Liquidity, Risk, and Occupational Choices - Appendix Not for Publication

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1 Model

We here provide a more detailed exposition of the model proposed in the main text. Consider a population of individuals who are heterogeneous in their initial wealth a and in their risk aversion r, drawn respectively by smooth distributions F and G with density f and g. Individuals live for two periods. In the first period, they choose their occupation: either they become self-employed, which requires a fixed investment of k units of capital, or they look for a salaried job. In addition, they choose the amount of wealth they wish to save from period 1 to period 2. We denote with s^e the amount of savings decided by an individual in case he becomes entrepreneur and with s^w the amount decided in case he looks for a salaried job. We do not allow borrowing and so impose

$$s^w \geq 0 \text{ and } s^e \geq 0, \tag{1}$$

and we normalize the returns of saving to one.

In the second period, individuals enjoy the returns from their occupation. The self-employed get y with probability p and zero otherwise. Among those who look for a salaried job, a fraction λ finds one while the rest remain unemployed. In the former case, individuals get a fixed wage w, while if unemployed they enjoy benefits b (e.g., non-monetary benefits, non-market production), with $b \leq w$. We further assume that

$$py - k \geq \lambda w + (1 - \lambda)b, \tag{2}$$

and

$$p \leq \lambda. \tag{3}$$

Notice that the variance of expected income as self-employed is $p(1-p)y^2$ while the corresponding variance for those who look for a salaried job is $\lambda(1-\lambda)(w-b)^2$. Equations (2) and (3) are sufficient to show that the former exceeds the latter. That is, self-employment is a profitable yet risky activity.

Savings and occupation are chosen in order to maximize

$$U = u(x_1) + \mathbb{E}[u(x_2)],$$

where $\mathbb{E}[\cdot]$ is the expectation operator and x_1 and x_2 denote consumption in period 1 and 2. We make the standard assumption that u exhibits decreasing absolute risk aversion (DARA) and for simplicity we abstract from time discounting. Finally, irrespective of their choices, individuals are entitled to cash transfers C_1 in period 1 and C_2 in period 2.

The expected utility of those who become entrepreneurs is

$$U^E = u(a - k - s^e + C_1) + pu(s^e + y + C_2) + (1 - p)u(s^e + C_2),$$

while for those who look for a job it is

$$U^W = u(a - s^w + C_1) + \lambda u(s^w + w + C_2) + (1 - \lambda)u(s^w + b + C_2).$$

We can then define the difference

$$D = U^E - U^W,$$

and say that an individual prefers being self-employed if $D \geq 0$. As standard in this class of models, there exists a threshold level of risk aversion r^* such that $D \geq 0$ for those with $r \leq r^*$. The equilibrium share of self-employed, denoted with ne, is then defined as

$$ne = G(r^*)[1 - F(k - C_1)].$$

Those with $r > r^*$ or $a + C_1 < k$ instead are either salaried or unemployed. Our main interest is in exploring how ne varies with the transfers C_1 and C_2.

Equivalence between Current and Future Transfers Consider first those individuals for whom borrowing constraints in (1) do not bind. These individuals set s^w such that their expected marginal utility is equalized across periods, i.e.,

$$u'(a - s^w + C_1) = \lambda u'(s^w + w + C_2) + (1 - \lambda)u'(s^w + b + C_2), \tag{4}$$

and in the same way they choose s^e such that

$$u'(a - k - s^e + C_1) = pu'(s^e + y + C_2) + (1 - p)u'(s^e + C_2). \tag{5}$$

Moreover, choosing $s^e > 0$ implies $a + C_1 > k$; hence, they become entrepreneurs if and only if $D \geq 0$. Notice also that by the envelope theorem we have

$$\frac{dD}{dC_1} = u'(a - k - s^e + C_1) - u'(a - s^w + C_1), \tag{6}$$

and

$$\frac{dD}{dC_2} = pu'(s^e + y + C_2) + (1 - p)u'(s^e + C_2) - \lambda u'(s^w + w + C_2) - (1 - \lambda)u'(s^w + b + C_2). \tag{7}$$

Substituting (4) and (5) into (6) and (7), we can see that for these individuals

$$\frac{dD}{dC_1} = \frac{dD}{dC_2}, \tag{8}$$

and so their occupational choice respond in the same way to current and future transfers.

Liquidity Constraints Consider the case in which $k > C_1$ and individuals are risk neutral. In this case, due to (2), everyone would like to be an entrepreneur, that is $D \geq 0$ for all individuals, while only those with $a + C_1 \geq k$ can do so. Hence, we would have $ne = 1 - F(k - C_1)$ and so

$$\frac{\partial ne}{\partial C_1} = f(k - C_1) \geq 0 \text{ and } \frac{\partial ne}{\partial C_2} = 0. \tag{9}$$

The total effect of changing C_1 and C_2 on ne depends on the fraction of the population who can optimally set its savings, for which equation (8) holds, and the fraction with binding borrowing constraints, for which equation (9) holds. Still, combining (8) and (9), we can say that the share of self-employed in period 1 is more responsive to period 1 than to period 2 transfers.

Insurance Constraints Consider the case in which start-up capital is low, that is $k \leq C_1$, but individuals are risk-averse. In this case, all those for whom $D \geq 0$ become self-employed, i.e. $ne = G(r^*)$. Consider an individual who is marginal in the occupational choice. We first notice that, for this individual, $s^e \geq s^w$ and so he never sets $s^e = 0$ and $s^w > 0$. In fact, suppose he sets $s^e < s^w$. Due to DARA utility, C_2 increases risk-taking through a classic wealth effect, and so when $D = 0$ we have

$$\lambda u^{'}(s^w + w + C_2) + (1 - \lambda)u^{'}(s^w + b + C_2) < pu^{'}(s^e + y + C_2) + (1 - p)u^{'}(s^e + C_2).$$

Combining the last inequality with (4) and (5), we have

$$u^{'}(a - s^w + C_1) < u^{'}(a - k - s^e + C_1),$$

which requires $s^w < k + s^e$ and so it is inconsistent with $s^e < s^w$. Hence, we have that

$$\begin{aligned} u^{'}(a - s^w + C_1) - \lambda u^{'}(s^w + w + C_2) - (1 - \lambda)u^{'}(s^w + b + C_2) > \\ u^{'}(a - k - s^e + C_1) - pu^{'}(s^e + y + C_2) - (1 - p)u^{'}(s^e + C_2). \end{aligned} \tag{10}$$

Combining (10) with (6) and (7), we have

$$\frac{dD}{dC_2} > \frac{dD}{dC_1}. \tag{11}$$

The total effect of changing C_1 and C_2 on ne depends on the fraction of the population who can optimally set its savings, for which equation (8) holds, and the fraction with binding borrowing constraints, for which equation (11) holds. Still, combining (8) and (11), we can say that the share of self-employed in period 1 is more responsive to period 2 than to period 1 transfers.

As a summary of the above results, we state the following Proposition.

Proposition 1 *Suppose individuals face constraints in allocating transfers across periods. Then current occupational choices are more responsive to the size of current transfers if liquidity constraints bind, while they are more responsive to the size of future transfers if insurance constraints bind.*

Working capital We now extend our model and introduce working capital. In fact, if the self-employed need additional investments before the initial investment starts to pay off, future transfers can influence current occupational choices even in a world with no risk. To explore this argument in the simplest framework, suppose entrepreneurs need to invest k_1 in period 1, k_2 in period 2 and they gain π_3 in period 3. Suppose payoffs are deterministic and such that self-employment is more profitable than salaried work. In order to become self-employed, it is necessary that

$$a + C_1 \geq k_1, \tag{12}$$

and

$$C_2 + (a + C_1 - k_1) \geq k_2, \tag{13}$$

where $(a+C_1-k_1)$ is the maximal amount of period 1 savings. If $k_2 < C_2$, then (12) binds and so $ne = 1 - F(k_1 - C_1)$. Hence, equation (9) holds, and the share of self-employed in period 1 is more responsive to the amount of period 1 transfers than to period 2 transfers. If instead $k_2 \geq C_2$, then (13) binds and so $ne = 1 - F(k_2 - C_2 - C_1 + k_1)$. In this case,

$$\frac{\partial ne}{\partial C_1} = f(k_1 + k_2 - C_1 - C_2) = \frac{\partial ne}{\partial C_2},$$

and so the share of self-employed in period 1 is equally responsive to period 1 and to period 2 transfers. Hence, future transfers may be relevant even with no insurance constraints. But, at least in this simple form, allowing for future investments is not sufficient to predict that future transfers matter more than current transfers.

Table A.1: Indicators of Covariate Balancing, Before and After Matching

Variable	Sample	Treated	Control	%Bias	T-C Diff (t-test)	Poly Reg (F-test)
	(1)	(2)	(3)	(4)	(5)	(6)
Years of Education	Unmatched	3.0346	2.2737	28.5		
	Matched	3.0448	3.0755	-1.1	0.505	0.899
Female	Unmatched	0.58911	0.58481	0.9		
	Matched	0.58781	0.58658	0.2	0.343	0.214
Age	Unmatched	39.681	42.807	-23.3		
	Matched	39.692	40.392	-5.2	0.241	0.001
Indigenous	Unmatched	0.41775	0.32586	19.1		
	Matched	0.41833	0.41916	-0.2	0.338	0.201
Individual Income	Unmatched	270.74	508.24	-38		
	Matched	272.34	267.88	0.7	0.251	0.779
Households Income	Unmatched	810.49	1370.9	-52.6		
	Matched	815.23	790.24	2.3	0.226	0.685
Number of Rooms	Unmatched	1.559	1.4882	7.6		
	Matched	1.5615	1.5512	1.1	0.458	0.973
Poverty Index	Unmatched	635.12	658.79	-33.4		
	Matched	639.97	645.62	-8	0.113	0.001
Land Ownership	Unmatched	0.5591	0.43787	24.4		
	Matched	0.55917	0.52548	6.8	0.426	0.370

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Table A.1 – Continued

	Sample	Treated	Control	%Bias	T-C Diff (t-test)	Poly Reg (F-test)
	(1)	(2)	(3)	(4)	(5)	(6)
Animals Ownership	Unmatched	0.31931	0.23227	19.6		
	Matched	0.31605	0.31462	0.3	0.390	0.550
Female HH Head	Unmatched	0.02939	0.07317	-19.9		
	Matched	0.02981	0.0292	0.3	0.517	0.996
Children Aged 0-5	Unmatched	0.74158	0.68239	13.1		
	Matched	0.73729	0.747	-2.1	0.309	0.010
Children Aged 6-12	Unmatched	0.74127	0.58194	34.2		
	Matched	0.73667	0.72606	2.3	0.492	0.472
Children Aged 13-15	Unmatched	0.40061	0.24678	33.3		
	Matched	0.39301	0.43118	-8.3	0.305	0.185
Children Aged 16-21	Unmatched	0.35519	0.32855	5.6		
	Matched	0.35504	0.38403	-6.1	0.275	0.048
Women Aged 21-39	Unmatched	0.73358	0.62061	24.3		
	Matched	0.7303	0.73345	-0.7	0.228	0.116
Women Aged 40-59	Unmatched	0.26804	0.31787	-11		
	Matched	0.27046	0.28385	-2.9	0.317	0.636
Women Aged 60+	Unmatched	0.09009	0.20803	-33.6		
	Matched	0.09081	0.08147	2.7	0.287	0.256
Men Aged 21-39	Unmatched	0.64199	0.56569	15.6		
	Matched	0.64164	0.63501	1.4	0.419	0.353

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Table A.1 – Continued

	Sample	Treated	Control	%Bias	T-C Diff (t-test)	Poly Reg (F-test)
	(1)	(2)	(3)	(4)	(5)	(6)
Men Aged 40-59	Unmatched	0.34492	0.35992	-3.1		
	Matched	0.34491	0.36067	-3.3	0.280	0.326
Men Aged 60+	Unmatched	0.08531	0.22636	-39.6		
	Matched	0.08615	0.08115	1.4	0.492	0.550
Share of Entrep.	Unmatched	0.09076	0.09655	-7.3		
	Matched	0.09101	0.0894	2	0.335	0.687

NOTE: This table reports matching quality indicators for each covariate included in the propensity score specification. Columns (2)-(3) display sample means for the treated and control (or matched) groups. In column (4), we report the median absolute standardized bias, defined as the difference of the sample means in the treated and control (or matched) sub-samples as a percentage of the square root of the average of the relative sample variances. In column (5), we present the p-values of the two sided t-test of mean differences between the treated and the control group within deciles of the estimated propensity score. In column (6), we report p-values of the F-test of the joint null that the coefficients on all of the terms involving the treatment dummy equal zero in a polynomial regression of degree 5 of each covariate on the estimated propensity score, the treatment dummy and the interaction terms.