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Economic Effects of Unemployment Insurance for Entrepreneurs in South Korea†

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This paper aims to examine the economic impact of the implementation of an unemployment insurance (UI) program for entrepreneurs in South Korea. Despite facing labor market risks similar to paid employees, entrepreneurs are often not eligible for UI in many countries. South Korea, where entrepreneurs represent over 20% of the workforce, is considering a design of UI for entrepreneurs, with the goal of providing coverage to this group by 2025. This study examines how the addition of UI for entrepreneurs would impact the economy using a model of entrepreneurship based on a search and matching framework. The study's findings suggest that the implementation of UI for entrepreneurs would lead to increased business closures and reduced hiring, resulting in a slack labor market, which in turn would reduce social welfare overall. However, social welfare can be improved by subsidizing UI contributions paid by entrepreneurs, which provides the greatest improvement in social welfare compared to other social protection systems such as unemployment assistance.

Keywords: Entrepreneurship, Unemployment Insurance, Search and matching
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I. Introduction

This paper examines the economic effects of implementing an unemployment insurance (UI) program for entrepreneurs in South Korea. Despite facing labor market risks similar to those of paid employees, entrepreneurs are typically not

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eligible for UI in many countries. In response, South Korea, where entrepreneurs represent over 20 percent of the workforce, is moving to extend UI coverage to this group of workers. Following the announcements of its "national employment insurance roadmap" in 2020, artists, special types of workers, and platform workers have become eligible for UI. Policymakers are now considering the design of UI for entrepreneurs, with the goal of providing coverage to this group by 2025.

To quantify the policy impacts, this study adopts a search and matching model approach. Using a model-based approach has several benefits. Firstly, given that UI for entrepreneurs has not yet been implemented in South Korea, there is no data available with which to conduct a rigorous empirical analysis. Although there is a voluntary UI system in place for entrepreneurs, less than one percent of eligible entrepreneurs choose to register. Moreover, mandatory and optional policies can have very different effects. While data from countries with mandatory UI schemes for entrepreneurs could be analyzed, differences in the economy and labor market characteristics across these countries would limit the implications for the Korean economy. Most importantly, policy changes impact agents' optimal decision-making processes, having indirect effects. A model analysis enables us to examine not only the direct impacts but also the adjustments made by agents in response to these changes.

The model has several key features. There are three types of agents interacting in the frictional labor market: the unemployed, wage workers, and entrepreneurs. Entrepreneurs, who play a crucial role in the model, face income risks. To replicate entrepreneurs' income volatility observed in the data, we assume that entrepreneurial productivity, a main determinant of entrepreneurs' income in the model, follows the AR(1) process. Based on their realized productivity, entrepreneurs decide whether to keep their business going or shut it down. Negative productivity shocks increase the likelihood of a shutdown. Those who choose to stay in business then decide how many job vacancies to post. In the benchmark economy, only wage workers are eligible for UI.

Starting from this setting, we examine how the addition of UI for entrepreneurs impacts the model economy. Our findings suggest that the implementation of UI for entrepreneurs results in increased business closures and reduced hiring. The provision of receiving UI benefits reduces the expected cost of unemployment, making it easier for entrepreneurs, especially those with low productivity, to close their businesses. UI for entrepreneurs also influences entrepreneurs' hiring decisions. The requirement to pay UI contributions places additional financial strain on entrepreneurs, causing them to hire fewer employees. More closures and less hiring result in a slack labor market, which in turn lowers workers' job-finding rates and raises unemployment. The resulting rise in unemployment leads to an increase in spending on UI benefits, which puts pressure on the UI budget balance.

As a result, the introduction of UI for entrepreneurs reduces overall social welfare. Although providing UI benefits does increase the welfare of former entrepreneurs, this benefit is offset by a slack labor market and a longer average duration of unemployment. Additionally, as the government covers the deficit in the UI fund, the amount of government transfer payments received by households

decreases, further reducing social welfare. However, by experimenting with various policy options, we also show that social welfare can be improved by subsidizing UI contributions paid by entrepreneurs. This effect is more pronounced when the level of the subsidy is disproportionate to recipients' income levels. Furthermore, we find that compared to other social protection systems such as unemployment assistance, UI benefits for entrepreneurs with subsidized UI contributions provide the greatest improvement in social welfare.

We build on the standard search and matching framework developed by Mortensen and Pissarides (1994), incorporating the decision-making processes of entrepreneurs, as discussed by Poschke (2019), Yuen (2021), and Kim (2022). Our work is distinguished from previous studies in that we take into account entrepreneurs' decisions to close their businesses. Previous studies, including those mentioned above, largely focused on entrepreneurial entry and have not paid sufficient attention to entrepreneurs' exit decisions, which are often assumed to be driven by exogenous shocks. However, in this paper, we consider entrepreneurs' exit decisions to be essential. Unlike wage workers who may be laid off involuntarily by their employers, the decision to close a business is entirely in the hands of the entrepreneur. The introduction of UI for entrepreneurs could alter their incentives to quit by providing some protection during a period of unemployment and therefore could alter their exit decisions. If UI for entrepreneurs leads to too many exits, such a situation could put a strain on the UI fund. To measure the cost of the policy accurately, it is important to understand how it would impact entrepreneurs' exit decisions, which is why we have incorporated the entrepreneurial exit decisions into the model here.

This study is closely related to work by Han (2021) that examines the economic effects of UI for entrepreneurs in a model that includes occupational choices, income volatility, and precautionary saving. He finds that the mandatory introduction of UI for entrepreneurs has only a modest positive effect on social welfare and that unemployment assistance would more effective improve social welfare compared to UI for entrepreneurs. This study differs from that by Han (2021) in two ways. Firstly, we examine the role of entrepreneurs in creating jobs in the economy. Our model takes into account entrepreneurs' hiring decisions and shows how implementing UI for entrepreneurs influences the number of jobs created and, in turn, overall welfare. Secondly, in the research setting in Han (2021), business closures are either voluntary or forced by an exogenous shock, with UI benefits only being provided in the latter case. This may not accurately reflect the real economy because even when a business closure appears to be voluntary, it can often be due to other factors, including some that are involuntary, such as financial difficulties or increased competition. This could underestimate the cost of UI for entrepreneurs as well because, even if the policy may cause more business closedowns, the expenses for UI benefits remain unchanged. To address this issue, our study assumes that business closures are voluntary but influenced by exogenous productivity shocks and that all former entrepreneurs are eligible for UI benefits.

The remainder of the paper unfolds as follows. In Section 2, we introduce the model framework used to analyze the effects of implementing UI for entrepreneurs. Section 3 presents the model results, illustrating the impact of the

policy on the economy. Section 4 discusses alternative design considerations for UI for entrepreneurs. In Section 5, we compare this policy with other social protection measures. Section 6 concludes the paper.

II. Model

To assess the impact of UI on entrepreneurs, we develop a search and matching model that includes entrepreneurs. The model has the standard features of the Diamond-Mortensen- Pissarides (DMP) model. In the frictional labor market, the unemployed engage in job searches. There are two types of employment in the economy: wage work and entrepreneurship. The likelihood of an unemployed worker obtaining a wage job depends on the tightness of the labor market, which is defined as the number of job vacancies relative to the number of unemployed individuals. A fraction of unemployed workers become entrepreneurs with a certain probability. Entrepreneurs' income depends on entrepreneurial productivity, which captures not only the ability of the entrepreneur but also idiosyncratic shocks that could affect the business. Because such shocks fluctuate over time, we assume that entrepreneurial productivity follows an AR(1) process, creating uncertainty in entrepreneurs' income. Entrepreneurs do not know their productivity beforehand. For each period, entrepreneurs observe their actual productivity and decide whether to continue running their business or to shut it down. If they choose to close it, they become unemployed and start searching for wage jobs. If they choose to continue, they decide how many job vacancies to offer. In the benchmark economy, only unemployed workers who used to be wage workers and who were laid off involuntarily are eligible for UI benefits. There is no UI scheme for entrepreneurs.

A. *Unemployed Value Function*

The value of unemployment V^u depends on assets a and UI benefits b.

$$V^u(a,b) = \max_{c,\,a'} u(c) + \beta E[\chi(\lambda^u V^{self}(z^{\sim},a',0) + (1-\lambda^u)V^{search}(a',0)) + (1-\chi)(\lambda^u V^{self}(z^{\sim},a',0) + (1-\lambda^u)V^{search}(a',b))]$$

$$V^{search}(a',\ b) = p(\theta)V^w(a') + (1-p(\theta))V^u(a',\ b)$$

$$\text{s.t} \quad c + a' = (1+r)a + b + T$$
$$a' \geq 0$$

If an unemployed worker is eligible for UI benefits, b will take on a positive value. In cases where the unemployed worker is not eligible, such as former entrepreneurs or if their UI duration has expired, b is set to zero. Each period, an

unemployed worker receives capital income $(1+r)a$, UI benefits b, and government transfer T, and makes a decision regarding their level of consumption c. For simplicity, we assume that borrowing is not allowed. χ refers to the probability of losing UI eligibility, reflecting the finite duration of UI receipt.

An unemployed worker enters entrepreneurship with a probability of λ^u. Upon entry, they receive the value of entrepreneurship, which is a function of entrepreneurial productivity z, assets a, and the number of employees n. The initial productivity $z^{\sim}$ is a random variable that follows a normal distribution, and entrepreneurs are not able to observe it until they start their businesses. New entrepreneurs do not have any employees initially ($n=0$). Unemployed workers who do not become entrepreneurs engage in a job search for wage work. The probability of unemployed workers obtaining a wage job is denoted by $p(\theta)$, where θ represents the tightness of the labor market.

B. *Wage Workers Value Function*

The value function of wage workers is determined by their assets a.

$$V^w(a) = \max_{c,\, a'} u(c) + \beta E[\delta V^u(a', b) + (1-\delta)V^w(a')]$$

$$\text{s.t} \quad c + a' = (1-\tau_l)(1-\tau_u)w + (1+r)a + T$$
$$a' \geq 0$$

Wage workers earn constant labor income w each period, from which they make UI contributions and pay income tax. τ_u and τ_l denote the UI contribution rate and the income tax rate, respectively. All wage workers are registered for UI[1]. Unlike entrepreneurs, wage workers do not face income uncertainty as their labor income remains constant. However, they do face the risk of unemployment, which occurs with a probability of δ. Former wage workers are eligible to receive UI benefits.

C. *Entrepreneurs Value Function*

The value of entrepreneurs depends on their entrepreneurial productivity z, assets a, and the number of employees n.

$$V^{self}(z, a, n) = \max_{c,\, a',\, v} u(c) + \beta E[\max\{V^{self}(z', a', n'), V^u(a', 0) - C_{exit}\}]$$

[1]This may differ from what we see in the data. While most full-time workers are registered for UI in South Korea, 62-70% of part-time workers and most daily workers are not. However, the share of part-time and daily workers has been declining rapidly, from almost 40% in 2010 to 28% in 2021. Hence, we assume that all wage workers are registered for UI in the model for simplicity.

$$
\begin{aligned}
\text{s.t} \quad & c + a' + \kappa v = (1-\tau_l)(f(z, n) - (1+\tau_u)nw) + (1+r)a + T \\
& n' = \max\{(1-\delta)n + q(\theta)v, 0\} \\
& z' = \rho z + \epsilon, \epsilon \sim N(0, \sigma_\epsilon^2) \\
& a' \geq 0
\end{aligned}
$$

The level of productivity and the number of employees determine the level of production. Entrepreneurial productivity encompasses not only the entrepreneur's ability to run the business but also captures idiosyncratic shocks that are uncertain and highly variable. To reflect this, we assume it follows an AR(1) process. At the start of each period, entrepreneurs observe realized productivity and decide whether to continue their business by weighing the value of continuing against the value of shutting down. If they choose to close down, they must pay a shutdown cost C_{exit}, which includes both financial and non-financial costs associated with the business closure. In the benchmark economy, former entrepreneurs are not eligible to receive UI benefits as they are not registered for UI.

The entrepreneur's exit decision is represented by the following equation:

$$V^{self}(z^*, a, n) = V^u(a, 0) - C_{exit}$$

The value z^* represents the level of productivity at which the values of continuing and shutting down the business are equal. If the realized productivity exceeds z^*, the entrepreneur decides to keep the business going. They then determine the optimal level of consumption and the number of job vacancies to post, thus incurring posting cost κ per vacancy. The probability of successful hiring is denoted by $q(\theta)$. Each period, the entrepreneur loses δn employees exogenously by a separation shock while hiring $q(\theta)v$ new employees. There is no firing, and exogenous separation involves no cost for the entrepreneur. The employees receive a constant wage of w, and the entrepreneur pays half of the UI contributions for their employees, as both the worker and employer are responsible for paying UI contributions in the South Korean UI system. Overall, the total labor cost for the entrepreneur amounts to $(1+\tau_u)nw$. The entrepreneur also pays a fraction τ_l of his profit as income tax.

D. *Government*

The government provides UI benefits to the unemployed through the contributions made by employers and workers. In addition, the government distributes transfer payments to all individuals, as funded by the revenue generated from income taxes. The total amount when adding UI contributions and income tax revenue should equal the amount of UI benefits plus the transfer payments given out. The UI contribution rate and income tax rate are determined exogenously from the existing system in

South Korea. For this reason, there is no assurance that the UI budget will remain balanced. In the event of a deficit, the government covers it using income tax revenue, which leads to a reduction in transfer payments to individuals. Conversely, if there is a surplus, the government increases the transfer payments. Thus, the government's budget constraint is represented by the following equation:

$$
\begin{aligned}
& b\int_a m_u(a)\mathbf{1}(b>0)da + T \\
& = (\tau_l(1-\tau_u)+\tau_u)w \int_a m_\omega(a)da \\
& +\tau_l \int_z \int_a \int_n (f(z,n)-(1+\tau_u)nw)m_s(z,a,n)\, dn\, da\, dz \\
& +\tau_u wn \int_z \int_a \int_{n\geq 1} m_s(z,a,n)\, dn\, da\, dz
\end{aligned}
$$

where m_u, m_w, and m_s represent the distributions of the unemployed, wage workers, and entrepreneurs, respectively.

E. *Equilibrium*

Stationary equilibrium in the model consists of the value functions for the unemployed, wage workers, and entrepreneurs; the policy functions for consumption; the number of vacancies posted; and exit decisions, labor market tightness, and government transfer payments. The following conditions are met, given the exogenously determined wage and interest rate.

1. The policy functions solve each individual's value maximization problem.
2. The government budget is in balance.
3. Labor market tightness is determined by the ratio of job vacancies to unemployed individuals.
4. The distribution of individuals in the state space remains constant over time.

F. *Calibration*

The model contains a total of 19 parameters, of which five are determined within the model. These are matching efficiency (A), the cost of posting a job vacancy (κ), the probability of entering entrepreneurship (λ_u), the cost of business closure (C_{exit}), and the probability of exogenous separation (δ). All five are calibrated to match target moments from the data. The remaining parameters are either drawn from the literature or estimated externally. As the aim of the model is make an accurate prediction of the impact of a policy that has not yet been implemented, it is important for the model economy closely to resemble the current economy. To achieve this, we use 2019 data, the latest year available (data from the years 2020-21 are excluded due to potential biases caused by the COVID-19 crisis), to compute the target moments. One period in the model corresponds to one month.

The model uses a constant relative risk aversion (CRRA) utility function, with

a degree of relative risk aversion (σ) of 2, a common value in the literature.

$$u(c) = \frac{c^{1-\sigma} - 1}{1-\sigma}$$

The real interest rate (r) and time discount factor (β) are set to represent an annual interest rate of four percent. Production depends on entrepreneurial productivity and the number of employees, as outlined by Kim (2021).

$$f(z, n) = e^{z}(1+n)^{\alpha}$$

The labor elasticity of production (α) is set to 0.85, following Atkeson and Kehoe (2005).

The matching technology between job seekers and potential employers is modeled with a constant returns to scale function.

$$m(v, u) = Au^{\gamma}v^{1-\gamma}$$

The matching efficiency, A, is calibrated to match the share of newly employed individuals in the total population[2]. The target moments of this study are primarily derived from the Economically Active Population Survey (EAPS), a comprehensive database on the South Korean labor market that collects information on labor force status and related characteristics of individuals aged 15 years and older on a monthly basis. An individual is considered newly employed if they are currently employed but were unemployed or out of the labor force the previous month. To determine the employment status of the individual in consecutive months, individual-level longitudinal data are required. Although the EAPS tracks the same respondents for up to 36 consecutive months, it is not possible to utilize this information as individual identifiers are not ability to the public. As an alternative, the number of newly employed individuals is calculated using the year and month each respondent left their current job[3]. The elasticity of matching (γ) is set to 0.859, following Kim (2020). The job-finding rate ($p(\theta)$) and hiring rate ($q(\theta)$) are functions of the matching efficiency, matching elasticity, and labor market tightness.

$$p(\theta) = \frac{m(v,\ u)}{u} = m(1,\ \theta) = A\theta^{1-\gamma}$$

$$q(\theta) = \frac{m(v,\ u)}{v} = m(\frac{1}{\theta},\ 1) = A\theta^{-\gamma}$$

[2]The parameters are jointly calibrated, but their significance varies for specific moments.
[3]The methodology is further explained in Kim (2021).

The cost of posting a job vacancy, κ, is calibrated to match the share of employers among entrepreneurs. The probability of entering entrepreneurship, λ^u, is set to match the share of entrepreneurs in the overall workforce. Ideally, the cost of closing a business, C_{exit}, would be set to match the monthly level of business closures in the data[4], but this information is not readily available. As an alternative, we determine the target moment for C_{exit} as follows. First, we identify former entrepreneurs among the currently not employed using their worker type information from their previous jobs. Then, we compare the date they left their previous job with the date of the survey. If the time gap between the two dates is within a month, we consider them to have closed their business in that given month. Finally, we divide the number of those newly closed entrepreneurs by the total labor force to use this outcome as the target moment of C_{exit}.

The parameters ρ and σ_ϵ determine the shape of entrepreneurial productivity. As discussed in the previous chapter, entrepreneurial productivity plays a crucial role in entrepreneurs' exit decisions. Hence, the shape of the productivity distribution affects the number of entrepreneurs who choose to exit due to the implementation of UI for entrepreneurs. In the model, entrepreneurial productivity directly determines entrepreneurs' profit. Therefore, we set the value of σ_ϵ to match the coefficient of variation of business income in the Survey of Household Finances and Living Conditions, ensuring that the productivity distribution in the model closely resembles the profit distribution in the data. ρ, which captures the persistence of entrepreneurs' income, is set to 0.92, following Chang *et al*. (2018).

The probability of exogenous separation, δ, is calibrated to match the unemployment rate. The policy parameters are set in accordance with the current tax and UI system in South Korea. The income tax rate is set to the rate applied to those whose annual incomes are under 46 million Korean won. The UI contribution rate is set to 0.8 percent. The level of UI benefits is set to achieve an income replacement ratio of 64.7 percent. The probability of losing UI eligibility is set so that the average duration of UI receipt is 4.4 months. The wage for wage workers is normalized to 1. Government transfer payments (T) and labor market tightness (θ) are determined endogenously within the model. These parameters are summarized in Table 1.

The performance of the model is shown in Table 2 by comparing the moments generated in the model to the corresponding real-world counterparts. The model moments match most of the targets, but the unemployment rate is slightly higher compared to the data. This difference appears to arise from the stricter definition of unemployment in the data compared to the model. In the model, all individuals who are not employed are considered unemployed, while in the data, some individuals, such as discouraged workers who are able and willing to work but who have not actively searched for jobs in the past four weeks, or those who want full- time work

[4]Because this is the key parameter of the entrepreneur's exit decision $V^{self}(z^*, a, n) = V^u(a, 0) - C_{exit}$, it is reasonable to set its value so that the model replicates the number of businesses that close down in the economy.

TABLE 1—CALIBRATED PARAMETERS

Parameter	Value	Description	Source/Target
σ	2	Risk aversion	Standard
r	0.003	Real interest rate	Annual rate of 4%
β	0.996	Discount factor	1/(1+r)
α	0.85	Labor elasticity of production	Atkeson and Kehoe (2005)
A	0.8684	Matching efficiency	Newly employed / Workforce (EAPS 2019)
γ	0.859	Matching elasticity	Kim (2020)
κ	1.0992	Vacancy posting cost	Employers / Entrepreneurs (EAPS 2019)
λ^u	0.0482	Prob. of entering entrepreneurship	Entrepreneurs / Employed (EAPS 2019)
C_{exit}	3.7994	Cost of business closure	Business closures / Workforce (EAPS 2019)
δ	0.1071	Prob. Of exogenous separation	Unemployment rate (EAPS 2019)
τ_l	0.15	Income tax rate	Income tax rate in SK
τ_u	0.008	UI contribution rate	UI contribution rate in SK
ρ	0.92	Persistence of z	Chang *et al*. (2018)
σ_ϵ	0.4752	Standard deviation of ϵ	CV of business income (HFLC 2019)
b	0.647	UI benefit	Income replacement ratio
χ	0.2941	Prob. of losing UI eligibility	Average duration of UI receipt
w	1	wage	Normalized to 1

TABLE 2—MODEL FIT

Target Statistics	Model	Data
Entrepreneurs / Employed	0.2453	0.2464
Employers / Entrepreneurs	0.2384	0.2301
Business closures / Workforce	0.0043	0.0042
Unemployment rate	0.0892	0.038
Newly employed / Workforce	0.0779	0.0728

but can only find part-time jobs, are not considered unemployed. Given this difference in the definition of unemployment, the discrepancy in the unemployment rates may be smaller than it appears. In fact, the model's unemployment rate is reasonably close to the expanded unemployment rate in the data which include discouraged workers and those who are working part-time for economic reasons as well as those who are officially unemployed.

III. The Impact of UI for Entrepreneurs on the Economy

We use the model in the previous chapter as a laboratory to simulate the impact of implementing UI for entrepreneurs. Under this new policy, entrepreneurs would be required to register for UI, just like wage workers, and would be eligible for UI benefits in the case of business closure. In general, UI benefits are granted

to those who are forced to leave their jobs. For wage workers, it is relatively easy to distinguish between layoffs and instances in which the worker voluntary quits. However, it is not easy to make such a distinction for entrepreneurs, who have more control over the decision to leave their businesses. In the current UI system in South Korea where entrepreneurs can voluntarily register, UI benefits are available to former entrepreneurs who have closed their businesses due to a reduction in income as well as due to illness or natural disasters. To be eligible for UI benefits, entrepreneurs must have experienced a loss of income for six months, a reduction in average monthly revenue over three consecutive quarters, or a decrease in average three-month revenue of more than 20 percent compared to the previous year.

In our model, entrepreneurs make the decision to shut down their businesses, but the factors that drive these decisions are beyond their control. These uncontrollable factors are represented as productivity shocks in the model. Productivity encompasses not only an entrepreneur's ability but also external factors that affect a business's revenue. For example, a negative shock could be due to a competitor opening a new business nearby, which leads to a reduction in the entrepreneur's revenue. If the entrepreneur decides to close their business due to this event, they are eligible for UI benefits despite the fact that it was their own decision to leave, as they had no control over the entry of the new competitor.

The entrepreneur's value function in this new policy scenario is given as follows:

$$V^{self}(z, a, n) = \max_{c, a', v} u(c) + \beta E[\max\{V^{self}(z', a', n'), V^{u}(a', b^{s}) - C_{exit}\}]$$

$$\begin{aligned} \text{s.t} \quad & c + a' + \kappa v = (1-\tau_l)(1-\tau_u^s)(f(z, n) - (1+\tau_u)nw) + (1+r)a + T \\ & n' = \max\{(1-\delta)n + q(\theta)v, 0\} \\ & z' = \rho z + \epsilon, \epsilon \sim N(0, \sigma_\epsilon^2) \\ & a' \geq 0 \end{aligned}$$

Entrepreneurs pay UI contributions and receive UI benefits in the event of a business shutdown. The UI contribution rate for entrepreneurs, τ^s, is set to balance the UI budget, meaning that the amount of UI benefits spent is equal to the amount of UI contributions paid by entrepreneurs. We assume that the UI funds for entrepreneurs and wage workers are separate and distinct from each other. The equilibrium contribution rate is determined to be 1.67 percent. The level of UI benefits, b^s, is calibrated to achieve an income replacement ratio of 64.7 percent. Unlike wage workers, who pay only half of the UI contributions with their employers covering the rest, entrepreneurs are responsible for paying the full amount of their UI contributions. The UI system for wage workers remains unchanged from the benchmark economy.

Table 3 compares a set of key variables between the benchmark economy and a counterfactual economy in which UI for entrepreneurs is implemented. Firstly, the share of entrepreneurs among the employed decreases from 24.5 percent in the benchmark

TABLE 3—UI FOR ENTREPRENEURS AND ITS IMPACT ON KEY ECONOMIC VARIABLES

Moments	Base Economy	UI for Entrepreneurs	Difference (%)
Entrepreneurs / Employed	0.2453	0.2293	-6.5
Employers / Entrepreneurs	0.2384	0.248	4.0
Business closures / Workforce	0.0043	0.0044	2.3
Unemployment rate	0.0892	0.0918	2.9
Newly employed / Workforce	0.0779	0.0752	-3.5
Labor market tightness	0.989	0.9197	-7.0
Transfer payments	0.2625	0.245	-6.7

economy to 22.9 percent in the counterfactual economy due to an increase in the number of entrepreneurs who choose to close their businesses. The monthly exit rate increases from 0.43 percent to 0.44 percent. In addition, the implementation of UI for entrepreneurs decreases the probability that job seekers will obtain a job. As the transition from entrepreneurship to unemployment increases and remaining entrepreneurs reduce their numbers of job postings, labor market tightness, the number of job vacancies available to each unemployed worker, decreases, leading to a decrease in the job-finding rate. Labor market tightness decreases from 0.99 in the benchmark economy to 0.92 in the counterfactual economy. As a result, the share of newly employed individuals in the workforce decreases from 7.8 percent in the benchmark economy to 7.5 percent in the counterfactual economy. The share of employers in the self-employed increases slightly[5]. The unemployment rate rises from 8.9 percent to 9.2 percent as the average duration of unemployment increases as a result of a slack labor market. The expenditure on UI benefits increases due to higher unemployment; as a result, the deficit in the UI funds for wage workers widens[6]. The government covers this deficit through income tax revenue, which results in a reduction of transfer payments workers receive from the government by around 6.7 percent.

These changes in aggregate variables reflect the adjustments in agents' behaviors in response to the policy change. The implementation of UI for entrepreneurs affects the decision-making process of entrepreneurs. Figure 1 illustrates the entrepreneur's exit decision.

The exit value remains constant, as it does not depend on entrepreneurial productivity. On the other hand, the value of continuing the business increases with the entrepreneur's realized productivity, as higher productivity results in higher profits. At the point where the value of continuing the business is equal to the value of exiting, the entrepreneur is indifferent between the two options. If the realized

[5]The implementation of UI for entrepreneurs does not change the number of employers significantly. The proportion of employers among the self-employed increases mainly because the total number of self-employed individuals decreases due to the policy change.

[6]The deficit in the UI funds for wage workers occurs because the UI contribution rate for wage workers is exogenously set to a value consistent with the South Korean UI system, which does not ensure a balanced UI budget in the model. In contrast, the UI contribution rate for entrepreneurs is determined internally at a level that balances the UI budget, ensuring that the UI budget for entrepreneurs is always balanced.

productivity exceeds a threshold, the entrepreneur chooses to continue the business. Otherwise, they choose to exit.

The implementation of UI for entrepreneurs changes the two value functions and thus changes the threshold. Both functions shift downwards. The value of staying in business decreases due to the added cost of UI contributions and reduced transfer payments from the government. The value of exiting the business also decreases, as former entrepreneurs experience a longer duration of unemployment as a result of a slack labor market, despite their receipt of UI benefits.

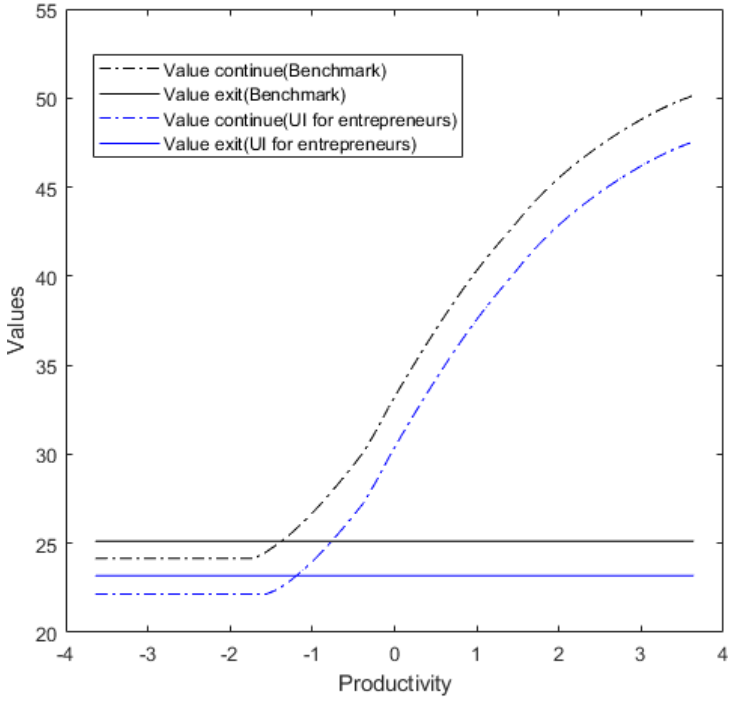
As a result, in the counterfactual economy, the threshold moves to the right (see Figure 1), meaning that higher productivity is needed for the entrepreneur to stay in business. In other words, in the economy with UI for entrepreneurs, the entrepreneur continues the business only if higher productivity than that in the benchmark economy is realized. This leads to more business closures in the counterfactual economy. However, the extent to which the policy change influences the entrepreneur's exit decision depends on the entrepreneur's assets. High-asset entrepreneurs are better equipped to endure a longer duration of unemployment, making the benefit of receiving UI benefits relatively small for them. As a result, the value of exiting decreases more than the value of continuing the business. The threshold remains almost unchanged in this case (see Figure 1-b). Taken together, it is reasonable to assume that business closures mostly occur among low-productivity and low-asset entrepreneurs. Consequentially, the share of low-productivity entrepreneurs decreases in the economy with the new UI system. This change is depicted in Figure 2, where we observe that the distribution of entrepreneurs over productivity shifted to the right in the counterfactual economy. The average productivity level is approximately 5.8 percent higher compared to that in the benchmark economy.

We now turn our attention to the welfare changes experienced by agents as a result of the implementation of UI for entrepreneurs. We compute the welfare change in terms of consumption equivalence, which is a common practice in the literature. Specifically, the welfare change, ϵ , is derived from the following equation:

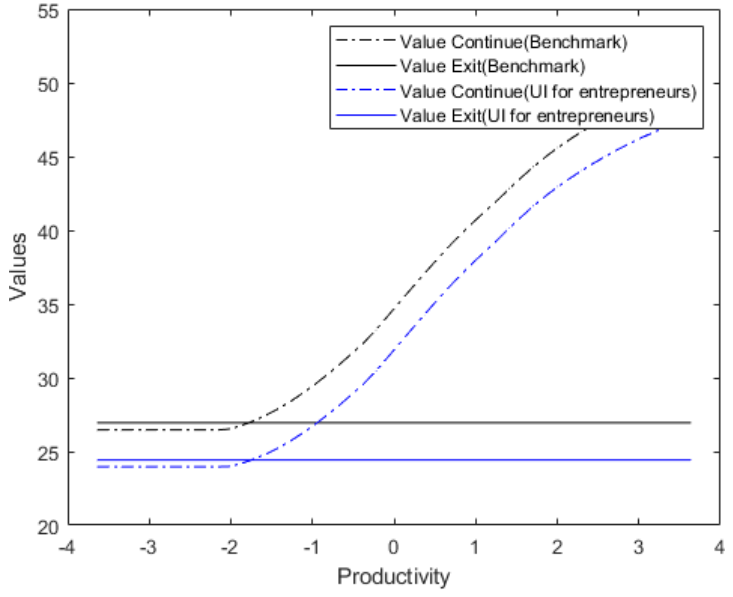
$$E_0 \sum_{t=1}^{\infty} \beta^t u((1+e)\bar{c}_t) = E_0 \sum_{t=1}^{\infty} \beta^t u(\tilde{c}_t),$$

where $\bar{c}_t$ and $\tilde{c}_t$ denote consumption in the benchmark and in the counterfactual economy, respectively. ϵ indicates the amount of consumption that an agent would need to pay (or be paid) in the counterfactual economy to maintain the same level of utility enjoyed in the benchmark economy. A positive value of ϵ indicates that the agent experiences higher welfare in the counterfactual economy, while a negative value implies the opposite.

Table 4 presents the welfare changes for different types of agents. The implementation of UI for entrepreneurs reduces the average welfare by approximately 1.36 percent. The benchmark economy consists of four types of agents: wage workers, entrepreneurs, unemployed workers who qualify for UI, and unemployed workers who are ineligible for UI. The latter group includes former entrepreneurs



(a) $a = 0$



(b) $a = 1.5$

FIGURE 1. UI FOR ENTREPRENEURS AND CORRESPONDING IMPACT ON ENTREPRENEURIAL DECISION-MAKING

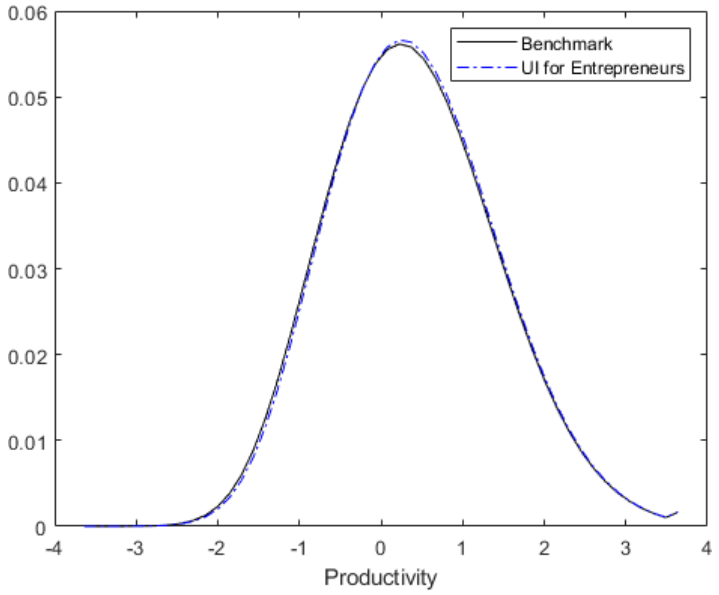


FIGURE 2. DISTRIBUTION OF ENTREPRENEURS OVER PRODUCTIVITY

TABLE 4—UI FOR ENTREPRENEURS AND ITS IMPACT ON WELFARE

	Welfare changes (%)
Average	-1.36
Unemployed w/ UI	-1.39
Unemployed w/o UI	-1.06
Wage workers	-1.39
Entrepreneurs	-1.27
$\leq$ Q1	-1.18
$>$ Q1, $\leq$ Q2	-1.27
$>$ Q2, $\leq$ Q3	-1.29
$>$ Q3	-1.28

Note: Q1, Q2, and Q3 represent the first, second, and third quartiles of the distribution of entrepreneurial productivity.

and former wage workers whose eligibility period has expired.

The group that benefits most from the introduction of UI for entrepreneurs are those who are not eligible for UI in the benchmark economy. Their welfare reduction is relatively low at 1.06 percent. While they receive UI benefits that were unavailable in the benchmark economy, their welfare still decreases due to a slack labor market, which decreases the probability of obtaining a wage job, resulting in the possibility of longer unemployment. However, due to additional UI benefits, their welfare reduction is lowest among all agent types.

The group that is least benefited from the new policy are the wage workers and

unemployed workers who already qualify for UI, including former wage workers whose eligibility period has not yet expired. As they were already receiving UI benefits, they do not receive any additional benefits from the new policy. However, they still have to bear the cost of the policy, which includes a slack labor market and reduced transfer payments. As a result, their welfare decreases by around 1.39 percent.

Finally, we examine the welfare changes of entrepreneurs. Our results indicate that the implementation of the new policy leads to a reduction in welfare of approximately 1.27 percent. While entrepreneurs benefit from the provision of receiving UI benefits, the cost of paying UI contributions and the decrease in transfer payments offset this benefit. The magnitude of the reduction in welfare varies according to entrepreneurial productivity, with relatively less productive entrepreneurs experiencing a smaller welfare reduction. For entrepreneurs in the lowest productivity quartile, the welfare reduction is only around 1.18 percent. As they are more likely to face a high risk of business closures than highly productive entrepreneurs, the potential benefits of registering for UI are greater for them.

The welfare analysis reveals that the implementation of UI for entrepreneurs comes with the underlying cost of a slack labor market. The requirement to pay UI contributions increases business closures and reduces new hiring, ultimately leading to a slack labor market. Unemployment rates increase due to lower job-finding rates and longer durations of unemployment, thereby placing pressure on the UI fund budget as expenditures on UI benefits rise. As the government compensates for the deficit by reducing transfer payments to households, the increased burden is felt throughout the economy. These findings suggest that in order to minimize the negative effects of UI for entrepreneurs, a complementary policy is needed to limit the increase in business closures and the reduction in hiring.

IV. Exploring alternative designs of UI for entrepreneurs

This section explores alternative designs of UI for entrepreneurs. We present a challenging issue regarding the allocation of the share of UI contributions by employers. Unlike wage workers, entrepreneurs do not have employers to share the costs of UI contributions and are therefore solely responsible for paying the entire amount. As demonstrated in the previous section, overburdening entrepreneurs with too much financial responsibility could exacerbate the adverse effects of UI for entrepreneurs. One potential solution is for the government to subsidize a portion of the UI contributions paid by entrepreneurs. However, before implementing such a policy, it is crucial to evaluate its potential costs and benefits carefully to ensure that the benefits outweigh the costs. To accomplish this, we conduct a comparative analysis of social welfare in a scenario in which the government subsidizes part of the UI contributions paid by entrepreneurs and in a scenario in which entrepreneurs are fully responsible for paying all UI contributions.

We propose three different scenarios for implementing UI for entrepreneurs. The first is that discussed in the previous section, where entrepreneurs bear the entire cost of UI contributions. In the second and third scenarios, the entrepreneur

and the government share the burden of UI contributions. In scenario 2, the government covers 50 percent of the UI contributions paid by each entrepreneur, while in scenario 3, the government subsidizes UI contributions selectively, with a larger portion of the contributions covered for entrepreneurs with lower incomes. In all three scenarios, the UI budget for entrepreneurs is separate from that for wage workers, and the UI contribution rate for entrepreneurs is determined to ensure that the UI budget is balanced. The government finances each policy scenario by reducing the transfer payments to households.

Table 5 and 6 illustrate the changes in key economic variables and welfare for each policy scenario. As previously discussed, when entrepreneurs are solely responsible for the cost of UI contributions, financially constrained entrepreneurs either close their businesses or reduce hiring, resulting in labor market slackness and higher unemployment rates. The increased unemployment puts additional pressure on the UI budget for wage workers, ultimately leading to a reduction in transfer payments to households, as the government injects additional expenditures to fill the deficit. Consequently, the average welfare under this policy scenario is 1.36 percent lower than in the benchmark economy where UI for entrepreneurs is not available.

In policy scenario 2, the burden of paying UI contributions on entrepreneurs is alleviated by the government sharing the cost. This leads to fewer business closures. Although the share of entrepreneurs in this economy is still lower (23.7 percent) than in the benchmark economy (24.5 percent), it is higher than in policy

TABLE 5—DIFFERENT UI DESIGNS AND KEY ECONOMIC VARIABLES

	Base	Policy 1	Policy 2	Policy 3
Entrepreneurs / Employed	0.2453	0.2293	0.2371	0.2389
Employers / Entrepreneurs	0.2384	0.248	0.2395	0.2208
Business closures / Workforce	0.0043	0.0044	0.0043	0.0043
Unemployment rate	0.0892	0.0918	0.0902	0.0899
Newly employed / Workforce	0.0779	0.0752	0.0745	0.0744
Labor market tightness	0.989	0.9197	0.9823	0.9892
Transfer payments	0.2625	0.245	0.2522	0.2586

TABLE 6—DIFFERENT UI DESIGNS AND WELFARE CHANGES (%)

	Policy 1	Policy 2	Policy 3
Average	-1.36	-0.63	-0.06
Unemployed w/ UI	-1.39	-0.66	-0.09
Unemployed w/o UI	-1.06	-0.33	0.24
Wage workers	-1.39	-0.67	-0.1
Entrepreneurs	-1.27	-0.48	0.08
$\leq$ Q1	-1.04	-0.41	0.17
$>$ Q1, $\leq$ Q2	-1.25	-0.48	0.1
$>$ Q2, $\leq$ Q3	-1.28	-0.5	0.06
$>$ Q3	-1.28	-0.5	0.06

Note: Q1, Q2, and Q3 represent the first, second and third quartiles of the distribution of entrepreneurial productivity.

scenario 1 (22.9 percent). Additionally, the reduction in hiring is less severe. Thus, the labor market is seven percent tighter than in policy scenario 1. The unemployment rate in this economy is nine percent, which is lower than the rate of 9.2 percent in scenario 1. Furthermore, each household receives transfer payments that are three percent higher due to the narrowing of the UI fund deficit.

A tighter labor market and higher transfer payments in scenario 2 improve social welfare significantly. Although the average welfare in scenario 2 is 0.63 percent lower than that in the benchmark economy, this decrease is much less severe than that of scenario 1. This suggests that sharing the cost for entrepreneurs mitigates the adverse effects of implementing UI for them. The primary factor contributing to the increase in social welfare is the rise in hiring. Additionally, the increased government expenditure on subsidizing entrepreneurs is counterbalanced by a reduced need to compensate for the UI budget deficit.

In policy scenario 3, social welfare is increased further by targeting entrepreneurs with lower incomes for the subsidy. The UI contribution paid by the government is higher for entrepreneurs with lower incomes. For entrepreneurs in the lowest income bracket, the government covers 70 percent of the UI contributions. Conversely, for entrepreneurs in the upper highest income bracket, the government only covers 30 percent. Generous subsidies targeted at entrepreneurs with relatively low incomes significantly reduce the number of business closures, as entrepreneurs who are financially stressed are more likely to shut down their businesses due to the implementation of UI for entrepreneurs. Consequently, the share of entrepreneurs in scenario 3 is higher at 23.9 percent compared to the first two scenarios. More businesses in the economy lead to a tighter labor market and a lower unemployment rate, which together ease the UI budget deficit. As a result, transfer payments for households are 2.5 percent higher than in scenario 2.

The results show that implementing scenario 3 leads to a slight reduction in social welfare by an average of 0.06 percent. However, this policy benefits unemployed individuals who were originally ineligible for UI benefits, who enjoy a welfare gain of 0.24 percent. The welfare of entrepreneurs also increases by 0.08 percent, with the most significant gains observed among those in the lowest income bracket, whose welfare increases by 0.17 percent. In contrast, entrepreneurs in the highest income bracket experience a more modest increase of 0.06 percent. In terms of wage workers and unemployed individuals who were already eligible for UI benefits, those who benefit the least from the new policy, their welfare loss is only 0.1 percent, which is relatively small compared to the other policy options. Overall, the results suggest that scenario 3 is a more efficient design for UI for entrepreneurs, as this scenario improves welfare for the target group while minimizing negative effects on other agents in the economy.

V. Comparison with other social protection policies

Next, we assess UI for entrepreneurs in comparison with other social protection policies. As UI for entrepreneurs is not the sole means of providing a social safety net to entrepreneurs, it is essential to determine its superiority

over other alternatives. One such alternative is unemployment assistance (UA), which offers financial support to all unemployed workers, including those ineligible for UI benefits. Unlike UI, UA is funded by taxes, making it less financially burdensome for entrepreneurs. However, the amount of financial support provided by UA does not typically match that by UI.

The amount of UA benefits is determined to ensure that the government budget is balanced. As with UI for entrepreneurs, as the government increases expenses to provide UA benefits to the unemployed, transfer payments for households are likely to decrease. To ensure a fair comparison, we fix the amount of transfer payments at the level in Scenario 3, which yields the most favorable welfare outcome among different designs of UI for entrepreneurs. The equilibrium UI benefits amount to approximately 34 percent of UI benefits for entrepreneurs. Unlike UI, there is no limit to the duration of receipt for UA. UI for wage workers remains unchanged from that in the benchmark economy. Both wage workers whose UI eligibility period has expired and former entrepreneurs are eligible to receive UA benefits.

In the economy where UA is implemented, entrepreneurs have a means to prepare for the risk of shutdown despite the fact that the UA benefits are small. This decrease in the shutdown cost is similar to the effect of UI for entrepreneurs. However, given that entrepreneurs do not have to pay UI contributions in this economy, fewer entrepreneurs choose to shut down compared to the number with mandatory UI for entrepreneurs. As a result, in the economy with UA, the share of entrepreneurs among the employed is higher than in Scenario 3 (see Table 7).

Additionally, the implementation of UA increases the number of job vacancies that employers post. In the model economy, entrepreneurs engage in precautionary savings to prepare for the risk of shutdown. With the introduction of UA, the costs associated with shutdown decrease, prompting entrepreneurs to reduce the amount of precautionary savings and hire more employees[7]. Consequently, this leads to an increased number of job vacancies, and the labor market becomes tighter. In the economy with UA, the labor market tightness is approximately 0.2% higher than in UI scenario 3.

Social welfare experiences a slight decrease of 0.08% from the benchmark economy,

TABLE 7—COMPARISON ACROSS DIFFERENT SOCIAL PROTECTION POLICIES: KEY ECONOMIC VARIABLES

	Base	Policy 3	UA	YU
Entrepreneurs / Employed	0.2453	0.2389	0.2417	0.2473
Employers / Entrepreneurs	0.2384	0.2208	0.2382	0.2193
Business closures / Workforce	0.0043	0.0043	0.0043	0.0043
Unemployment rate	0.0892	0.0899	0.0896	0.089
Newly employed / Workforce	0.0779	0.0744	0.0783	0.0777
Labor market tightness	0.989	0.9892	0.9912	0.9892
Transfer payments	0.2625	0.2586	0.2586	0.2586

[7]This effect is also found in the case of UI for entrepreneurs. However, in that scenario, entrepreneurs are reluctant to increase hiring due to the burden of paying UI contributions.

showing a slightly larger decline compared to UI scenario 3 (see Table 8). Welfare losses for wage workers and unemployed workers originally eligible for UI are relatively similar between the economy with UA and Scenario 3. However, entrepreneurs and unemployed workers ineligible for UI appear to fare better with UI for entrepreneurs than with UA, as they receive more benefits in the former case. Entrepreneurs with the lowest productivity witness the most substantial welfare gain of 0.03% with UA.

Another alternative is to incentivize entrepreneurs to build buffer savings voluntarily to prepare for the risk of a shutdown by providing a subsidy to their capital income. This approach is inspired by the Yellow Umbrella Mutual Aid Fund of South Korea, which offers tax deductions to small business owners who save for a potential shutdown or for retirement. Similar to the UA case, we keep the transfer payments fixed at the level in UI policy scenario 3, and the subsidy rate is set to maintain a balanced government budget. The equilibrium rate is estimated to be 5.4 percent, implying that entrepreneurs receive a subsidy equivalent to 5.4 percent of their capital income.

The subsidy provided to entrepreneurs' capital income leads to a reduced rate of business shutdowns, which in turn increases the share of entrepreneurs in the economy compared to the benchmark economy. With fewer shutdowns occurring, the unemployment rate in this economy decreases to a lower level than in both Scenario 3 and the economy with UA.

With the incentive to save more, entrepreneurs reduce their spending on consumption and hiring, which leads to a decrease in labor market tightness and social welfare. The decrease in the number of job vacancies posted results in lower labor market tightness. Social welfare experiences a relatively large decrease of 0.3 percent compared to other policy scenarios, primarily due to the reduction in present consumption.

In summary, among social protection policies for entrepreneurs, UA maximizes hiring, while the subsidy to entrepreneurs' capital income minimizes business shutdowns. However, when considering social welfare, UI for entrepreneurs with selective government subsidies on UI contributions appears to be the most favorable option.

VI. Concluding Remarks

In this study, we utilized a model-based approach to investigate the effects of a mandatory unemployment insurance (UI) policy for entrepreneurs in the economy. Surprisingly, our findings show that the implementation of UI for entrepreneurs results in welfare losses for all types of agents, including entrepreneurs and those previously ineligible for UI benefits, the main beneficiaries of the policy. This unexpected outcome is attributed to the changes in entrepreneurs' hiring decisions due to the policy. With the burden of paying UI contributions, entrepreneurs choose to post fewer job vacancies, leading to a slack labor market and reduced job-finding rates. The welfare gains

TABLE 8—COMPARISON ACROSS DIFFERENT SOCIAL PROTECTION POLICIES: WELFARE CHANGES (%)

	Policy 3	UA	YU
Average	-0.06	-0.08	-0.31
Unemployed w/ UI	-0.09	-0.10	-0.32
Unemployed w/o UI	0.24	0.04	-0.32
Wage workers	-0.10	-0.11	-0.32
Entrepreneurs	0.08	0.00	-0.29
$\leq$ Q1	0.17	0.03	-0.31
> Q1, $\leq$ Q2	0.10	0.01	-0.29
> Q2, $\leq$ Q3	0.06	-0.01	-0.28
> Q3	0.06	-0.01	-0.28

Note: Q1, Q2, and Q3 represent the first, second, and third quartiles of the distribution of entrepreneurial productivity.

from receiving UI benefits are offset by the prolonged duration of unemployment. Moreover, the slack labor market contributes to higher unemployment rates, leading to an increase in the UI budget deficit. To cover this deficit, the government reduces transfer payments for households, further reducing social welfare.

Our experiment demonstrates that implementing complementary policies to alleviate the financial burden on entrepreneurs can improve social welfare. By providing a government subsidy to UI contributions paid by entrepreneurs, we observed in the model a reduction in business shutdowns and an increase in job vacancies, mitigating the adverse effects of implementing UI for entrepreneurs. These subsidies are particularly effective when they target entrepreneurs in the lower end of the productivity distribution, resulting in increased welfare for this group. Compared to other social protection policies, this modified version of UI for entrepreneurs proves to be more welfare-enhancing.

We conclude by addressing the limitations of our findings. Our model may underestimate the potential positive impacts of UI for entrepreneurs due to a couple features. Firstly, the implementation of UI for entrepreneurs could incentivize the creation of more firms by increasing the value of starting businesses, thereby tightening the labor market. However, given that entrepreneurial entry is exogenously determined in our model, we do not capture this positive effect of the new UI scheme. Secondly, as the exits induced by the new UI system primarily affect low- productivity entrepreneurs, the aggregate productivity of the economy could increase. Because our model does not include aggregate productivity, we do not consider this cleansing effect of UI for entrepreneurs. We leave these aspects for future research.

APPENDIX

A. *Entrepreneurs' exit decisions*

Figure A1 depicts the policy function $z^*(a, n)$, which illustrates how the optimal productivity threshold for entrepreneurs varies with their asset levels and the number of employees. z^* decreases as assets increase, suggesting that entrepreneurs with higher asset levels are more likely to continue their business despite low realized productivity, while those with lower assets require higher productivity to survive. The number of employees does not appear to have a significant impact on z^*. Upon implementing UI for entrepreneurs, the policy function shifts upward, indicating that a higher level of productivity is required to prevent business closure under the new UI system. This shift is particularly pronounced for entrepreneurs with lower asset levels. As asset levels increase, the difference between the policy functions diminishes, suggesting that business closures are more prevalent among entrepreneurs with lower asset levels.

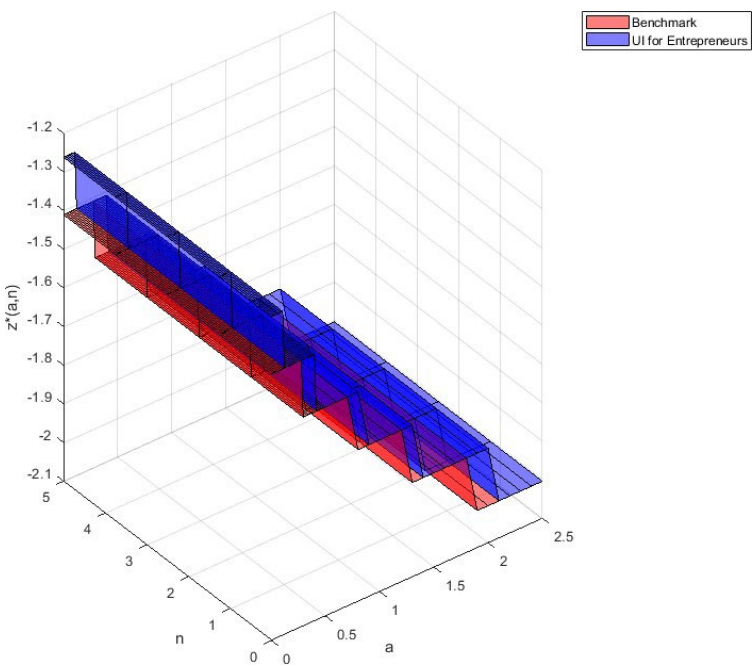


FIGURE A1. POLICY FUNCTION FOR z

B. *Computational Appendix*

We start by discretizing the state space for assets and entrepreneurial productivity. Productivity, which is assumed to follow a continuous AR(1) process, is discretized using the method proposed by Tauchen (1986). We jointly

solve for equilibrium and calibration procedures by following the algorithm below.

1. Guess a vector of parameters ($A, \kappa, \lambda_u, C_{exit}, \delta$), market tightness, and government transfer payments.
2. Compute the policy functions for consumption, the number of vacancies posted, and exit decisions by solving the problems for each type of worker and entrepreneur.
3. Update the value functions.
4. Repeat steps 1-3 until the value functions converge.
5. Using the policy functions obtained above and the initial distributions of assets and productivity, calculate the distributions of workers and entrepreneurs. We assume that individuals in the model economy start with no assets and that the initial distribution of entrepreneurial productivity follows a normal distribution.
6. Compute the government surplus or deficit from the government budget constraint and update the government transfer payments.
7. Update the market tightness.
8. Compute the model moments.
9. Repeat the whole process until the difference between model moments and corresponding data targets is small enough, the government budget constraint is balanced, and the market tightness converges.

C. *Case of a joint UI budget*

In this section, we extend the model by combining the UI budget for both wage workers and entrepreneurs. The contribution rate is set such that the combined UI budget is balanced. The joint equilibrium contribution rate turns out to be around 2.8 percent. This means both wage workers and entrepreneurs now face higher UI contributions.

Compared to the scenario with a separate budget, the most significant difference is observed in the responses of employers, who reduce the number of employees rather than closing down their businesses. Because entrepreneurs share the burden of employees' UI contributions, the cost of maintaining employees becomes too high with the increased rate. Table A1 shows that the share of entrepreneurs is higher in the case of a joint budget, while the share of employers is lower. Despite the reduced number of employers, labor market tightness does not decrease due to the decreased inflow to employment from entrepreneurs. Also, the size of government transfers received by individuals increases because there is no longer a need to offset the UI budget deficit.

These changes result in significant welfare enhancements. Table A2 shows that with the joint budget, the welfare losses from introducing UI for entrepreneurs are much smaller. The average welfare is only 0.14 percent lower than in the benchmark economy where there is no UI for entrepreneurs; entrepreneurs and originally UI-ineligible unemployed workers experience welfare gains. The average welfare loss of -0.14% is substantially smaller than in the case of a separate budget (-1.36%), and

almost equivalent to that in Policy 3 (-0.06%) in Section 4, which is the most welfare-enhancing scenario.

TABLE A1—JOINT BUDGET AND KEY ECONOMIC VARIABLES

	Base	Joint budget	Separate budget
Entrepreneurs / Employed	0.2453	0.2475	0.2293
Employers / Entrepreneurs	0.2384	0.2181	0.248
Business closures / Workforce	0.0043	0.0043	0.0044
Unemployed rate	0.0892	0.0891	0.0918
Newly employed / Workforce	0.0779	0.0736	0.0752
Labor market tightness	0.989	0.979	0.9197
Transfer payments	0.2625	0.2725	0.245

TABLE A2—JOINT BUDGET AND WELFARE CHANGES (%)

	Joint budget	Separate budget	Policy 3
Average	-0.14	-1.36	-0.06
Unemployed w/ UI	-0.18	-1.39	-0.09
Unemployed w/o UI	0.16	-1.06	0.24
Wage workers	-0.19	-1.39	-0.1
Entrepreneurs	0.03	-1.27	0.08

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