker	-0.016	0.002	-0.024	0.011	-0.007	0.001	-0.016	0.012
Self-employed	-0.012	0.007	-0.017	0.014	-0.005	0.003	-0.010	0.015
Unemployed	-0.016	0.006	-0.024	0.020	-0.007	0.002	-0.016	0.020
All	-0.016	0.003	-0.024	0.012	-0.007	0.001	-0.016	0.013
Ability (θ)								
Low-skilled	-0.017	0.004	-0.027	0.012	-0.008	0.003	-0.017	0.026
Middle-skilled	-0.016	0.002	-0.024	0.009	-0.007	0.001	-0.016	0.012
High-skilled	-0.011	0.005	-0.014	0.014	-0.003	0.001	-0.009	0.010
All	-0.006		-0.007		-0.003		-0.002	
Fraction (in %) $cev_i > 0$	29.2		37.5		37.1		41.4	

Table. 10. Welfare over the transition (in $\%cev_i$). *Note:* ≤med. and >med. refer to population masses below and above the median wealth level in the economy.

5 Conclusion

In this paper, we evaluate and decompose self-employment assistance programs that extend the unemployment insurance system. The assistance provided under these policies is shown to help reduce the implicit incentive of existing UI systems to search for a job instead of starting a self-employed business from unemployment while producing important shifts in occupational choices. As a consequence, *type-dependent* and non *type-dependent* SEA policies select very different new self-employed agents, with the former facilitating the entry of (on average richer) higher-skilled individuals. We finally show that SEA programs interplay with the UI system and isolate the effects of extending UI duration on the share of self-employed agents.

References

Ali, Abdul, I. Elaine Allen, Candida Brush, William D. Bygrave, Julio De Castro, Julian Lange, Heidi Neck, Joseph Onochie, Ivory Phinisee, Edward Rogoff, and Albert Suhu (2008): "What Entrepreneurs Are Up To,"Technical report, Global Entrepreneurship Monitor.

Astebro, Thomas and Jing Chen (2014): "The entrepreneurial earnings puzzle: Mismeasurement or real?" *Journal of Business Venturing*, Vol. 29, pp. 88–105.

Bassetto, Marco, Marco Cagetti, and Mariacristina De Nardi (2015): "Credit Crunches and Credit Allocation in a Model of Entrepreneurship," *Review of Economic Dynamics*, Vol. 18, pp. 53–76.

Buera, Francisco J. and Yongseok Shin (2013): "Financial Frictions and the Persistence of History: A Quantitative Exploration," *Journal of Political Economy*, Vol. 121, pp. 221–272.

Cagetti, Marco and Mariacristina De Nardi (2006): "Entrepreneurship, Frictions, and Wealth," *Journal of Political Economy*, Vol. 114, pp. 835–870.

——— (2009): "Estate Taxation, Entrepreneurship, and Wealth," *American Economic Review*, Vol. 99, pp. 85–111.

Caliendo, Marco (2016): "Start-up subsidies for the unemployed: Opportunities and limitations," *IZA World of Labor*.

Caliendo, Marco, Jens Hogenacker, Steffen Künn, and Frank Wießner (2015): "Subsidized start-ups out of unemployment: a comparison to regular business start-ups," *Small Business Economics*, Vol. 45, pp. 165–190.

Caliendo, Marco and Alexander Kritikos (2009): ""I Want to, But I Also Need to": Start-Ups Resulting from Opportunity and Necessity," IZA Discussion Papers 4661, Institute for the Study of Labor (IZA).

Caliendo, Marco and Steffen Künn (2011): "Start-up subsidies for the unemployed: Long-term evidence and effect heterogeneity," *Journal of Public Economics*, Vol. 95, pp. 311–331.

Chatterjee, Satyajit, Dean Corbae, Makoto Nakajima, and José-Víctor Ríos-Rull (2007): "A Quantitative Theory of Unsecured Consumer Credit with Risk of Default," *Econometrica*, Vol. 75, pp. 1525–1589.

D'Erasmo, Pablo N. and Hernan J. Moscoso Boedo (2012): "Financial structure, informality and development," *Journal of Monetary Economics*, Vol. 59, pp. 286 – 302.

Ejrnæs, Mette and Stefan Hochguertel (2014): "Insurance, Entrepreneurial Start-Up, and Performance," Tinbergen Institute Discussion Papers 14-040/V, Tinbergen Institute.

Evans, David and Linda S Leighton (1989): "Some Empirical Aspects of Entrepreneurship," *American Economic Review*, Vol. 79, pp. 519–35.

Fairlie, Robert W., Kanika Kapur, and Susan Gates (2011): "Is employer-based health insurance a barrier to entrepreneurship?" *Journal of Health Economics*, Vol. 30, pp. 146 – 162.

Gaillard, Alexandre and Sumudu Kankanamge (2022): "Gross Labor Market Flows, Self-Employment, and Unemployment Insurance," *SSRN 3902165*.

Hamilton, Barton H (2000): "Does entrepreneurship pay? An empirical analysis of the returns to self-employment," *Journal of Political economy*, Vol. 108, pp. 604–631.

Herranz, Neus, Stefan Krasa, and Anne P. Villamil (2015): "Entrepreneurs, Risk Aversion, and Dynamic Firms," *Journal of Political Economy*, Vol. 123, pp. 1133 – 1176.

Hombert, Johan, Antoinette Schoar, David Sraer, and David Thesmar (2020): "Can unemployment insurance spur entrepreneurial activity? Evidence from France," *The Journal of Finance*, Vol. 75, pp. 1247–1285.

Hurst, Erik and Benjamin Wild Pugsley (2011): "What Do Small Businesses Do?," *Brookings Papers on Economic Activity*, Vol. 42, pp. 73–142.

Kitao, Sagiri (2008): "Entrepreneurship, taxation and capital investment," *Review of Economic Dynamics*, Vol. 11, pp. 44–69.

Knaup, Amy E. and Merissa C. Piazza (2007): "Business Employment Dynamics data: survival and longevity, II," *Monthly Labor Review*.

Landier, Augustin and David Thesmar (2008): "Financial Contracting with Optimistic Entrepreneurs," *The Review of Financial Studies*, Vol. 22, p. 117.

Mankart, Jochen and Giacomo Rodano (2015): "Personal bankruptcy law, debt portfolios, and entrepreneurship," *Journal of Monetary Economics*, Vol. 76, pp. 157–172.

Poschke, Markus (2013): "Who becomes an entrepreneur? Labor market prospects and occupational choice," *Journal of Economic Dynamics and Control*, Vol. 37, pp. 693–710.

Quadrini, Vincenzo (2000): "Entrepreneurship, Saving and Social Mobility," *Review of Economic Dynamics*, Vol. 3, pp. 1–40.

Reynolds, Paul Davidson (2017): "When is a Firm Born? Alternative Criteria and Consequences," *Business Economics*, Vol. 52, pp. 41–56.

Røed, Knut and Jens Fredrik Skogstrøm (2013): "Unemployment Insurance and Entrepreneurship," IZA Discussion Papers 7121, Institute for the Study of Labor (IZA).

Schoar, Antoinette (2010): "The Divide between Subsistence and Transformational Entrepreneurship," *Innovation Policy and the Economy*, Vol. 10, pp. 57–81.

Shimer, Robert (2005): "The Cyclical Behavior of Equilibrium Unemployment and Vacancies," *American Economic Review*, Vol. 95, pp. 25–49.

Thurik, A. Roy, Martin A. Carree, AndrÃ© van Stel, and David B. Audretsch (2008): "Does self-employment reduce unemployment?" *Journal of Business Venturing*, Vol. 23, pp. 673 – 686.